

Smart Water Infrastructure Pilot for NRW reduction

Sheet Anchor, Guyana

1. Objective

The main objective of this innovation pilot is to assist Guyana Water Incorporated (GWI) in the incorporation of smart water technologies to improve network management targeting the reduction of non-revenue water (NRW) in one of the proposed areas. This comprises the piloting of an Information Management System (IMS) that allows data integration between GWI information systems to efficiently manage the network (including active leakage management, pressure management, asset management, water meter management, customer management) with the ultimate objective to reduce losses and improve financial sustainability. Based on the MIS features, overall recommendations on its application for the improvement of NRW reduction strategies in the pilot area should be provided.

2. The water supply system

The Guyana Water Incorporated (GWI) is the sole provider and distributor of potable water throughout Guyana to all coastal and urban areas. GWI currently provides water to more than 90% coastal and urban areas with around 170,000 customers. It also provides service to 85% of the Hinterland areas of the 200 communities.

One of the biggest challenges for GWI is the reduction of NRW, which in some cases exceeds 70% of the total water production. The below paragraphs describe the network characteristics of the system to be considered under this Pilot. While Sheet Anchor is the preferred site, the other sites are included to provide a picture of the different status of the network supply system across the country. Additional details of the networks are presented in Annex A.

The Sheet Anchor Water Treatment Plant (SAWTP) is one year old and serves a total of 27 villages spanning over 22 km of 4031 customers (about 16,000 persons). Of this, 95 % of customers are metered. The design capacity of the plant is 8ML/d. The current output for the plant is 5.6ML/d with a supply time of 24 hours. The entire network is covered with 12 DMAs and PMAs installed with boundary valves and the average pressure for the network is 18psi. Network modifications were made to the network and updating of the maps on GIS is ongoing with 15% of the data collection. Data collection is expected to be completed by the first quarter of 2021. Data integration to the hydraulic model depends on software availability. NRW levels are estimated at 33.7% at end of 2019.

The Uitvlugt Water Treatment Plant (UWTP) is one year old and serves a total of 12 villages spanning over 13 km of 5829 customers (about 23,000 persons). Of this, 87 % of customers are metered. The design capacity of the plant is 10ML/d. The current output for the plant is 9.7ML/d with a supply time of 24 hours. The entire network is covered with 16 DMAs and PMAs installed with boundary valves and the average pressure for the network is 10psi. Network modifications were made to the network and updating of the maps on GIS is ongoing with 5% of the data collection. NRW Levels are estimated at 56.9% at end of 2019.

The Amelias Ward Water Treatment Plant (AWWTP) is approximately six years old and serves a total of 6 villages spanning over 6 km of 2509 customers (about 10,000 persons). Of this, 61 % of customers are metered. The current output for the plant is 5ML/d with a supply time of 24 hours. The entire network is covered with 5 DMAs that are not currently active and no PMAs in this area. The average pressure for the network is 15 psi with approximately 10% of the area receiving a generally poor service of an average of 3psi. The GIS survey is planned to commence in 2021 and a metering program for 100% metering. NRW Levels are estimated at 70.6% at end of 2019.

The Monrepos Water Treatment Plant (MWTP) was rehabilitated approximately 17 years ago and serves a reduced boundary of 5 villages spanning over 3 km of 4,539 customers (about 18,000 persons). Its original design boundary spanned 10 villages. Of this, 61 % of customers are metered. The current output for the plant is 7.8ML/d with a supply time of 10 hours. DMAs and PMAs are planned to be set up in this area. The average pressure for the network is generally poor service of an average of 2psi. The GIS survey is planned to commence in 2021 and a metering program for 100% metering. NRW Levels are estimated at 59.1% at end of 2019.

The Port Mourant Water Treatment Plant is approximately 20 years old and currently serves a reduced boundary of only 6 villages of approximately 4,139 customers across (about 16,000 persons). Its original design boundary spanned 18 villages. Of this, 67 % of customers are metered. The current output for the plant is 6.9ML/d with a supply time of 20 hours (9 hours per day with a maximum pressure of 18 psi and 11 hours per day with a reduced pressure of 8 psi). The level of service is generally poor with an average distribution pressure of 4.6psi. The GIS survey is planned to commence in 2021 and a metering program for 100% metering. NRW Levels are estimated at 54.4% at end of 2019.

As a result of inefficiencies in the systems, GWI's annual energy costs exceeds US\$13.4M per year. The reduction of NRW losses would have a direct impact on GWI's level of service and would significantly lower its operating costs. NRW reduction would also result in improved customer satisfaction, with a tangible increase in their supply of water, better water pressure and improved pumping hours. GWI has recognized the potential and usage of technology for improvement and has initiated development and utilization of mobile applications that aid in meter installation, leakage management, customer reporting and meter reading in order to improve on efficiencies.

As part of this NRW reduction initiative, GWI requires to put in place early on in the pilot area a set of critical systems, such as mapping capabilities (GIS), SCADA, Hydraulic Modeling and Asset Management, with DMAs and PMAs to be implemented in parallel with an integrated Information Management System (IMS). Subsequently, AMR/AMI devices should be eventually installed (not part of this pilot activity).

3. The Challenge

Addressing GWI's needs for improving water services requires a well-structured program that addresses directly and aggressively the problem of high non-revenue water throughout its network. The NRW reduction solutions need to take into account the scale of the problem (a relatively small network, but spread through low-density settlements), an old and deteriorated network, lack of data integration, and limited management systems in place. While GWI has initiated development and utilization of mobile applications that aid in meter installation, leakage management, customer reporting and meter reading

to improve on efficiencies, the limited integration with other systems hinders obtaining the full benefits of the applications.

A phased approach, with gradual improvements over time and gradual incorporation of technology to manage the network would be called for.

4. Pilot Project General Structure

GWl is looking to develop a phased approach for the reduction of NRW in its existing system in Sheet Anchor, which should include, among others:

1. GWl will complete the assessment of the existing network in the pilot area (current progress 15%), with a characterization based on age and condition of the network.
2. Determination of a scope of work for coverage of a leak detection program for NRW in the pilot area.
3. Proposed method for leak detection, and pilot application in a segment of the network.
4. Implement an integrated MIS that incorporates data obtained from the different information systems and apps used by GWl from the pilot area, incorporating mapping capabilities (GIS), Hydraulic Modeling and Asset Management, and energy efficiency modules, with SCADA, DMAs and PMAs, and demonstrate its application to improve the management of the network, specifically NRW reduction and improvement of energy efficiency in the network.
5. Support GWl to refine Sheet Anchor's NRW water reduction strategy, based on the software information, including leak detection and coordination with GWl's leak repairing activities.
6. Support/provide recommendations to GWl in establishing operational routines for NRW reduction in the pilot area, with working operational systems, based on the features of the MIS.
7. Develop capacity building for GWl operational staff on the use of MIS and application for network management, particularly NRW reduction.

GWl will provide materials and execute the works related to GIS mapping, building of hydraulic model, and any additional DMA's and PMA's implementation.

Relevant Company/program information.

Expanded GWl presentation of challenge:

<http://comunidad.socialab.com///uploads/16015193185f753ed6ee8f1.pdf>

Additional network information for SWIT Pilot Location

Location	Preferred Pilot Location	Additional locations to provide a full picture of different status of networks across GWI water supply system			
	Sheet Anchor	Uitvlugt	Amelia's Ward	Port Mourant	Mon Repos
Customers	4,031	5,829	2,509	4,139	4,539
Production m3/year	2,058,270	3,529,515	1,839,600	2,519,430	2,847,000
Source	Sheet Anchor	Uitvlugt 1&2, Lenora	Amelia's Ward	Port Mourant 1&2	Mon Repos
NRW levels estimated	33.7%	56.9%	70.6%	54.4%	59.1%
Dedicated NRW Reduction Team in Place	No	Yes	Yes	No	No
GIS status	15%	5%	20%	0%	0%
Hydraulic model status	0%	0%	10%	0%	0%
DMA active	12	16	0	0	0
Metered Coverage	95%	87%	58%	67%	61%
App – Meter Installation	Implemented	Implemented	To be Implemented Jun 2021	To be Implemented Jun 2021	To be Implemented Jun 2021
App – Leakage Management Dashboard	To be fully implemented by Jan 2021	To be fully implemented by Jan 2021	To be fully implemented by Jan 2021	To be fully implemented by Jan 2021	To be fully implemented by Jan 2021
App – Customer (Leakage and Meter Reading)	Implemented	Implemented	Implemented	Implemented	Implemented
App – Meter Reading	To be fully implemented by 1 st Quarter of 2021	To be fully implemented by 1 st Quarter of 2021	To be fully implemented by 1 st Quarter of 2021	To be fully implemented by 1 st Quarter of 2021	To be fully implemented by 1 st Quarter of 2021
PMA	yes	yes	no	no	no
Instrumentation on site	yes	yes	yes	yes	yes
Pressure gauges	6	1	2	2	1
Flow meters	13	17	2	2	1
Telemetry in instrumentation	GPRS Dataloggers	GPRS Dataloggers	GPRS Dataloggers	GPRS Dataloggers	GPRS Dataloggers
Customer data base status	80% cleaned	60% cleaned	10% cleaned	10% cleaned	10% cleaned
Treated or untreated	Treated	Treated	Treated	Treated	Treated
Hours of supply per day	24	24	24	20	10