Deploying full water metering at the household/final user level

In a nutshell

SUMMARY
It is best practice to install water meters for each residential unit and any other individual final user (industrial plant, commercial building, public building, etc.) in order to base all water bills on actual water consumption. By adopting smart water meters, in particular, it is possible to monitor water use remotely and in a timely manner and, for instance, to analyse the consumption patterns of different customers or identify weaknesses of the water distribution networks. Billing actual water consumption and enabling early identification of abnormal water usage (e.g. leakages) can result in significant water savings.
Target group
Public administrations responsible for supplying potable water in their territory.
Applicability
The technique is applicable to any existing water supply network.
Environmental performance indicators
• Penetration rate of water metering (% of consumers, % of water consumption covered by metering) • Percentage of smart meters out of the total water meters in use (%) • Reduction in water use by final users after installation of water meters and/or smart meters (l/user)
Benchmarks of excellence
• The penetration rate of water meters at household or final user level is 99 % or higher • In water-scarce areas (at least for part of the year), water meters at household/final user level are smart meters • All new buildings are equipped with water meters (smart meters in water-scarce areas)

Description

It is best practice to install water meters for each residential unit and any other individual final user (industrial plant, commercial building, public building, etc.) in order to base all water bills on actual water consumption. By adopting smart water meters, in particular, it is possible to monitor water use remotely and in a timely manner and, for instance, to analyse the consumption patterns of different customers or identify weaknesses of the water distribution networks. Billing actual water consumption and enabling early identification of abnormal water usage (e.g. leakages) can result in significant water savings.

It is important that residential, public and commercial buildings are equipped meters that allow charging the water bill in light of actual consumption (see Figure 1). In multi-unit dwellings (apartments) and multi-residential blocks, each flat/apartment/housing unit needs to be equipped with a water meter. The water bill includes a basic fee but it mainly

depends on the actual water consumption measured by the meter. Commercial buildings, such as shopping centres or office buildings, public buildings and any other non-residential building or places of water supply are also equipped with a main meter and sub-meters for the relevant consumption areas.

Environmental benefits

Conventional and smart meters lead to a more conscious consumption of water which is thus decreasing and it is associated with the conservation of water resources, with a reduced energy consumption (for pumping and, where required, for treatment), and a reduced chemical consumption where the raw water has to be treated before delivery.

Moreover, smart water meters enable

- a better understanding of time of day residential and commercial consumption and provides a sound basis for seeking behaviour change (more efficient consumption practice) of consumers and, at least, for raising awareness about own water use (Beal et al., 2014),
- the identification of leakages within households (so-called post-meter leakages (Willis et al., 2011; Britton et al., 2013; Beal et al., 2013)) as well as in the water distribution system and network (Beal et al., 2014),
- increasing water end-use (micro-component) insights in residential homes and commercial as well as public buildings (Stewart et al., 2010; Beal et al., 2014),
- helping city and urban planners to better understand consumption trends and exploiting opportunities to extract greater efficiencies from the present supply system (Beal et al., 2014).

Further, the lifetime of smart meters is significantly longer. Usually, conventional meters are exchanged after about six years whereas smart meters are in use for about 15 years. This saves resources and energy for meter production. In addition, smart metering saves costs for reading the consumption and increases the accuracy of the water quantity consumed.

Side effects

There are no relevant cross-media effects known.

When replacing conventional by smart meters, the environmental burden for producing and installing the meters could be considered; however, the replacement often takes place after the lifetime of the conventional meters.

Applicability

The technique is applicable to any existing water supply network.

Economics

The costs for conventional water meters are between 10 and 25 EUR.

When first smart meters were applied in Australia, the price for a smart meter with data logger was about AUD$ 1000 (about EUR 700) (AWA, 2011); however, the system applied included smart meters with data loggers from which the data were permanently transferred by means of radio signals. This was very costly. But today, the price is about EUR 75 in Australia (Beal et al., 2014). In Europe, depending on the situation of the individual Member State, the price is in the range of EUR 90-100 up to 150 – 170. This opens up opportunities for much wider deployment (Beal et al., 2014).

The amortisation time for replacing conventional by smart meters is about 6 years. The assumptions for this calculation are (prices from the calculation of the replacement of conventional by smart meters in the German cities Künzell and Pegnitz):

- 5000 meters in households to be replaced
- Average water consumption per household: 110 m^3/yr
- Fee for potable water: 1.3 EUR/m^3
- Fee for waste water: 2.5 EUR/m^3
- Price for one mechanical meter to be replaced every 6 years: 10 EUR
- Price for the casing of the conventional meter (one time): 13 EUR
- Costs for manual reading of the conventional meter: 9 EUR
- Price of the smart meter: 90 EUR
- Price for the software used: 2 EUR
- Costs for automatically reading the smart meter: 0.5 EUR
- Expected annual reduction of water losses: 2 %

In many cases, the initial investment is a considerable obstacle for municipalities.

Driving forces for implementation

The driving forces are:

- to reduce the costs for the manual reading and to increase its accuracy,
- to detect leakages and to reduce them (post meter leakages and leakages in the distribution network),
- to improve the quality of the consumption data to cross-check the water balance practically real-time,
- to use the data in order to raise awareness and behaviour of consumers.

Reference organisations

Conventional meters are in use across Europe. In hundreds of municipalities, cities or villages in Germany, the Netherlands, Denmark and Sweden (most probably in other countries as well), all households and other final water users are equipped with conventional meters; the consumption is recorded and billed at least once a year.

Smart meters are in use in following cities and countries:

- New York/US: about 875,000 (Beal et al., 2014)
- Whole United States: about 10 million (Beal et al, 2010)
- Australia: about 20,000 (Beal et al. 2014)
- Delhi/India: about 250,000 (Boyle et al., 2013)
- Mumbai/India: about 150,000 (Boyle et al., 2013)
- Ottawa/Canada: about 210,000 (Boyle et al., 2013)

- Abbotsford/Canada: about 25,000 (Boyle et al., 2013)
- Malta: about 120,000 (Boyle et al., 2013)
- Künzell/Germany: about 5000 (Künzell, 2014)
- Pegnitz/Germany: about 2300 (more 5200 within the next 4 years) (Pegnitz, 2014)
- Skanderborg Forsyning/Denmark: about 6500 (http://www.skanderborgforsyning.dk/)
- Hammel Water/Denmark: about 3200 (http://www.hammelvandvaerk.dk/)
- Sønderborg Forsyning/Denmark: about 3000 (http://sonfor.dk/), additional 15000 smart meters will be installed
- Vestforsyningen/Denmark: 8000 (http://www.vestforsyning.dk/)
- Hjerting Water/Denmark: 3200 (http://www.hjerting.net/).

Literature

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