9. Water Pricing

basic guidance:

\[ \text{Agg. Eff.} \Rightarrow MB=MC \text{ or } MNB=0 \]

Agent Behavior: \( MB = p \)

Managers should set \( p = MC \)

Pricing Lingo

- **water price** (or water rate); must be volumetric
- water rates, water bills
- flat rates (are nonvolumetric)
- rate structure
  - uniform or constant rate
  - decreasing block rates
  - increasing block rates
- time of year (TOY) pricing
  - mainly summer & winter (currently)
- **meter charge** (minimum charge, service charge); flat and recurring each billing period
- **connection charge** (...); nonrecurring
- winter averaging (wastewater only)
Increasing block rate example:

\[
\text{Bill for } \dot{w} = M + \begin{cases} 
  p_1 \dot{w} & \text{if } \dot{w} \leq w_1 \\
  p_1 w_1 + p_2 (\dot{w} - w_1) & \text{if } w_1 < \dot{w} \leq w_2 \\
  p_1 w_1 + p_2 (w_2 - w_1) + p_3 (\dot{w} - w_2) & \text{if } w_2 < \dot{w}
\end{cases}
\]

College Station

WATER RATES

The increasing volumetric rate structure for water outlined below applies to residential single family customers only. Commercial irrigation-only customers, for example businesses and HOA common areas, pay the $2.68 per thousand gallons rate.

<table>
<thead>
<tr>
<th>Usage (gallons)</th>
<th>Rate / 1,000 Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td></td>
</tr>
<tr>
<td>0 - 10,000</td>
<td>$2.26</td>
</tr>
<tr>
<td>11,000 - 15,000</td>
<td>$2.94</td>
</tr>
<tr>
<td>16,000 - 20,000</td>
<td>$3.61</td>
</tr>
<tr>
<td>21,000 - 25,000</td>
<td>$4.28</td>
</tr>
<tr>
<td>26,000- above</td>
<td>$4.95</td>
</tr>
<tr>
<td>Meter Fee</td>
<td>$10.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Usage</th>
<th>Rate / 1,000 Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial - Domestic</td>
<td>Domestic (inside) usage</td>
<td>$2.49</td>
</tr>
<tr>
<td>Commercial - Irrigation</td>
<td>Irrigation (outside) usage</td>
<td>$2.68</td>
</tr>
<tr>
<td>Meter Fee</td>
<td>Varies by meter size</td>
<td></td>
</tr>
</tbody>
</table>

WASTEWATER RATES

Inside City Limits - Wastewater Rates effective 10/1/12

<table>
<thead>
<tr>
<th>Customer Class</th>
<th>Monthly Service Charge</th>
<th>Usage Charge</th>
<th>Maximum Billing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family Residential</td>
<td>$10.76</td>
<td>$3.76 /1,000 gallons</td>
<td>$41.34</td>
</tr>
<tr>
<td>Multi-Family Residential: Less than 50 units, no kitchens</td>
<td>$10.11 per month (no usage included)</td>
<td>No usage charge</td>
<td>No maximum</td>
</tr>
<tr>
<td>Multi-Family Residential: 50 or more units, no kitchens</td>
<td>$14.91 per month, per unit</td>
<td>No usage charge</td>
<td>$14.91 (flat rate)</td>
</tr>
<tr>
<td>Multi-Family Residential w/kitchens in each unit</td>
<td>$23.89 per month, per unit</td>
<td>No usage charge</td>
<td>$23.89 (flat rate)</td>
</tr>
<tr>
<td>Commercial</td>
<td>$16.11 per month (no usage included)</td>
<td>$4.47 /1,000 gallons</td>
<td>No maximum</td>
</tr>
</tbody>
</table>
Commonly Noted Pricing Goals

1. Revenue sufficiency (cost recovery, revenue neutrality)
2. Revenue stability
3. Economic efficiency
4. Equity; fairness
5. Simplicity
6. Legality

Are these goals redundant or opposing?
What Utility Accountants Do:

a. Focus on breaking even

b. So mainstream practice is to estimate upcoming costs and to devise rates that will hopefully offset these costs

c. Emphasis is on cost allocation, excluding opportunity costs

d. Emphasis is on average costs, not marginal costs

Three Primary Pricing Tools!
(applied in unison)

- water price
- connection charge
- meter charge

If we can move beyond accounting practice so as to confront water scarcity, a great division of duties is:

1. water price  
2. connection charge  
3. meter charge  

Set these efficiently  
Balance the budget with this one.
Efficient water prices include opportunity costs:

\[
\text{SW : } p = \frac{\partial C}{\partial w} + \text{MVW} + \text{MCC}
\]

or

\[
\text{GW : } p = \frac{\partial C}{\partial w} + \text{MUC} + \text{MCC}
\]

Nonaccounting opportunity costs:

MVW – marginal value of water (renewable)
MUC – marginal user costs (nonrenewable)
MCC – marginal capacity costs

Some or all of these might be zero.

Nonaccounting opportunity costs:

- Including any nonaccounting opportunity costs in water price can yield excess revenue for the supplier.
- This revenue is unmatched by accounting costs, so it will create a “profit” unless the surplus can be dispersed in a harmless way.
- Let’s disperse it by lowering M, the meter charge.
Accounting costs:

Systemwide water use

previously (simple): $C(W)$

new & improved: $C(W, N, \Delta N)$

Making rates efficient

1. Efficient meter charge

That is, lower everyone’s meter charges to eliminate surplus -- effectively treating everyone as shareholders of the utility/district.

“water dividend” has nice welfare properties, too

Making rates efficient

2. Efficient new connection fee

We should compute a dynamic version of a new connection’s impact upon systemwide costs.
Making rates efficient

New connections “shift forward” the entire schedule of:

- water development
- capital replacement & maintenance
- depletion
- water rights acquisitions

<table>
<thead>
<tr>
<th>Year</th>
<th>Capital costs w new conn’s</th>
<th>Capital costs wo new conn’s</th>
<th>∆PV(∆)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>1</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>2</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Costs caused by new connections & basis of new connection charge.

MCC

Rationing Capacity and Staying on the Optimal Capacity Schedule
The Optimal Schedule
(is a lumpy thing)

Optimal Capacity

Now
When NPV of next project is max'd (or at least is greater than zero)

Do you want to build capacity in advance of demand for it?

- Asked another way:
  - What’s the cost savings of delaying a $30m project one year?
  - The answer depends of the cost of capital (interest rate), but a one-year delay postpones all project expenditures one year,
    - so, for ex., $30m \times 0.05 = $1.5m
    - hmmm

- So, it doesn’t make sense to build a $30m project that will result in excess capacity unless this year’s value of the project is at least $1.5m.
• Therefore, it can be optimal to have periods in which capacity is “inadequate”.

• How should we ration available capacity during these periods?

Therefore, MCC moves in concert with capacity.

An optimal capacity schedule is supported by an optimal MCC schedule and vice versa.

MCC is in addition to water scarcity value (if MCC is not zero).