

# **Grand Challenge for development of “Smart water supply measurement and monitoring system”**

The Ministry of Electronics & Information Technology (MeitY) in partnership with National Jal Jeevan Mission (NJJM), Department of Drinking Water and Sanitation, Ministry of Jal Shakti announces to develop a ‘Smart water supply measurement and monitoring system’ via an ICT Grand Challenge.

## **1. Background:**

Jal Jeevan Mission (JJM) has been launched which aims at providing Functional Household Tap Connection (FHTC) to every rural household by 2024. The programme focuses on service delivery at the household level, i.e. water supply regularly in adequate quantity and of prescribed quality. This necessitates the use of modern technology in systematic monitoring of the programme and to capture service delivery data automatically for ensuring the quality of services.

Recent technological advancements (such as IoT, Big Data Analytics, AI/ML, Cloud) and declining costs of mobile data, hardware (sensors), and software, provide an opportunity to digitise water supply infrastructure in rural India. Digitally enabled water supply infrastructure will help in near real-time monitoring and evidence-based policymaking. There is an opportunity to deploy a frugal IoT based system to monitor quantity, quality, and periodicity of water delivery. Digitisation of water supply infrastructure has the potential to solve some of the biggest societal problems facing the nation. More importantly, it will help anticipate and address future challenges.

## **2. Aim:**

To conduct an ICT Grand Challenge which bring innovative, modular, and cost-effective solution to develop a “Smart water supply measurement and monitoring system” to be deployed at the village / semi-rural / semi-urban levels. The system would collect and facilitate centralised monitoring of data.

## **3. ICT Grand Challenge Problem Statement:**

The ICT grand challenge invites proposal for developing a ‘Smart water supply measurement and monitoring system’.

The proposed solution should focus on the following:

- i. The solution shall comprise of integration of IoT sensors collectively referred to as nodes. Two variants of nodes are envisaged for development in which

- Source Node assesses the quality, quantity, flow control and time of water supply at the supply points (Source Points) and Tail Node assesses the quantity and remote disconnect feature for the end points (tail Points);
- ii. These nodes shall regularly update these data readings to be accessible on a centralised dashboard. This data could further be used for deep learning of water consumption and tracking changes in quality;
  - iii. These nodes shall also be capable of sending alerts such as warning levels, fault identification inside sensors and system, thus exhibiting a self-diagnostic mechanism;
  - iv. The nodes should be provisioned with geo tagging during deployment. Further, the system could be reset remotely from the centralised control room;
  - v. The system should be able to compare schedules uploaded by the local authority on websites with data from nodes to generate alerts on account of any deviations;
  - vi. The node at supply side would analyse and determine the quality of water supply at each location based on factors such as pH, TDS, residual chlorine and nitrate. There shall be an added provision to incorporate other elements such as Fluoride and Arsenic, given the pilot location. (Basic Water Quality parameters are available in the JJM Guidelines);
  - vii. Each node of the system shall be modular to allow a plug and play approach, to ease the maintenance and calibration by less skilled individuals;
  - viii. A detailed user manual must also be provided for each node;
  - ix. The teams are also expected to strategise the most optimized maintenance and upkeep strategy;
  - x. A battery back-up for controller may support the system for downtime and it is expected that the design should support 48 hours back-up;
  - xi. The sensors should be battery powered with more than 5 years of battery life;
  - xii. Each node must be capable of executing the tasks mentioned above, at water delivery point of bulk water supply or outlets of tube-wells, pumping system and/or overhead tanks, and at the tail end deliver point, i.e. the last household;
  - xiii. Source nodes must contain sensors for pH value, TDS, residual chlorine, nitrate and a flow meter to determine the quantity;
  - xiv. Tail nodes (at last house in water distribution system) must contain a sensor for residual chlorine, a flow meter and/or pressure sensor to determine the quantity and regularity;
  - xv. The 40% value of Bill of Materials of the system should be Indian;

- xvi. Both the nodes should be designed with tamper protection and support for secure data communication;
- xvii. Nodes should have pluggable communication module with 2G/4G/ NB-IoT;
- xviii. The sensors should be in-line and nodes should have an onboard display with high resolution mode and OTA support;
- xix. The devices should support communication with protocol like TLS for providing data security;
- xx. The enclosures of the nodes must be able to with stand the harsh environment conditions and consumables being used in each sensor(s) must have a shelf-life of least 6 months;
- xxi. The water flow meters that measures the bulk flow as well as the flow at the delivery point has to be calibrated and tested as per ISO standards;
- xxii. The (smart tap) water meters that are associated with a control valve at the consumer end (tail node) may be operated at a minimal power. It may be battery powered with more than 5 years of life;
- xxiii. The design house should adopt DLMS metering standard for both the systems that were developed. They need to develop web application along with Dash board complaint to DLMS to receive and display data;
- xxiv. The teams have to get the tail node water meters calibrated/tested for standard compliance.

A representative model of the smart water supply measurement and monitoring system to define the scope is given in Figure 1. This is just for the sake of visualization but can differ in accordance with use case scenarios. Also, critical pressure points are assumed to be maintained by the water distribution authority and it is kept out of scope of this work.

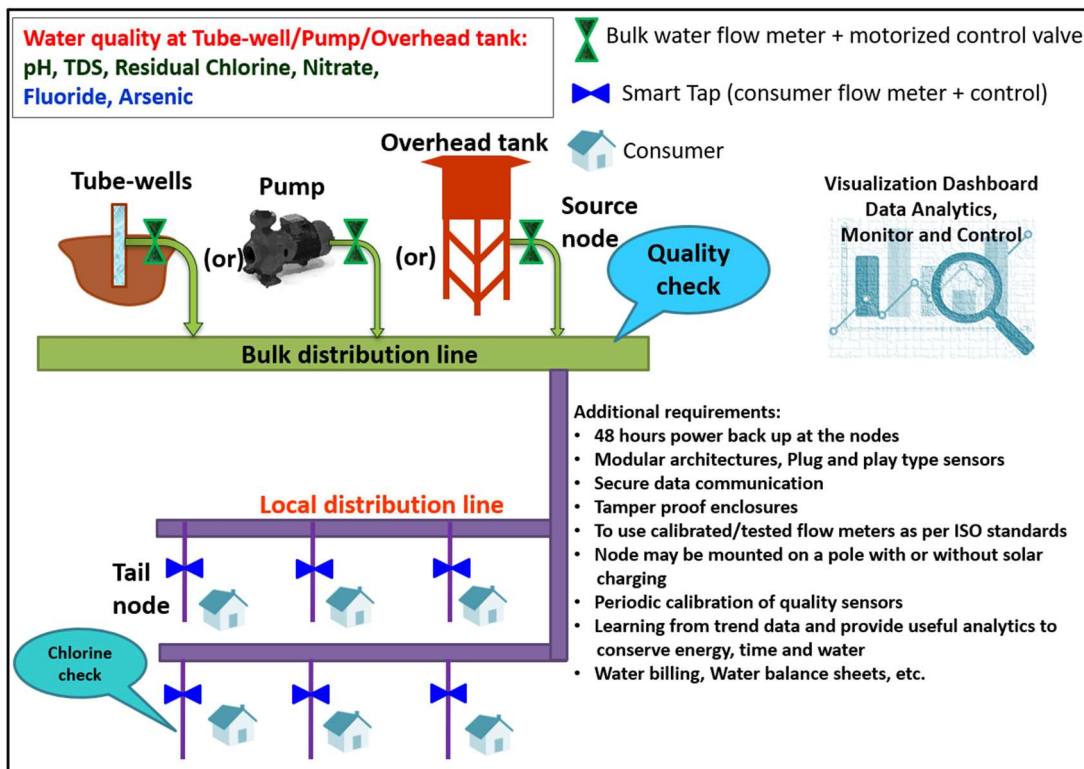


Figure 1 Pictorial representation of the water network to define the scope

#### 4. Eligibility Criteria:

The Indian Tech start-ups, MSMEs, Companies, LLPs registered in India under Companies Act can apply. The entity must have 51% or more shareholding with Indian citizen or person of Indian origin. The applicant's entity should not be a subsidiary company of any foreign corporation.

To encourage participation from academia and industry, participating teams are not mandatorily required to be registered Indian Companies / startups / MSMEs LLPs to apply for the challenge. However, the 10 teams shortlisted at Ideation Stage will be required to apply for registration as Indian Startups/ Company/ MSMEs/ LLPs and submit the proof of having applied at stage of submission of Prototype. It will be expected that by the time of selection at the final stage, necessary registration will be completed.

It may be noted that funds will be transferred only in the bank accounts of Startups/ Company / MSMEs / LLPs and not in the bank accounts of individuals.

#### 5. Implementing Agency:

CDAC would be the implementing agency of the grand challenge and provide technical support also. Jal Jeevan Mission would be user agency of the Grand Challenge. Also, Jal Jeevan Mission would provide locations and financial support for sourcing and installation of devices/solutions deployment as well as logistics, travel and other contingency expenses.

## 6. Evaluation Methodology :

**Blind Review:** An expert panel from Academia, Government and Industry will evaluate the proposals and will shortlist approximate 15-20 proposals.

**Stage–1 (Ideation to Prototype Stage):** Shortlisted teams will be asked to make a presentation to Jury\*. Based on the recommendations of Jury, 10 proposals will be shortlisted and provided financial support to the tune of Rs. 7.5 Lakh each to develop a working prototype of the proposed solution within **two months** duration (max). In this stage, design house required to build and demonstrate both Source node and Tail node prototypes, communicating to a web server.

\*Jury: Experts from Academia, user agency (Jal Jeevan Mission), MeitY, Industry etc. will be constituted.

**Stage – 2 (Prototype to Product Stage):** This is the critical phase of the Grand Challenge to build upon the idea and mature the prototype. The teams would present their prototypes to Jury. Best four techno-economically viable prototype shall be selected for product development and each team will receive Rs 25 Lakh to build their solution as per the need of the user agency within **three months** duration (max) and subsequently field trial, testing& deployment and demonstration at approx. 25 locations across the country as identified by user agency in next **one month**. These four teams shall be provided with financial support for necessary handholding by the Jal Jeevan Mission, MeitY and the implementing agency (CDAC) for testing, deployment and demonstration at the live site.

For these field trials, each finalist will be provided the following financial support:

- towards sourcing and installation of devices/solutions deployment
- towards logistics, travel and other contingency expenses @ 10 Lakh each

The cost of sourcing and deployment of devices and solutions will be estimated by the implementing agency based on business plan submitted by the applicants, in which such cost have to be mentioned explicitly.

**Stage – 3 (Product Deployment Stage):** The four selected teams of Stage-2 will get a chance of a lifetime to deploy a fully functioning product at location earmarked by the user agency. The products will be presented to Jury and user agency. The solutions would be evaluated based on parameters that will include Innovation, Replicability, Scalability, Usability, Price of the product, Ease of deployment/roll-out, Potential risks involved in implementation of the solution etc. Based on evaluation, one winner and two runner-ups will be selected and supported by 50 Lakh (winner) and 20 Lakh each (runner-ups).

All teams including the winning team shall be free to market the product to any entity outside the user agency with consent of user agency, if required.

**7. Evaluation Parameters and quantifiable matrix to be adopted by the implanting agency**

The ideas/ prototype/ final product will be judged on the following parameters

#	Parameter	Description
1	<b>Approach Towards Problem Solving</b>	Product Idea, Degree of Innovation, Simplicity of Final Solution, Uniqueness & scalability of Idea, Novelty of Approach,
2	<b>Business Use Case</b>	Business Case, USP and Vision
3	<b>Solution Technical Feasibility</b>	Product features, Scalability, Interoperability, enhancement & expansion, Underlying technology components & stack and futuristic orientation
4	<b>Product Roadmap</b>	Potential Cost to Build Product, Go to Market Strategy, Time to Market
5	<b>Team Ability &amp; Culture</b>	Team Leader's Effectiveness (i.e. Ability to guide, Ability to present idea), Ability to Market Product, Growth Potential of Organization
6	<b>Addressable Market</b>	Natural Sales Appeal, Affordability, ROI, Sales Distribution Channel
7	<b>Price Discovery</b>	Cost of sensors/IoT devices

The weightage of each parameter is elaborated in ICTGC scheme document. The implementing agency has to adopt the same weightage criteria.

**8. Incubation and Marketing support by MeitY/User Agency**

- a) The successful developers may be given an opportunity to join the MeitY supported incubator / CoEs for further nurturing of their solution. This will be facilitated by challenge implementing agency.
- b) The technologies that developed & demonstrated successfully and approved by the Competent Authority may be listed in GeM.
- c) MeitY may facilitate in deployment of successfully developed solutions in other emerging geographies.

## 9. Duration of ICTGC:

Total duration of the challenge would be 6 months (ideation, prototype and product stage)

## 10. Budget:

The budget ICTGC is as below:

Sr.N.	Head	Budget (Rs in Lakh)
1.	Ideation to prototype stage: 10 selected teams @ Rs 7.5 Lakh each	75
2.	Prototype to product stage: 4 selected teams @ Rs 25 Lakh each	100
3.	<ul style="list-style-type: none"><li>Support towards sourcing&amp; installation of devices/solutions* deployment in respect of package of 100 nodes [top 4 teams (Rs 70 Lakh)]</li><li>Field trial, testing &amp; deployment and demonstration expenses for logistics and travel @ Rs 10 Lakh (top 4 teams)</li></ul>	110
3.	Award: Winner-1 @ Rs 50 Lakh and runner-ups-2 @ Rs 20 Lakh each	90
4.	Administrative charges** of implementing agency @ Rs 25 Lakh	25
<b>Total***</b>		<b>400</b>

\*Being submitted by the top four finalists as business plan

\*\*Media publicity, Promotion, Communication, application process/scrutiny, logistics, technical support for PoC development, mentor support, technical guidance etc

\*\*\*MeitY contribution: **250 Lakh** and User agency contribution: **150 Lakh**

## 11. Rules & Guidelines

a) All participants and team have to be eligible (See Eligibility Criteria) to participate.

- b) During the Challenge, the Team Leader shall be considered as the Single Point of Contact for all engagements & communication by the Challenge implementing agency. Furthermore, the Team Leader cannot be changed during the course of the Challenge.
  - c) The Team Leader and Participants will be required to use their E-mail ID and Mobile number for the purpose of Team Registration and Account Creation on MeitY Startup Hub (MSH) for participating in the Challenge.
  - d) All communication between the Implementing agency and Team Leader shall happen via the registered Email id only. This will be the only form of communication and any other forms of communication will not be entertained.
  - e) Any outcome of this initiative shall only be consumed by the participating team for the purpose of the Challenge for development of Smart water supply measurement and monitoring system.
  - f) Teams shall maintain detailed documentation of their Idea, Prototype and Solution at all stages of the Challenge for reference and record purpose. The Challenge Organizing Team reserves the right to review these documents any time during the program.
  - g) Teams are allowed removal/voluntary withdrawal of team members, only once, during the program before prototype stage. Any such step will have to be disclosed to the Challenge Organising Team for approval. No other form of team modification will be entertained.
  - h) The funding under Challenge shall be spent for development of the Smart water supply measurement and monitoring system only.
  - i) Winner(s) will retain the rights of the solution/product developed as part of the Challenge. The winner(s) will however have to conform to the terms and conditions defined for the Challenge during the competition and post winning the award
  - j) The solution should not violate/breach/copy any idea/concept/product already copyrighted, patented or existing in this segment of the market.
  - k) Anyone found to be non-compliant, may get their participation cancelled.
  - l) For any dispute redressal, Secretary (MeitY)'s decision will be the final verdict on the matter.
  - m) The winning entity would be free to market the product to any entity outside Union/State/UT Government Organizations of India.
12. The Ministry of Electronics and Information Technology (MeitY) reserves the right, at its discretion, to change, modify, add, or remove portions of Terms of this Innovation Challenge at any time by posting the amended Terms on MeitY's website.

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## ANNEXURE-I

S. No.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible limit in the absence of alternate source
1.	pH	-	6.5 - 8.5	No relaxation
2.	TDS	Milligram/Litre	500	2000
3.	Residual Chlorine	Milligram/Litre	0.2 - 2.0	-
4.	Flouride	Milligram/Litre	1.0	1.5
5.	Arsenic	Milligram/Litre	0.01	No relaxation
6.	Nitrate	Milligram/Litre	45	No relaxation

### Technical Specification:

The technical specifications required for the proposed smart water monitoring system are as below:

S. No.	Characteristic	Unit	Range to be detected	Accuracy	Operating Temperature Range
1.	pH	-	0-14 Resolution-0.01	±0.05	0-55 °C
2.	TDS	Milligram/Litre	0-5000 Resolution-1	±20	
3.	Residual Chlorine	Milligram/Litre	0-5.0 Resolution-0.01	±0.05	
4.	Flouride	Milligram/Litre	0.0-20.0 Resolution-0.1	±0.5	
5.	Arsenic	Milligram/Litre	0-3 Resolution-0.002	±0.01	
6.	Nitrate	Milligram/Litre	0-500 Resolution-1	±5	