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Nagari

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24-hour Water Supply: Is this Goal Achievable?

Drawing lessons from rapid distribution system diagnostic assessments in Indian cities



Foreword

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 (24/7), year round, has become so alien to our mindset, 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 behavioral changes, to transition successfully to a 24/7 supply system.

At the request of the Government of India's Ministry of Urban Development (MoUD), and with funding from Sweden's International Development Agency (SIDA), the Water and Sanitation Program-South Asia (WSP-SA) initiated a program to assess what it would take to move to a 24/7 water supply system. Through

rapid technical assessments, draft strategies were developed for Guwahati (Assam), Indore (Madhya Pradesh), and the Delhi metropolitan area. In parallel, the Government of Karnataka and the World Bank carried out distribution system diagnostics in three cities in Karnataka — Belgaum, Gulbarga, and Hubli-Dharwad. Results of these studies were discussed in a national workshop organized by the Change Management Forum (led by the Administrative Staff College of India) and WSP-SA in Hyderabad in September 2003.

I am pleased to note that the two-day workshop demonstrated that conversion from discontinuous supply to continuous supply is both essential and achievable in the Indian context. It also amply illustrated how this can only be achieved through carefully structured strategies based on known practical procedures and investment programs, tailored to the individual needs of each city. The country has the capacity, resources, and talent required to run a 24-hour water supply system, it makes no sense to be still discussing 24/7 as an option, it must become the norm.

The proceedings and deliberations of the workshop are documented in this publication.

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Background

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; and
- inadequate demand-responsiveness and customer-orientation among service providers.

Why Convert to 24/7 Supply?

Discontinuous water supply gives rise to several deficiencies, including:

- serious risks to health, resulting from ingress of contaminated groundwater into the distribution system;

- inability to practice efficient supply management;
- inability to practice effective demand management;
- operational inadequacies which unduly weaken physical infrastructure; and
- customer inconvenience, which for many people, particularly the poor, results in:
 - a loss of household income or productive time as at least one family member has to cope with securing water on a daily basis;



- limiting water usage to levels below what is required for safe hygiene; and
- an unwillingness to pay for a sub-standard service.

Water Kills

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.

Workshop Objectives and Preparatory Work

The objectives of the workshop and associated preparatory work were:

- to begin testing the hypothesis that, under the diverse conditions found in urban India, continuous water supply is feasible and practical, and also a cost-effective and sustainable way of supplying water;
- to demonstrate that the strategies to transition to 24/7 supply are sufficiently flexible to accommodate a wide range of affordability and water resource constraints; and
- to promote a discussion and exchange of ideas on 24/7 supply among participants.

Rapid diagnostic studies were carried out for the water distribution systems of three cities – Delhi, Indore, and Guwahati – by consultants who have actually operated and managed modern water utilities. They used recently-developed techniques in leakage management to determine the measures needed to re-structure and convert these distribution systems to 24/7 operation. The results of these studies – and a case study on the transition of Phnom Penh, the capital of Cambodia, to 24/7 – were shared and discussed at the workshop.

A Report of Three Cities: Delhi, Indore, and Guwahati

The rapid diagnostic assessments were conducted in cities representing a range of climates, population sizes, and water sources. All three cities have an intermittent water supply.

Base data was collected on the distribution network length and pipe materials, numbers of connections, population, water production, and leak repair and operational data. In addition, flow and pressure measurements were made on the networks themselves while they were in service. This data was used to prepare an Annual Water Balance (AWB) for each city using the Aqualibre Software.

Data From Delhi, Indore, and Guwahati			
	Delhi	Indore	Guwahati (Municipal Area)
Population supplied	10 million	1.8 million	250,000
Water source	Rivers: within and outside supply area	Narmada River: transported 70 km with vertical lift of 550 m	Brahmaputra River on which city sited
Distribution network length (km)	9,000	1,500	200
Authorized connections	1.4 million	140,000	19,000
Water utility employees	29,000	350	300

The constituent elements of an AWB as promoted by the International Water Association can be seen below.

AWBs were prepared for both the existing situation and for the future, assuming that the system had been restructured to operate under 24/7 supply conditions. Clearly, without proper management, a system operated continuously would lose more water through leakage than one operated intermittently. For the purposes of the study, it was assumed that, in the future, the systems would be operated at an average pressure of 10 meters, that demand would be managed to restrict consumption to 135 liters per person per day (it is actually much less than this at present), and that the networks would have been divided into small, hydraulically discrete District Metered Areas (DMAs). An AWB is not just a record of how water produced by a utility divides into revenue-producing water and the various elements of non-revenue water (NRW).

IWA Standard Water Balance				
System Input Volume	Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption	Revenue Water
			Billed Unmetered Consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-revenue Water
			Unbilled Unmetered Consumption	
	Water Losses	Apparent Losses	Unauthorized Consumption	
			Customer Meter Inaccuracies	
		Real Losses	Leakage and Transmission and Distribution Mains	
	Leakage and Overflows at Storage Tanks			
	Leakage on Service Connections up to Point of Customer Meter			

When combined with appropriate modern software, it is a planning tool that allows the formulation of strategies for improving the efficiency and effectiveness of supply systems.

Strategic Building Blocks for 24/7 Implementation Strategy

Strategies for conversion from intermittent to 24/7 supply will vary between cities; however, essential building blocks will be common to all. These are:

- Credible data on bulk supply and distribution infrastructure, and accurate customer records. While this basic operational and management data is necessary for sound operations and management, it is generally not available in credible and usable forms in most Indian cities. Network plans should preferably be prepared on a GIS base, one of the foundations for modern management.
- A hydraulic model of the supply system which would ensure that bulk water fed into the system can be distributed equitably to all parts of the urban area. The system would be divided into operational zones which may be defined on the basis of service reservoirs, main or booster pumping stations, pressure zones or other operational considerations. The operational zones would then be further sub-divided into DMAs, each ideally covering between 500 and 1,000 connections (possibly more in urban India).
- Installation of bulk meters at all critical points on the transmission



system in order to monitor and control supply to the operational zones.

The division of a network into DMAs is the fundamental building block for conversion from intermittent to 24/7 supply. Each DMA is a hydraulically discrete portion of the network, isolatable from neighboring DMAs and preferably fed with water from a single point on its boundary. A meter chamber is built at the inlet to the DMA, and flow and pressure into the area is continuously

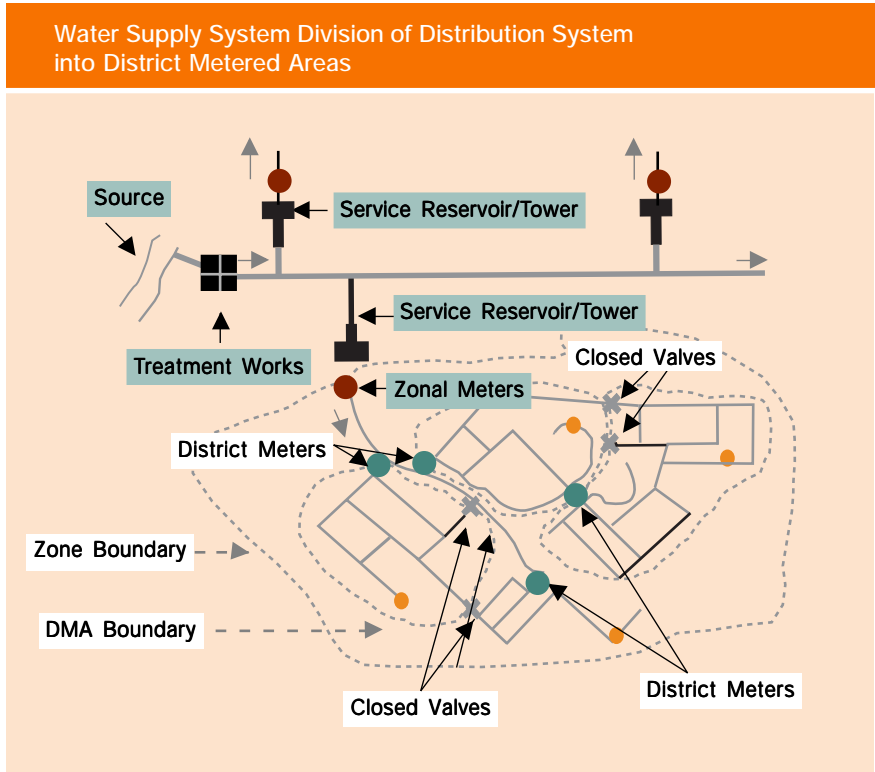
metered. A pressure control valve is installed.

It is important to upgrade customer connections as 60 to 70 percent of leakage appears to take place from these connections. Badly leaking customer connections should be replaced using LDPE or MDPE pipe and a good quality saddle connection, and the customer meter certified for accuracy (or replaced if needed). This operation should be supervised by the water utility. Many customers have

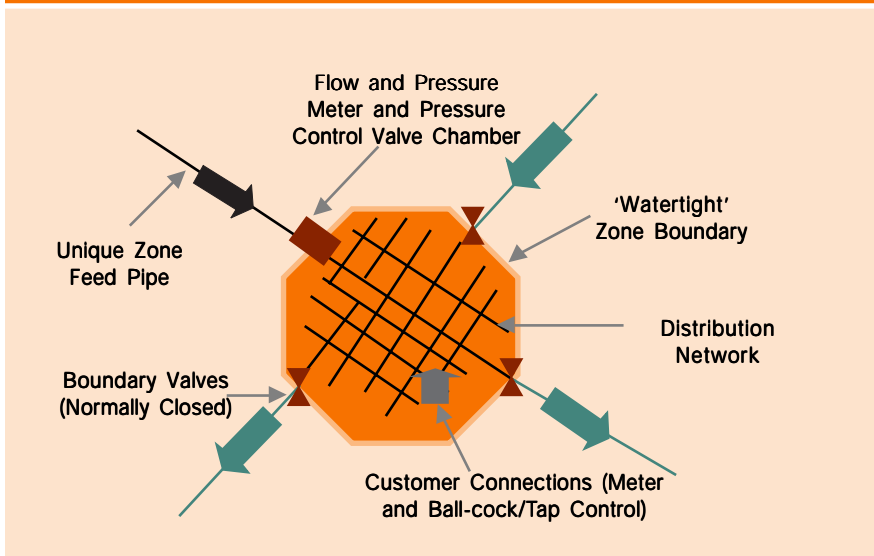
'open-ended' connections into their house or a storage tank to cope with the intermittency of supply. Taps will need to be fitted – or ball-cock valves in the case of storage tanks – to ensure water is used only on demand.

Once established, the DMA provides full operational control to the water utility for the first time – as the water input to the DMA and usage within the zone is known. The difference between the two is the volume of NRW.

Leakage from within the DMA must be brought down to tolerable levels through a mix of measures which include management of system pressure, repair of the backlog of pipe bursts, replacement and rehabilitation of the worst parts of the distribution network, and replacement of property connections. An appropriate mix can be derived through use of modern leakage



Basic Ingredients to Achieve 24/7 Supply District Metered Area



management software. The DMA is now ready for continuously-pressurized, 24/7 operation.

Although less service reservoir capacity is needed in a continuous supply situation than for intermittent supply, there may be a need for additional reservoirs to ensure an equitable supply to all zones and DMAs.

In cases where the system is fed by pumping stations, rather than from service reservoirs, the pumps may need to be modified for 24/7 supply as supply should match the demand pattern. This may necessitate the introduction of variable speed motors or the provision of pumps with a range of pumping capacities.

Matters of the City: Strategy for 24/7

A four-step approach to a strategy for conversion to 24/7 supply was proposed at the workshop. This approach is inherently suitable for a step-by-step or area-by-area approach. In this way, the pace of conversion can be tailored to local circumstances, particularly access to financial and water resources.

Recognizing that little credible data may be available on which to prepare the 24/7 strategy, an initial implementation phase covering a few small distribution areas has been proposed for India (Delhi and Karnataka).

Data from these initial works will be used to refine the strategies and cost estimates for a full-scale program. For Delhi, two Delhi Jal Board (DJB) operational zones, totalling a coverage of about 13 percent of the city's connections, have been chosen for the first phase.

Each step includes the following activities:

Step 1

Preparing the Strategy

- collect data – bulk supply and transmission and distribution infrastructure, customer database, demand estimates, etc;
- define levels of service and draw up water balance;
- prepare hydraulic model and system restructuring plan – zoning and DMA definition;

- choose representative pilot zones;
- prepare, and estimate the costs of a prioritized roll-out plan;
- prepare tariff transition plan – tariffs structured to manage demand and cover costs;
- carry out a customer awareness and information program; and
- train staff in modern operational techniques, for example, leak detection and pressure management.

Step 2

Pilot DMAs

- create pilot DMAs, legitimizing unauthorized connections;
- convert to 24/7 supply and operate for at least 12 months in a sustainable way;
- introduce volumetric charging;

- collect construction and operations data; and
- monitor changes in customer attitudes and behavior (including coping strategies).

Step 3

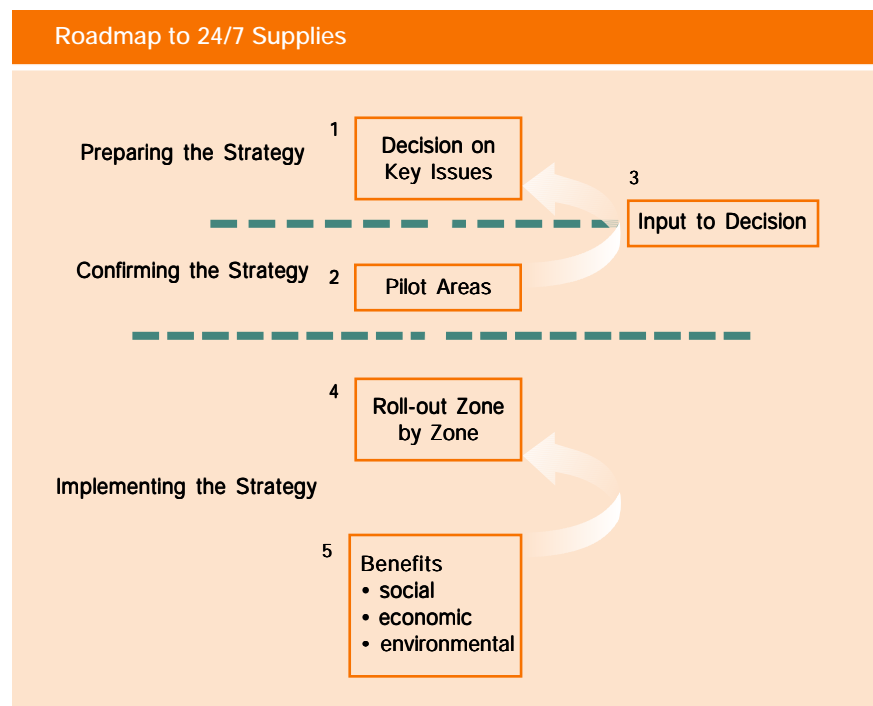
Confirming Strategy

- use pilot trial data to refine designs and strategy;
- re-visit key decisions in the strategy; and
- check costs and financing plan based on tested consumption patterns and willingness-to-pay.

Step 4

Implementing the Strategy

- roll-out full-scale 24/7 conversion program.



Tell Me How

The workshop responded to a number of frequently-asked questions on 24/7 supply:

“Is an investment in 24/7 worth making?”

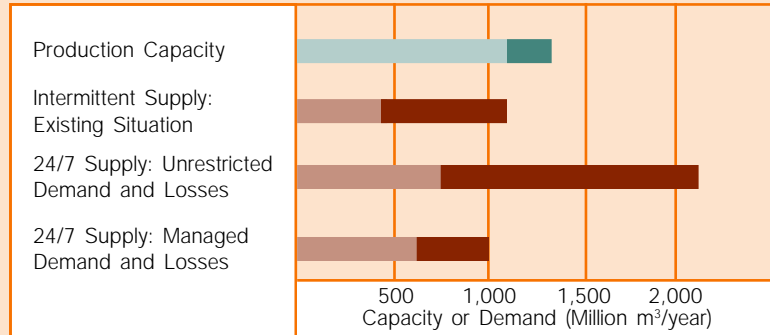
An increasing proportion of urban consumers are already making their own investments to simulate 24/7 supply at the household level – borewells, surface and overhead storage, booster pumps, tanker suppliers, etc. These investments are supplemented with water purification methods such as filtration and boiling.

While it is difficult to estimate the full economic (including environmental and health) costs of these household mechanisms to cope with intermittent water supply, the workshop concluded that they are economically inefficient (as they reduce savings which could be invested more productively), are unaffordable to the poor who suffer disproportionately, and are not sustainable for reasons discussed in other parts of this report.

Direct costs and benefits of transitioning from intermittent supply will be city-specific, depending upon conditions of the distribution network and investments in the main trunk infrastructure to ensure reliable water supply to all parts of the city.

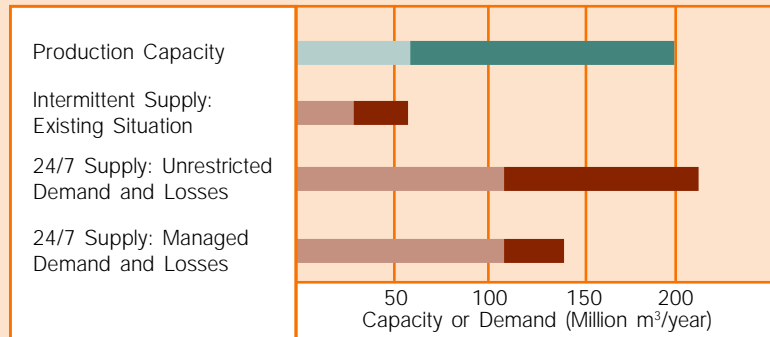
Diagnostic work carried out in Karnataka has estimated that conversion to 24/7 supply will cost between Rs. 7,500 and 11,000 (US\$ 165-245) per connection.

Delhi: Demand vs Capacity



Production Capacity: Existing (light blue) Planned (dark blue)
Billed Water (light brown) Non-revenue Water (dark brown)

Indore: Demand vs Capacity



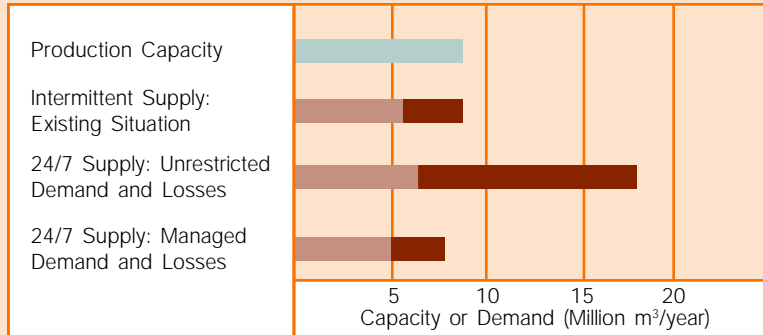
Production Capacity: Existing (light blue) Planned (dark blue)
Billed Water (light brown) Non-revenue Water (dark brown)

Cost estimates for Delhi are expected to be available by early-2005. These costs will be used in the economic analysis of converting to 24/7 water supply by comparing incremental costs and benefits against scenarios of ‘business as usual’ or alternative

approaches a city may be considering for meeting the demand.

Leakage reduction is the most direct benefit of moving to 24/7. Other benefits are likely to include a longer life of distribution assets and a consequent

Guwahati: Demand vs Capacity



Production Capacity: Existing (light blue) Planned (dark blue)
Billed Water (brown) Non-revenue Water (dark brown)

reduction in capital costs (on account of a steady pressure in the system rather than short-term high pressure shocks), improved energy efficiency, reduction in water-borne diseases, and a reduction in other consumer-level coping costs.

“Is there enough water for 24/7 supply?”

This is the most common doubt concerning introduction of 24/7 supply. Under intermittent supply, consumers accept that they tend to waste a considerable amount of water.

Taps are left on – resulting in overflow of storage systems – and ‘stale’ water is dumped when fresh supply arrives. On the supply side, service providers accept that intermittent supply results in higher levels of leakage, mainly due to undiscovered bursts and the high system pressures needed to ‘punch’ large volumes of water through the system in a short period.

Operating a continuously-pressurized system managed through a system of small DMAs brings a number of operational advantages:

- As flow rates are lower, system pressure can be lower.
- As the system is always full, leaks can be detected using traditional or modern sounding techniques
- Unauthorized use can be equated to a leak and can also be detected.

In effect, leakage can be reduced and converted to water supplied to customers from which revenue may be recovered.

The studies looked at prevailing supply-demand imbalances and simulated what would happen if the three cities switched over to 24-supply with and without a ‘managed’ approach.

In the case of Delhi with a production capacity of just under three million liters per day (mld) – all of which goes into

supply but only 40 percent of which is billed – only about 2.7 mld would need to be produced under a managed 24/7 supply system to deliver 135 liters per person per day, with NRW reduced from about 55 percent to 40 percent.

However, without a properly managed 24/7 system, about 5.6 mld would need to be produced to deliver the same level of 135 lpcd!

Similar comparisons for Indore (which is already in the process of doubling its water production capacity) and Guwahati are reproduced here.

“Why does system pressure have to be controlled with 24/7 supply?”

Controlling pressure is one of the fundamental requirements for efficient and effective management of distribution systems operating under 24/7 supply.

System pressure can be a double-edged sword. It allows effective metering, leakage detection, etc. However, more pressure than is needed has adverse effects.

Leakage from most systems is now known to be approximately proportional to pressure, that is, a system normally operated at an average pressure of 10 meters would lose twice as much water if pressure is not controlled and rises to 20 meters.

The actual relationship for a particular system depends upon the proportions of rigid and flexible pipe materials used and the number of breaks at the joints – the greater the proportion of flexible pipes and broken joints, the greater the rate of leakage for a given pressure.

Recent international research has shown that the frequency with which pipe bursts are experienced in a network rises approximately in proportion to the cube of the pressure change.

Thus, doubling the pressure from 10 to 20 meters would result in eight times the bursts that would have been experienced at the lower pressure.

Pressure in a distribution system normally rises when leaking and weak pipelines are replaced.

It follows that if pipes are replaced without controlling pressure, it will create new bursts, negating all or a part of the benefit that would have been derived from the investment.

There are always undetectable leakages in every system. Controlling pressure is the only way to control the volume of water from such leaks.

Thus, every 24/7 supply project should incorporate pressure management systems.

“Can we afford the pumping energy needed for 24/7 supply?”

It is a myth to consider that a system supplying water 24 hours a day uses more power than an intermittent supply. At worst, no more power would be consumed with 24/7 supply but, in fact, under many conditions, power consumption would be less.

With appropriate demand management, no more water needs be pumped under continuous supply than would be the case with intermittent supply. Further, with suitably designed secondary

storage reservoirs and recourse to cheaper off-peak rates for electricity (as these become available), water utilities could reduce pumping costs significantly.

Finally, as power consumption is related to system pressure and duration of pumping, energy consumption for increased pumping duration would likely be offset by a lowering of the high pressures needed to transmit water through the system under intermittent supply.

“Won't people be satisfied if supply just increases from 2 to 10 hours a day?”

It is likely that few customers:

- will have known 24/7 supply or know of its benefits;
- know just how high is the health risk posed by intermittent supply; and
- realize the possible economic benefit to themselves of 24/7 supply.

While awareness-building among customers will need to be part of any 24/7 supply strategy, moving to continuous supply will be worthwhile to the service provider in any case for the reasons discussed above (reduced leakage, increased revenue water, etc). If there is an obligation to provide piped water service for even one hour a day, it is likely to be in the interest of the supplier to move to a managed 24/7 system.

“What if people consume more than the 135 lpcd norm used in the studies and illegal consumption continues unabated?”

In water scarce regions or seasons, uncontrolled consumption by customers who begin to receive continuous supply will neither be sustainable nor equitable.

In addition to reducing significantly the leakages in the supply system, 24/7 water supply will permit accurate metering and billing of consumption, thereby allowing water tariffs and metering to become instruments of effective demand management.

Tariffs can be set to ensure that poor people can afford at least a basic level of service necessary for health and hygiene ('lifeline' tariff for a basic amount of consumption) and higher levels of consumption can be priced to prevent wasteful and unaffordable consumption.

Illegal consumption will also need to be brought under control. Several cities (Bangalore, Hyderabad) have already taken effective strides in this area by legitimizing water supply to illegal settlements, thereby permitting metering and the charging of tariffs.

The emerging view is that most people would much rather receive water legally, and pay a fair price for it, than steal it or receive it from an intermediary who may have stolen it.

“Benchmarking leakage — is there a uniform way of comparing performance?”

The success of a project to convert from intermittency to 24/7 supply is highly dependent upon performance in controlling losses of water from the system.

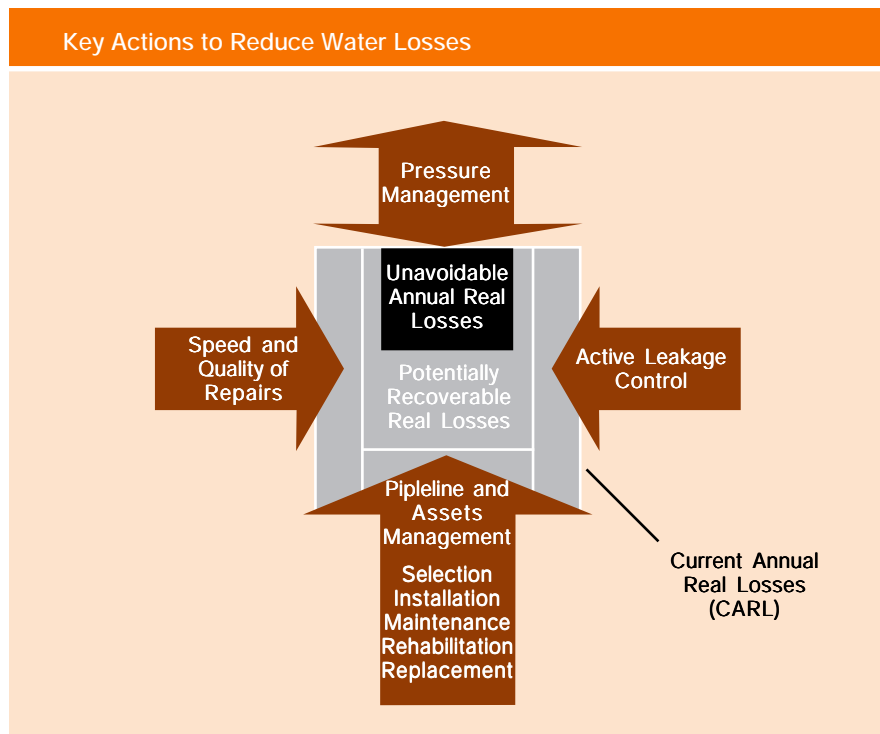
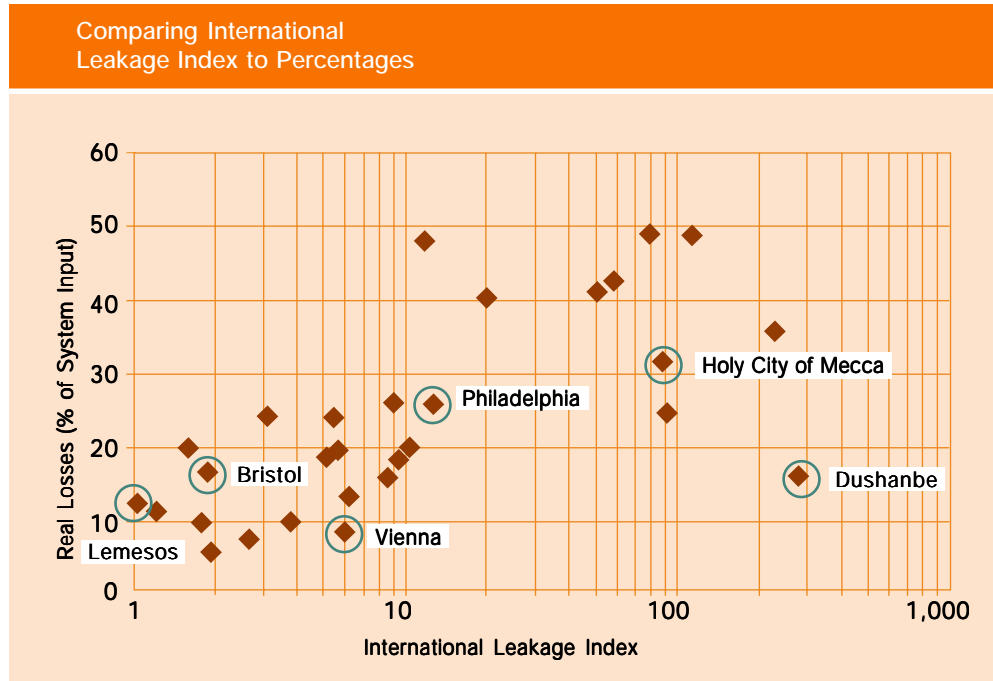
In the past, leakage management performance has been measured as 'water losses as a percentage of production'. This criterion is now seen as inadequate for comparing performance as it does not capture the quality of service – duration or pressure – both of which will impact leakage levels.

A task force of leakage management specialists from around the world, established by the International Water Association (IWA), has recommended a number of more rational criteria for measuring and comparing performance.

For most urban situations in India, the appropriate performance measure for real or physical losses (leakage) is likely to be: *Liters per service connection per day per meter of system pressure.*

However, as this measure assumes that the system is pressurized 24 hours a day, for comparison purposes, present losses would need to be adjusted upwards to represent a notional 24-hour loss.

In the UK, through tightened regulation, loss performance of the 24 companies ranges between 80 and 220 liters per service connection per day which, given the national average system pressure of 45 meters, equates to 1.78 and 4.8 liters per service connection per day per meter of system pressure.



A newer comparison of performance – also endorsed by the IWA – is a ratio which relates Unavoidable Annual Real Losses (UARL) to Current Annual Real Losses (CARL). The UARL is the economic level of real losses below which it would cost more to reduce loss than the value placed on that loss. Software is now available to estimate UARL. The ratio is termed the International Leakage Index (ILI). An ILI of two or less is considered excellent.

ILIs for about 25 companies conducted by the IWA are presented here. ILIs were estimated in the course of the studies carried out for the workshop. In Delhi, one of the best areas studied was the Rohini district of Delhi – its ILI was estimated at 44. However, the ILI for Guwahati was estimated to be 208.

While the distribution system infrastructure in India needs much improvement, ILIs can be reduced in a phased manner. In Delhi, the ILI for the Rohini area may well be reduced significantly with little intervention other than pressure management and repairing of the backlog of bursts.

The Heart of the Matter

24/7 Supply in the Context of Broader Institutional Reforms

Throughout India today, due to the difficult circumstances under which most water service providers operate, the quality of water service provision falls far short of international standards. The unquestioned acceptance of intermittent water supply is one symptom of systemic problems.

A key problem is the inability of the service to charge cost recovery tariffs, enforce payment of these low tariffs and, above all, put in place the incentives to provide demand-responsive services in an efficient and sustainable manner.

From the customer's point of view, it is not unreasonable to resist payment as the service remains unsatisfactory. From the service provider's point of view, intermittent supply does not encourage efficiency, demand-responsiveness or training of staff in modern utility management.

Introduction of 24/7 provides the environment in which management of the service can be radically improved – by providing a better quality service and breaking the vicious, downward spiral.

However, other institutional reforms would need to be introduced in parallel, such as:

- re-orientation from supply-based operation to a customer (demand)-based service;
- modern financial and technical management





The Vision: 24/7 Supply for Urban India by 2015



The workshop attempted to demonstrate – through the case studies presented and lessons drawn from them – that, with the possible exception of chronically ‘water-starved’ areas, conversion from intermittent supply to a continuous, 24/7 service is beneficial, desirable, achievable, and affordable.

It is essential that India reverses the downward spiral in the quality of its urban water service and that it moves progressively towards the goal of continuous supply. There is no other reasonable option. A chronically sub-standard service will never generate the revenue needed for investment to achieve a service that meets the best international standards. The current inadequate service imposes an ever-present risk to health and acts as a brake on economic growth. It needs to be recognized, at both government and operational levels, that:

- processes, systems, and techniques;
- upgrading of management information systems;
- policies and incentives to reward service providers for good performance;
- cost recovery tariffs, structured to manage demand and provide a safety net for the poor and vulnerable;
- re-deployment and re-training of staff to work with the new systems and techniques; and
- effective regulation, including monitoring service performance and setting tariffs.

- there is no acceptable option but to progressively convert to continuous supply;
- conversion to 24/7 supply will require investments in physical assets and human resources;
- the pace at which conversion will proceed will depend upon the cost of the necessary work, customers’ capacity and willingness to pay, willingness to charge reasonable tariffs, and access to financing;
- there would be dramatic improvements in service as zones are converted to 24/7; however, in large cities, it may take 10 to 20 years to complete the process; and
- structured approaches and new technologies can help formulate strategies and investment priorities to achieve the objective of continuous water supply.

The vision of 24/7 supply in all urban India by 2015 is within the technical and financial capability of India. However, can India summon the will to convert the downward, deteriorating ‘vicious spiral’ into an upward, improving ‘virtuous spiral’?

Can India summon the will to convert the:		
downward, deteriorating ‘vicious spiral’	into an	upward, improving ‘virtuous spiral’?
		

Kampuchea Shows the Way

The Phnom Penh Water Supply Authority has successfully completed a campaign to move from intermittent to continuous supply over a period of eight years. In this time, piped supply coverage has increased from 50 percent to 99 percent of the urban area, now serving approximately one million persons, NRW has been reduced from 60 percent to 25 percent. How this was achieved, under difficult social and economic circumstances, was presented at the workshop.

The per capita GDP of Cambodia is about 50 percent of that of India and serves as an illustration that continuous supply does not depend upon the economic status of a country.

Rehabilitation work began on the outdated and almost defunct Phnom Penh water utility in 1995. The utility had virtually ceased functioning during the years of civil war, between 1975 and 1979. At the time the reform implementation process was initiated, in 1995, NRW was estimated to be as much as 61 percent, with only 40 percent of the city's residents connected.

The reform process began with the government setting out goals and announcing a change in policy, advocating full cost recovery for services and full autonomy for the service provider. The Phnom Penh Water Supply Authority announced support for changes in managerial culture, including measures that would enhance autonomy, regulation, restructuring and streamlining job responsibility and, above all, initiated measures to boost motivation and discipline among management and other staff.

A water loss control team was set up to monitor loss and NRW supply within a designated pilot zone, comprising 2,000 household connections, with a 'water-tight boundary'. Staff were trained in such activities as valve operations, locating leakage and detecting unauthorized connections. Only HDPE pipe was permitted for customer connections. Zoning and leak detection was progressively introduced throughout the city, as was 24/7 supply, over a period of eight years.

Billing of the full cost of the water service was introduced, a major step in a country that had been used to subsidized and very poor quality, intermittent water supply.

Some of the notable achievements of the program have been:

- Payment for water usage introduced in 1996, for the first time in the country.
- Full autonomy granted to the utility in 1997.
- Virtually no unauthorized connections were in existence by end-1997.
- Increase in new unauthorized connections fell from 300 per year to three per year.
- Physical loss due to leakage reduced to 23 percent by end-2001 (though the target had been 35 percent) and to 20 percent by June 2002 (though the target was 25 percent by end-2003).
- Savings from control of losses (arising from both physical leakage and NRW) estimated at 22 US cents per m³.
- Tariffs raised in December 2000 (after credibility of the service established).
- All of Phnom Penh's inner city and 60 percent of its suburbs today received metered piped water.

Dr-Ing. Chea Visoth, PPWSA Assistant General Director, while making the presentation said, "Technical and financial expertise and support are not enough... the most crucial element is commitment."





Conclusions and the Way Forward

The workshop was attended by a range of stakeholders in the urban water supply service sector – state and city administrators, operators, engineers, and political representatives. The main conclusions drawn from presentations made at the workshop and the plenary and break-out group discussion sessions were:

- conversion from intermittent to continuous (24/7) water supply in India is both achievable and affordable – and essential to improved sector performance;
- the technical process for converting to 24/7 supply is not complicated; it is well-suited to phased implementation but requires careful preparation and planning;
- sufficient bulk water is available for 24/7 supply in much of urban India; some countries in Africa on 24/7 supply have only 40 to 50 liters per person per day;
- only when a distribution system is continuously pressurized can
 - continual risk of in-pipe contamination of water supplies be eliminated;
 - normal customer meters function with any accuracy;
 - routine leak detection be practiced; and
 - modern supply and demand control techniques be exercised.
- conversion to 24/7 supply should form the cornerstone of a general upgrading of water service performance, providing the

foundation for improved efficiency, effectiveness, and customer responsiveness;

- 24/7 supply should lead to increased customer satisfaction and willingness to pay;
- a volumetric tariff should be applied in areas with 24/7 supply; the average tariff should recover the full, reasonable costs of supplying water; the tariff structure should ensure that the poor can afford at least a basic level of service and provide strong incentives for demand management;
- increased revenue can fund the extension of piped supply to the poor, further improvements and increased maintenance of water service infrastructure; and
- the conversion process should be accompanied by a communication program to inform customers on water use and user charges under 24/7 supply conditions.

Support and Incentives for 24/7 Initiatives

If 24/7 supply is to be transformed from a vision to reality, ‘champions’ of water distribution reform will be needed at federal, state, and city levels. These ‘champions’ will need to build acceptance of the concept and benefits of 24/7 supply and act as the prime movers of all activities needed to support and implement 24/7 supply.

Federal and state governments, as well as the international agencies, need to provide support and incentives.



Federal Government

- ‘Seed’ financial support for start-ups.
- Develop a manual of distribution management and operations.
- Draft support legislation – drinking water standards and enforcement mechanisms.
- Monitor and publish service providers’ performance.

State Governments

- Water policy to include 24/7 as objective with realistic timeframes.
- Training programs for managers and operational staff.
- Assistance in formulating.
- Re-structuring water service and departments.
- Customer communication programs.
- Standards for domestic plumbing.

International Agencies

- Support to central and state governments to formulate policy and support the implementation of 24/7 supply and associated reforms.

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The Urban Think Tank

The Urban Think Tank is a participatory forum which enables experts and practitioners to address issues related to the service delivery of water supply and sanitation services to the poorest sectors of the community. The Think Tank is also intended to spark policy-level debate and provide a forum where the issues and concerns of municipal managers can be brought forward. Regular meetings have been hosted by the Water and Sanitation Program-South Asia (WSP-SA) since December 1994.

The 15th Urban Think Tank which was held in Hyderabad on September 23-24, 2003, discussed the issue of 24-hour water supply for urban India. The participants debated whether this essential goal was achievable or not. They drew lessons from rapid distribution system diagnostic assessments held in Delhi, Indore, and Guwahati. The objective of the

workshop, which was consultative in nature, was to improve the understanding of the factors leading to 24/7 water supply distribution the year round.

Through the publication of *Nagari*, the proceedings and key issues of meetings are disseminated to municipalities all over India. The purpose of this information note is to share lessons learnt, highlight emerging issues, illustrate examples of best practice, and provide a link between municipalities and other stakeholders to foster a better operating environment in the sector of water supply and sanitation services. We would welcome your ideas on any of the issues discussed and feedback forms are enclosed for this purpose. Please also write to us with any comments and suggestions on topics that you feel are important for managers of local urban bodies.

WSP MISSION

To help the poor gain sustained access to improved water and sanitation services.

WSP FUNDING PARTNERS

The Governments of Australia, Austria, Belgium, Canada, Denmark, Germany, Italy, Japan, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom, the United Nations Development Programme, and the World Bank.

PARTNERSHIPS

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Fifteenth Urban Think Tank: Agenda and List of Participants

'24-hour Water Supply: Is This Achievable?'
September 23-24, 2003, Hyderabad, India

AGENDA

Tuesday, September 23: Session 1

Morning

Registration (08.30 – 09.15)

Welcome and Introductory Notes (09.15 – 09.45)

Dr E A S Sarma, Principal, ASCI/CMF, Professor V Chary, ASCI

Straw Poll Session 1 (09.45 – 09.55)

'Do you consider 24/7 supply possible in India?' *Salman Zaheer, WSP-SA*

Keynote Presentation *Stephen Myers, Consultant, WSP-SA* (09.55 – 10.25)

Tea/Coffee Break (10.25 – 10.45)

DELHI, GUWAHATI AND INDORE STUDIES (10.45 – 13.00)

1. 'Background to the Studies' *Andreas Stoitsits, Bristol Water Services*

2. 'Strategic Building Blocks' *Richard Pilcher, Halcrow Water Services*

3. 'Strategies – A Road Map' *Susan West, Halcrow Group Limited*

Q & A – Discussion Session

Lunch (13.00 – 13.45)

Session 2

Afternoon

'Intermittent to Continuous Supply' Video from Phnom Penh, Cambodia (13.45 – 14.25)

Dr Chea Visoth, Phnom Penh WS Authority and Rick Kamionko, Bristol Water Services

SYSTEM MANAGEMENT – KEY ELEMENTS (14.25 – 15.35)

1. 'Making the Most of What You Have' *Roland Liemberger, Bristol Water Services (Consultant)*

2. 'Economics of Distribution System Management' *Stephen Martin, Halcrow Water Services*

Break-out Group Session (15.35 – 16.40)

Plenary Session Discussion (16.40 – 17.40)

Dinner 19.30

Wednesday, September 24: Session 3

Synopsis of Day 1 Proceedings (09.00 – 09.20)

Stephen Myers, Consultant, WSP-SA

PRACTICE AND STRATEGY (09.20 – 10.30)

1. 'The Importance of Pressure Management' *Richard Pilcher, Halcrow Water Services*

2. '24/7 Supply Strategies – Casebook Recipes' *Roland Liemberger, Bristol Water Services*

Break-out Group Session (10.30 – 11.30)

Plenary Session Discussion (11.30 – 12.30)

Straw Poll Session 2 (12.30 – 12.45)

'Do you consider 24/7 supply possible in India?' *Salman Zaheer, WSP-SA*

Lunch (12.45 – 13.45)

Session 4

'Implementing 24/7 Supply – Principal Issues and Next Steps' *Stephen Myers, Consultant, WSP-SA* (13.45 to 14.45)

Workshop Summary (14.45 to 15.15)

(including results of straw polls) *Junaid Ahmad, WSP-SA*

Concluding Remarks (15.15 to 15.45)

Ministry of Urban Development/Change Management Forum

Tea/Coffee

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