基础类成果

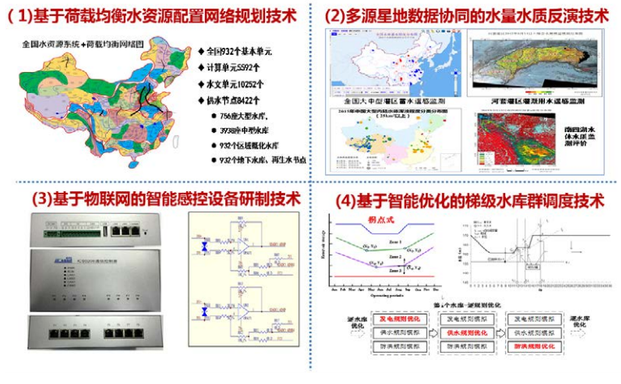
智能水网工程理论与技术

【创新性】

提出了智能水网的概念模型，解析了现代水网系统结构，诠释了智能水网的概念内涵和 SMART 表征，提出了水物理网、水信息网和水管理网组成的基本框架及关键技术体系。提出了智能水网的建构方向，提出了以空间均衡和高效利用、以全面感知和智能辅助决策、以科学决策和精准控制等为核心的水物理网、水信息网、水管理网的重点建设任务。研究了智能水网的关键技术，研发了基于荷载均衡的水资源配置网络规划、多源星地数据协同的水量水质监测、基于物联网的感控设备研制、基于智能优化的梯级水库群调度等关键技术。开展了智能水网的区域应用，在北京、天津、河北、山东、云南、黑龙江、广西等区域开展了现代水网规划建设理念方法与技术的典型应用。

【影响力】

时任副总理汪洋到中国水科院调研时，我院向其提交了《建设国家智能水网，提升水安全保障能力》的材料。向水利部呈报了《关于将“国家智能水网工程”作为新时期水利创新发展战略抓手的建议》。起草了“关于京津冀协同发展框架下水安全保障机制建设的建议”，提出建设京津冀一体化水网，得到李克强总理批示。“水利现代化建设的综合载体－智能水网”获水利部组织的“探索中国特色水利现代化道路”主题征文第 1 名。“智能水网工程技术”被中国工程院“工程科技 2035 发展战略研究”遴选为公共安全水领域未来核心技术。科技部将“智能水网工程技术”列为水利领域未来 5-10 年将对我国产生重大效益的 5 项关键技术之一。与 KICT 等国际机构就智能水网作为专题进行多次交流。



主要完成人：王建华、匡尚富、赵红莉、王峥瀛、冶运涛、赵　勇、田　雨、肖晓春、尚毅梓、袁平路

受奖单位：水资源所

THEORY AND TECHNOLOGY OF SMART WATER GRID PROJECT

【Innovation】

It proposed the conceptual model of Smart Water Grid(SWG), analyzed the structure of the modern water network system, and interpreted the connotation of the SWG and its SMART characteristics, and put forward the basic framework and key technical system consisted of water physical network, water information network and water management network. It also gave the direction to the building of the SWG, and assigned key tasks for the construction of water physical network, water information network and water management network centering on balanced and efficient space utilization, fully perceived and intelligent assistant decisions, and scientific decision-making and precise control. It studied key technologies for the SWG, such as the planning on the water resource allocation network based on load balancing, water quantity and quality monitoring with multi-source satellite-ground data collaboration, research and development of IoT-based sensing-controlled equipment, the cascaded multi-reservoir scheduling based on intelligent optimization, etc. It carried out the regional application of the SWG, achieving the typical application of the concept, method and technology for the planning and construction of the modern water network in regions such as Beijing, Tianjin, Hebei, Shandong, Yunnan, Heilongjiang, Guangxi, etc.

【Influence】

When Wang Yang, then vice minister of China, conducted a survey at IWHR, we submitted a report on “building the national smart water grid and improving the water safety guarantee capacity” to him. IWHR submitted a report entitled “Opinions on viewing the national smart water grid project as a strategic opportunity for innovative development of water conservancy in a new era” to the Ministry of Water Resources of the People’s Republic of China. It drafted the “Opinions on establishing the water safety guarantee mechanism under the collaborative development of Beijing, Tianjin and Hebei, and proposed the building of the integrated water network for Beijing, Tianjin and Hebei, which was approved by Premier Li Keqiang. “Smart Water Grid - a comprehensive carrier for the hydraulic modernization construction” ranked the first place in an article-soliciting activity themed “Exploring the path of hydraulic modernization with Chinese characteristics”, which was organized by the Ministry of Water Resources of the People’s Republic of China. The “smart water grid project technology” was selected as a core technology in the public safety water sector in the future by the “strategic research of the development of engineering science and technology in 2035 ” of the Chinese Academy of Engineering. The Ministry of Science and Technology of the People’s Republic of China listed “smart water grid project technology” as one of the five critical technologies that will bring great benefits to China’s water resources sector over the next five to ten years. The research group has carried out various exchanges on the SWG with international institutions, including KICT, as a special subject.

Main Contributor : Wang Jianhua, Kuang Shangfu, Zhao Hongli, Wang Zhengying, Ye Yuntao, Zhao Yong, Tian Yu, Xiao Xiaochun, Shang Yizi, Yuan Pinglu

Award-winning Unit : Department of Water Resources