# WATER RATE SETTING POLICY FOR WATER CONSERVATION AND PEAK LOAD MANAGEMENT

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## PROBLEM DESCRIPTION AND PURPOSE OF THIS PAPER

The Atlanta Regional Commission's Water Supply Plan forecasts future water demand and allocates existing and planned water supplies among the communities in the Atlanta Region. This plan incorporates water conservation assumptions in the forecasts which have the purpose of reducing, over time, both the average per-capita consumption and the peak-day to average-day ratio allowed by water utilities in the Region. Measures have been implemented to control and reduce average water demand, the most notable of these are adoption of low-flow plumbing fixture laws and water conservation education programs. However, not enough has been done to control peak water use.

Many areas of the Region have experienced trends of increasing peak-day to average ratios due to excessive outdoor watering and lack of outdoor water conservation. The result has been permit violations and water supply distribution/pressure problems. Some residential areas of the Region can experience peak factors up to 2:1.

The cost of providing the treatment or distribution system capacity for these occasional peaks is much greater than for supplying the average daily demand. Since most rate structures in the Region do not take this into account, those users who use outdoor water excessively are not paying their fair share of the cost of providing peak capacity. The result is that those who limit their outdoor water use are subsidizing those who do not.

In order to carry out the directive in the ARC Water Supply Plan's Research and Policy Development Needs chapter, this briefing paper presents one approach to help address the peak demand management problem and increase water conservation efforts. An outline of the general objectives of water utility rate setting and description of the type of water and wastewater rate structures currently being used in the Atlanta Region is presented. The paper then evaluates the potential for pricing and rate structures to be used as a water conservation and peak load management measure. Finally the paper concludes with recommendations for the Atlanta Region.

## RATE SETTING

Water and wastewater rates should be developed in a manner that equitably allocates the cost of supplying water and treating wastewater. Water and wastewater rates can also be used to encourage water conservation and the reduction of wastewater flows. During the rate setting process the utility should identify revenue requirements, determine the costs of serving each customer class and then design the rate structure.During this process several pricing objectives should be considered, including:

* generating sufficient revenues to cover operating and capital costs;
* equitably allocating costs to the customer;
* encouraging the conservation of water;
* ease of implementation and administration of the rate structure;
* producing rates which are reasonably stable for the customer and produce reasonably constant revenues;
* anticipating the financial impact of new environmental regulations on treatment costs and the development of new supply sources.

Water demands in the Atlanta region are characterized by large seasonal fluctuations caused by outdoor water use. Therefore, in the Atlanta region, it would be appropriate to develop rate structures which encourage water conservation in general, and especially to discourage the excessive use of water for outdoor purposes. Higher rates for seasonal water use would also more equitably allocate the costs of supplying water to those who are responsible for creating the seasonal peaks.

## RATE STRUCTURES AND THEIR USE IN THE ATLANTA REGION

Rate structures are generally made up of a fixed minimum service charge a volume or consumption charge. The minimum charge can be a flat fee for some volume of water used, or a service or readiness to serve fee based on meter size. This minimum charge covers certain fixed costs such as meter reading, billing and administration, which are independent of the volume of water pumped. The volume or commodity charge can be assessed in many different ways. Rate structure types which are applied to the volume used are described below.

Flat Rate This is a simple rate structure which charges all users the same amount regardless of the volume used. It is usually used only where customers are not metered and the

volume of water used is unknown. It is very inequitable because small volume users are charged the same as large volume users. This rate encourages waste because there is no cost associated with excessive use. This rate is used by only one utility in the Atlanta Region because the majority of that utility's customers are not metered. This is a small municipality that has less than 400 customers.

Uniform Rate This rate structure applies a constant price per unit volume of water used. The uniform rate can encourage water savings because the total cost increases directly proportional to the amount used. The rate is fairly equitable in allocating operation and maintenance expenses because it should cost the same to pump the first gallon as it costs to pump the last gallon. This rate structure is most commonly used because it is relatively simple, reasonably equitable and does not encourage excessive water use. It is used by 61 percent of the water utilities and 88 percent of the wastewater utilities in the Atlanta Region.

Decreasing Rate This rate structure applies increasingly lower per volume charges as water usage increases. Decreasing rate structures are no longer seen as appropriate in most areas of the country. This approach was developed many years ago when it was assumed that large volume users with constant demands were less costly to serve per unit of water, because they generally do not contribute to the peak load on the distribution system (Calif., 1988). A large part of the cost of developing water supplies is the cost of providing additional capacity for peak demands. However, since there are small residential and commercial customers that also have constant demands and do not contribute to excessive peak demands, this rate structure is seen as an inequitable subsidy of larger users. The declining block rate structure can encourage excessive water us because the per unit volume cost decreases as water use increases. The use of this rate structure is becoming less common. It is used by only 26 percent of the water utilities and only one wastewater utility in the region.

Increasing Rate This rate structure was designed to discourage excessive water use. The per volume charge increases with increasing water use. Although, this method is credited with having the greatest conservation impact on water use, large industrial and institutional water users whose use patterns are constant and do not add to peak demands may be unfairly penalized. Increasing block rates are used by 11 percent of the water and 6 percent of the wastewater utilities in the Atlanta Region. Several variations of increasing rate structures are described below.

Seasonal Surcharge or Excess Use Charge This is a rate developed to discourage excessive seasonal water use, primarily residential outdoor use. The customer's average wintertime or nonseasonal use is determined and then any use above that by some percentage (for example, 130% of winter average) is surcharged. This method is the most economically equitable at targeting those customers responsible for seasonal water demand peaks. Implementation of this type of rate structure can be complex and it may take a year to determine a new customer's average winter usage. Therefore, provisions for new customers who are often establishing new landscapes must be made so they are subject to this conservation oriented rate. There may be situations where summer outdoor water use is not the cause of peaks such as children being home from school, etc. However these situations are not the norm and should not play a role in rate setting.

Seasonal Uniform or Increasing Block Rate This refers to a rate structure designed specifically for summertime or peak water use periods. Rather than being based on wintertime or nonseasonal use, these rates automatically go into effect for a particular time of year for all users. This rate type will encourage water conservation during peak usage periods and is relatively simple to administer. However, this rate type is not as equitable as the excess use charge because all users may be impacted, whether their use is greater in the summertime or not. By applying seasonal rates to residential customers only, this problem can be minimized. Currently there are no seasonal rates in use in the Atlanta Region.

## EFFECT OF PRICE AND RATE STRUCTURES ON WATER USE

The effect that price has on water use is often a controversial subject. Most economists will describe the basic supply-demand relationship and it's effect on price: that as price increases, demand will decline. Others will argue that water is a nonreplaceable good, and consumers have no alternative choices and will not respond to increases in price. However, there have been many studies that have shown that increasing prices will drive down demand. A publication by the Corps of Engineers (Boland, 1984) evaluates 29 previous studies which demonstrated that price has an effect on water use. The relationship between a change in demands caused by a change in price is called price elasticity. Price elasticity is a statistical measure of the average change in demand caused by a unit change in price. The studies showed that summer seasonal water use is more elastic than winter nonseasonal use and therefore supports the seasonal surcharge approach to reduce demand. The precise effect of price on water demand is difficult to determine because of other conflicting factors such as weather conditions and other conservation measures which have been implemented.

The effect of price on water demand is important as a conservation tool. Price is one of the few factors that influence demand that the water resource manager can control, unlike weather, population, etc. It is also a factor that can be changed by a large amount. By designing a rate structure in which the cost for water increases at a direct or increasingly proportional rate with some type of seasonal rate, excessive water use can be discouraged and the costs of the water equitably allocated. Similar effects may be noticed with wastewater generation. Bills for these two services should be listed separately so that customers can be better informed and respond to price changes appropriately.

Utilities often implement uniform, increasing or seasonal rate structures for the following purposes: 1) conservation of water supplies during drought; 2) to delay the need for increasing capacity of water and wastewater facilities; 3) to

more equitably allocate the costs of service; and 4) to reduce peak daily and seasonal demands.

Increasing rate structures were implemented in Oakland, California and Tampa, Florida because of extreme droughts. In Tampa, they expect to reduce water demand by approximately 10%. The Boston Water and Sewer Commission implemented an increasing block rate to promote water conservation but primarily to finance expensive repairs and upgrades of the area's sewer system and treatment facilities and to reduce the generation of wastewater.

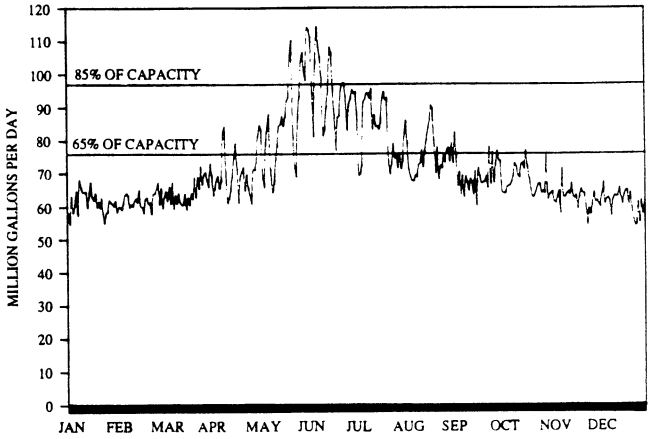
The uniform rate is in use by the majority of utilities across the country. Many utilities have also implemented seasonal rates in conjunction with uniform rates to discourage excessive seasonal water use. The cities of Newport News, Virginia, Los Angeles and Fairfax County (Alexandria, Virginia) have implemented uniform rates with seasonal excess use charges (AMWA Bulletin, May 24, 1990). Their goal was to reduce seasonal outdoor water use which creates the need for little used additional water production capacity.

The Fairfax County Water Authority implemented a seasonal excess use charge in 1975 to reduce summertime outdoor water use which accounted for a large part of the water system's seasonal peak demand. Customers are assessed a surcharge for seasonal use which is greater than 1.3 times their winter quarter consumption. The surcharge was set at 350% of the basic commodity rate. Although the Authority found it difficult to evaluate the overall impact of the seasonal rate on demands, it has reduced the peak use. Before the rate was implemented, demands had occasionally exceeded the design peak rate of 1.6 but they have not exceeded this rate in the 13 years since (Griffeth, 1988). The Orange County, Florida Water Department implemented a seasonal rate which is 150% of the normal rate for any residential water use in excess of 15,000 gallons per month. They determined that this reduced the number of customers using greater than 15,000 gallons per month by 25% in some service areas (Briggs, 1989). Other utilities have implemented some type of seasonal rate to demonstrate their commitment to conservation in order to gain support from the public, as well as the Federal government for developing new water sources.

## LOCAL CASE STUDY

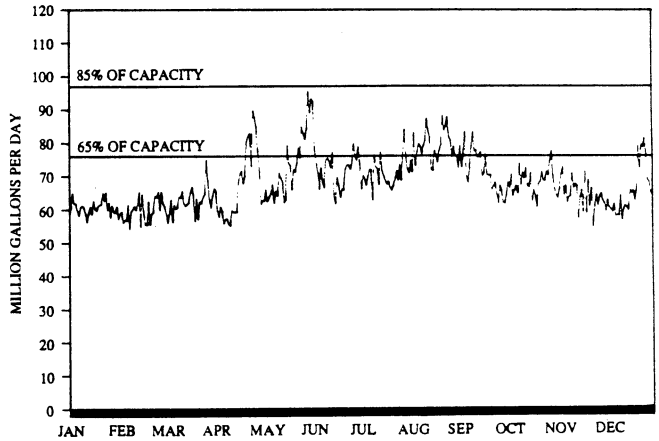
The need for seasonal controls is illustrated in the graphs of Cobb County - Marietta Water Authority's (CCMWA) daily demand. In 1988, for CCMWA the demand exceeded 85% of capacity for only 14 days during the summer, and 65% of capacity for only 95 days. During a wet year in 1989, demand never exceeded 85% of capacity. This means that the upper 15% of CCMWA's capacity was needed during only 4% of 1988 and not at all in 1989. Under current rate schedules, all water system customers subsidize this seasonal outdoor use. If seasonal rate structures were implemented, then the customers creating the peaks would be more financially responsible for the costs and low and fixed income customers and others who use little outside water would not be subsidizing this use.

COBB COUNTY MARIETTA WATER AUTHORITY
DAILY WATER DEMAND




1988 DRY YEAR

COBB COUNTY MARIETTA WATER AUTHORITY
DAILY WATER DEMAND




1989 WET YEAR

## ARC'S RECOMMENDED PRICE AND RATE SETTING POLICY

Local governments should develop rate structures which both equitably distribute the costs of supplying water and discourages excessive use. Water supplies are currently adequate in the Atlanta Region during nondrought periods. However, rapid growth, the increasing competition between user groups, Federal regulations which make developing new surface water sources difficult and costly and the effect of extreme peak seasonal demands exceeding the infrastructure's ability to meet those demands are all reasons why we should aggressively pursue conservation and demand management.

In order to discourage excessive water use and dampen seasonal peaks, a pricing policy should be developed in which the cost per unit of water used remains constant or increases as water use increases. It is logical that the customers responsible for peak demands should pay the cost of securing additional capacity. A large part of seasonal outdoor water use in the Atlanta Region is due to the use of automatic irrigation systems. Many utilities offer customers the option of installing a second meter for outdoor use so that they are not assessed sewer charges for this water. This practice has encouraged outdoor watering and has contributed to excessive peak demands. Most utilities bill the customer at the same rate as for indoor water use, however, to discourage excessive outdoor use a seasonal surcharge should be applied to this meter.

Decreasing rate structures encourage water use, inequitably subsidize large water users and should be eliminated as the foundation for rate structures in the Atlanta region. **Water utilities should at a minimum adopt uniform rate structures** as the foundation for allocating costs for average demands **and a peak use surcharge for demands over 130% of the average winter use** in order to more equitably distribute the costs of providing peak capacity and also to provide a management tool for excessive outdoor water use. The seasonal surcharge should also be applied to secondary meters for outdoor water use.

**The following amendment to the ARC Regional Water Supply Plan was made by the Atlanta Regional Commission on July 25, 1990 revising the policy regarding pricing to read as follows:**

Water and wastewater rate structures and policies should equitably distribute costs of providing capacity and should encourage water conservation.

- oDecreasing type rate structures should no longer be used in the Atlanta Region.
- oWater utilities should, at a minimum, adopt uniform rate structures as the foundation for average demands and apply a peak use surcharge or increasing rate to control peak demands. It is recommended that the surcharge or increasing rate be applied to demands over 130% of average winter use (average of Dec., Jan., and Feb.).
- oPeak use surcharges and increasing rates should be set sufficiently high to decrease peak demands in accord with the ARC Water Supply Plan. Surcharges of 200% of the base rate or more may be necessary to control excessive water use. Peak factors will be set system by system in the ARC Water Supply Plan.
- oWhere second meters are used, the surcharge or increasing rate should be applied to demands over 130% of the combined household or indoor meter and outdoor meter average winter use.
- oProvide explanation to customers at the effective date of implementation.
- oThese policies should be implemented by January 1, 1992. Following implementation, a period of evaluation and revision can occur such that final policies are in place by January 1, 1993.

## LITERATURE CITED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