

Smart Water Grid application to Geumsan City, South Korea

Seongjoon Byeon, Pierre Y. Julien and Hwa Young Kim
Department of Civil and Environmental Engineering, Colorado State University

Abstract. This study focuses on the water supply and water treatment systems. The water supply originates from multiple sources including dams, reservoirs, rivers, lakes, rainfall harvest, ground water, desalination plants and waste water treatment plants etc. Only few of those sources are currently being used and many water distribution systems experience high losses and low revenue rates. It is imperative to improve the efficiency of the water supply system to gain a better understanding of the water cycle in the urban environment. The Smart Water Grid (SWG) project combines Water Business (Water) with Information Business (Smart) and Infrastructures Business (Grid). In bridging an important gap in the field of water resources, the SWG approach not only ensures water quality and a safe water supply with high efficiency and low cost, but it also prepares for climate change. We are seeking a practical way for investigating water conservation in pipe networks by checking outbreak locations and the non-revenue water losses. This can be achieved by closing valves and stop supplying water to pipe networks while monitoring water flow meters at night time when the water use is approximately zero. To increase water revenue, the SWG is applied to Geumsan City in South Korea. This city has a 30 year old pipeline network and is being used to test the applicability of the SWG approach. Large blocks of pipeline networks were tested for leakage. New methods for tracing leakages and apparent losses such as unauthorized consumption, meter errors, and systematic data handling errors are developed by: (1) polygon inspection to find block with losses; (2) polyline inspection to find pipeline with losses; and (3) point inspection to find accurate point losses. Traced and closed blocks are developed using a validated version of the EPA-NET model so that optimized maintenance and monitoring can be applied by using the SWG approach. This practical approach can serve as a business model for small or isolated towns by maintaining low cost operations and achieving high efficiency in water use and increasing the ratio of revenue to non-revenue water.