Our proposal for a smart water management pilot

Veolia’s Solutions for Smart Cities
Veolia and its Smart Water approach

Today, natural resources are becoming increasingly scarce while our needs are growing in an ever more densely populated and urbanized world facing climate change issues.

The world has to rethink its relationship with resources and come up with new social and economic growth models that are more efficient, better balanced and more sustainable.

With 160 years of expertise in the areas of water, energy and waste, Veolia applies its capacity for innovation to pursuing human progress and wellbeing, and improving the performance of businesses and regions.

To make the switch from a resource consumption rationale to a use-and-recover approach in today’s circular economy, Veolia designs and implements solutions aimed at improving access to resources while at the same time protecting and renewing those same resources.

Veolia accompany cities in their smart development through a network of companies and experts at three levels of integration:

- Smart operations
- Smart services
- Smart ecosystem

Veolia key figures 2013

- 62 million people connected to wastewater systems
- 94 million people supplied with water
- 51 million people on behalf of municipalities
- 38 million metric tons of waste recovered as energy
- 108 million square meters managed
- 9.4 million MWh saved
To us smart water services means improving water efficiency for the benefit of the city and its residents, using data and technologies as enablers, to increase efficiency of irrigation networks and reuse of water, allow for deferred investment in water production plants and optimization in pipe renewal, as well as preserve resources (energy and water) by enhancing leakage management and enabling demand response programs.

Activities to reach these targets concern three levels:

**Performance**

"Utility level: monitoring water quality, reducing non-revenue water, benchmarks of operation, optimizing capital spending and return on asset, real-time control of operations to optimize resources"

**Customer experience**

"End-user level: enhance customer satisfaction and bring new services to them, while raising awareness about resource conservation and facilitate the introduction of new tariff schemes, and supporting VIP/large consumers in decreasing their water footprint"

**Multiple benefits**

"Stakeholders outside the water sector: multiply the benefits of sharing data to reduce costs, enhance innovation and increase the overall smartness of the city"

We propose a long-term partnership with quick wins and commitment on performance, where Veolia could assist in all phases: designing, implementing and operating innovative solutions.
As part of our overall proposal for your city, we have identified priority steps for smart water management, one of which is the implementation of a pilot: To successfully design and implement innovative services, we recommend developing a pilot area for leakage management and automated meter reading for the distribution networks of potable water and Treated Sewage Effluent (TSE). This pilot will help develop a tailor-made solution adapted to local specificities, test new services, and identify how to adapt operational procedures to make the most of the area and city assets.

Main aspects to be considered

THREE AREAS OF FOCUS have been identified where we consider Veolia would deliver the highest value to your city:
1. Audit & Design

**Understand: customers, water assets (pipe, meter, SCADA...), main challenges: local / city**
- Understand the potable water and recycled water networks of the pilot area: network schematics, maps, GIS, hydraulic model, ...
- Review of customer meter databases (potable water, treated sewage effluent)
- Identify the main challenges faced at the local level (pilot area) and at the city level by water utilities

**Definition of the functions for the smart water management**
- Identification of the users (utilities, customer types, other entities) and data (occupancy profile, consumption, quality, building occupancy type...)
- Description of the needs from the different users to derive the different functions for the smart water management
- Identification of corresponding workflows of data
- Coordination with other initiatives under implementation at the pilot level: areas of collaboration with other stakeholders (beneficial data exchange), data available vs ease of access
Design of the smart water management system

- Identification of the available technologies for remote data collection, communication, transfer, display and analysis
- Definition of the technical specifications for the smart water management system
- Coordination with other initiatives
- Prepare scope of works for the technology providers
- Analysis of the proposals and cost/benefit analysis

On-site hydraulic validation of the District Metered Areas (DMA) and meter inspection

- Pressure testing (essentially at night) - drop-test procedure to prove hydraulic isolation
- Identification of missing or erroneous network interconnections
- Metrological assessment of existing flow meters used as flow monitoring points
- Inspection of water meters, gaps and anomalies in the customer meter database
- Recommendation for remediation plan if needed
  - Number of known boundary valves that need to be changed
  - Number of new boundary valves that need to be installed
  - Meters to be further tested
  - Meters to be repaired / replaced
**Turn-key solutions**

Veolia can deliver turn-key smart water management solutions from the smart meters to the operations of the water networks. Veolia has already deployed its field proven solutions successfully with 3 million units being operated.

**The main competitive advantages of Veolia’s in-house solutions are the following:**

- Complete solution from Automated Meter Reading to Web portal: no additional software or hardware needed
- Independency from meter vendors: compatible with a wide range of water meters currently deployed, no replacement required
- Reliable: resistant with time, tamper, flood...
- Low power / low consumption
- Flexible: a comprehensive range of radio modules (integrated, remote, sub metering...)
- Reliable indicators based on Automated Meter Reading
- Daily calculation of Key Performance Indicators for fast reaction
- District Metered Area architecture for immediate focus on the weakest part of the network
- Scalable for a variety of deployments
2. Implementation

Deployment of Automated Metering Infrastructure

Typical steps to deploy a dedicated Machine to Machine network:

- Arrange survey / fit: Source materials (eg radio modules, water quality probe,...), programme works, survey / fit
- Set up webportal account
- Upgrade water meters, install sensors: programme works, upgrade with Automated Meter Reading
- Commission M2M network: Pairing
- Hand over

Focus: Instrumentation of District Metered as (DMA)

- Construction works of instrumentation chamber (flow meter, pressure sensors) if needed
- Flow and pressure monitoring
  - 5 minutes time-step recording for the flow
  - 15 minutes time-step recording for the pressure
- Data retrieved
  - Once a day towards a web platform
  - Or manual downloading via a datalogger
Focus: Configuration of a web portal for data display and alert threshold

- Key Performance Indicators: eg supplied volumes, network efficiency, apparent losses, night flow, active chlorine concentration
- Dashboards: eg map of global view of anomalies and alarms for all the meters of the area, map of network efficiency per district, graphs of distributed volumes, consumed volumes and apparent losses
- Individual Meter management: eg complete list of water meters and associated detailed information (consumption and anomalies)
- Consumer Focus: eg global consumption of each customer segment (domestic, companies, shops, governmental entities, ...)

Setting up of new services for customers of potable water

- Customer information
  - Development and validation of new communications channels (integrated or not to the existing systems): Mobile app, web pages, SMS...
  - Roll out of new services for the customers:
    - Customised information: bill, monitoring of water consumption, comparison with previous consumption and similar consumer
    - Alerts: leakage suspected in the house, emergency works on the water networks

Baselining

- Collection of data during a baseline period (duration to be validated)
- Real losses computation
- Apparent losses computation
- Water quality
3. Operation

M2M networks operations and data sharing

- One of the options could be to design, build and operate a dedicated Machine to Machine network with Veolia guaranteeing data availability. Such networks could then be also used for other applications and shared with other stakeholders such as monitoring of environmental conditions (air pollution, noise, weather...), as well as other parameters in the area (eg fill level of waste containers).

- Test of business models

- Data sharing with other entities (governmental bodies or other) using a 3D platform and city model

Customer awareness

- Analyse data collected for the water distribution networks in the pilot area
  - Benchmarking: profiling: per occupant type, season, building type, occupancy level, ...
  - Analysis of consumption trends
  - Comparison with other districts from the city if available

- Implement demand response programme
  - Simulation of new tariff structures based on time of use: peak/off-peak, seasonal, ...
  - Identification of anomalies (alert + response management)
  - Provide water footprint awareness to end user
  - Engage end-user in a better resource conservation
  - Organise a communication campaign
    - Workshop on conservation awareness
    - Contest on benchmarked consumption between buildings
    - Link with carbon footprint

- Provide a specific service linked to leak occurring within premises: from end-user alert to the repair, and prompt identification of leakage
Reduction of apparent losses
- Analysis of the data linked to the water meters
- Apparent losses computation
- Meter sizing according the consumption profile measured
- Identification of blocked / defective meters
- Replacement / renewal plan of water meters

Enhanced leak detection and water quality
- Near-time monitoring of the distribution water networks (flow, pressure, water quality)
- Specific service related to water quality monitoring for sensitive areas: Swimming pools, nurseries, ...
- Real losses computation
- Preparation of new O&M procedures
- Training of leak detection teams
- Priority dispatch of work order and emergency works and assignment to relevant teams in case of anomalies
- Priority management to ensure speed and quality of repair

Asset management
- Participate to the water asset inventory
- Ensure the accuracy of the data, eg water meter database, customer database
- Update the Geographical Information System / maps with relevant information (stressed pipes, burst, defective meters...)
- Update of hydraulic model with data collected
- Assist in pressure management with the design and installation of pressure reducing valves
- Support to define the specifications for a central control centre (water utilities only or shared with other stakeholders)
Key benefits

For the pilot area

- Establish the pilot area as a showcase and model for the deployment of smart water management at the city scale
- Enhance customer experience by inventing new services for end-users
- Assess, monitor, and limit the level of leakage at the district level
- Decrease environmental footprint
- Customize and adapt functions from the smart water management system
- Adjust solutions to legacy systems (meters, communication networks, management systems...)
- Involve stakeholders on an urban data platform
- Test new business models linked to machine-to-machine networks
- Optimize operational procedures

From the implementation at a larger scale

- Savings of potable water and recycled water (enhanced leakage management, water efficiency program and demand response)
- Increased availability of recycled water and water reuse
- Deferred investment in water production and distribution
- Long-term partnership with quick wins
- Smooth transition to new services making the most of new technologies and communication services
- New services to your city’s residents
- Multiple benefits for your city’s stakeholders outside the water sector
SELECTION OF BUSINESS CASES
A comprehensive range of high-quality services and innovative solutions – SEDIF, France

Syndicat des Eaux d’Île-de-France (SEDIF) is the water authority for the Greater Paris region and the largest in France. It is also one of the biggest in Europe. In 2011, SEDIF once again put its faith in Veolia with a new 12-year contract to manage the public water service – a contract that puts the focus firmly on innovation.

Some **250 million cubic meters of water are supplied every year** through **8,800 km of pipes** to more than **4.4 million people** in **149 municipalities** in the Greater Paris area. The service provided is also highly complex due to the quality of the available water resources, consisting of water from rivers, which requires very sophisticated treatment.
The water service in a nutshell

The service uses a single control center, the ServO, which is tasked with optimizing production, network maintenance, emergency call-outs, customer service management and risk management. Considerable efforts to reduce energy consumption, manage emissions and discharge, and pursue an ambitious reforestation program have delivered a carbon-neutral service, a world first for a water utility.

Water traceability is based on the model used in the food & beverage industry, guaranteeing consumers continuous control over the sanitary quality of their water. Third-generation meter reading technology, Téléo, will be deployed by 2015, and already provides precise monitoring of consumption for half of the people who use the service, along with easy leak detection. The automated meter reading solution is open and interoperable and will be the largest in Europe. Customer relations have also been improved through services adapted to different types of user and close consultation with the public.

High-quality service for all residents

With the service provided by smart metering, water end-users can follow up their daily water consumption and will be automatically alerted in case of leakage. Services implemented include an online account to access information on the water services and daily water consumption. For example, water end-users can set up alerts via email or SMS to be informed in case their water consumption exceeds the usual level. In addition, alerts following suspected leakage at their place will be automatically sent to them. All of these services contribute significantly to raise awareness with customers on the need to preserve water resources through a more responsible behavior.

560,319 subscribers for the first water service to receive the “Customer Relations Center” NF Service mark from French standards organization AFNOR Certification

550,000 meters to be deployed over 5 years
m2ocity, first Machine to Machine telecom operator in France

In 2010, Veolia and Orange have created m2ocity, an operator specializing in automated water meter reading and environmental data services. Capitalizing on the expertise of Veolia, which already had more than 230,000 smart meters in service, and on the know-how of telecom operator Orange, m2ocity offers local public authorities (municipal companies or water service operators), a complete, turnkey service based on an ultra-low energy radio network. m2ocity offers an open and interoperable telecom solution available to stakeholders concerned by the sustainable development of the city. For example, m2ocity’s network is able to collect data from environmental sensors (to combat noise and pollution, for example) in response to public authorities’ expectations.

Open & interoperable telecom solution for tomorrow’s smart city

Design, roll-out & operations

20 MILLION INPUTS COLLECTED DAILY

1 MILLION END POINTS CONNECTED
The urban community of Beaune decided in 2008 to include in the specifications renewal of the Delegation of Public Service awarded to Veolia, the implementation of automated reading of water consumption and district metering areas. Smart meters have been installed in the city of Beaune where all end-users can now access new online services to better monitor their water consumption and receive customized alerts, especially in case of leakage.

In 2010, district metered areas (DMA) have been deployed and connected to the automated metering infrastructure (AMI) in place. Automated metering infrastructure hence helps strengthen the operational performance of the water utility. By choosing to pool the AMI for metering and leakage detection, the water utility has optimized the operation of the water system.

Hydraulic sectors have been identified, and district flow meters have been connected to the AMI at each boundary. Every day, these flowmeters calculate the volume of water in the pipes. By combining this information with the volume of water actually consumed in each area, the performance can be monitored on a daily basis. DMA associated with AMI allows the calculation of the network efficiency and to concentrate leak detection on the areas with lower yield.

In addition, 80 acoustic loggers permanently installed and connected to the AMI allow listening to the flow in the pipes and pinpoint leaks within a 100 m diameter area. The advantage is significant, as pinpointing the location of the leak reduces the nuisance generated by repair. Interventions are short and effective, to the great satisfaction of residents.

Improvement of operational performance and conservation of natural resources – Beaune, France

The urban community of Beaune has 53,000 inhabitants of which 22,000 for the only town of Beaune with 6,500 water meters.

+10% Network efficiency increase (to reach 77%)
300,000 m3 saved in 2011 equivalent to 80 Olympic swimming pools saved
A global robust track record

Other references across the world include:

**Managed Meter Service** for Thames Water (UK) including meter installation & maintenance, revenue meter reading, sales investigation, developer services in London City and its suburb: 1 million water meters to be coupled with AMR modules (3.3 million households)

Implementation of **single monitoring and operations centers**: Shanghai Pudong (China), Prague (Czech Republic), on-going: Lyon (France)

**Water losses reduction** for Public Authority for Electricity and Water (PAEW) (Oman): Implementation of **130 Districted Metered Areas (DMA)** with continuous flow and pressure monitoring in 10 regions: 10,000 km of networks and 350,000 customers

**19 million m³ targeted water savings in 2 years**: 8.6 million m³ of apparent losses and 10.4 million m³ of real losses.
SMART = global-local dedicated team to support your city.
Resourcing the world