24 X 7 Water supply - Is the Goal Achievable?

Author: Nisharg D. Dalwadi
M. Plan (Enviro), B.Tech. Civil – Construction (Hons.)
Co-Author: Er. A. G. Desai.

Abstract

From water-rich cities such as Guwahati and Delhi, to water scarce towns in Rajasthan and Madhya Pradesh, the possibility of 24-hour access to piped water remains a mere dream for urban households in India.

The concept of 24-hour water supply, seven days a week (24X7), year round, has become so alien to our mind-set, that even new supply systems are designed for less than a continuous supply. This increases the size (and costs) of supply infrastructure, pushes higher coping costs on to consumers (in the form of storage tanks, pumps, water filters, bottled water, boiling of water, and in waiting for the water to come), and is dissatisfying for both consumers and system operators.

The benefits of continuous water supply are well-documented. However, much work is needed to understand the costs, and the operating, management, and behavioural changes, to transition successfully to a 24X7 supply system.

This paper is an effort to break that alien mind set and for stepping in to the world of sustainable 24x7 water supply systems.

Introduction

According to a UNICEF report, India loses an estimated 2,500 children every day – close to one million annually – to diarrhea and other intestinal diseases caused by polluted drinking water and lack of sanitation. Diarrhea and related diseases are responsible for over 25 percent of all deaths among children in the 0-5 age group.

About 21 percent of all communicable diseases and over 11 percent of all diseases in India are water-borne. The most common are typhoid, polio, hepatitis A and E, leptospirosis, and diarrhea and other intestinal diseases.

The Voluntary Health Association of India estimates that the country loses 73 million working-person days because of illnesses caused by water-borne diseases while UNICEF puts the same estimate at 1,800 million work-days.

With few exceptions, users of piped water distribution systems in Indian cities receive an intermittent supply of water. Discontinuous supply is practiced even though many cities have sufficient water resources to provide a continuously pressurized system, operated 24 hours a day.

Although the Indian Manual of Water Supply and Treatment recommends that intermittent supply be discouraged, its practice has become so routine that it is now considered the norm in India, rather a sub-standard exception.

Some factors that have contributed to this practice of discontinuous supply include:

* Rapid growth in population and water demand (and in some areas, shortage of water);
* Inadequate water charges and billing/ collection mechanisms, leading to insufficient revenues to repair, maintain, and replace infrastructure;
* Intermittent and poor quality electricity supply;
* Inadequate human resource development, including training in modern utility operations;
* Inadequate demand-responsiveness and customer-orientation among service providers.

In water policy of India it is stated that every person has adequate safe water for drinking, cooking and other domestic basic needs on a sustainable basis. Safe water should be readily and conveniently accessible at all times and in all situations. (WSP, Towards Drinking water security in India, 2010) for getting the drinking water sustainability Govt. of India is looking towards three major things, namely, Improved rural water supply, quality of drinking water supply and sustainability of the source.

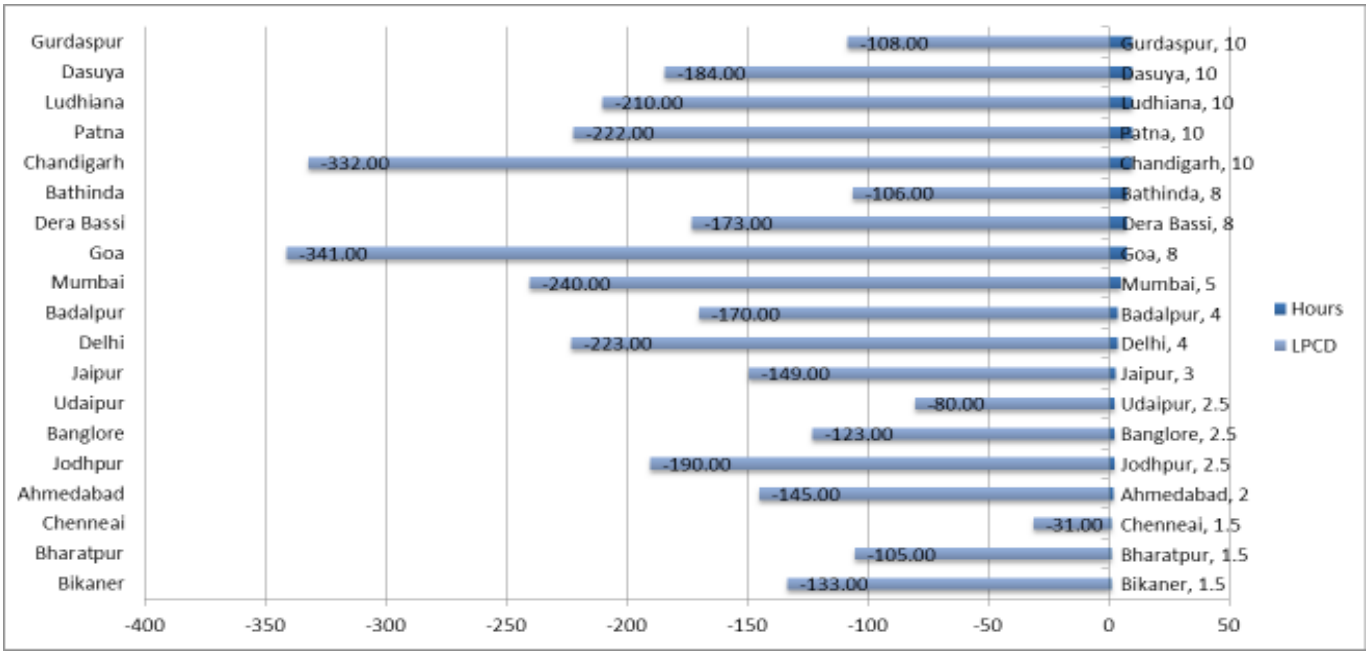
Millennium development goals considers the importance of ensuring sustainable water supply in developing countries, the United Nations formulated the famous Millennium Development Goals (MDGs). Member countries adopted the same and mean to achieve the stated goals by 2015. (Dr. Sanjay and V. Dahasahasra, 2007)

Ministry of urban development has produced benchmarks for urban services, which states that the 24 X 7 water supply is the ultimate benchmark. The existing data available for 28 pilot cities in India shows that 3.3 hours per day is the average hours of water supply in cities under pilot study. The range of supplying drinking water was varying from 1 hour per 3 day to 18 hours a day, which is a drastic difference.

In this paper the attempt is done to answer the question – Is 24 X 7 water supply goal Achievable? The answer is given by reviewing and analyzing two case studies. Case study one is of the state Karnataka – a successful implementing state for 24 X 7 water supply in the urban areas. The other one is from Gujarat – Jepur Village in Surendranagar District. The paper starts with the benefits of 24 X 7 system over intermittent system. In the second portion two case studies are discussed in detail.

Intermittent water supply drawbacks

Water supply systems do not operate as designed. Therefore, reservoir capacities are often underutilized. The valves suffer wear and tear. Since, water is supplied by zoning the distribution system, more man power is required. During non-supply hours, pipes are empty and dirt water enters pipelines at vulnerable spots and water is contaminated. Large doses of chlorine or other disinfectants are required to make water safe from microbial pollution. Due to limited hours, peak factor is often in the range of 4 to 6 in most of the systems. Therefore, large sizes of pipe mains are required for strengthening the network to meet the hydraulic requirements. Inconvenient supply hours affect poor people. Large size of storage is required



and consumers have to pay for pumping. Also, it results in poor sanitation practices leading to increase in health risks and mortality. Due to intermittent water supply, often meters go out of order resulting in loss of revenue. Besides, due to uncertainty consumers store a large quantity of water and waste it before collecting fresh water again. This adds to a huge undue wastage of precious treated water. (Dr. Sanjay and V. Dahasahasra, 2007)

Benefits of 24 X 7 water supply

* 24x7 supply delivers better quality water for public health.

High levels of bacterial contamination are experienced in the first 10 minutes of re-pressurization of an intermittent system, in some cases persisting for up to 20 minutes. Maintaining full pressure removes that risk.

* 24x7 supply gives significantly better service to all consumers.

Access to clean water with improved quantity, timing, and pressure, including effective service to supply pipe 'tail ends'.

* 24x7 supply revolutionizes service to the poor.

Consumers can access more water for improved health and hygiene while saving time in queuing and carrying, and gainfully using the time thus saved for employment opportunities.

* 24x7 supply converts household coping costs into resources for the service provider.

Coping costs that consumers need to incur are reduced; they pay for a better service.

* 24x7 supply reduces the burden on water resources.

Continuous supply reduces water wastage arising from overflowing storage systems and open taps. It saves on stored household water that is discarded when new supply comes in. Because the network is renewed where needed, it also reduces losses arising from leaks in the old pipes.

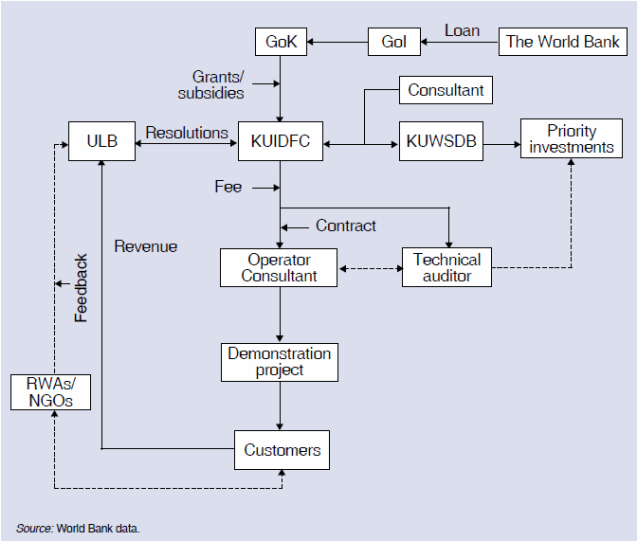
* 24x7 supply delivers effective 'supply management' and 'demand management'.

Continuous supply makes possible the effective management of leakage through pressure management and flow measurement. Water conservation is also encouraged through metering and price signals via a volumetric tariff to consumers.

* 24x7 supply enables improved efficiency of service provision.

Operational efficiencies are achieved because of a reduced need for valve men, and a conversion of these jobs into more efficient ones of meter reading and customer care. It also makes possible the management of illegal connections.

Case Study 1:
Implementing 24 X 7 Projects - Karnataka



Source: World Bank data.

A Project Management Unit was established in the KUIDFC for coordinating project activities, including the social component of the project. A state-level committee for steering the project through its overall life-cycle was instituted by the GoK and the sector reform component of the project was driven and managed by the GoK's Urban Development Department. The design, procurement, construction, and supervision of the priority investments were handled by the Karnataka Urban Water Supply and Drainage Board (KUWSDB) which acted as an agent on behalf of the KUIDFC.

For the demonstration projects, the selected OC acted as the agent on behalf of the urban local body (ULB) to deliver water services to the consumers. A Technical Auditor, reporting to the ULBs and the KUIDFC, oversaw the performance of the Operator Consultants and implementation of priority investments.

1. Preparation

The first task in the preparation phase was to determine the number of potential consumers and their likely demand for water, in addition to assessing the condition of the existing pipes, followed by hydraulic design of the new system. Fifteen weeks had been allotted to the OC for this task, and it was achieved with a short delay (an additional six weeks had been allowed for such flexibility).

"It was the most difficult stage as there was no information available. There were no bulk water meters, no household meters; nobody knew where the water was going. They were saying the losses could be 40 percent to 50 percent but that was simply a guesstimate." – Spoke person from KUWSDB.

The OC took samples of the existing 15- to 20-year-old plastic PVC pipes and, having tested them in a laboratory, found that they would not be able to withstand higher pressures. It also found that many pipes had been installed at too shallow a

depth where they were being squeezed out of shape by traffic loading. There was a similar challenge with the house connections, with approximately one-third comprising cast iron 'saddle connections' fixed on to a PVC pipe or directly welded iron household connections on to cast iron pipes, all leaking or likely to leak once the mains would be pressurized.

Because of the performance risks (and bonus) that the OC was carrying and the very short time available to make decisions, the OC requested permission to replace the entire distribution network. This was seen by some observers as an unfair 'shortcut' and by others as 'uneconomical and wasteful'. The original proposal by the consultants had assumed 62 percent asset replacement. However, because 24x7 supply means a significant reduction in peak flows, through hydraulic modeling the OC was able to determine that, by using 63 mm and 110 mm pipes (rather than the assumed standard of 150 mm), there could be a significant cost saving. With that saving the OC also committed to a higher quality of polyethylene pipe (PN10) than had been normal, again to protect against any deformation from the weight of traffic on the road above, and to ensure a long asset life.

2 Phase B: Implementation

With KUIDFC approval of the Final Investment Plan, the OC was able to hydraulically isolate the demonstration zones, install an all new pipe network, including service connections, along with bulk and consumer metering, pressure management, and monitoring devices. A billing and customer service system was established along with a performance monitoring system.

For the key task of pipe renewal, the OC appointed a subcontractor, using World Bank procurement rules with regard to competitive tendering, to supply and lay the high quality, high density polyethylene (HDPE) pipes. A second subcontractor was appointed to supply and fix the meters and house connections. Bulk flow monitors and pressure management valves were similarly procured.

As per the contract, community communication was to be handled entirely by the ULBs and the KUIDFC through nongovernmental organizations (NGOs). However, the OC had to provide regular updates to the technical auditor, KUIDFC, KUWSDB, and the Corporation through monthly meetings and reports.

3. Phase C: Operation

Over a period of months, in 2006 and 2007, the new water distribution pipes were brought into service, new household connections were made, and the new system was brought into operation with full metering of bulk supply and household metering of all connections. Households received continuous water supply at the design pressure, water in taps inside their homes, even in three stories apartments, 24 hours a day, seven days a week.

The OC was also provided with some performance criteria that had to be fulfilled. The criteria's were:

* 24x7 continuous pressurized water supply to every property, 100 percent metered, with emergency stoppages not exceeding 12 hours and not more than four emergency stoppages in any continuous 12 months.

* Full computerization of the billing system with all meters to be read and billed monthly.

* 24x7 operation of a customer service desk with a required seven-day response time for new

connections, 12-hour response time for complaints, resolution within 24 hours when dealing with issues of low pressure or poor water quality, 24-hour response time with seven-day resolution for other complaints, and reported surface leaks to be repaired within 24 hours.

Scope, Structure & Remuneration

Scope and Structure

The OC's role was to deliver 24x7 water through a structured management and engineering reform plan and establish a customer billing centre in the demonstration zones. Revenue for the services was to be collected by the municipal corporations based on tariffs set by urban local bodies using Government of Karnataka guidelines. Community participation was envisaged through nongovernmental organizations, along with provision for appropriate feedback mechanisms.

The 183 - week contract was divided into three phases:

(A) Preparation of an Investment Plan for achieving the performance targets, which included development of a hydraulic model for the system, preparation of a rehabilitation plan, and estimating the cost of works involved.

(B) Implementation of the Investment Plan including preparation of contract documents, procurement, selection of subcontractors and rehabilitation of the system. Phases A and B were expected to be completed within 79 weeks.

(C) Operation and maintenance (O&M) of the rehabilitated 24x7 system for 104 weeks.

Remuneration

The OC's remuneration, separate from the capital expenditure requirement, was divided into two parts. 'Fixed remuneration' was equal to 60 % of the total, to be paid to the OC in 15 equal quarterly instalments from the start of the contract term until the end of the 42nd month. 'Performance remuneration' was to be paid to the OC in instalments through the O&M period based on achievement of performance targets (see Box 5). 10 % of all payments (both fixed and performance) was to be retained as retention money, to be released on the successful completion of the contract. The contract provided for a 'capital efficiency bonus' linked to savings in capital expenditure with 3.75 % of the OC remuneration for savings up to 25 %, and 10 % of additional remuneration for capital expenditure savings higher than 25 %. The benefits of continuous water supply are well-documented. However, much work is needed to understand the costs, and the operating, management, and behavioural changes, to transition successfully to a 24X7 supply system. This paper is an effort to break that alien mind set and for stepping in to the world of sustainable 24x7 water supply systems.

People's Voice

A family that benefited from this project said: "The water supply is good, no problems now. It used to be once in three days. We moved here in 1987 when the water supply used to be continuous, and

then it gradually went off and became fully intermittent in about 2000—we think it was due to the expansion of the city. We paid Rs. 200 last month. We have five members in the household and we are also watering the garden plant pots. There is good enough pressure to fill the roof tank. We used to use electricity on the booster pump which we now save. We are still using Aquaguard. It costs Rs. 6,000 per unit, with the recharge element being Rs. 600 per year."

The voice of Ellamma, a quarry worker and female head of her household, summarizes the impact on the poor, "Earlier I was waiting for water and could not go to work to earn a living. Now I go to work and the water is waiting."

Case Study 2:

Jepar village, Surendranagar District,Gujarat

Jepar of Chuda Taluka in Surendranagar District, Gujarat, is a village that embraced the decentralized community managed water supply system in 2006. It has developed a water distribution system, which allows all 160 households to have tap connections and enjoy 24x7 water supply. The village's two sources of water – a well and Narmada pipe water supply system – supplement each other to ensure regular safe water supply to the village. The total storage capacity is an Elevated Storage Reservoir (ESR) of 50,000 liters and one sump of 20,000 liters.

Before the village adopted 24x7 water supply system in 2006, the supply was available for about two hours a day and the average consumption of water was around 400 liters per day per household. When each household was assured of 24x7 supply, the consumption per household reduced to 250 liters per household, thus saving 25,000 liters per day which represents 38 % of the water previously distributed. Power consumption reduced too by 4.39 units per day or a decrease in one-third of the previous electricity bill; an annual saving of about Rs. 7,900. The reduction in consumption of water occurred primarily because people abandoned the practice of storing water to cover several days' needs. Now, 125 villages in Gujarat are successfully operating the 24x7 water supply system.

Conclusion

It is not possible to deliver 24x7 water without significant change in the management approach to consumers, to billing, and to revenue collection. These shifts can be seen as a move towards a reformed utility which is viable in the long term as it becomes ever more consumer and commercially oriented.

The Karnataka demonstration project has provided 'proof of concept'—24x7 continuous water supply is as feasible in India as it is in the rest of the world. It delivers significantly improved, and valued, services to consumers, particularly to the poor, with perceived direct health benefits, reduced impact on water resources and improved revenue generation. In the context of long-term capital investment, it is affordable.

Based on the savings in operational expenditure, increase in revenues, and improved health benefits, the payback period on the capital maintenance investments is just two and- a-half years.

So 24x7 water is possible but it requires commitment at all levels and over the long term. India's Jawaharlal Nehru

No. of connections (Nos.)	Water consumption for cattle (litres)	Water consumption per day (litres)			Power consumption per day (units)			Saving of power at Rs.5/unit (Rupees)	
		Before 24x7 (2 hrs/day)	After 24x7	Water saving	Before 24x7 (2 hrs/day)	After 24x7	Unit saving	Per day	Per year
160	10000	65000	40000	25000	13.15 units	8.76 units	4.39 units	21.95	7900

National Urban Renewal Mission also includes 24x7 water supply. The National Urban Renewal Mission is a critical source of funding as service providers seek support for this step change in their performance.

At the beginning of this decade, the question was asked: "Is 24x7 water supply achievable?" It is appropriate to affirm that 24x7 water has proved to be achievable whereas also acknowledging that so far there has only been a very limited demonstration. The 44 proposals under JNNURM are stronger evidence that there is life beyond this demonstration project.

The extent of the scalability of the concept now has to be proved. The final and key question therefore is not whether but rather: "When will 24x7 water supply become the norm for India?"

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