



Smart water grid: the future water management platform

Seung Won Lee, Sarper Sarp, Dong Jin Jeon, Joon Ha Kim*

School of Environmental Science and Engineering, Gwangju Institute of Science and Technology, 261 Cheomdan-gwagiro, Buk-gu, Gwangju 500-712, South Korea, email: joonkim@gist.ac.kr

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ABSTRACT

This study introduces a schematic methodology for smart water grids (SWGs) for use in water management platforms, which integrates information and communication technology (ICT) into a single water management scheme. SWG technology is seen as a promising solution for resolving recent critical global water problems. To ensure the security of water quantity, safety of water quality, and ICT-based water management solutions, SWG technology should integrate five prime research areas: (1) platform configuration in both water and ICT networks, (2) guarantee water resources including both natural and manufactured water, (3) intelligent control of water flow using bi-directional communication in water infrastructure, (4) better management scheme dealing with risk-minimization for assets in the water infrastructure, and (5) energy efficiency in operating and maintaining water infrastructure. Two platforms (i.e. water and ICT platforms) are introduced as examples of well-designed platforms for the management of bi-directional water and data flows in accordance with both the consumer's water demands and supplier's water distribution schemes, in both centralized and decentralized water distribution grids. To guarantee water resources, harvesting both natural sources (e.g. river, lake, groundwater, etc.) and manufactured sources (e.g. desalination, reused waters, etc.) is proposed as a top priority. Using the platforms and multiple water resources, the intelligent water grid control plays a key role in satisfying the consumer's as well as the supplier's water needs, using self-diagnosing sensors and ICT-based cooperative networks. Improved management in risk-minimization for water infrastructure assets requires the GIS-based information of assets, their historical changes, and their renewal plans according to monitoring/forecasting data, etc. To improve water infrastructure energy efficiency, low energy processes combined with alternative energy sources and smart power grid management are suggested as key cost-saving methods for water production and/or distribution. Thus, integrating the five prime research areas in SWG technology can provide water managers insight into planning water infrastructure and shed light on the roles of the SWGs in future smart cities.

Keywords: Smart water grid; Intelligent water management; Water infrastructure; Bi-directional water flow; Centralized and decentralized water network; Water-energy nexus

*Corresponding author.