Development of innovative data acquisition and transmission systems for diagnosis and control of water networks

Introduction and state of the art

The Regulatory Authority for Energy, Networks and Environment (Autorità di Regolazione per Energia, Reti e Ambiente, ARERA) in 2017 introduced the resolution 917/2017R/idr, containing a specific Technical Quality Regulation about the integrated water services (RQTI) [1]. This regulation considers all the aspects related to the water supply, including the urban wastewater collection and treatment. It is a measure of great importance because every year the Italian water managers must report to the Authority their technical and economic performance, using specific forms. The evaluated classes are then used to rank the managers and only the best performing managers in Italy are allowed to increase the tariffs and hence the income, while the worst-performing managers must decrease tariffs and related incomes.
The result of the new regulations was an increase of the interest in the control of the managed systems, i.e. water supply and distribution, sewer and treatment systems. For this reason, there is an increasing interest in the market about automatic control systems that are able to increase the values of the macro-indicators defined by the 2017 resolution.
The water distribution systems in the Umbria region are highly fragmented, with a few main interconnected systems and many small systems in the peripheral areas.

Research objectives

The research aims to find and apply innovative techniques to improve the macro-indicators of the technical quality of the integrated water service by developing smart control systems.
Considering the particular features of the Umbria region systems, such aims will include the design, production and test of low cost, highly distributed ultra low power systems.

Methodology

The available technology for the system monitoring and control will be reviewed and then innovative systems will be proposed for special needs, such as the water treatment in small systems, the analysis of transients for monitoring and diagnosis, the functioning conditions of sewer systems and others. The cooperation with water distribution managers will be crucial in pointing out the most relevant needs. The required knowledge about big data collecting, ultra low power monitoring systems and Italian regulations about the water sector, will be improved by taking specific courses on these topics.

Expected results

The research activity is expected to help in improvement of the indicator classification, which also guarantee the satisfaction and safety of the users and the reduction of the impact on the environment related to the management of the water resources.