Smart Water Metering in Japan

Japan Water Research Center

May 2016
Table of Contents

• Overview of Smart Water Metering in Japan

• Necessity & Potential Benefits of Smarter Metering

• Current Status of Metering Efficiency (AMR & AMI)

• Issues & Concerns of Smarter Metering

• Smart Water Meter Study Group (Smart Water Metering Committee)

AMR : Automated Meter Reading
AMI : Advanced Metering Infrastructure
Overview of Smart Water Metering in Japan

Water supply

- Population decline impacting supply demand and utility revenues
- 97% water supply coverage = 97% meter penetration
- Meters reads normally done manually every 2 months
- AMR adopted in heavy snow areas and by some progressive utilities
- 1,400 large water supplies (serving > 5,000 people) = difficult to have one standard system
- Limited number of utilities engaged in AMI field tests

1970s 1990s 2010s 2015

48,000 wired-AMR operated in Tokyo (1976-98)
several millions of mobile-AMR operated in snow areas
AMI field test start by Kobe etc.
Electricity & Gas start nationwide smart meter deployment to be complete by 2025
Necessity & Potential Benefits of Smarter Metering

Necessity

Population decline: difficult to project “reduction in demand” → Important to understand individual water use accurately and more frequently

Benefits

• Better planning of system downsizing and infrastructure renewal
• Better demand forecast per distribution block and time of the day
• Effective pressure control
• Prompt leakage detection on service and distribution mains

Population trend and projection in Japan
(Source: National Institute of Population and Social Security Research)
Automated meter reading adoption very limited. Why?

- With 97% of properties already metered, new installation would involve large initial cost.
- Manual reading is so common (70% of total) that its outsourcing is affordable.
- Bimonthly reading being a long-standing practice, few utilities are motivated for more frequent data collection (reading for billing, not for management planning!)
Current Status of Metering Efficiency – AMR (2)

Hokkaido  Sapporo
A. Since 1998  
B. 56,000 properties  
C. Heavy snow area; Improved reading efficiency  
D. Meter reading by mobile device

Wakayama  Koya
A. Since 2000  
B. 1,700 properties  
C. Improved reading efficiency  
D. Automatic remote reading via cable

Nagano  Tateshina
A. Since 1996  
B. 2,600 Properties  
C. Improved reading efficiency  
D. For water and gas using cable broadcasting

Tokyo
A. Since 2010  
B. 57,000 properties  
C. Mitigate reading difficulty, Improved efficiency  
D. Meter reading by mobile device

Source: Made by JWRC
## Current Status of Metering Efficiency – AMI (1)

<table>
<thead>
<tr>
<th></th>
<th>Tokyo Waterworks Bureau</th>
<th>Yokosuka Waterworks Bureau</th>
<th>Yokohama Waterworks Bureau</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What to do</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Visualization of water use at property through in-house device and Internet</td>
<td>Smart meter installed at 200 properties using wireless communication (u-bus air); assess technology and data processing</td>
<td>Smart meter and electric meter installed at apartment buildings; connect both to the same transmitter and compare efficiency and reliability between property-visit reading and of wireless automated reading</td>
</tr>
<tr>
<td>2.</td>
<td>Email alarm to customers about unusual water consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Partner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• NTTPC Communications</td>
<td>• Daiichi-Kankyo Corporation</td>
<td>• Tokyo Gas</td>
</tr>
<tr>
<td></td>
<td>• OKI (Oki Denki Kogyo)</td>
<td></td>
<td>• Hitachi</td>
</tr>
</tbody>
</table>

Source: JWRC’s 1st smart water metering committee
Current Status of Metering Efficiency – AMI (2)

[Example] AMI field test by Kobe Waterworks Bureau

Remote data collection of water flow] (Once wireless station approved - Mar 2017)
Smart meter installed at 9 points; 280MHz wireless network

Evaluate displayed data type & customer notification method

Develop and assess MDMS

Source: Website of Kobe waterworks Bureau (published July 2015)
Q. What would drive smart water meter use?  
(96 respondents; mostly water utility staff)

- 19% Lower cost driven by technology development
- 19% Cooperation with elec. & gas industry
- 14% Reliable financial & cost-benefit assessment
- 11% Safe & optimized data transmission system
- 10% More examples of actual installation and use
- 10% Mitigation of security risks
- 8% Standardization of related meter specifications
- 8% Longer statutory meter use period
- 1% Human resource development

Source: Questionnaire responses from attendees of JWRC’s 5th smart water meter study group
Issues & Concerns of Smarter Metering (2)

Water utilities concerned about cost-benefit aspect:
Electric industry expects positive impacts

Cost-benefit analysis by Kyushu Electric Power Co.

- Improved metering efficiency starts generating benefits 10 years after installation begins
- In 2035, accumulated balance reaches 64.5 billion yen surplus (= 79.6 million AUD)

Source: Agency for Natural Energy and Resources (Partially modified by JWRC)
Smart Water Meter Study Group

Activity
JWRC organized a smart water meter study group for 3 years until March 2015, inviting speakers from national government, utilities and corporations (6 times, 100 attendees each).
http://www.jwrc-net.or.jp/kenshuu-koushuu/handout/smartmater.html

Objective
• Understand current situation and related technology
• Provide opportunities for public and private entities to share and discuss related information
• Have a better idea of how smarter metering for water supply could be achieved in Japan

Discussion topics
1. Current metering practice
2. ICT Technology
3. Benefits of smart metering
4. Challenges for smart metering
Smart Water Metering Committee

In November 2015, JWRC set up a smart water metering committee with water utilities conducting AMI/AMR field tests to share progress and discuss potential standardization.

Issues and concerns

- Smart Metering
- Communication & Controls
- Innovation & ICT
- Operations
  - Water Loss
  - Energy Reduction
  - Water Quality
- Asset Management
  - Adapting to Demand decline
- Optimize Water Network
- New Technologies
  - BIG Data
  - AI
  - IoT
  - Cloud Computing
  - Cyber Security
- Lesson Learned
  - AMI
  - AMR
- Collaborate with electricity & gas
- Customer Service
- Billing
Conclusion

• Government plans a nationwide roll-out of smart meters to electricity customers by 2025

• AMI field tests for Smart Water Metering are going to start

• There are concerns about roll-out benefits of smart water meters as most properties are already metered and new installation would involve large initial cost

• Water Metering Committee looks into case study projects, reporting on how smarter system could benefit utilities in terms of system downsizing, demand forecasting, effective pressure control and prompt leakage detection