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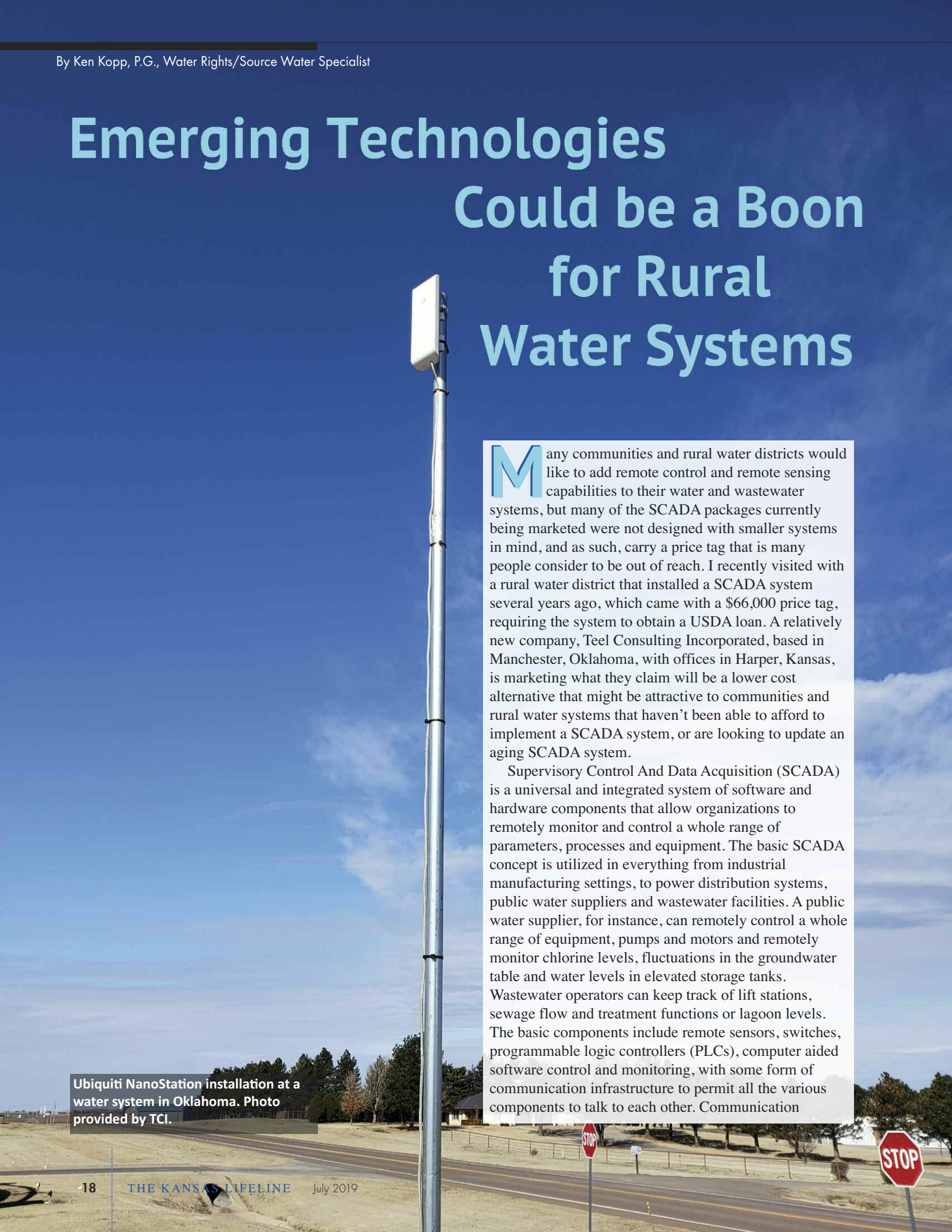
Emerging Technologies Could be a Boon for Rural Water Systems



Ubiquiti NanoStation installation at a water system in Oklahoma. Photo provided by TCI.

Many communities and rural water districts would like to add remote control and remote sensing capabilities to their water and wastewater systems, but many of the SCADA packages currently being marketed were not designed with smaller systems in mind, and as such, carry a price tag that is many people consider to be out of reach. I recently visited with a rural water district that installed a SCADA system several years ago, which came with a $66,000 price tag, requiring the system to obtain a USDA loan. A relatively new company, Teel Consulting Incorporated, based in Manchester, Oklahoma, with offices in Harper, Kansas, is marketing what they claim will be a lower cost alternative that might be attractive to communities and rural water systems that haven't been able to afford to implement a SCADA system, or are looking to update an aging SCADA system.

Supervisory Control And Data Acquisition (SCADA) is a universal and integrated system of software and hardware components that allow organizations to remotely monitor and control a whole range of parameters, processes and equipment. The basic SCADA concept is utilized in everything from industrial manufacturing settings, to power distribution systems, public water suppliers and wastewater facilities. A public water supplier, for instance, can remotely control a whole range of equipment, pumps and motors and remotely monitor chlorine levels, fluctuations in the groundwater table and water levels in elevated storage tanks. Wastewater operators can keep track of lift stations, sewage flow and treatment functions or lagoon levels. The basic components include remote sensors, switches, programmable logic controllers (PLCs), computer aided software control and monitoring, with some form of communication infrastructure to permit all the various components to talk to each other. Communication

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typically is achieved over UHF radio frequencies, copper phone lines, fiber optic or cellular technologies. SCADA can also allow water and wastewater operators the ability to monitor and control their assets from multiple devices at any location over the internet, including desktop computers, tablets and cell phones.

One of the ways TCI is hoping to cut costs is the integration of Ubiquiti Labs' wireless networking products, operating in the FCC license-free 5.0 GHz frequency range. The advantage of integrating this type of point to point technology with a SCADA system is that a water or wastewater system can purchase these internet protocol (IP) radios, off the shelf and at very low cost, without the need for monthly service charges from a third-party telecommunications company to provide telephone, internet or cellular connectivity at every site being monitored or controlled. This technology is especially ideal for connectivity between rural sites that may not have internet access or where cellular data is unreliable or non-existent. Depending upon local terrain, the Ubiquiti Air Fiber radios can have a communication range of approximately 100 miles, which would generally provide an adequate footprint for data collection across most systems in Kansas. However, in some extreme cases, a much greater range can be obtained. In 2007, for instance, a non-profit association founded by a group of Italian radio amateur operators set a world record for Wi-Fi

Ubiquiti AirFiber installation on an elevated water storage tank in Oklahoma. Photo provided by TCI

Ubiquiti LightBeam (small dish) installation at a wellhouse in Oklahoma. Photo provided by TCI.

communications, establishing a data connection over a distance of 188.89 miles between Monte Amiata (Amiata Mountain) in central Italy to the island of Sardinia, achieving data-rates of about 5Mbps, at 5GHz using stock Ubiquiti (XR5) gear and parabolic dish antennas. While TCI doesn't suggest they'll be able to break any world records with Ubiquiti gear, the topography of Kansas and the High Plains is ideally suited for distances within the upper range of normal, especially for systems with access to an elevated storage tank or a radio tower. Repeater sites can be utilized to make an additional wireless hop between sites and to expand range, where needed.

Modern Ubiquiti gear can sustain a data throughput of up to 100Mbps. With such data rates, a community or rural water district also would be able to integrate security cameras and instantaneous real-time monitoring throughout the entire system. The radios operate on a standard electrical power supply (110v), but where necessary, the Ubiquity radios are also well suited for photovoltaic solar power, if electrical service is not readily available at a monitoring or control site. System wide security is provided by linking sites with encrypted virtual private network (VPN) technology.

Utilizing Ubiquiti Air-Fiber technology also has other implications for bringing internet access to remote sites and to allow a community to utilize Internet of Things (IoT) technology to effectively manage other assets and resources. As an example, a project TCI worked on in Oklahoma stacked internet access on the Ubiquiti

network to provide more reliable internet access to a city library. They have also done work for municipal and county law enforcement offices, to set up cameras and alarm systems. Additional functions on the network such as these can be kept secure and discrete from the SCADA data and other network functions.

TCI systems works with and can support the likely more well-known SCADA software packages, such as WonderWare and DAQfactory, but TCI also has their own customizable software, a version of MYSCADA, which is a basic and intuitive graphical user interface that can be tailored for the specific needs of a smaller system. TCI claims to be able to implement MYSCADA at a fraction of the cost of other software platforms, which is another way they are hoping to make SCADA systems more affordable. And while most SCADA systems focus solely on real-time current information, TCI's implementation of MYSCADA incorporates automated tracking, record keeping and report data. They can also program other parameters, such as the limitations of a systems water rights in MYSCADA, to prevent an operator from unwittingly exceeding their authorized instantaneous diversion rates or annual quantities. Their system is also highly scalable. With low startup costs for a very basic system, additional components can be added and the system easily expanded over time as funds become available. No system is too small for MYSCADA and Ubiquity. As an example, TCI recently worked with the water operator at Foss, Oklahoma, a rural community of 150 people along I-40, in western Oklahoma, to network their system and add SCADA to a system with two wells and an elevated storage tank.

TCI is just beginning to break into the SCADA market in Oklahoma and Kansas, but is looking to try their MYSCADA software and Ubiquiti radios at more systems. While TCI certainly isn't the only option for implementing SCADA technology in Kansas, their innovative approach to new technologies and their apparent willingness to work within the limited resources of many rural water and wastewater systems seems to make them an attractive alternative.

More information about the types of Ubiquiti products being utilized by TCI can be found online at the following links:

http://ui.com/airmax/nanostation-ac/

http://ui.com/airmax/litebeam-ac-gen2/

http://ui.com/airfiber/airfiber5/

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