ITU-SUDACAD Regional Forum on Internet of Things for Development of Smart and Sustainable Cities

Khartoum, Sudan 13-14 Dec 2017

Smart City Water Management based IoT practical experiences

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- Smart water management system based on IoT
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- Architecture of the solution
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Background

Approach followed in Malawi

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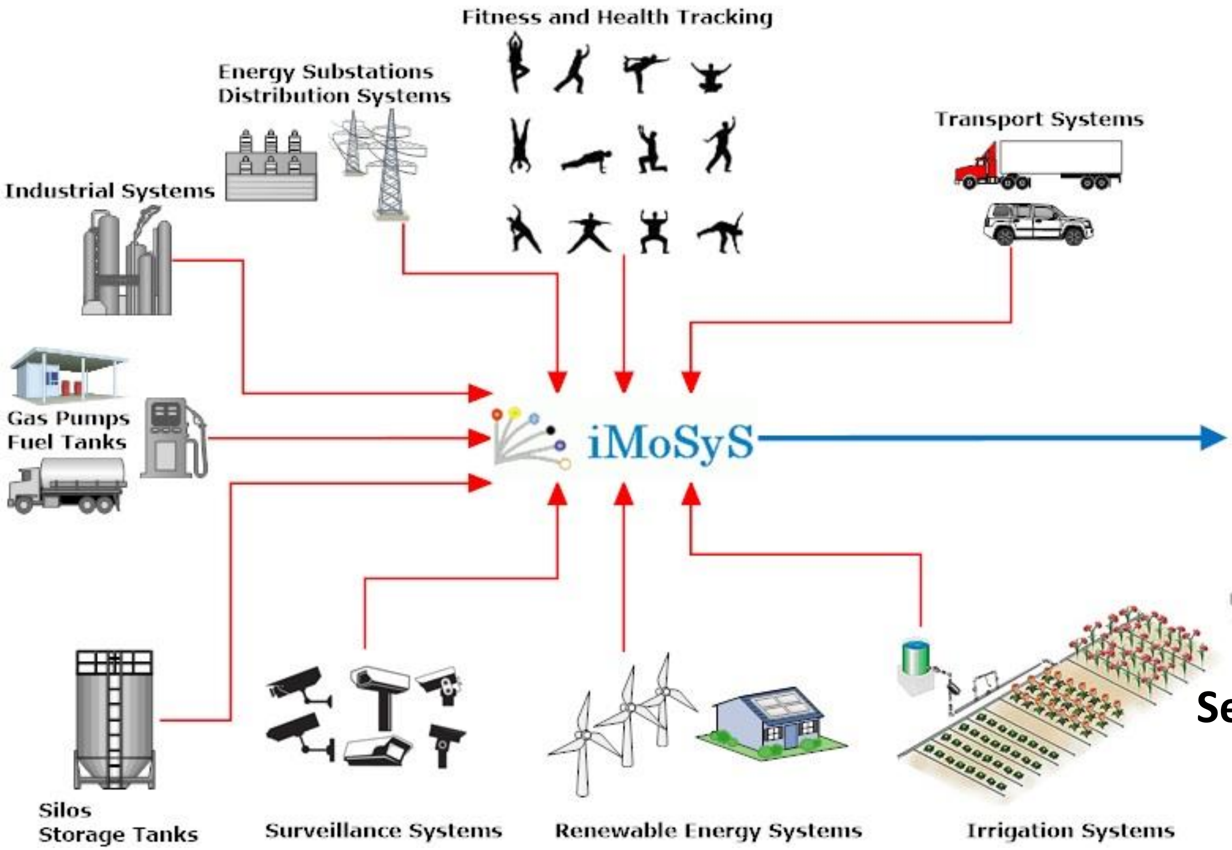
Through the Intelligent Monitoring System – iMoSyS



MONITOR FROM ANYWHERE

Several industries and individual in Malawi are supported in this setup to enable remote monitoring and control of their infrastructure

“ f you can’t measure it = you can’t ”

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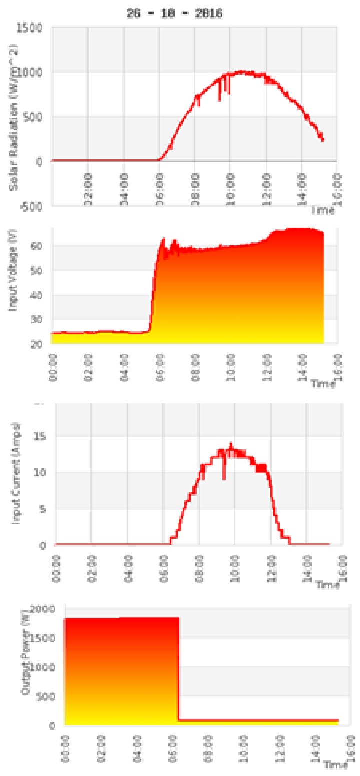
Background activities

Extended the feature and supported remote monitoring of several solar farms in Kuwait



Solar irradiation

Solar Panel Voltage

Solar Panel Current

Consumption Power

All key performance parameters are remotely monitored by engineers to assist them in their Strategic decisions.

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Background activities

- Smart irrigation system
  - Irrigate intelligently
  - Save time and money
  - Irrigation only activated according to the soil moisture which is adequate for the crop
  - Can be programmed to run at night when the evaporation is low, and in times of water restrictions
  - Farmer can switch ON/ OFF through SMS
  - Query or get notifications of the irrigation status

IoT based practical experience

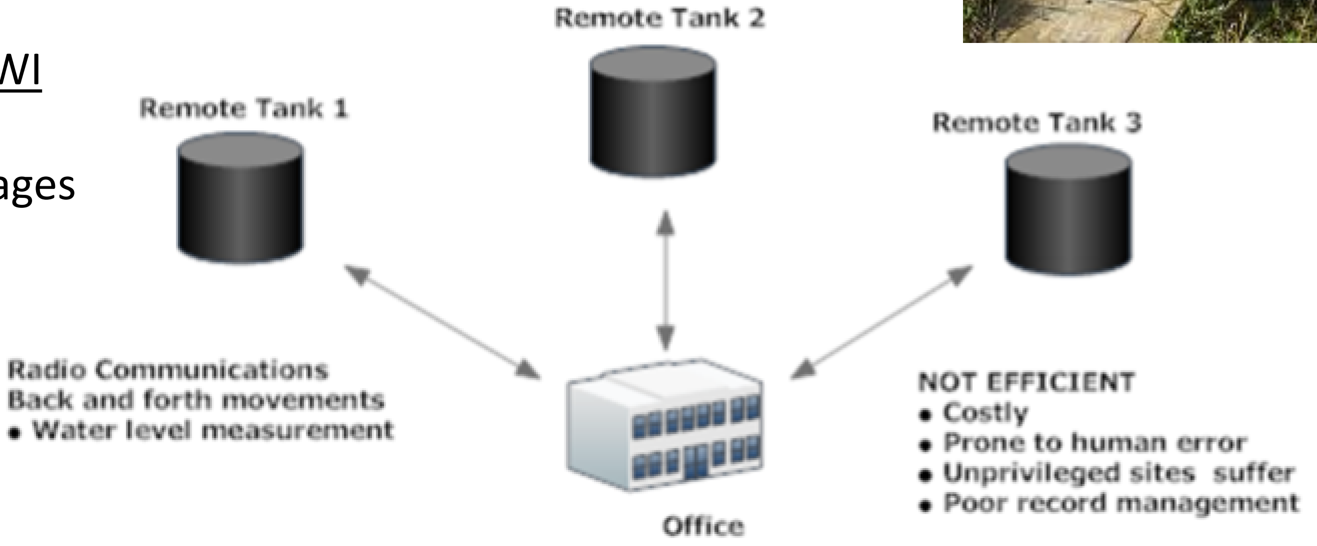
Smart City Water Management

Problem definition

- Traditional ways of water level measurements present challenges in managing the resource for distribution
  - Inaccurate measurements
  - Long distance and poor road network between sites
  - Time consuming

- Need to develop a low cost solution through remote monitoring

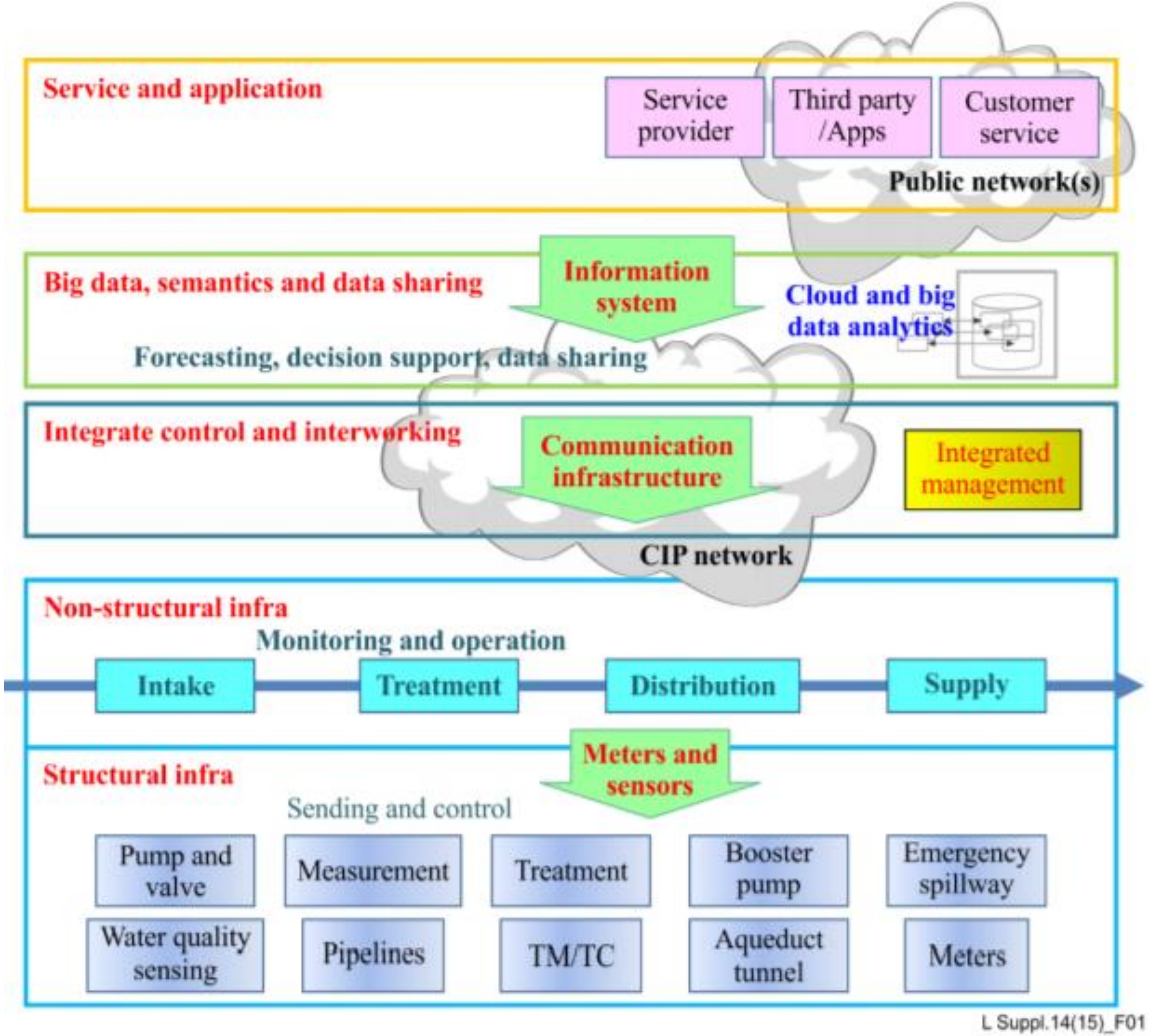
<u>CASE STUDY FROM MALAWI</u>
Lilongwe Water Board
Utility company that manages
Water distribution across
The capital city of Malawi



Problem definition

- Challenges in monitoring water quality issues across the distribution system
  - Samples taken 3 times a week on selected points in the distribution system
  - But real time monitoring is ideal on all strategic points
- Unable to distribute the water to different locations according demand

- Challenges in reducing non revenue water
  - Difficulties in identifying points where a pipe is broken
  - Illegal connections

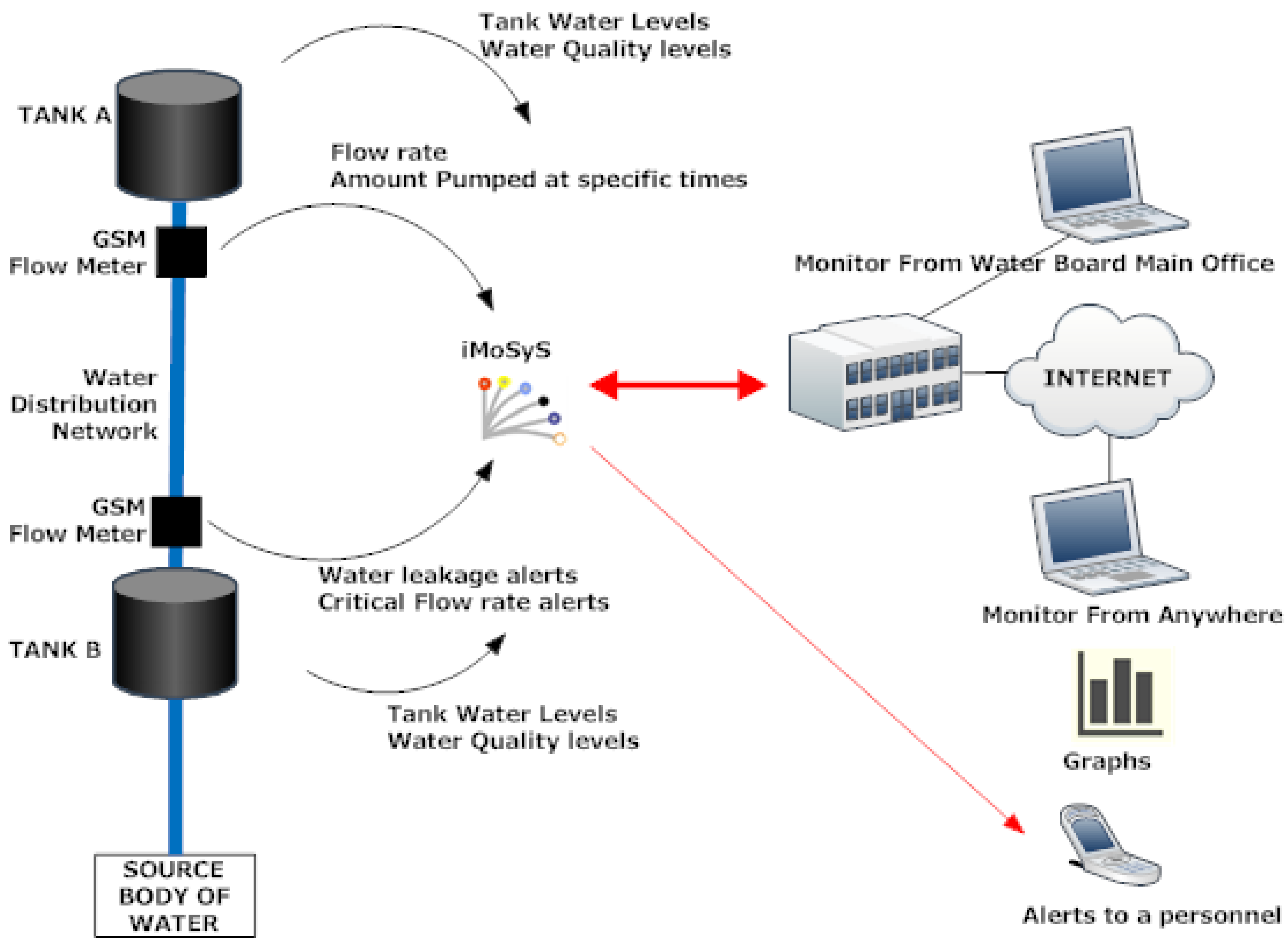


ITU conceptual model of water management system with ICT

Key elements to consider for such projects

- From previous discussion on best practices for SWM project
  - What type of sensors to use
  - How to power remote units that capture data
  - How will the data be transmitted from remote sites to engineers/ operators/ decision makers
  - How is the data presented to users to enable quick and accurate strategic decisions
  - Management issues
    - Project capital
    - Mind set of operators

Overall Architecture of the Solution



- Water level monitoring
  - To avoid overflows
  - To manage demand
- Water flow rate monitoring in pipe systems
  - Scheme for detecting pipe bursts
  - Scheme for detecting illegal connections
- Water quality monitoring

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Remote monitoring units setup

Antenna to improve signal strength

SIM Card slot to enable transmission through cellular network

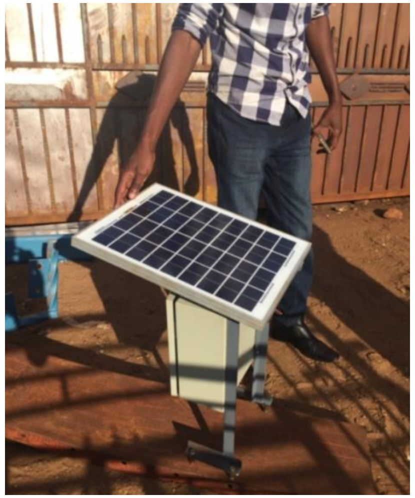
Typical installation setup. Solar panel used as source of energy

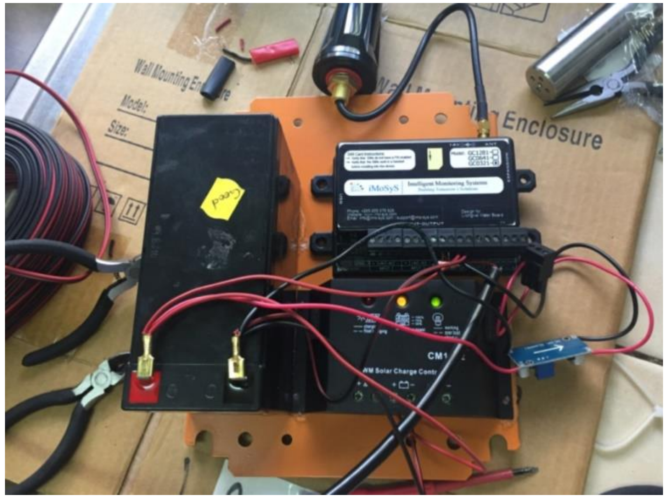
Intelligent board with input & output ports to connect to sensors and actuators

Battery to supply energy during the night

Charge controller

Remote monitoring units setup

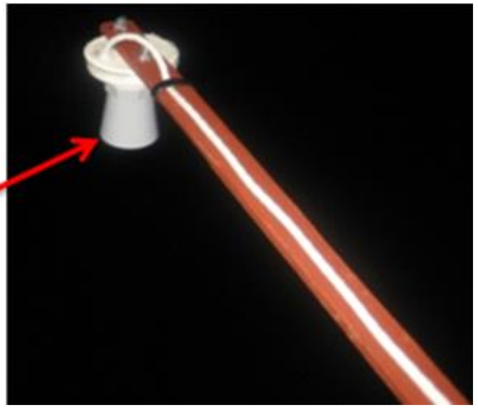




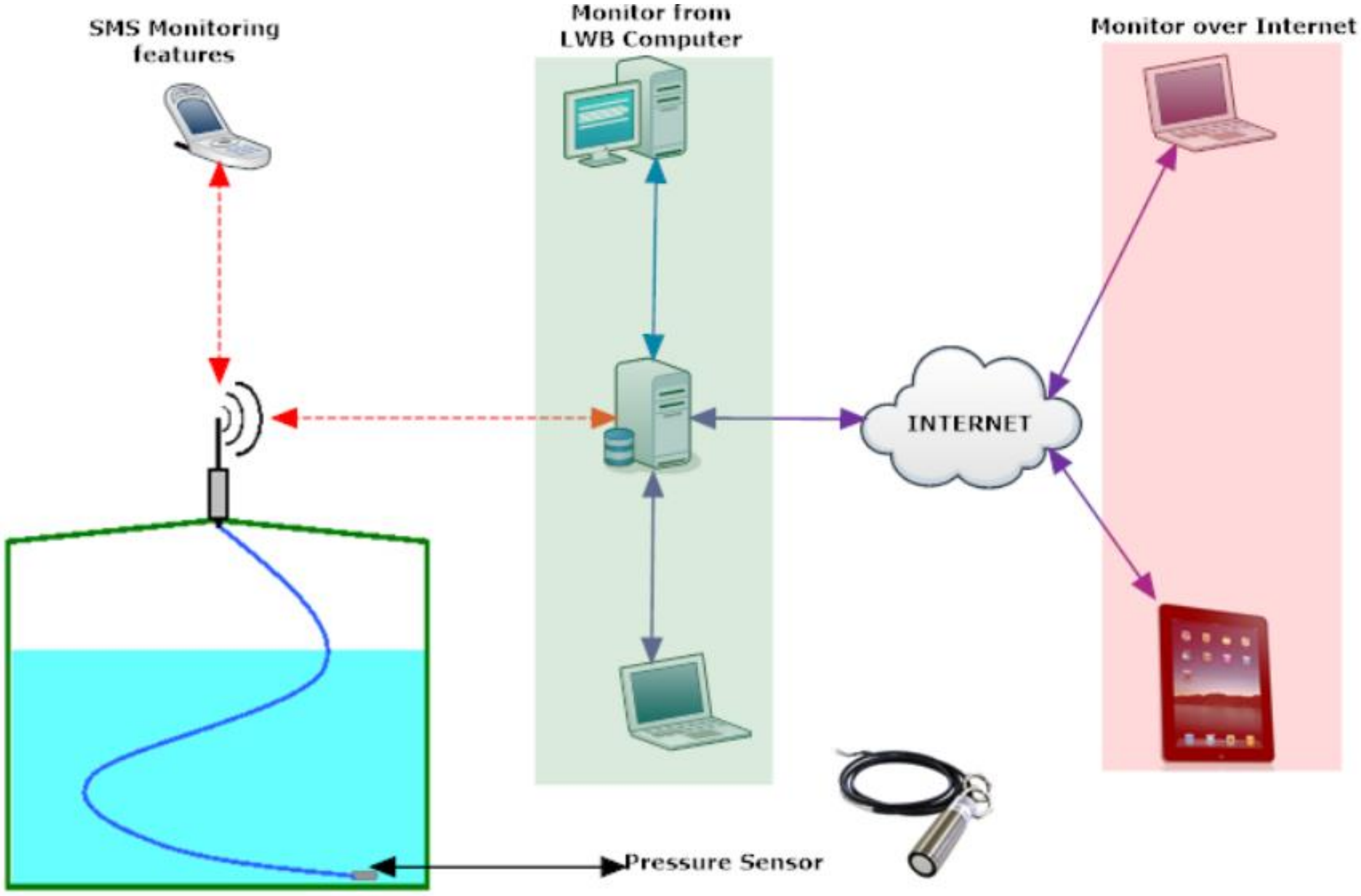
Before in 2011

Remote monitoring units setup

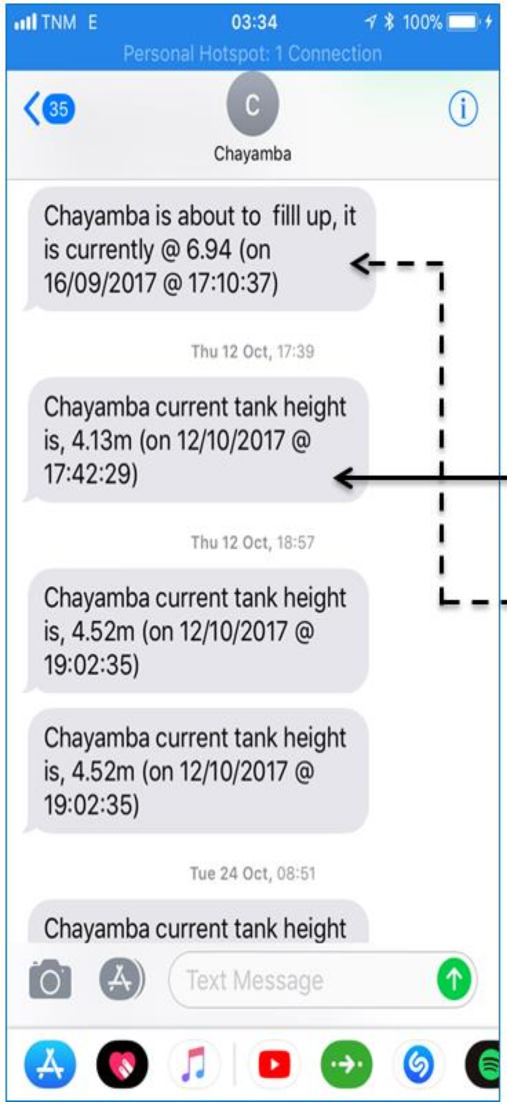
- What type of sensors to use
  - Should be able to survive in harsh environmental conditions
    - Chroline can make metal items to degrade – eaten – corrode



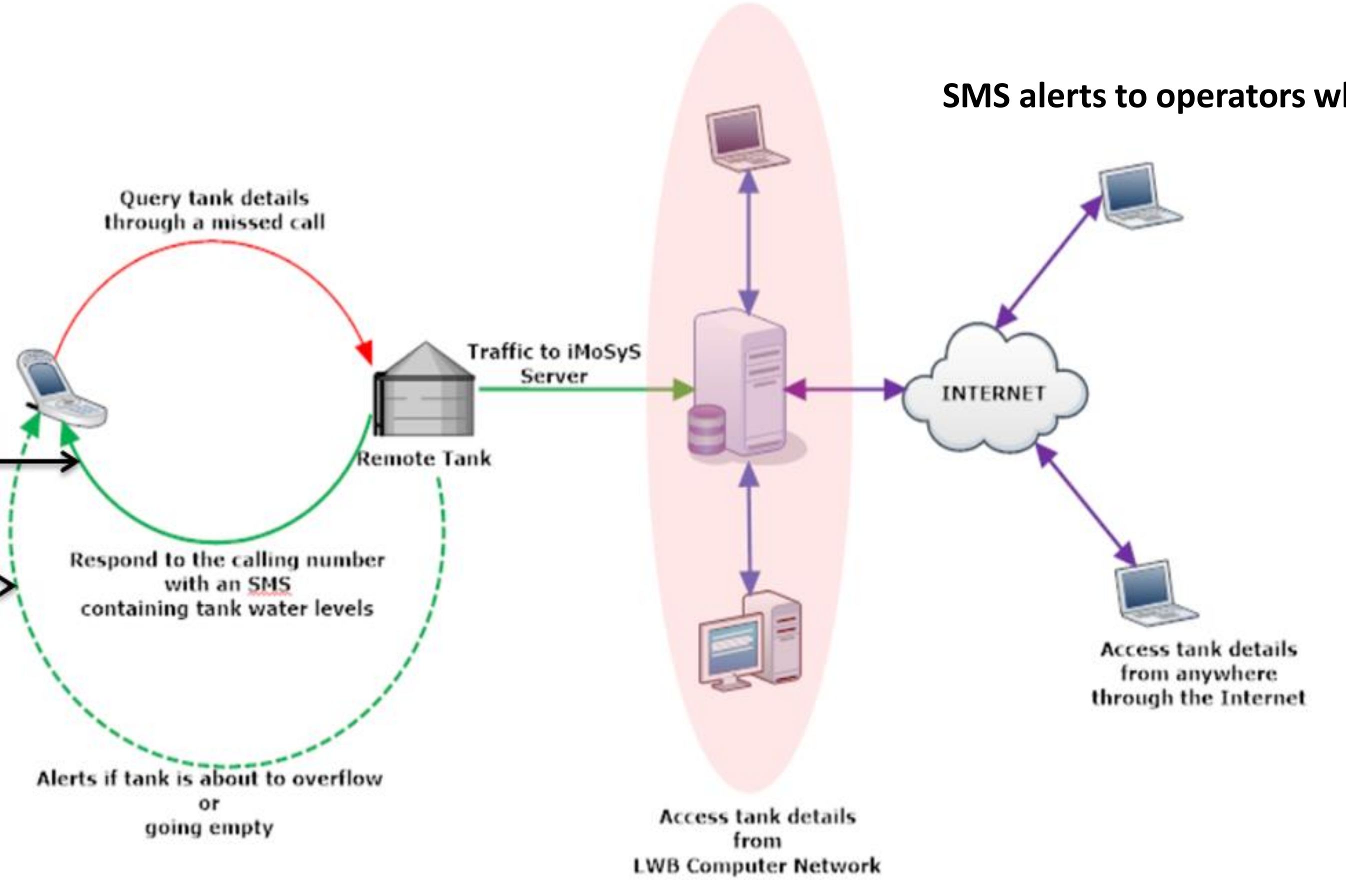
Remote monitoring units setup



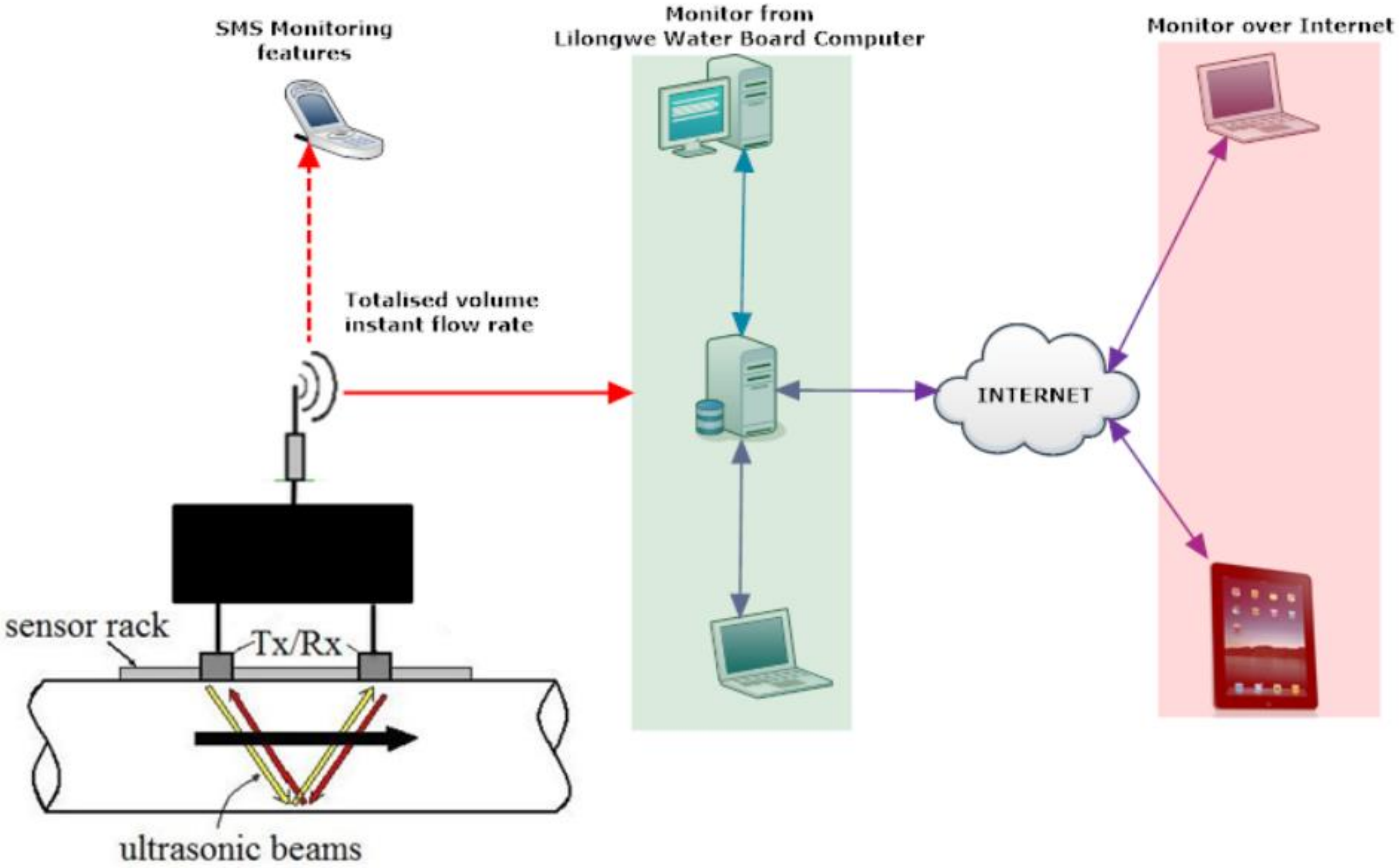
System Alerts to reduce Non revenue water



SMS alerts to operators when a tank is about to overflow



Flow rate monitoring



- Electromagnetic flow sensors
  - Optimum for high pressured pipe systen
- Insertion type and cramp on meters
  - Ideal for existing wate distribution systems
  - No need for major excavations to pipe work
- Some already integrated with GSM/ GPRS transmitters
  - Else attach a transmission module through the I/O pins

SNAPSHOT OF THE RESULTS ON A WEB PORTAL

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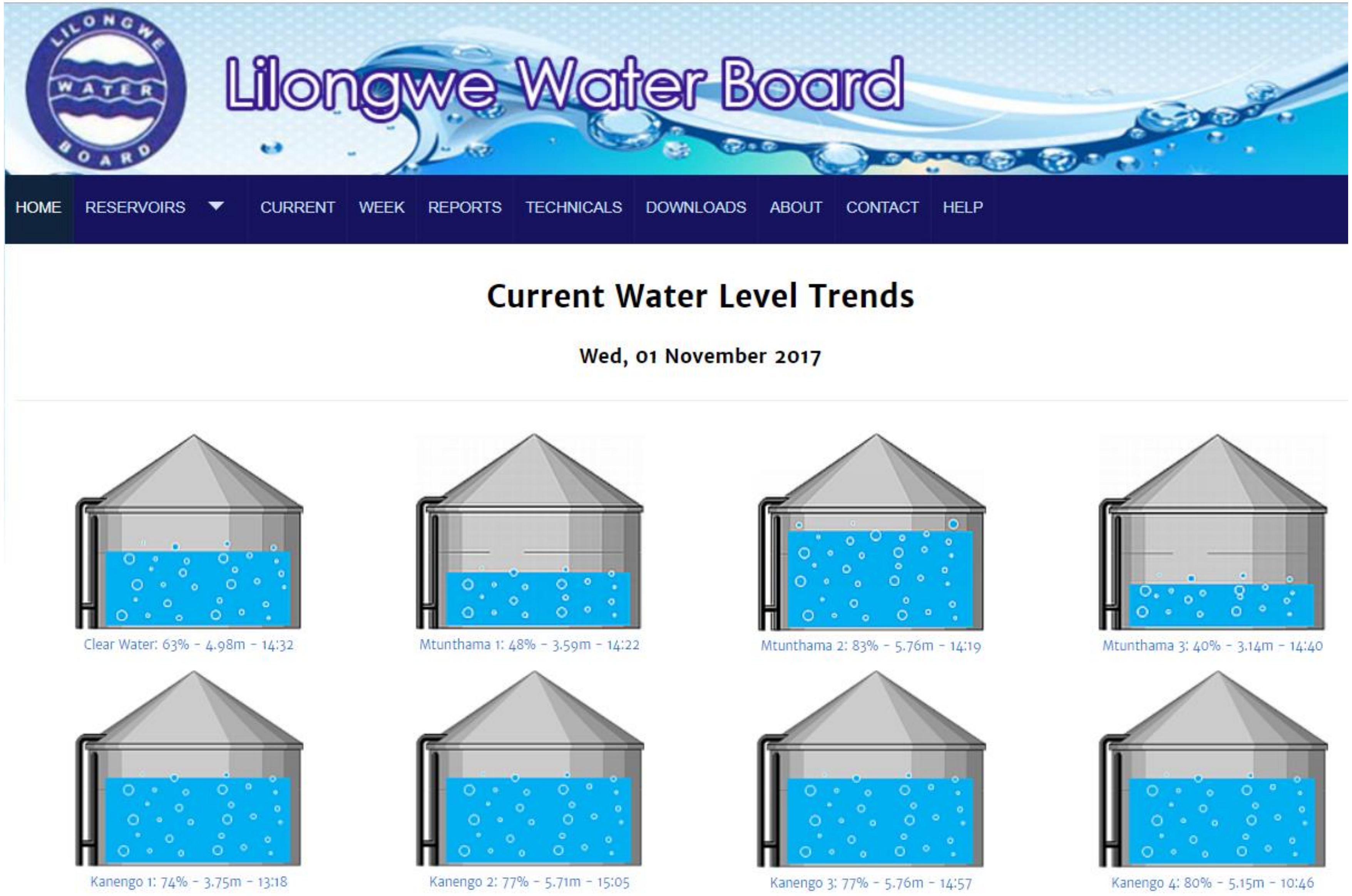

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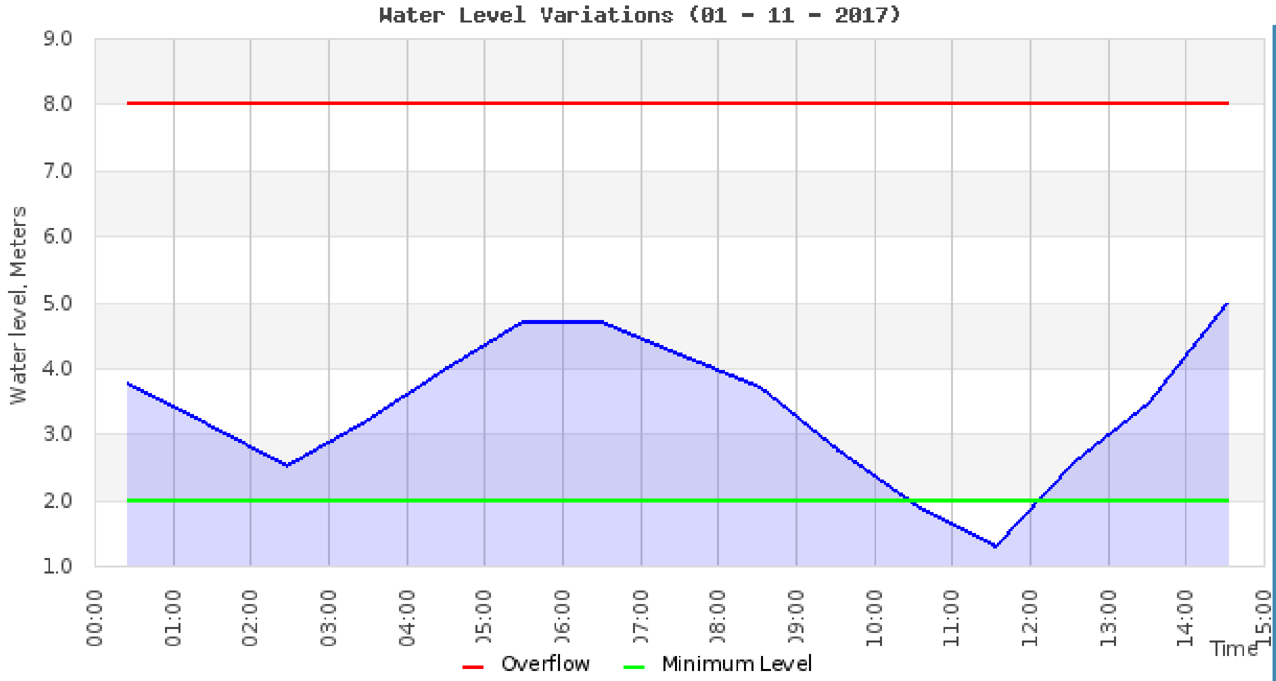
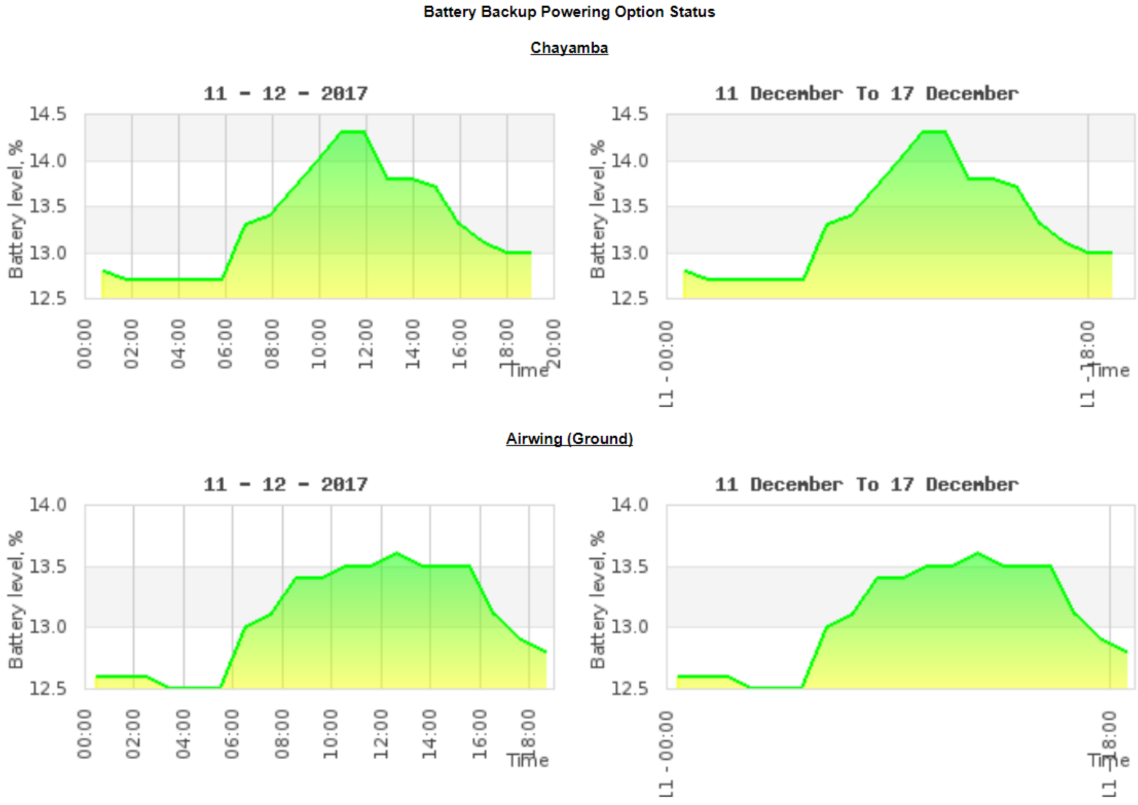
Snapshots of the results on a web portal



Tabulated Summary (01 – 11 – 2017)

Time	00:25	01:26	02:26	03:27	04:28	05:29	05:29	06:29	07:30	08:31	09:32	09:32	10:32	11:33	12:34	13:31	13:31	14:32
Level	3.75	3.14	2.52	3.19	3.98	4.7	4.7	4.7	4.2	3.7	2.75	2.75	1.91	1.29	2.58	3.47	3.47	4.98

Trends of water levels



Backup battery power trends

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Conclusion

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Thank You