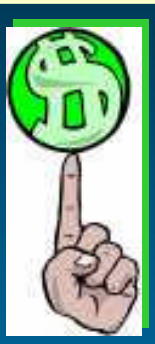
Developing Water System Financial Capacity

- This training module was developed for the **Drinking Water Academy** (DWA) of the U.S. Environmental Protection Agency.
- The Academy is developing a number of **training modules.** These modules cover topics identified by the DWA Workgroup as most important in supporting SDWA implementation. The modules are being developed for new employees in particular.
- This module is **Developing Water System Financial Capacity.**
- The purpose of the module is to provide a general **introduction and overview** and to provide opportunities for discussion. Additional information resources and training materials are available on many of the subjects reviewed in this module.

Workshop Objectives

- The methods for assessing financial capacity
- The importance of rate revenues to water system capacity
- The implications for affordability



- The purpose of this presentation is to:
  - Describe some of the **available methods** for assessing the financial capacity of water systems;
  - Highlight the central importance of **rate revenues** to water systems in terms of developing financial capacity and overall capacity; and
  - Discuss the implications for water-service **affordability.**

Fundamental Goals of Capacity Development

- To ensure consistent compliance with drinking water standards
- To enhance water system performance
- To promote continuous improvement

- The **1996 Safe Drinking Water Act** (SDWA) emphasizes developing the capacity of water systems.
- The **fundamental goals** of capacity development are:
  - To protect public health by **ensuring consistent compliance** with drinking water standards, including Federal and State regulations and other applicable standards of performance;
  - To **enhance performance** beyond compliance though measures that bring about efficiency, effectiveness, and service excellence; and
  - To **promote continuous improvement** through monitoring, assessment, and strategic planning. All water systems, regardless of size or other characteristics, can benefit from a program of continuous improvement.

What is Capacity?

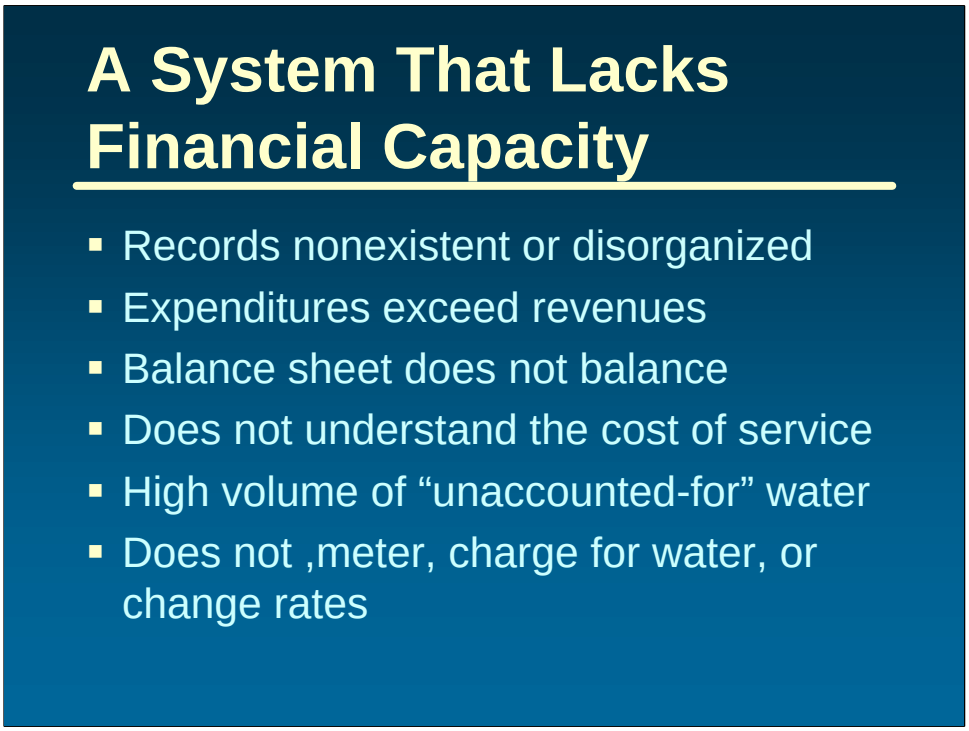
- Fundamentally, water system capacity is the ability to plan for, achieve, and maintain compliance with applicable drinking water standards.
- Capacity development also extends beyond compliance.
- For a system to have "capacity" it must have *adequate* capability in three areas--technical, managerial, and financial.

- Water system **capacity** (not to be confused with production capacity as measured in units of water) is:
  - The ability to plan for, achieve, and maintain compliance with applicable drinking water **standards.**
- Capacity development, however, extends **beyond compliance** to include activities that enhance water system performance and promote continuous improvement.
- For a system to have capacity, adequate capability is required in **three** distinct but interrelated areas:
  - Technical
  - Managerial
  - Financial
- The three basic elements of capacity have a statutory basis. Definitions and refinements were developed in EPA guidance documents with the broad-based input of stakeholders.
- Participants may want to discuss the meaning of "adequate."

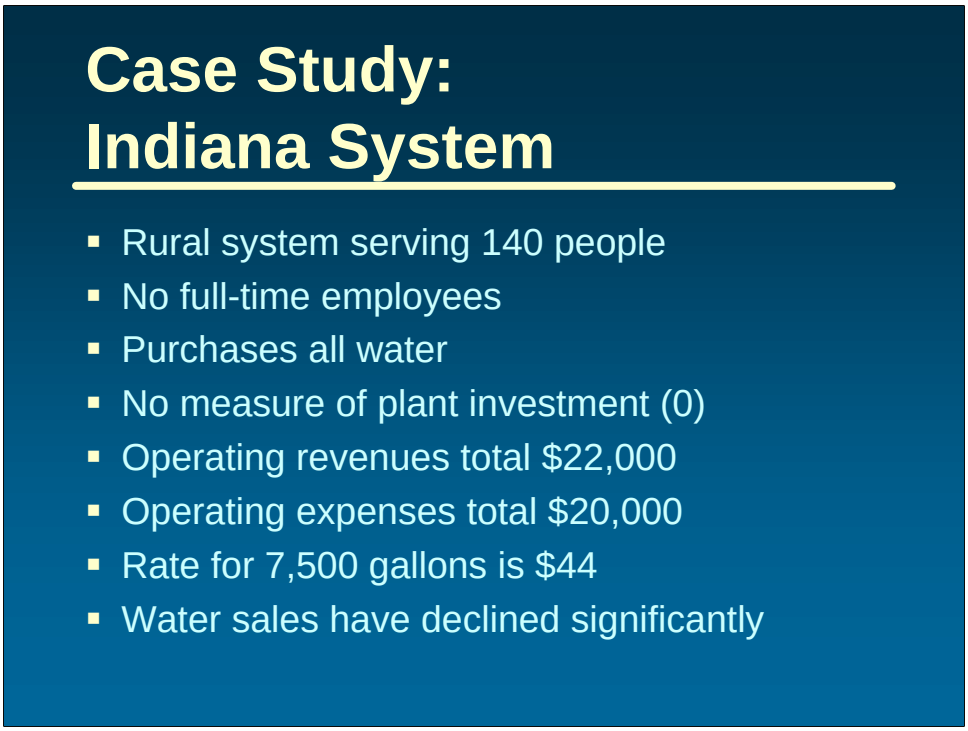
Exercise

- Describe a system that “has financial capacity”
- Describe a system that “lacks financial capacity”

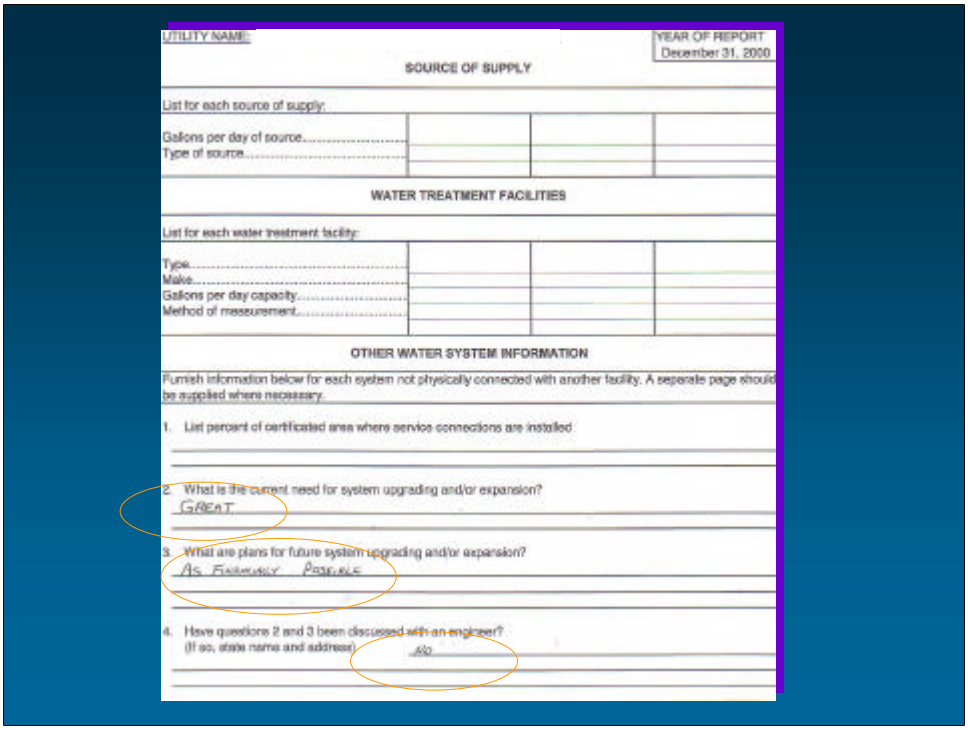
- Here is an **exercise** for defining capacity in practical terms.
- Participants in the workshop can provide their practical or working **definition** of capacity.
  - How do we know a **troubled system** when we see one?
  - How do we know when a system is **at risk?**
- **Describe** a system that “has capacity.”
  - List common characteristics and issues.
- **Describe** a system that “lacks capacity.”
  - List common characteristics and issues.



- Example characteristics of a system that **lacks financial capacity:**
  - **Records** nonexistent or disorganized (also a managerial capacity problem).
  - **Expenditures** exceed revenues (efficiency and revenue concerns).
  - **Balance sheet** does not balance (accounting problems).
  - Does not understand the **cost of service** (lack of knowledge, tools).
  - High volume of **“unaccounted-for” water** (non-revenue producing water).
  - **Does not meter,** charge for water, or change rates (revenue insufficiency over time).



- This **case study** explores a small, nonprofit water system in Indiana.
  - Rural system serving 140 people.
  - No full-time employees.
  - Purchases all water.
  - No measure of plant investment (0).
  - Operating revenues total $22,000.
  - Operating expenses total $20,000.
  - Rate for 7,500 gallons is $44.
  - Water sales have declined significantly.



UTILITY NAME:

YEAR OF REPORT
December 31, 2000

SOURCE OF SUPPLY

List for each source of supply:

Gallons per day of source			
Type of source			

WATER TREATMENT FACILITIES

List for each water treatment facility:

Type			
Make			
Gallons per day capacity			
Method of measurement			

OTHER WATER SYSTEM INFORMATION

Furnish information below for each system not physically connected with another facility. A separate page should be supplied where necessary.

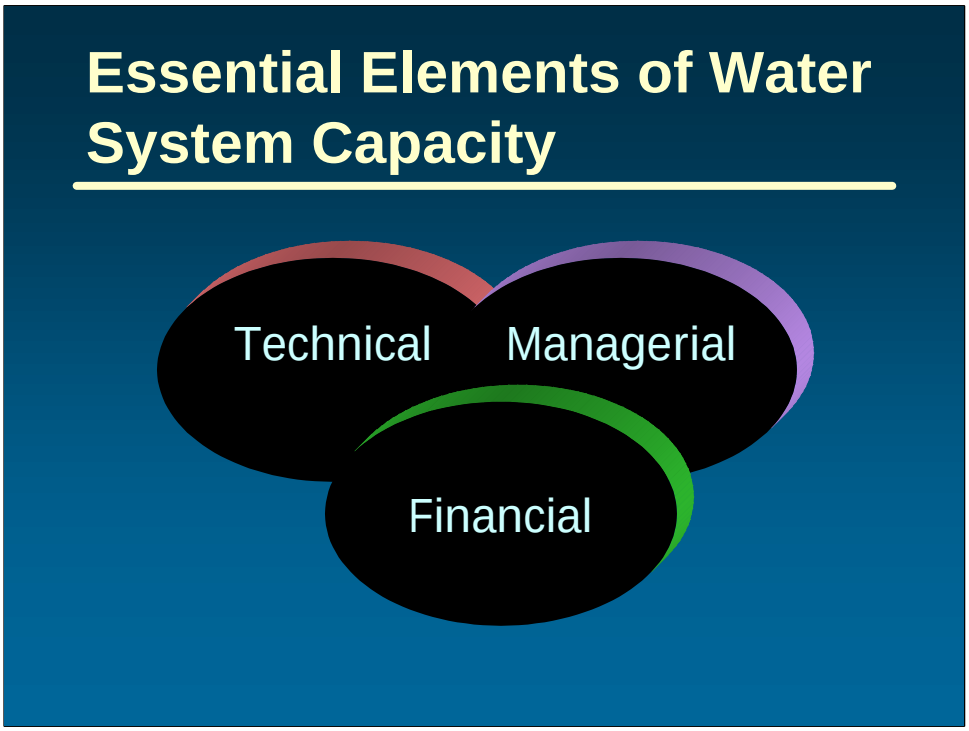
1. List percent of certificated area where service connections are installed

2. What is the current need for system upgrading and/or expansion?
   GREAT

3. What are plans for future system upgrading and/or expansion?
   AS FINANCIALLY POSSIBLE

4. Have questions 2 and 3 been discussed with an engineer?
   (If so, state name and address) NO

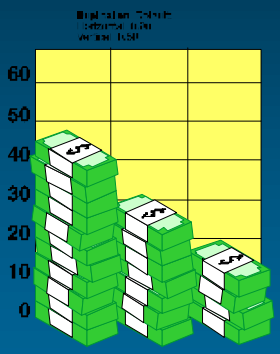
- Sample page from a small system **annual financial report.**



- Three three essential elements of capacity--technical, managerial, and financial, are closely related and can be represented by a **"Venn diagram"** depicting the intersections among the elements.

Financial Capacity

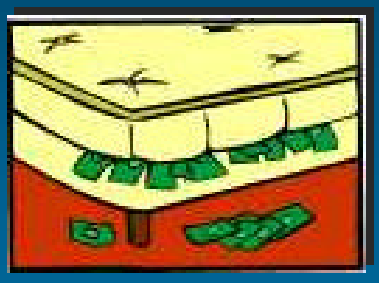
- The ability of a water system to acquire and manage sufficient financial resources to allow the system to achieve and maintain compliance with SDWA requirements.



- **Financial capacity** is defined as:
  - The ability of a water system to acquire and manage sufficient financial resources to allow the system to achieve and maintain compliance with SDWA requirements.

Elements of Financial Capacity

- Revenue sufficiency
- Credit worthiness
- Fiscal controls



- The essential elements of **financial capacity** are:
  - Revenue sufficiency
  - Credit worthiness
  - Fiscal controls

Revenue Sufficiency

- Are the system's costs and revenues known and measurable?
- Are system assets properly valued and reflected in rates?
- Do revenues from rates and charges cover system costs?

- **Revenue sufficiency** can be explored by asking:
  - Are the system's costs and revenues known and measurable?
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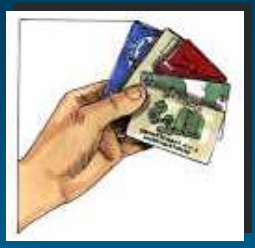
  - Do revenues from rates and charges cover system costs?

Credit Worthiness



- Is the system financially healthy, as measured through indicators, ratios, and ratings?
- Does it have a credit record and access to capital through public or private sources?
- Can it provide assurance of repayment?

- **Credit worthiness** can be explored by asking:
  - Is the system financially healthy, as measured through indicators, ratios, and ratings?
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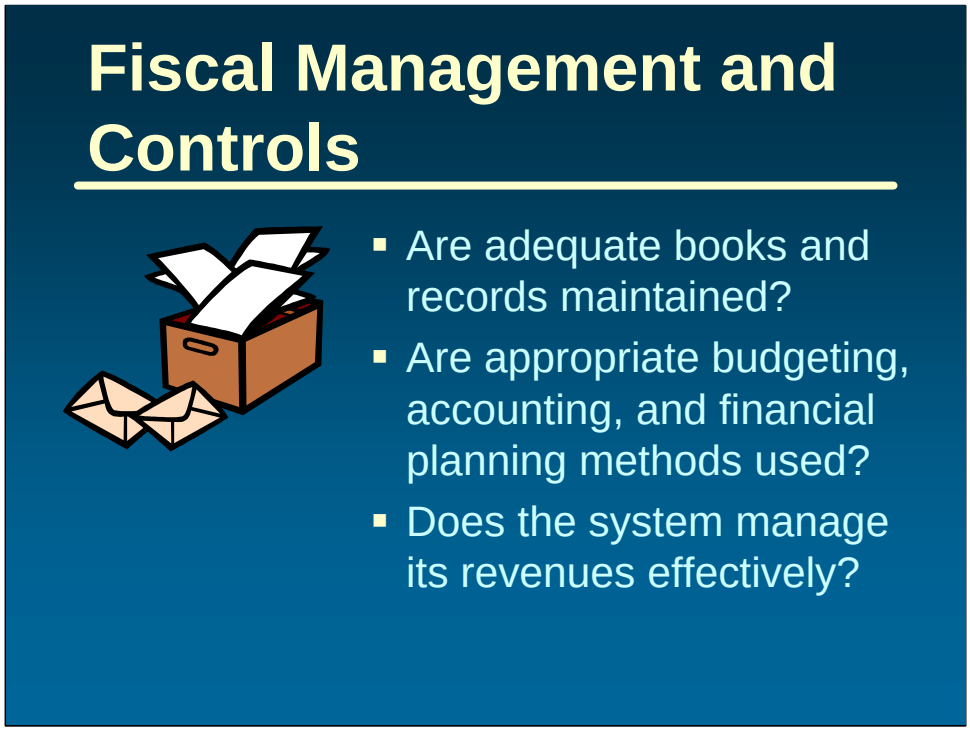
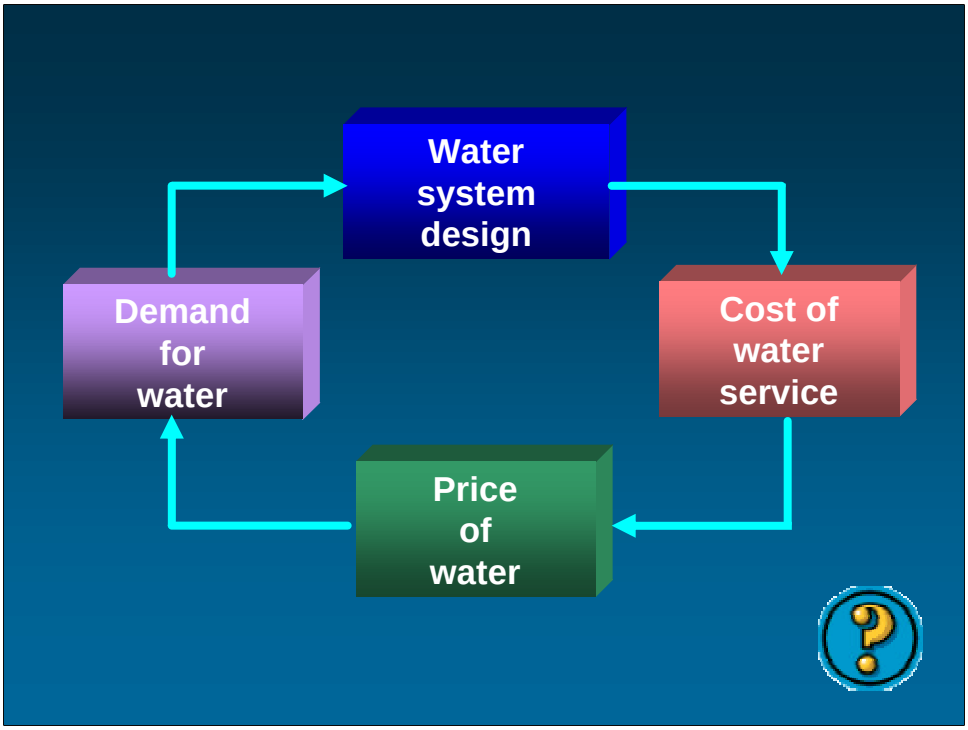
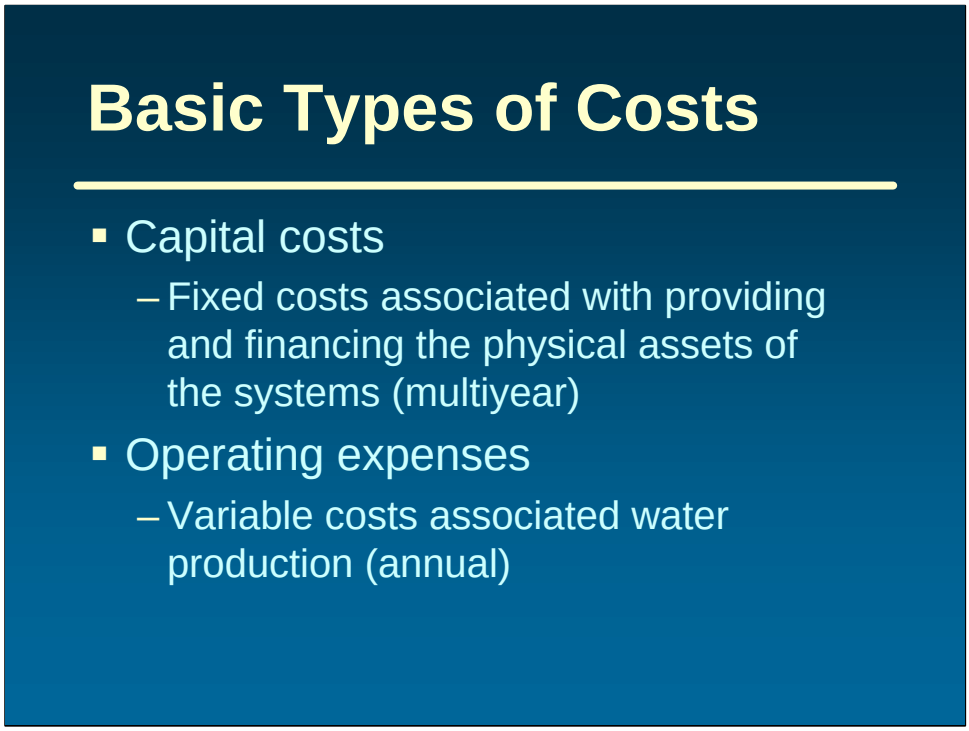


- **Fiscal management and controls** can be explored by asking:
  - Are adequate books and records maintained?
  - Are appropriate budgeting, accounting, and financial planning methods used?
  - Does the system manage its revenues effectively?

Drinking Water Costs

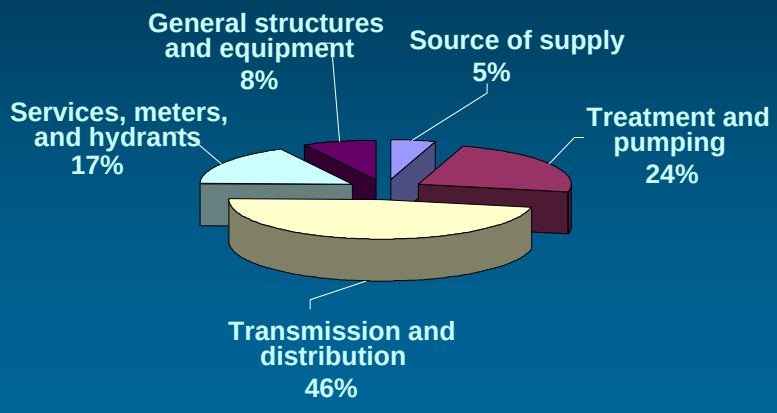


- A **circular relationship** exists among:
  - Demand for water (usage);
  - Water-system design;
  - Cost of water service; and
  - Price of water.
- A **change** in any of these factors, in other words, has implications for the others.
- **For example,** a change in the design of a water system (including improvements) affect the cost of service.
- As **another example,** an increase in the price of water can affect how much water customers consume.

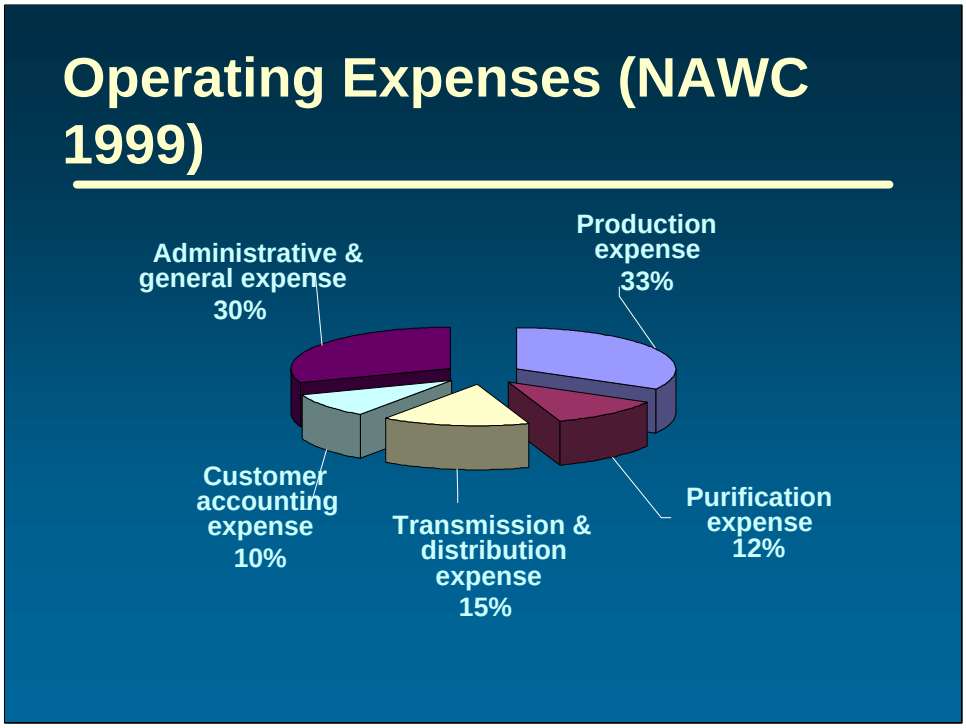


- Water system **capital costs** are associated with physical assets, such as treatment plant, pumps, and pipes.
  - The capital assets of **water facilities** have a relatively long useful-life span(even when compared with other utilities).
  - Capital projects typically are **financed** over several years.
- Water system **operating costs** include the costs of labor, water, energy, and chemicals.
  - Most operating costs **recur annually.**
  - Some operating costs (such as chemical costs) **vary with water use**; others (such as labor costs) do not.
  - **Efficiency** practices can help reduce operating costs.
  - Typically, operating costs are **not financed** but covered by an annual operating budget (and recovered through water rates).

Capital Investment for a Large Water System (AWK 2000)



- For many water system, capital investment in **utility plant** is concentrated in the transmission and distribution functions.
- Data from the **American Water Works Company,** which provides water to more than 800 water systems in 21 States, transmission and distribution accounts for nearly half of all investment in utility plant.
- **Source of supply** accounts for about percent of utility plant; **treatment and pumping** account for about 24 percent.
- These **proportions** vary significantly by system size, age, and location. For example, systems in water scarce regions (such as California) spend relatively more on source of supply.



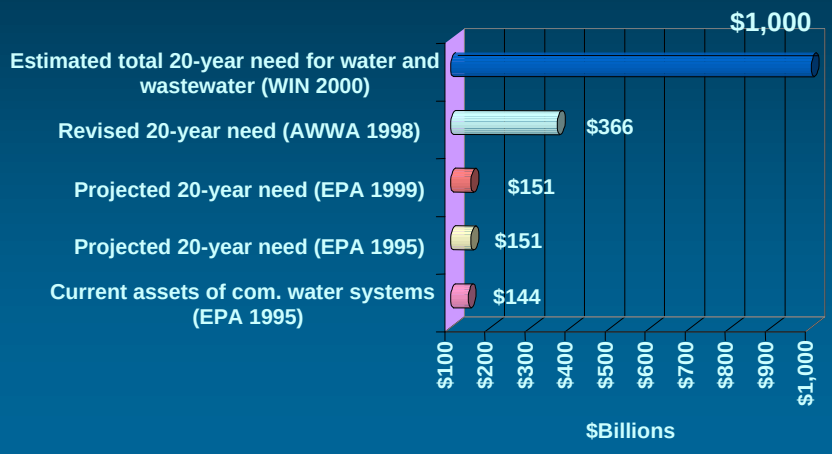
- For water utilities, expenses are relatively evenly divided among core **functions.**
- **Based on data** from the National Association of Water Companies (NAWC), production (source of supply) accounts for about 34 percent of expenses; transmission and distribution accounts for about 15 percent of expenses; and water treatment accounts for about 11 percent of expenses.
- These **proportions** also vary according to the size, age, and location of water systems.
- On a **nonfunctional** basis, for the American Water Works Company systems, labor costs take the largest overall share of operation and maintenance expense (about 41 percent), followed by operation and maintenance materials (27 percent), fuel and power (9 percent), purchased water (8 percent), customer billing and accounting (5 percent), chemicals (4 percent), waste disposal (3 percent), and other (3 percent).

Current Cost Drivers

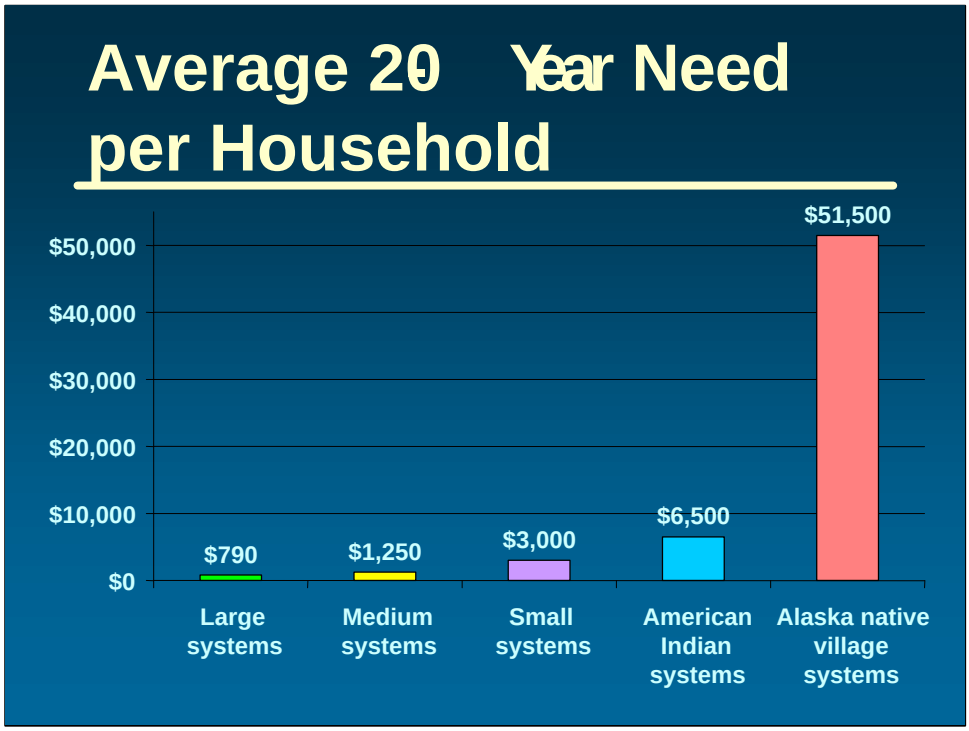
- Compliance with drinking water standards
- Replacement and improvement of aging infrastructure
- Meeting demand growth (population)

- Water systems today face three **significant cost pressures:**
  - **Compliance** with Federal and State drinking water standards.
  - Replacement and improvement of an aging water delivery **infrastructure.**
  - Meeting **demand growth,** that is, growth in consumption associated with growth in population (in areas experiencing growth).

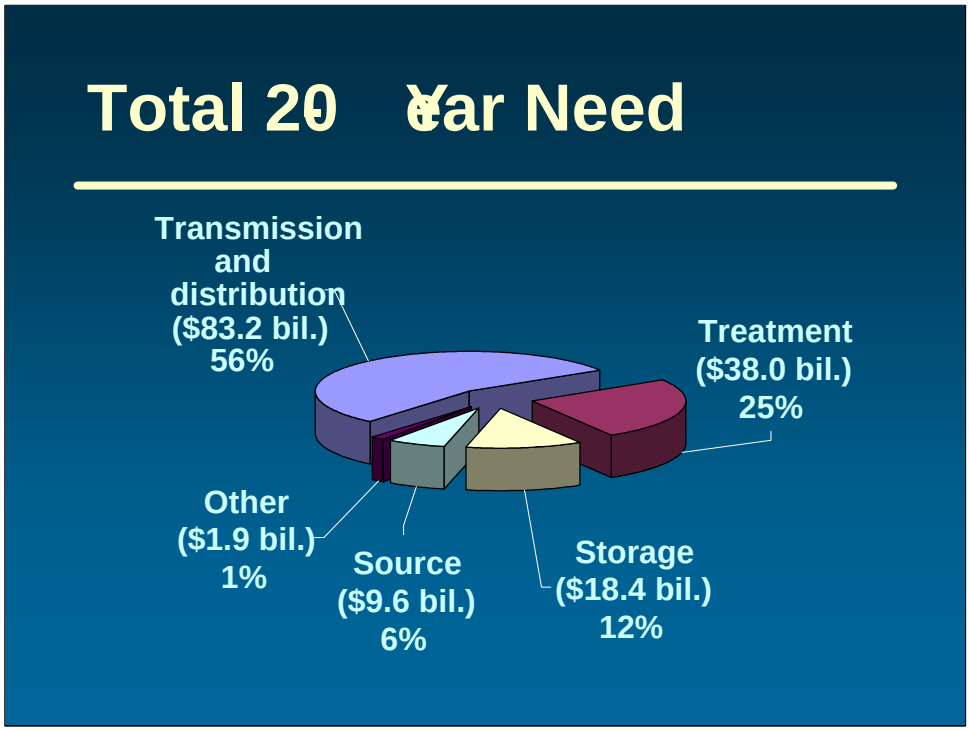
Estimates of Infrastructure Need



- EPA has estimated (in 1997 and again in 2000) that the water industry's 20-year **infrastructure need** totals $151 billion ($1999).
- The **American Water Works Association** (AWWA) increased the estimate based on anticipated transmission and distribution costs, for a revised total need at $366 billion ($1999).
- Recently, an estimate by the Water Infrastructure Network (**WIN**) s have placed total 20-year **water and wastewater** need at $1 trillion.
- Although the level of need cannot be known precisely, there is little doubt that a **substantial** amount of investment is required.



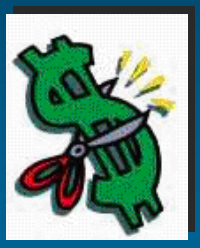
- EPA also estimated the average 20-year water **infrastructure need** on a per-household basis.
- The **per-household need** is much greater for smaller systems (including many native American systems) is much greater than for larger systems.
- The difference is largely due to **economies of scale**; that is, unit costs are lower for larger systems than smaller systems.



- The **primary factor** behind the current infrastructure funding need is grounded in demographics, that is, the age of the distribution pipes that were installed to provide service to a sprawling population.
- The infrastructure need includes needs related to each of the basic utility **functions:**
  - Source of supply
  - Storage
  - Treatment
  - Transmission and distribution
- The need to upgrade and replace **transmission and distribution** systems accounts for more than half of the total estimated need (56 percent). Piping costs illustrate why infrastructure replacement is a major cost driver. According to many industry experts, pipes costing about $1 per foot when originally installed can cost $100 per foot to replace. These estimates can vary widely.
- Water **treatment facilities** account for approximately 26 percent of the total estimated need.

Opportunities for Cost Reduction

- Efficiency practices
- Technological innovation
- Market-based approaches
- Industry restructuring
- Integrated resource management



- As noted, today's water systems face considerable **cost pressure.**
- However, **opportunities** also exist for cost reduction.
- These include:
  - Efficiency practices (least-cost);
  - Technological innovation (capital and operating);
  - Market-based approaches (competitive bidding);
  - Industry restructuring (consolidation); and
  - Integrated resource management (supply and demand side).
- **Planning** can help water systems identify and implement cost reduction strategies.

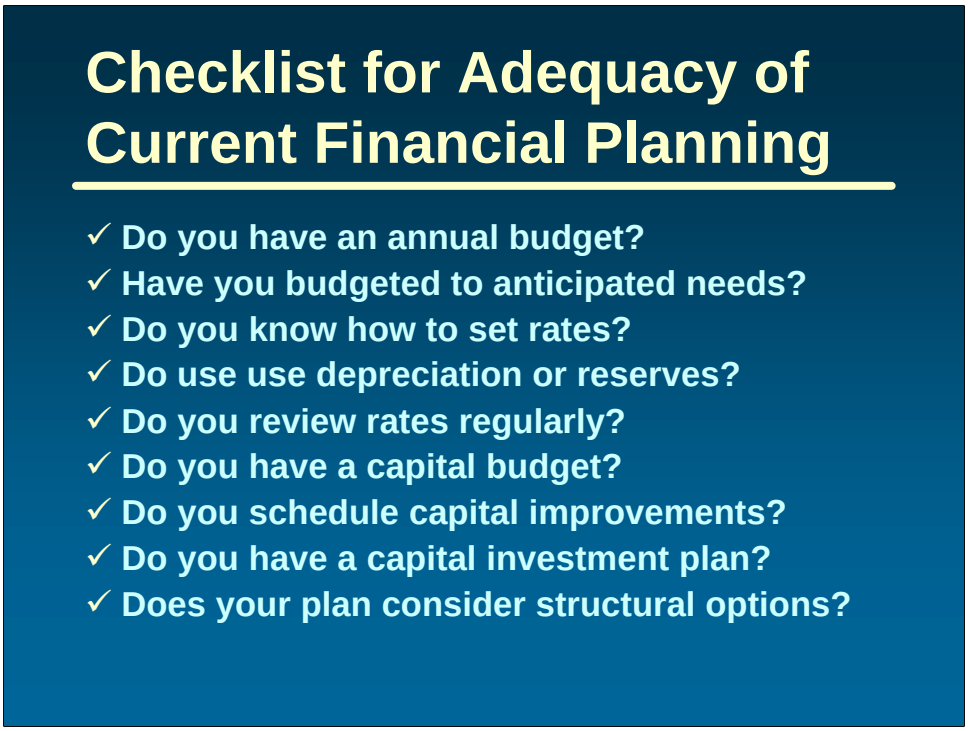
Screening and Assessment

- Screening and Assessment

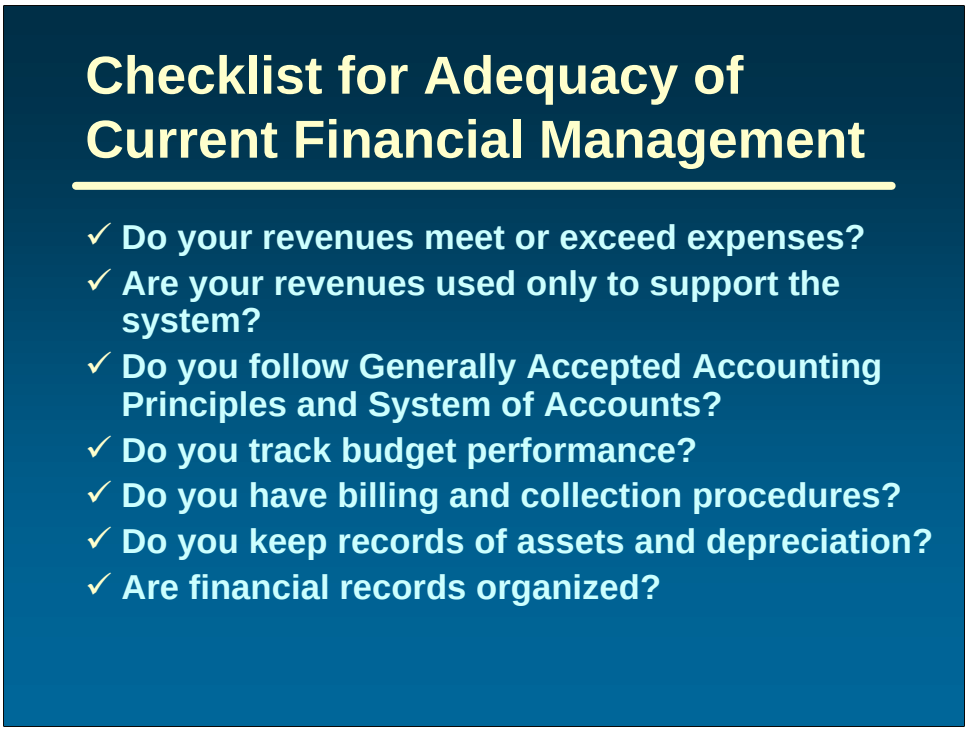
Assessing Financial Capacity

- Importance in capacity development
- Identifies systems in trouble or at risk
- Assessment methods
  - Checklists
  - Budget worksheets
  - Financial indicators and trends
  - Benchmarking
  - Reports, audits and reviews

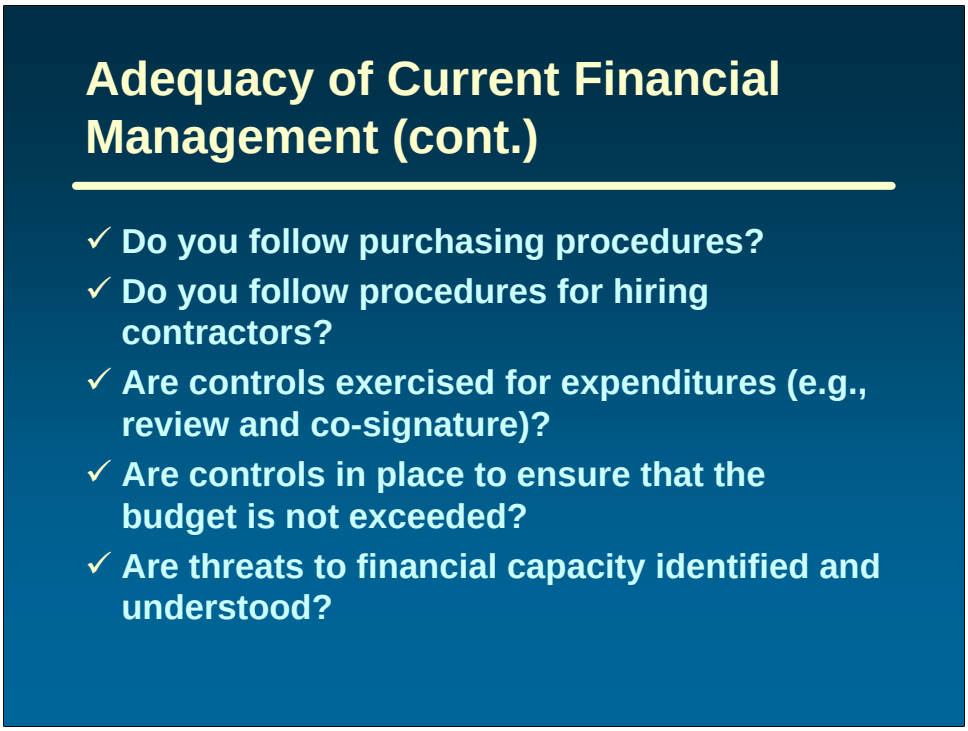
- The **assessment process** (which may include the join evaluation of managerial and financial capacity), can play an important role in capacity development.
- Assessment methods can be used to identify systems in **financial trouble** or **at risk** of experiencing financial difficulty in the future.
- Some of the **methods** available for assessing financial capacity include:
  - Checklists;
  - Budget worksheets;
  - Financial indicators and trends;
  - Benchmarking; and
  - Reports, audits and reviews.



- The following **checklist questions** can be used to assess financial capacity in terms of financial planning:
  - Do you have an annual budget?
  - Have you budgeted to anticipated needs?
  - Do you know how to set rates?
  - Do use use depreciation or reserves?
  - Do you review rates regularly?
  - Do you have a capital budget?
  - Do you schedule capital improvements?
  - Do you have a capital investment plan?
  - Does your plan consider structural options?



- The following **checklist questions** can be used to assess financial capacity in terms of financial management:
  - Do your revenues meet or exceed expenses?
  - Are your revenues used only to support the system?
  - Do you follow Generally Accepted Accounting Principles and System of Accounts?
  - Do you track budget performance?
  - Do you have billing and collection procedures?
  - Do you keep records of assets and depreciation?
  - Are financial records organized?

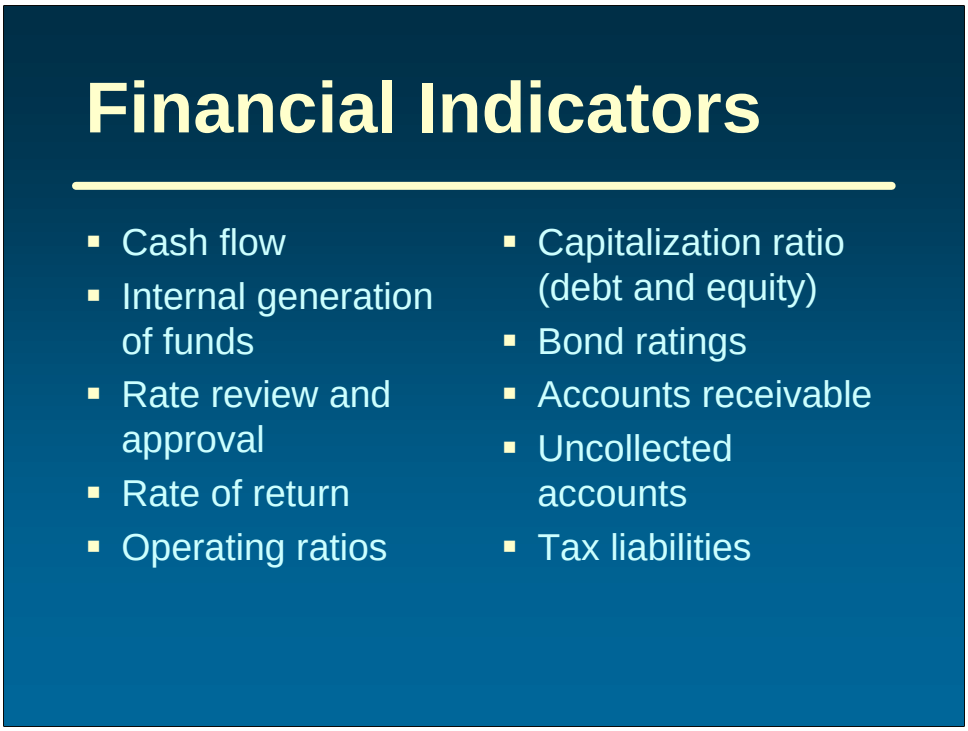


- Questions regarding adequacy of current financial management **(continued):**
  - Do you follow purchasing procedures?
  - Do you follow procedures for hiring contractors?
  - Are controls exercised for expenditures (e.g., review and co-signature)?
  - Are controls in place to ensure that the budget is not exceeded?
  - Are threats to financial capacity identified and understood?

Budget Worksheets

- Expense budget
- Capital budget
- Reserves budget
- Revenue analysis
- Budget surplus or deficit

- **Budgeting** involves keeping track of revenues and expenditures in major categories. Budgeting also involves analysis of trends and anticipated changes within categories, such as operations and capital expenditures. Preparation of a relatively detailed budget is a key element in improving a utility's effectiveness.
- Simple **worksheets** can be used to develop budgets for the following areas:
  - Expense budget;
  - Capital budget;
  - Reserves budget;
  - Revenue analysis; and
  - Budget surplus or deficit.



- A variety of **financial indicators** for screening and assessment:
- These **indicators include:**
  - Cash flow
  - Internal generation of funds
  - Rate review and approval
  - Rate of return
  - Operating ratios
  - Capitalization ratio (debt and equity)
  - Bond ratings
  - Accounts receivable
  - Uncollected accounts
  - Tax liabilities

Special Role of Cash Flow

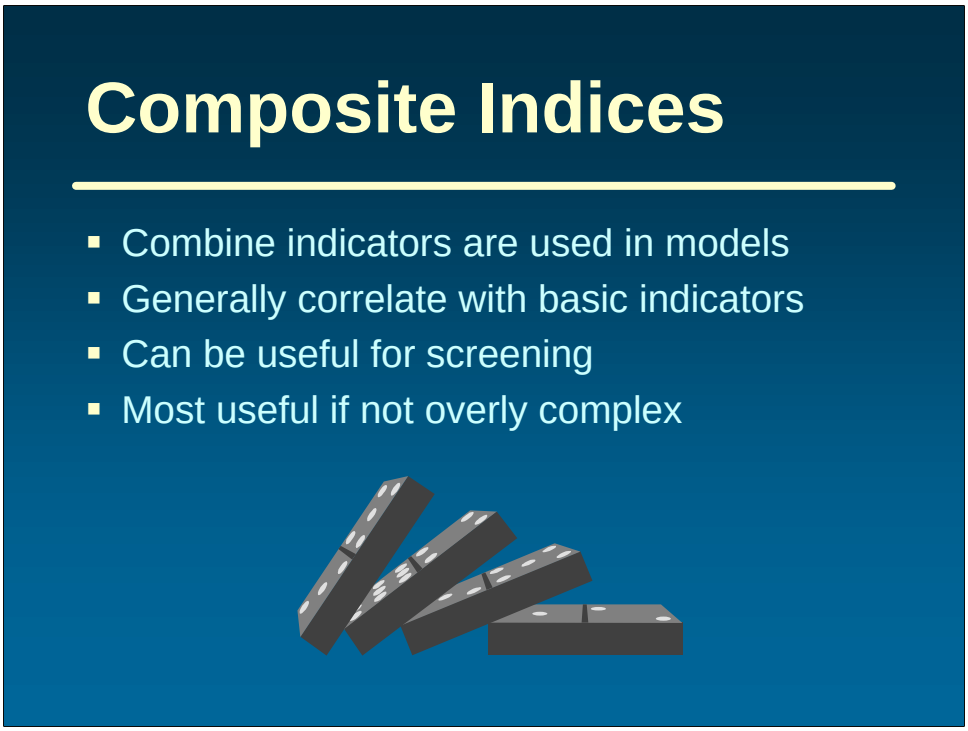
- Positive cash flow: revenues exceed expenditures
- Cash flow is essential for small business
- Cash flow tends to correlate with other indicators
- Complex assessment methods may not be necessary

- **Positive cash flow** is achieved when revenues exceed expenditures for a sustained period of time.
- Cash flow is **essential** for all small businesses, including water systems.
- Cash flow tends to correlate with other indicators of **financial health.**
- Highly **complex** assessment methods (such as multivariate financial models) may not be necessary for small water systems.

Select Financial Ratios

Profitability	Net income/operating revenues
Efficiency	Revenues/expenses
Liquidity	Assets/liabilities
Growth	Revenues/assets
Coverage ratio	Revenues/debt service
Investment ratio	Capital outlays/revenue

- Some basic **financial ratios** also are used in financial assessment.
- Each ratio is used to interpret a particular **financial characteristic** (such as profitability or efficiency). More than measure can be used for many of these characteristics.
- Some **typical financial ratios** that can be calculated from the data available under a system of accounts are:
  - Profitability. Net income/operating revenues
  - Efficiency. Revenues/expenses
  - Liquidity. Assets/liabilities
  - Growth. Revenues/assets
  - Coverage ratio. Revenues/debt service
  - Investment ratio. Capital outlays/revenue



- **Composite** financial indicators can be used in assessment, as well as predictive models of financial health.
- Composite measures generally **correlate** with the basic indicators.
- Composite measures and models can be **useful for screening,** to see whether systems need further attention or assistance.
- Financial models using composite indicators are most useful if **not overly complex** or difficult to interpret.

Trend Analysis

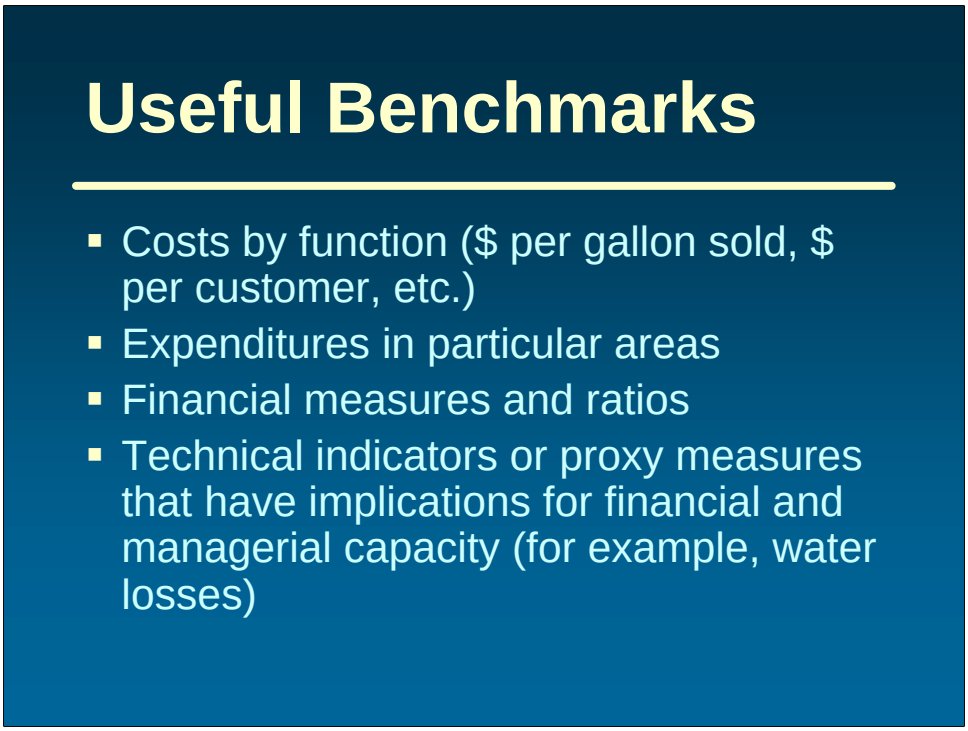
- Trends in key financial indicators and ratios
- Requires consistent measurement
- Controls for other factors and helps identify anomalies.
- Short-term and long-term horizons
- Identifies weaknesses and potential remedies

- **Trend analysis** makes use of time series data for key financial indicators and ratios.
- Requires **consistent measurement.**
- **Controls** for other factors and helps identify anomalies.
- Short-term and long-term **horizons** can be used.
- The **analysis of trends** can point to particular financial weaknesses and potential remedies.

Benchmarking

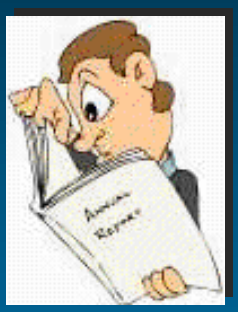
- Benchmarks can be used for comparable systems
- Benchmarking requires caution because comparability is difficult
- Ranges are preferable to points
- Comparing rates is problematic
- Benchmarking can provide insights about system costs and efficiency, and identify areas for improvement

- **Benchmarking** can be used to compare a water system to comparable systems.
- Benchmarking requires considerable **caution** because comparability among systems is difficult to achieve (along such factors as size, age, source water quality, etc.)
- **Ranges in values** are preferable to particular points of reference.
- **Comparing rates** charged for service is particularly problematic because of difference in ratemaking practices.
- Benchmarking can provide insights about system costs and efficiency, and identify areas for **improvement.**



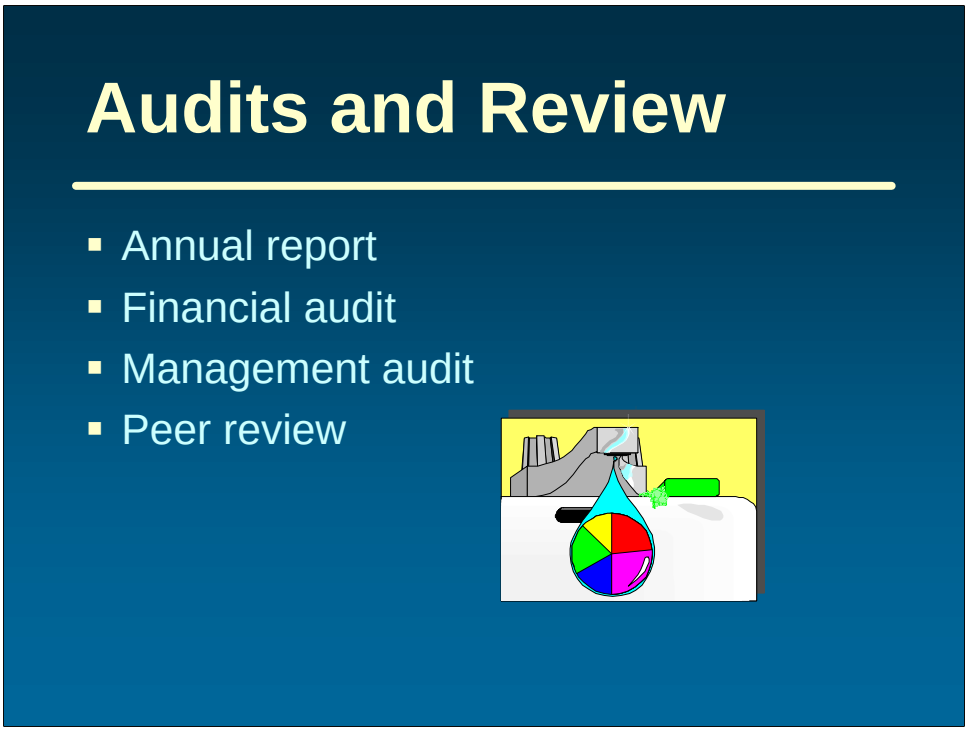
- Some **useful benchmarks** are:
  - Costs by function (such as operating expense per gallon sold or administrative expense per customer, etc.);
  - Expenditures in particular areas;
  - Financial measures and ratios; and
  - Technical indicators or proxy measures that have implications for financial and managerial capacity (for example, water losses).

Annual Report



- Annual financial reports ensure accountability to oversight bodies
- Useful for evaluating financial and managerial capacity
- Preparing a report enhances capacity
- Can be prepared by an independent analyst

- An **annual report** is very useful for assessing financial and managerial capacity.
- Annual **financial** reports ensure accountability to oversight bodies, including boards of directors and regulators. Regulators may have reporting requirements.
- Annual reports are useful for evaluating **financial and managerial** capacity in both qualitative and quantitative terms.
- The **process of preparing** is a means of enhancing the capacity of the water system.
- Some annual reports are prepared and certified by an **independent analyst.**



- **Audits and reviews** provide the most comprehensive assessment of financial and managerial capacity.
- **Types** of audits and reviews for water systems include:
  - Annual reports;
  - Financial audit;
  - Management audit; and
  - Peer review.

Financial Audit

- Review of books, record-keeping, and procedures
- Review of expenditures
- Review of revenue sufficiency

- A **financial audit** involves a thorough review of:
  - Books, record-keeping, and procedures for accounting and financial controls;
  - Expenditures according to key categories; and
  - Revenues and revenue sufficiency.
- The **auditor** must have independence in the review process.
- Both **internal and external** review processes may be needed and they should be complementary in terms of achieving accountability goals.

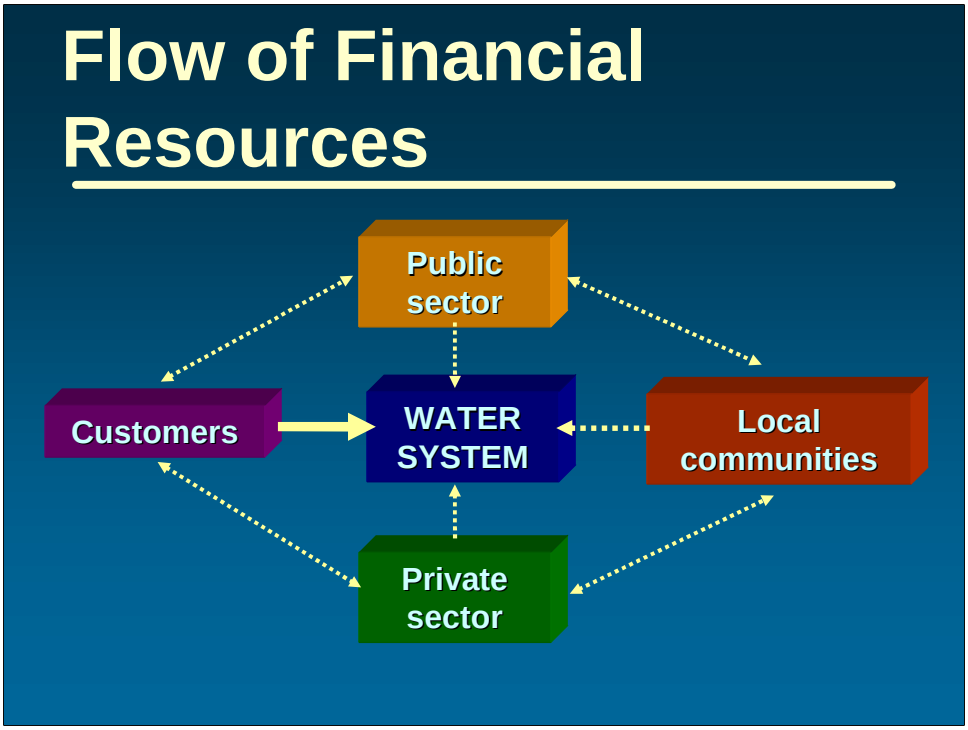
External Reviews

- Certified accountant or financial auditor
- Board of directors
- Funding agencies (SRF and other)
- State utility commission
- Peer reviewer (QualServe)

- An **external review** of financial capacity may be conducted by:
  - Certified accountant or financial auditor;
  - Board of directors (independent from management);
  - Funding agencies (SRF and other);
  - State public utility commission (economic regulator); or
  - Peer reviewer (QualServe).

Understanding the Role of Rates

- Understanding the Role of Rates



- Water systems can be supported by different types of **financial resources:**
  - The public sector can provide loans and grants.
  - The private sector can provide loans and equity.
  - Local communities can provide subsidies, including low-cost debt financing.
  - Customers can provide revenues through rates (rate revenue in turn is used to repay debt and equity costs).
- **Rate revenue** from customers is an essential financial resource that ideally supports the cost of service.

Rates Support Financial Capacity

- Ensure revenue sufficiency and sustainability
- Reduce the need for external subsidies through grants and loans
- Provide an indicator of credit worthiness and fiscal management

- **Rates charged** by water systems to their customers are the fundamental means of supporting financial capacity.
- **Water rates:**
  - Ensure revenue sufficiency and the system's sustainability over the long term.
  - Reduce the need for external subsidies through grants and loans from government sources.
  - Provide an indicator of the water system's credit worthiness and fiscal management.

Pressure on Rates

- Rising costs coupled with:
  - Flat or declining demand
  - Inefficiency (macro and micro)
  - Historic underpricing
  - Need to promote conservation

- The upward **pressure on water rates,** and associated problems of affordability, are aggravated by:
  - Rising costs (infrastructure investment, compliance with drinking water standards, growth);
  - Flat or declining demand for water;
  - Inefficiency (macro and micro);
  - Historic underpricing by many systems and associated ratemaking practices; and
  - Need to promote conservation, efficiency, and wise water use.
- Cost pressures on **small systems** are particularly significant.

Ratemaking

- Ratemaking is the process of allocating revenue requirements to customers via the price of water
- Water systems, regulators, courts, and policy analysts follow several accepted ratemaking principles

- **Ratemaking** is the process of allocating the water system's revenue requirements to customers via the price charged for water service.
- Water systems, regulators, courts, and policy analysts follow several accepted ratemaking **principles** when setting rates for water service.

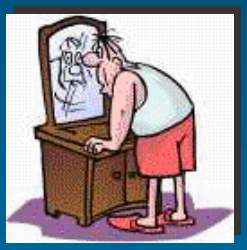
Oversight of Ratemaking

- Varies by type of system and State
  - State public utility commissions
  - Water system boards of directors
  - City councils or other local bodies

- Responsibility for **overseeing ratemaking**, and the overall financial health of a water system, varies with the type of system and the jurisdiction of the State.
- Economic regulators at the state **public utility commissions** provide oversight for most private or "investor-owned" utilities.
- Publicly and privately owned systems may also be accountable to **boards of directors**.
- Oversight for municipal systems often is the responsibility of a **city council** or other local governing body.

Costs and Rates

- Rates ideally reflect the "true" cost of providing water service, which will ensure adequate capacity *and* promote economic efficiency
- Rates must recover costs from water sold (revenue-producing water)



- **Water costs** and water rates are intrinsically related.
- Rates ideally reflect the **"true" cost** of providing service to ensure adequate capacity and promote economic efficiency.
- Rates must recover costs from water that is actually **sold** (revenue-producing water); the true cost of water and the associated rate impact is measured by dividing all costs by water sold (not water produced).

What are True Costs?

- For a water utility, true costs include all prudently incurred costs associated with operations and capital investment, including appropriate financing costs, depreciation expenses, and reserves

- True costs include **all prudently incurred costs** associated with water utility operations and capital investment, including appropriate financing costs, depreciation expenses and reserves.
- Economic theory defines true costs in terms of **marginal costs,** discussed later in this workshop.

AWWA Policy

1. ***Every water utility should receive sufficient revenues from water service and user charges to enable it to finance all operating and maintenance expenses and all capital costs.***
2. **Water utilities should maintain their funds in separate accounts. Such funds should not be diverted to uses unrelated to water utilities…**
3. **Every water utility should adopt a uniform system of accounts …**
4. **Water rate schedules should distribute the cost of water service equitably…**

- AWWA's **policy statement** on financing and rates (revised January 26, 1992) clearly supports the use of user charges to pay for the total cost of water service.
- Water systems, in other words, should be **self-sustaining.**
- The **policy** states that:
  1. Every water utility should receive sufficient revenues from water service and user charges to enable it to finance all operating and maintenance expenses and all capital costs.
  2. Water utilities should maintain their funds in separate accounts. Such funds should not be diverted to uses unrelated to water utilities…
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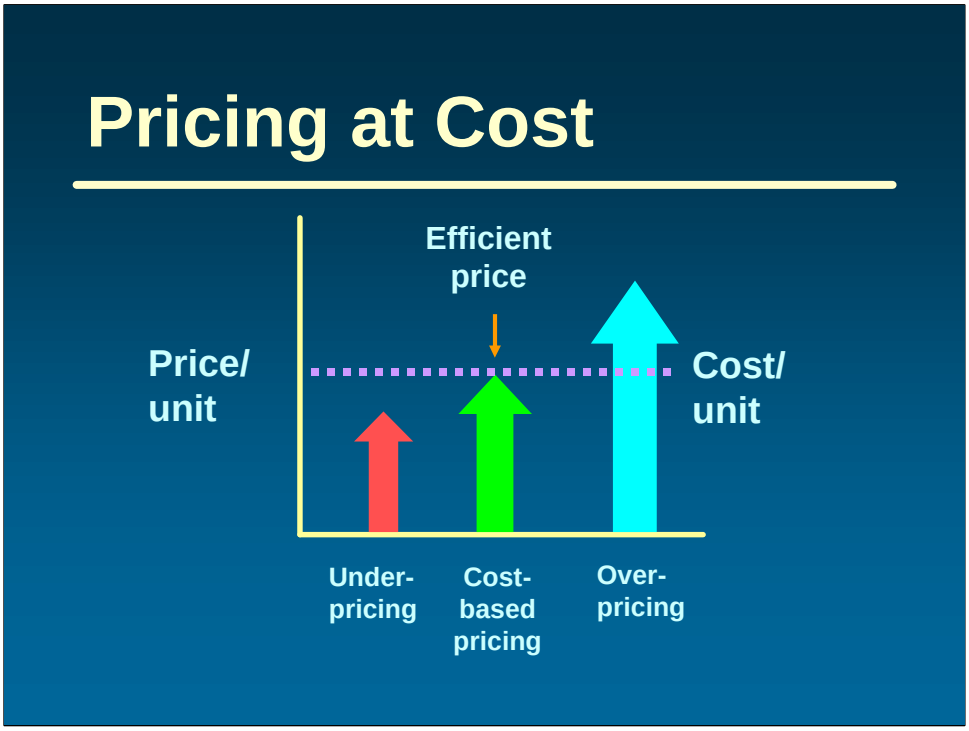


- Economic theory suggests that prices should reflect **true costs.**
- Water systems avoid **under-pricing** or **over-pricing** in order to promote **economic efficiency.**
- An efficient price encourages efficiency in **production** and **consumption.**
- An efficiency price also promotes **sustainability.**

Underpricing

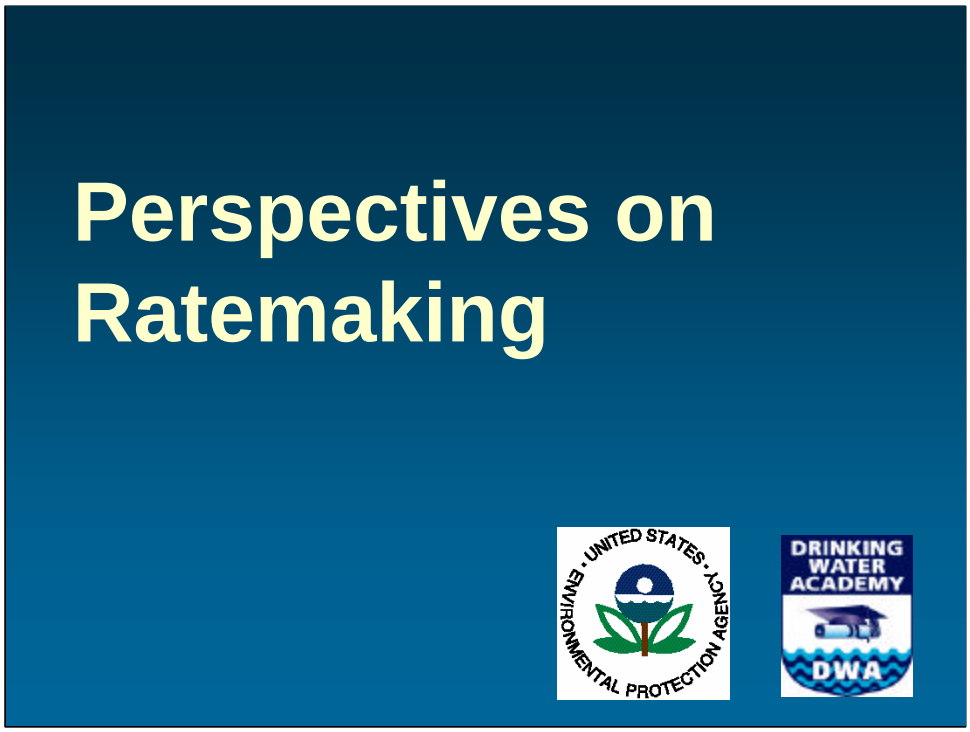
- Rate revenues do not cover revenue requirements
- Underpricing often is associated with underinvestment
- Underpricing induces over-consumption (inefficient use)

- **Underpricing** is a problem for some--possibly many--water systems.
- For systems that underprice, rate revenues **do not cover** revenue requirements.
- Underpricing can be associated with **underinvestment,** including postponement of essential investments.
- Underpricing induces **overconsumption,** that is, customers will use more water than is economically efficient.

Overpricing

- The system collects more revenues than requirements justify
- Revenues may be used to subsidize other services or functions
- Price induces under-consumption (inefficient use reduction)

- **Overpricing** by water systems presents problems as well.
- A system that **overprices** collects more revenues than requirements justify.
- Revenues from overpricing are sometimes used to **subsidize** other services or functions.
- Subsidies from ratepayers are **inconsistent** with cost-based ratemaking and generally unfair, particularly if customers have not explicitly approved the subsidy.
- The higher price induces customers to **underconsume,** that is, to use less water than is economically efficient.

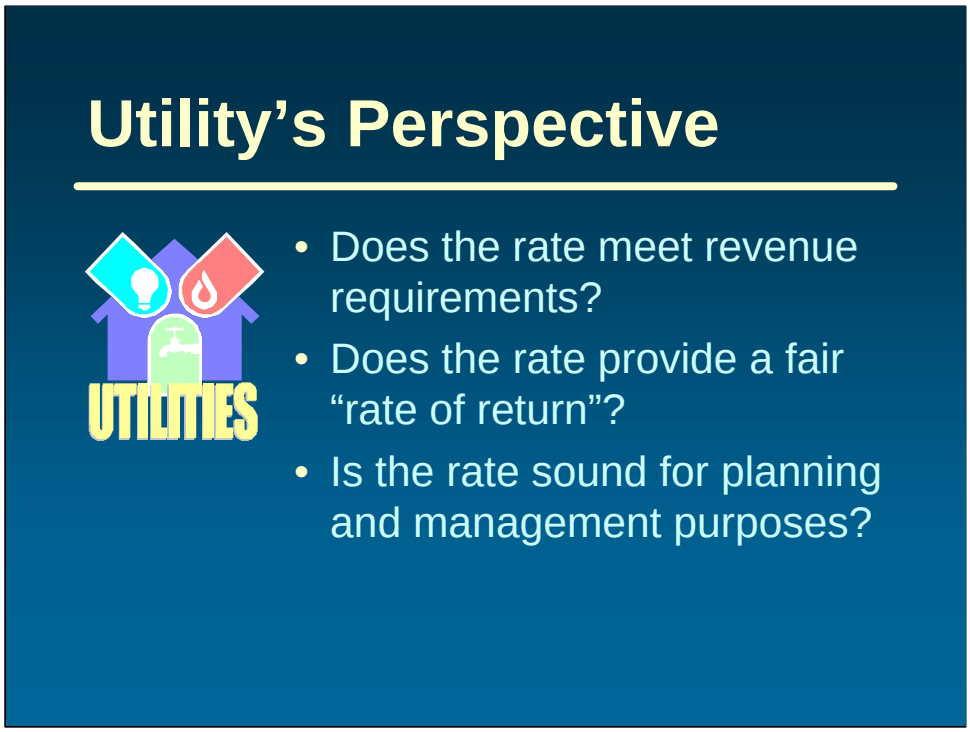


- Perspectives on Ratemaking

Perspectives on Water Rates

- Water utilities
- Water customers
- Society at large
- Price regulators

- Different **stakeholders** have different views about the ratemaking processes.
- **Alternative perspectives** of ratemaking come from:
  - Water utilities;
  - Water customers;
  - Society at large; and
  - Economic regulators.

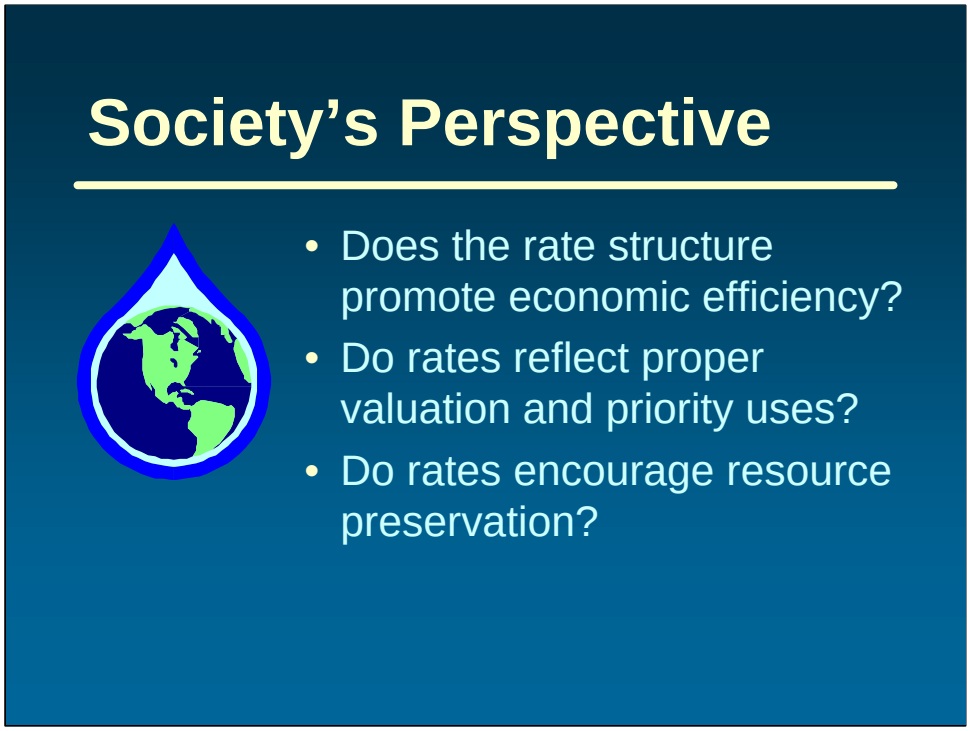


- From the **utility's perspective**, ratemaking raises the following key questions:
  - Does the rate meet revenue requirements?
  - Does the rate provide a fair "rate of return"?
  - Is the rate sound for planning and management purposes?

Customer's Perspective

- Are the process and the result fair?
- Is the rate structure understandable?
- Is the water bill affordable?

- From the perspective of **customers or ratepayers**, ratemaking raises the following key questions:
  - Are the process and the result fair?
  - Is the rate structure understandable?
  - Is the water bill affordable?



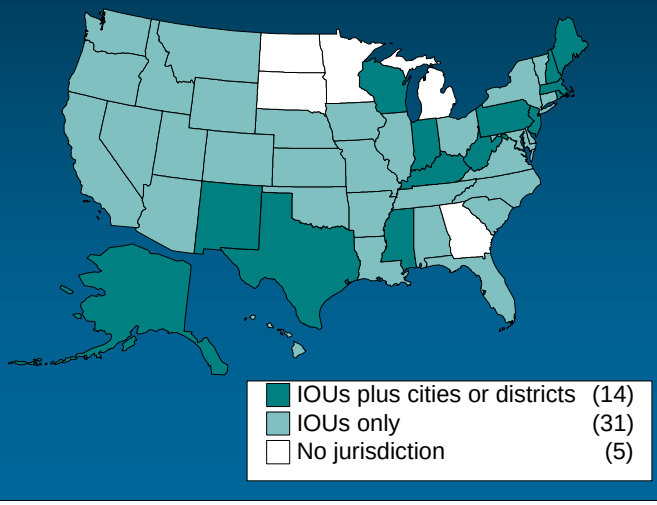
- From the **perspective** of society at large, ratemaking raises the following key questions:
  - Does the rate structure promote economic efficiency?
  - Do rates reflect proper valuation and priority uses?
  - Do rates encourage resource preservation?

Price Regulator's Perspective

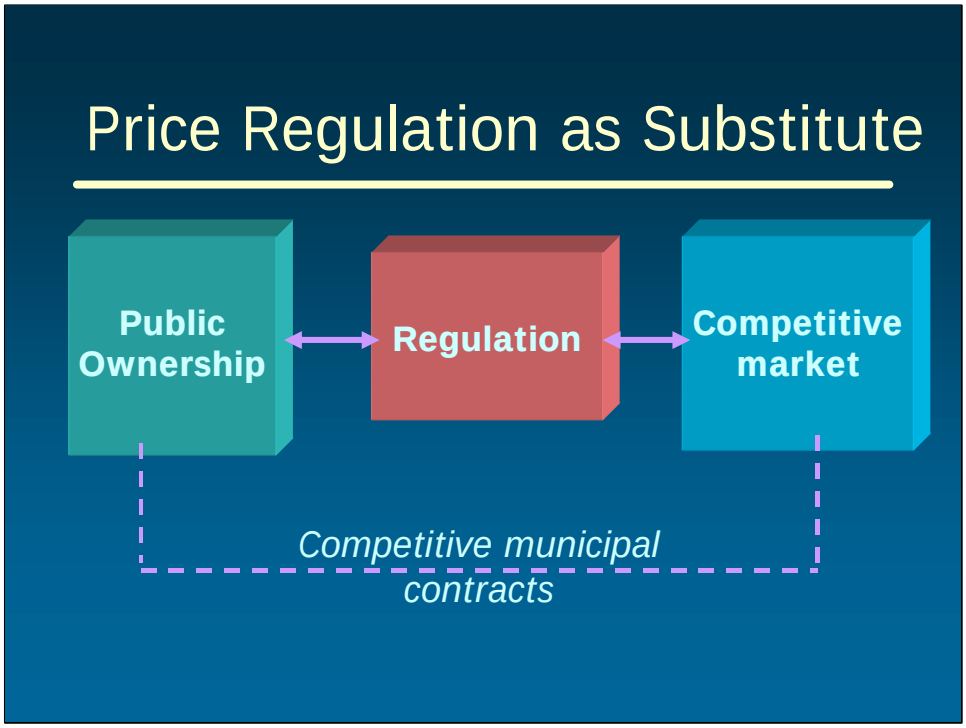
- Do rates balance system and customer interests?
- Is the process in accordance with accepted principles?
- Is the result administratively feasible?

- From the perspective of **price regulators**, ratemaking raises the following key questions:
  - Do rates **balance** system and customer interests?
  - Is the process in accordance with **accepted principles**?
  - Is the result **administratively feasible**?

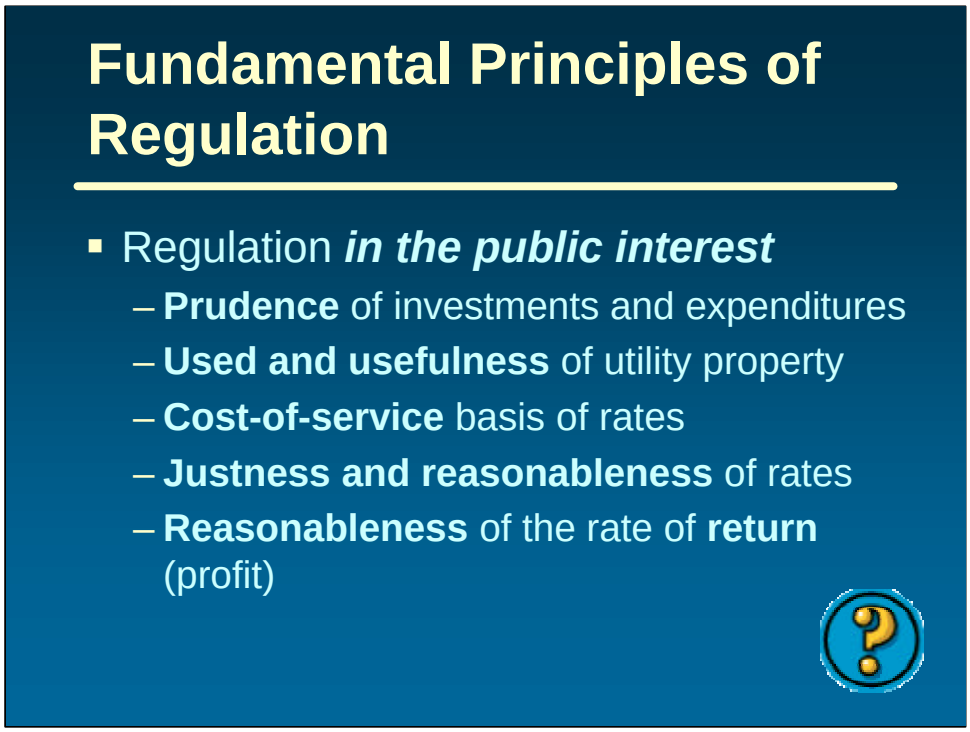
Price Regulation: State PUC Jurisdiction



- **Jurisdiction and authority** for the water industry varies substantially by state.
- Among the **States**, 45 regulate investor-owned water utilities; 11 regulate municipally owned utilities and 7 regulate water districts (to some degree).
- Jurisdiction for **municipal** systems often is triggered by the provision of service outside of city boundaries and other conditions.
- Jurisdiction for other types of water systems (such as as cooperatives, homeowners' associations and nonprofits) is limited.
- A total of 28 States have jurisdiction for investor-owned **wastewater** utilities; jurisdiction for other types varies.
- For most jurisdictions, regulators have the authority to review:
  - Rates or prices;
  - Profits or returns;
  - Investment decisions;
  - Financing decisions;
  - Service quality;
  - Service territory; and
  - Customer complaints.



- Economic regulation **substitutes** for public ownership and competitive markets.
- Regulation prevents abuse of **economic power** by monopoly service providers with respect to their captive ratepayers (who have no choices with respect to service).
- In effect, **municipal contracts** can circumvent economic regulation.



- Several basic **principles**, grounded in tradition, law, accounting, and economics, guide the regulatory process.
- An overarching principle is that regulation should be **in the public interest,** in connection with which a number of other operating principles:
  - Utility investments and expenditures must be considered by regulators to be **prudent**;
  - Utility property must be **used and useful** in fulfilling the service obligation to customers;
  - Rates for service should reflect the **cost of service**;
  - Rates for service charged to captives should be **just and reasonable**; and
  - The **rate of return** or profit earned by the utility (a monopoly) should be reasonable.

Small System Regulatory Methods

- Simplified reporting
- Simplified filing
- Simplified proceedings
- Limited or single-issue case
- Operating-ratio method
- Price indexing
- Rate-case assistance
- Exemption and safe harbors

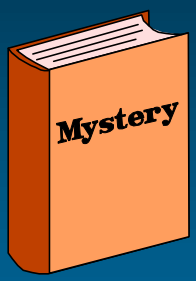
- Economic regulators at the commissions also have devised a number of methods to address the particular circumstances and needs of the **small water systems** they regulate.
- Small system regulatory **methods** include:
  - Simplified reporting;
  - Simplified filing;
  - Simplified proceedings;
  - Limited or single-issue case (reduces expense);
  - Operating-ratio method (alternative for calculating revenue requirements);
  - Price indexing (automatic adjustments to rates);
  - Rate-case assistance (direct staff assistance); and
  - Exemptions and safe harbor (reduced or relaxed regulation based on size thresholds, consumer complaints, or other criteria).

Cost Accounting

- Cost Knowledge

Cost Knowledge

- Water systems are not unlike other businesses in terms of cost issues
- Knowing system costs is critical for financial capacity development, particularly revenue sufficiency
- Cost knowledge provides the basis for developing rates

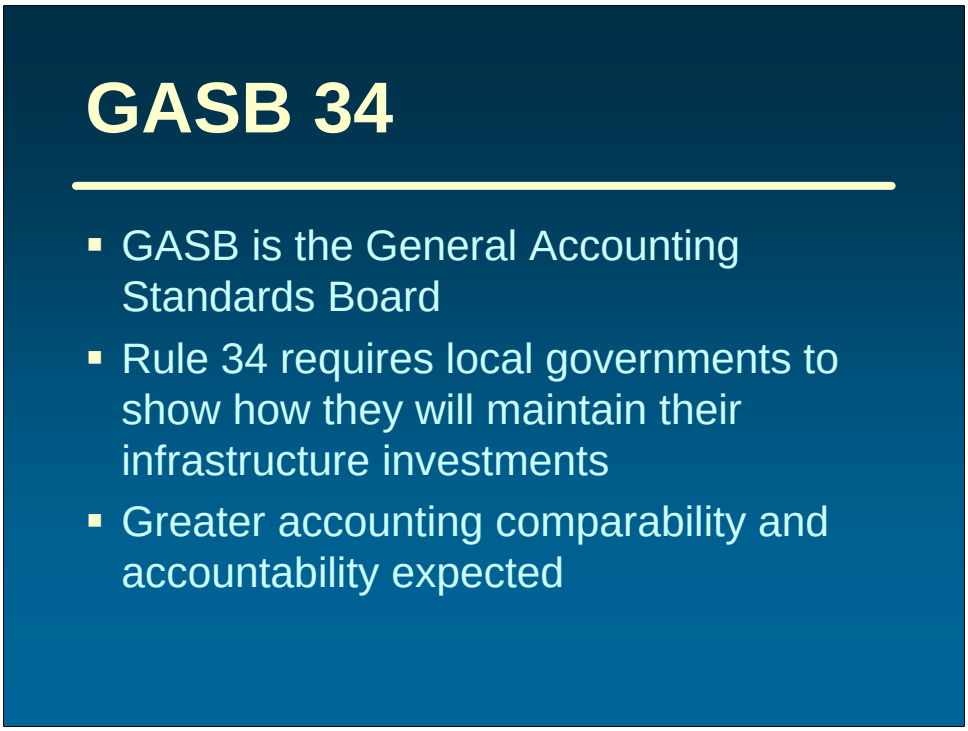


- Water systems are not unlike **other businesses** in terms of fundamental cost-of-business issues.
- **Knowing** water system costs is critical for financial capacity development, particularly in terms of ensuring revenue sufficiency.
- Cost knowledge provides the basis for **developing rates.**

Cost Accounting

- A system of accounts is a valuable tool for revenue enhancement, planning, and financial capacity development
- Water utilities should follow generally accepted accounting principles (GAAP)
- Activity-based accounting can be useful

- **Cost accounting** for water systems is essential.
- A **system of accounts** is a valuable tool for revenue enhancement, planning, and financial capacity development.
- Water utilities should follow **Generally Accepted Accounting Principles** (GAAP).
- **Activity-based accounting** can also be useful for understanding the costs associated with particular functions and actions.

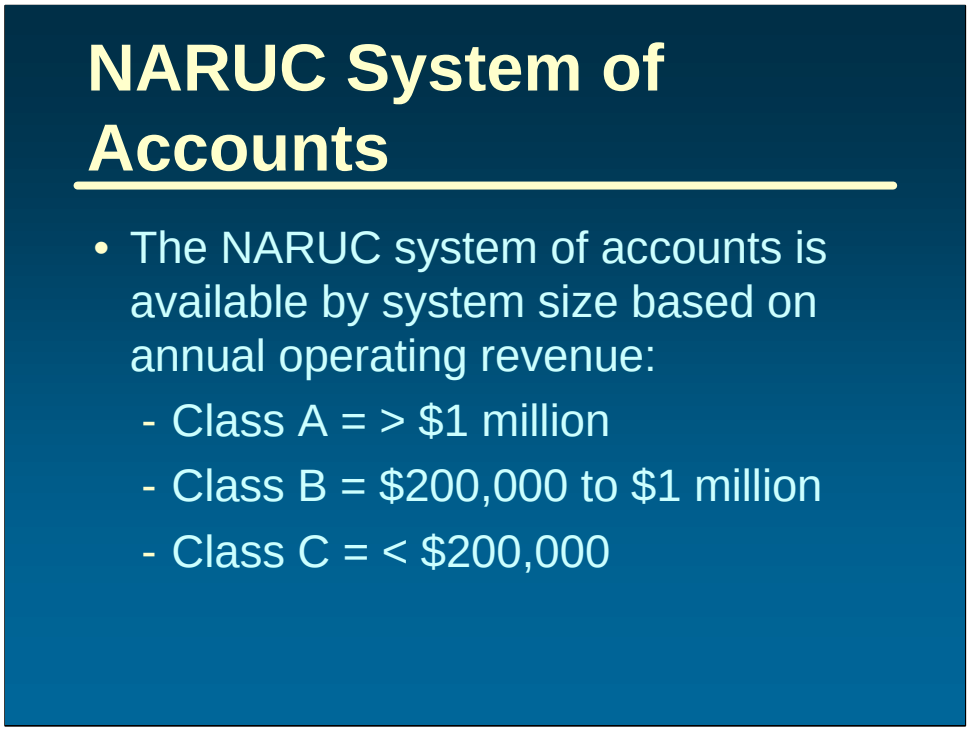


- **GASB** is the General Accounting Standards Board.
- **Rule 34,** adopted recently, requires cities to show how they will preserve their infrastructure investments.
- **According to the rule,** "Infrastructure assets that are part of a network or subsystem of a network are not required to be depreciated as long as the government manages those assets using an asset management system that has certain characteristics and the government can document that the assets are being preserved approximately at (or above) a condition level established and disclosed by the government."
- Greater **accountability** and comparability is expected.
- Some expect GASB 34 to stimulate interest in **privatization** because of its emphasis on asset management expertise.

Valuation

- A valuation study establishes the value of a water system, including a full accounting of utility plant and other assets
- Understanding value is essential for setting rates
- Plays an important role when water systems are bought and sold

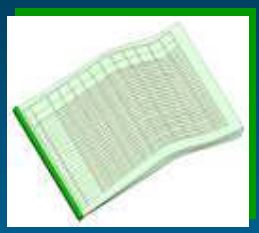
- A **valuation study** establishes the value of a water system, including a full accounting of utility plant and other assets.
- Understanding the utility's value is essential for setting **rates.**
- Valuation studies play an important role when water systems are **bought and sold.**



- The National Association of Regulatory Utility Commissioners (NARUC) has established a **system of accounts** for water utilities (revised in 1996).
- NARUC commissions **regulate** almost all private (investor-owned) water utilities, and some publicly owned utilities.
- The NARUC system of accounts is available by **system size** based on annual operating revenue:
  - Class A = > $1 million
  - Class B = $200,000 to $1 million
  - Class C = < $200,000
- NARUC also has established a system of accounts for **wastewater** utilities.

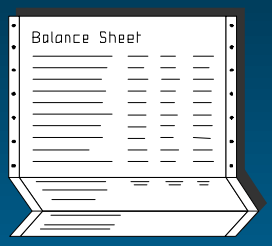
Basic Accounting System (NARUC)

- Balance-sheet accounts
- Water utility plant accounts
- Income accounts
- Water operating revenue accounts
- Water operation and maintenance expense accounts



- The NARUC system of accounts consists of five interrelated **sets of accounts:**
  - Balance-sheet accounts;
  - Water utility plant accounts;
  - Income accounts;
  - Water operating revenue accounts; and
  - Water operation and maintenance expense accounts.

Balance Sheet



- Assets and other debts, including utility plant *(see next)*
- Equity (stock)
- Liabilities and other credits
  - Accounts payable
  - Debt, interest
  - Contributions, advances
  - Taxes

- The utility's **balance sheet** includes represents:
  - Assets and other debts, including utility plant (detailed in "water utility plant accounts");
  - Equity (stock);
  - Liabilities and other credits;
  - Accounts payable;
  - Debt, interest;
  - Contributions, advances; and
  - Taxes.

Balance Sheet Example

Utility plant in service	$63,800,000
Less accumulated depreciation	($18,600,000)
Plus net adjustments	100,000
Net utility plant	45,300,000
Total other property and investments	200,000
Total current and accrued assets	2,800,000
TOTAL ASSETS	**$48,300,000**
Total equity capital	24,700,000
Total long-term debt	13,300,000
Total current and accrued liabilities	2,200,000
Contributions in aid of construction	8,100,000
TOTAL EQUITY CAPITAL AND LIABILITIES	**$48,300,000**

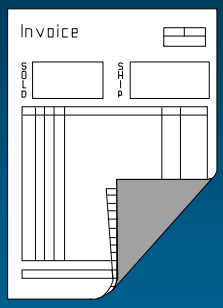
- An example of a water utility **balance sheet.**

Water Utility Plant Accounts (General)

- Intangible plant
- Source of supply and pumping
- Water treatment
- Transmission and distribution
- General plant

- **Utility plant accounts** cover the major functional areas of the utility:
  - Intangible plant;
  - Source of supply and pumping;
  - Water treatment;
  - Transmission and distribution; and
  - General plant.
- The system of accounts actually provides for 28 specific account **categories.**
- For different systems, **different cost drivers** will be important.

Income Statement



- Utility operating income
  - Revenues *(see next)*
  - Expenses *(see next)*
- Other income and deductions
- Taxes applicable to other income and deductions

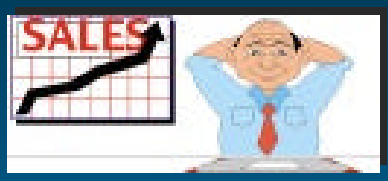
- The **income statement** consists of:
  - Utility operating income;
  - Revenues (detailed in “water operating revenue accounts”);
  - Expenses (detailed in “water operation and maintenance expense accounts”);
  - Other income and deductions; and
  - Taxes applicable to other income and deductions.

Income Statement Example

Operating revenues	$7,800,000
Operating expenses	5,000,000
Depreciation expense	1,300,000
Taxes	300,000
Utility operating expenses	6,600,000
Net utility operating income	1,200,000
Other income	100,000
Total utility operating income	$1,300,000

- An example of a water utility **income statement.**

Water Operating Revenue Accounts

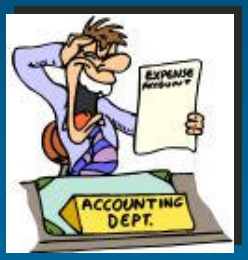


- Metered water revenue by customer class
- Unmetered water revenue by customer class
- Fire protection revenue
- Sales to irrigation customers
- Sales for resale
- Other water revenue

- Water **operating revenue** accounts include:
  - Metered water revenue by customer class;
  - Unmetered water revenue by customer class;
  - Fire protection revenue;
  - Sales to irrigation customers;
  - Sales for resale; and
  - Other water revenue.

Water Operations and Maintenance Expense Accounts

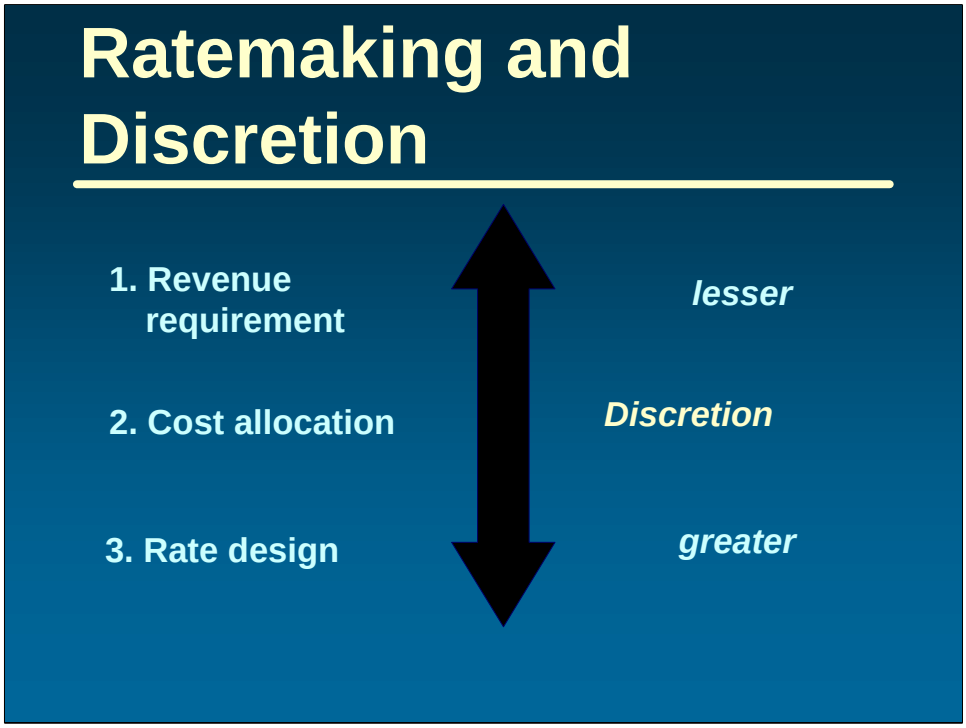
- Salaries and wages, pensions, benefits
- Purchased water, purchased power
- Fuel and chemicals
- Materials and supplies
- Contract services
- Rents, transportation, insurance
- Regulatory expenses
- Bad debt
- Miscellaneous



- Water **operations and maintenance expense** accounts include:
  - Salaries and wages, pensions, benefits;
  - Purchased water, purchased power;
  - Fuel and chemicals;
  - Materials and supplies;
  - Contract services;
  - Rents, transportation, insurance;
  - Regulatory expenses;
  - Bad debt; and
  - Miscellaneous.

Principles of Ratemaking

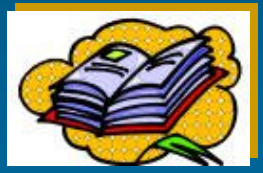
- The Ratemaking Process



- In the course of ratemaking, **discretion** is less for determining revenue requirements (cost), is somewhat greater for cost allocation, and plays a greater role in rate design.
- In effect, in other words, the **range of choices** expands as the ratemaking process proceeds

Traditional Ratemaking Criteria

1. **Revenue recovery** ✓
2. **Fairness in cost allocation (equity)** ✓
3. **Efficient resource use** ✓
4. Practicality (understanding, acceptance)
5. Interpretability (noncontroversial)
6. Revenue stability
7. Rate stability
8. Discrimination avoidance



✓ *Most important*

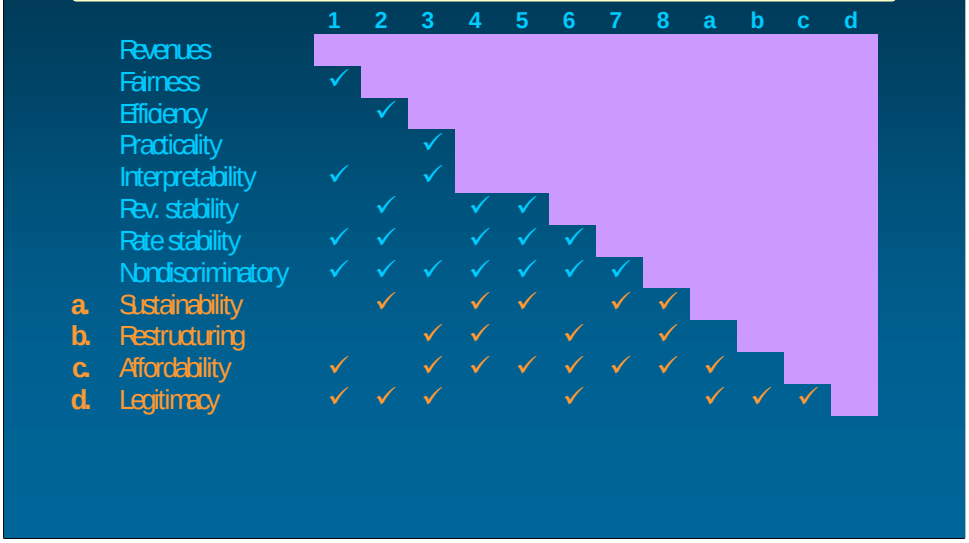
- Ratemaking for public utilities has been guided by a set of fundamental evaluation criteria (or goals), identified by regulatory scholar James **Bonbright**.
- These principles are followed in **traditional ratemaking** for water and other regulated public utilities (such as electric, gas, and telephone companies).
- Bonbright identified eight principles:
  1. Does the rate provide adequate **revenue recovery** ?
  2. Does the rate promote **fairness** in cost allocation (equity)?
  3. Does the rate promote **efficient resource use**?
  4. Is the rate **practical** (understanding, acceptance)?
  5. Is the rate easy to **interpret** (noncontroversial)?
  6. Does the rate provide **revenue stability** for the utility?
  7. Does the rate provide **rate stability** for customers?
  8. Does the rate avoid undue **discrimination** among customers?
- Bonbright's top criterion—revenue recovery—and others speak directly to **capacity development** for small water systems.

Other Potential Evaluation Criteria

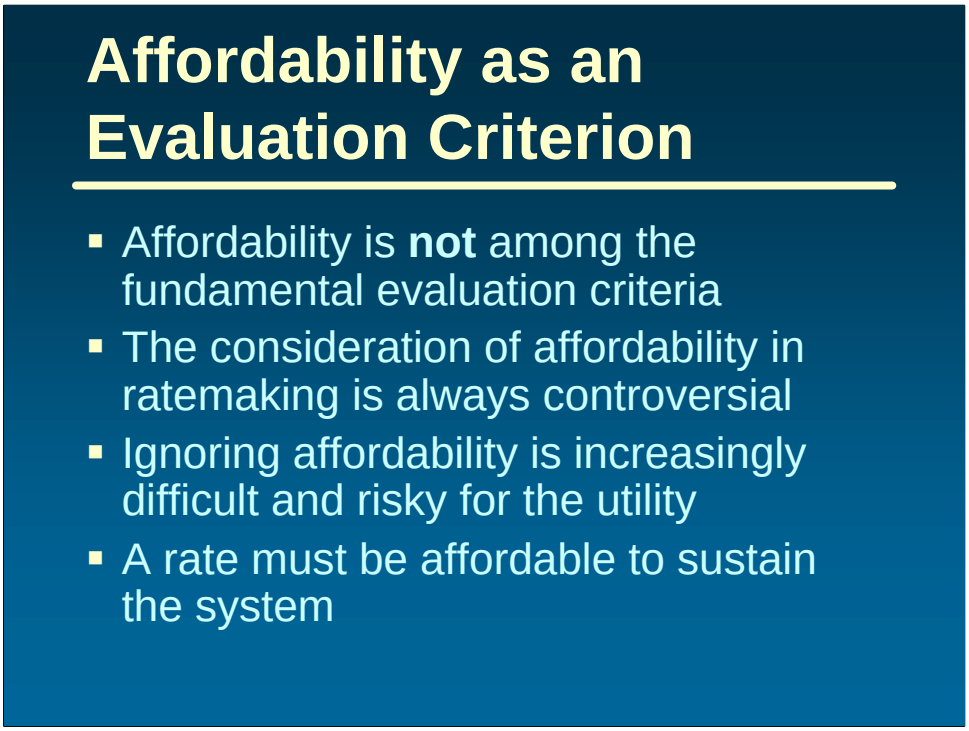
- Long-term **sustainability**, investment, and environmental compliance
- Beneficial **restructuring**, including consolidation and regionalization
- **Affordability** to customers, particularly low-income households
- Acceptance by stakeholders and institutional (policy) **legitimacy**

- For water systems, some **additional ratemaking criteria** might be applied:
  - Does the rate structure encourage long-term **sustainability**, adequate infrastructure investment, and compliance with all appropriate environmental and other regulations?
  - Does the rate structure facilitate beneficial **industry restructuring** of the water industry, including consolidation and regionalization?
  - Is the rate **affordable** to customers, particularly low-income households, given the essential nature of water service?
  - Do water stakeholders and prevailing policymaking institutions support the **legitimacy** of the rate structure and the policy it reflects?

Possible Tension Among Criteria



- Potential **tension** persists even among the traditional evaluation criteria for rates.
- **Policymakers** should recognize these inherent tensions explicitly when designing rates.
- Ultimately, rate design usually involves **tradeoffs** among competing criteria.



- Affordability is **not** among the fundamental evaluation criteria.
- The consideration of affordability in ratemaking is always **controversial.**
- The essential nature of water services, the pressure on rates from rising costs, and the challenge of building adequate financial capacity make **ignoring affordability** increasingly difficult and risky for the water utility.
- At a basic level, the rate charged to customers must be affordable to customers in order to **sustain** the system.

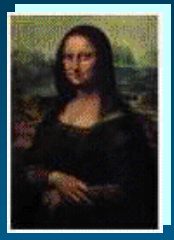
Rates and Equity

- Horizontal
  - Same costs, same rates
- Vertical
  - Different costs, different rates
- Intergenerational
  - One generation is not forced to subsidize another

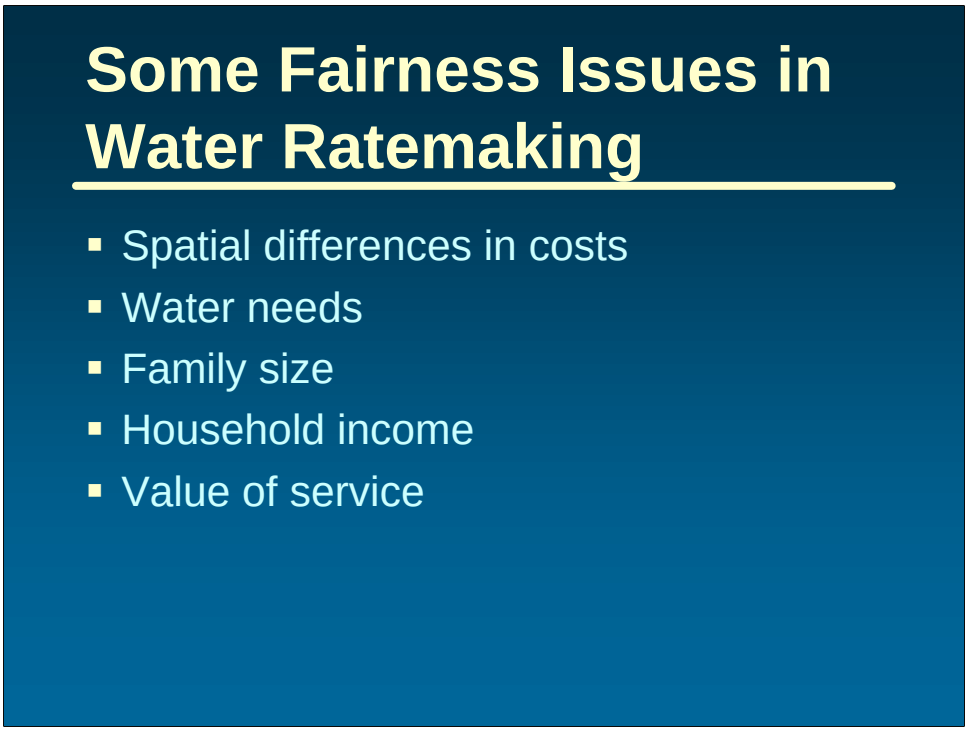
- **Equity** considerations are very important in ratemaking.
- Three types of equity are considered:
  - **Horizontal** equity
    - Customers with the essentially **the same costs** pay the same rates for the same service. Some degree of cost averaging is always used.
  - **Vertical** equity
    - Customers with substantially **different costs** pay different rates for the same service. Often applies to different customer "classes" (residential versus nonresidential).
  - **Intergenerational** equity
    - One generation of customers is not forced to **subsidize** another generation of customers. This issue is especially important in the context of long-life capital investment.

Fairness

- Tension between equity versus efficiency
- Often highly subjective
- Values vary from place to place
- Regulation considers whether rates are just and reasonable
- In practice, rate design is as much art as science



- Ratemaking also raises issues of **"fairness."**
- A **tension** often exists between equity and efficiency.
- Ideas about fairness often are highly **subjective.**
- **Perceptions** of fairness also vary from place to place: a type of rate considered fair in one community may be considered unfair in another.
- Regulators look to whether a rate is **"just and reasonable."**
- In practice, the process of rate design is **as much art as science,** in part because of the need to address equity issues.

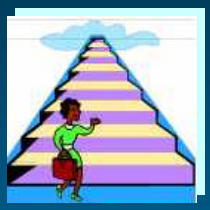


- Several issues in water ratemaking raise issues related to **fairness.**
- These include:
  - **Spatial differences** in costs. Should people who live in different areas served by the system be charged differently based on differences in the cost of service?
  - **Water needs.** Should people who need more water be charged more or less for water service?
  - **Family size.** Should large families receive discounts for water service?
  - **Household income.** Should poor households receive discounts for water service?
  - **Value of service.** Should the price of water reflect the value of service to the customer? For example, should a family living in a more expensive home pay more for water service because of the value of fire protection service?

The Ratemaking Process

- The Ratemaking Process

Key Steps in Ratemaking



1. Determination of revenue requirements (cost assessment) for a test year
2. Allocation of costs to customers based on usage patterns
3. Rate design to recover costs through rates and charges

- The ratemaking process consists of three distinct but interrelated **steps:**
  1. Determination of **revenue requirements** (cost assessment) for a test year;
  2. **Allocation** of costs to water customers based on usage patterns and associated functional costs; and
  3. **Rate design** to recover costs through various rates and charges.

Utility Revenue Requirements (simplified)

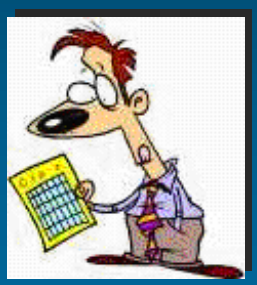
Annual revenue requirements =

Annualized **capital costs** (including debt and equity costs) + **annual operating expenses** (including operation and maintenance expenses, depreciation, and taxes)

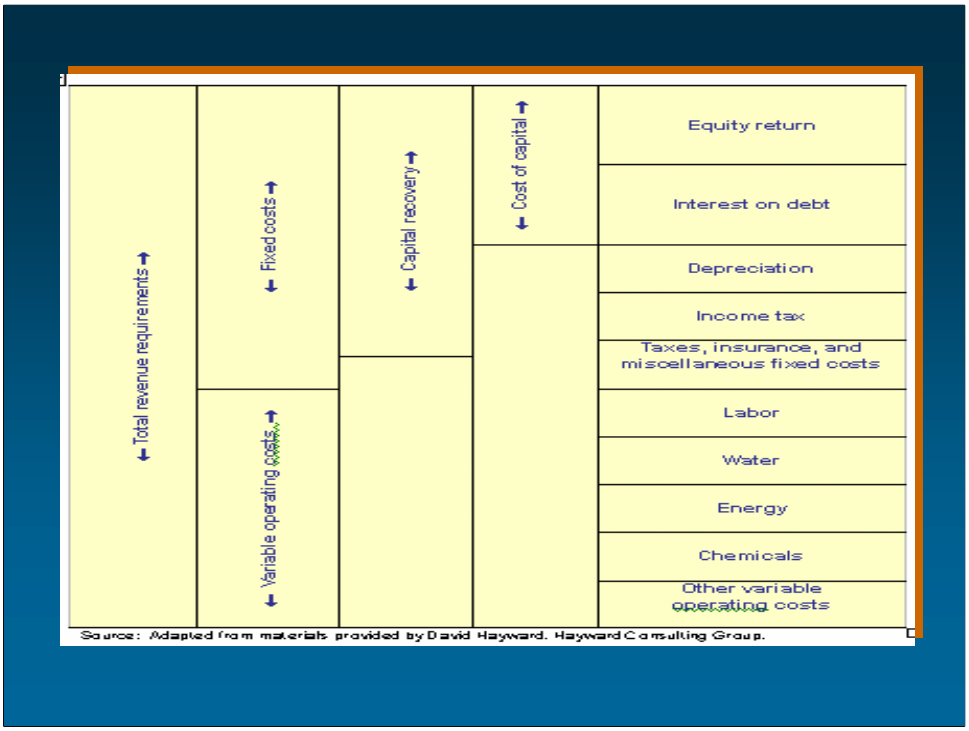
- A water system's annual **revenue requirements** consist of:
  - **Annualized capital costs** (including debt and equity costs) +
  - **Annual operating expenses** (including operation and maintenance expenses, depreciation, and taxes).

Fixed v. Variable Costs

- In the short-run, almost all costs (capital and operating) are "fixed" or obligated
- *In the long-run, all costs are variable* or subject to change



- Costs also can be distinguished according to whether they are **fixed or variable.**
- In the **short-run**, almost all costs (capital and operating) are "fixed," or obligated. In other words, they must be "covered" by the water system.
- In the **long-run,** all costs are variable, or subject to change. In other words, water systems can change their cost profile over time.

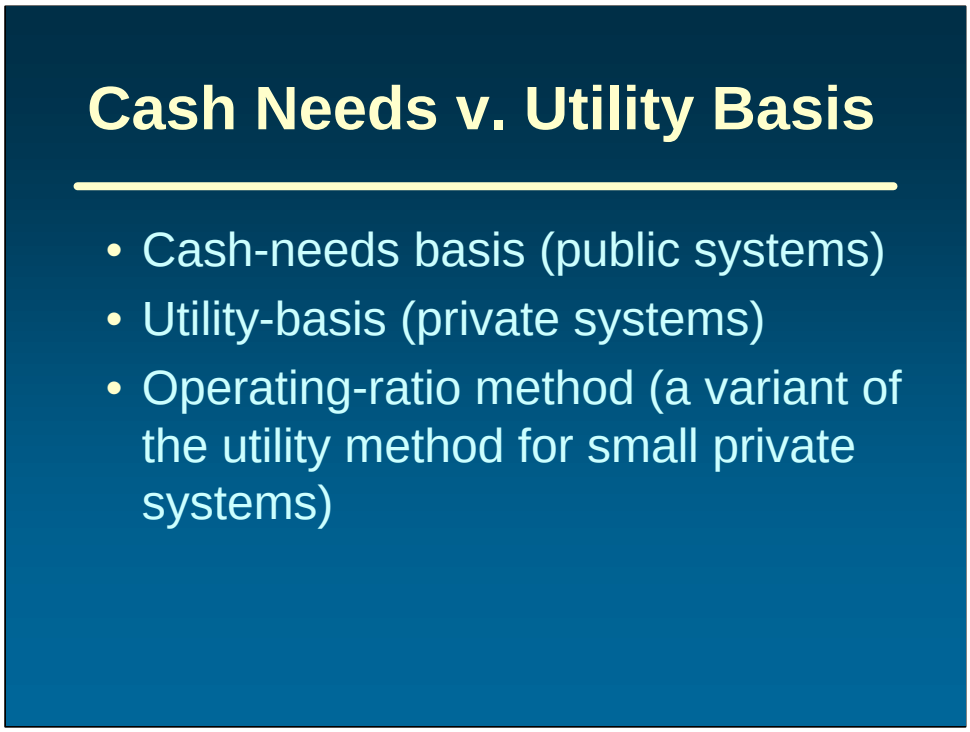


- **Components of revenue requirements** for an investor-owned water utility.
- **Fixed costs** include mostly costs related to capital recovery, including equity return, interest on debt, depreciation, taxes, and other miscellaneous costs.
- **Variable costs** include certain labor, water, energy, chemicals, and other variable operating costs that vary with production.

Test Year

- A twelve-month accounting period used to establish revenue requirements
- Data are “normalized” and “known and measurable” costs are considered
- Three types
  - Historical (accounting data)
  - Future (forecast data)
  - Mixed (combined data)

- The **test year** used for ratemaking purposes is a twelve-month **accounting period** used to establish revenue requirements.
- Data are **“normalized”** (to account for anomalies in the test year) and **“known and measurable”** anticipated costs generally are considered for ratemaking purposes.
- **Reconciliation** with actual costs is needed whenever costs are projected for ratemaking to avoid overcharging customers.
- **Three types:**
  - Historical (accounting data)
  - Future (forecast data)
  - Mixed (combined data)
- A forward-looking test year can help support the goals of **capacity development.**

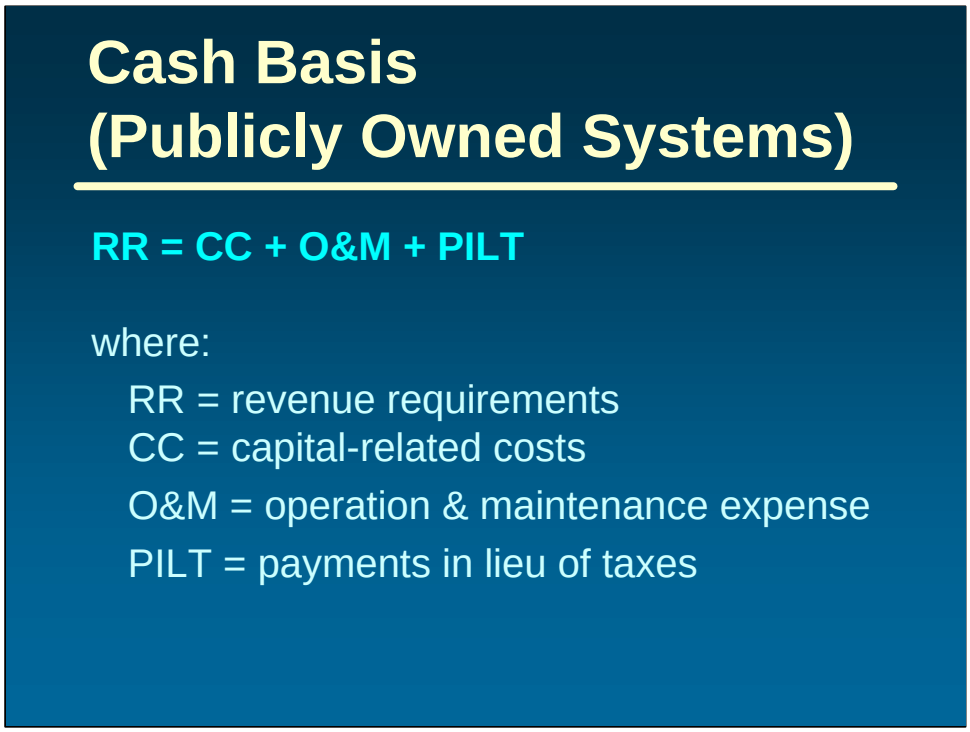


- **Three methods** are used to assess the utility system's revenue requirements for the specified test year:
  - **Cash-needs basis** (typically used by public or nonprofit water systems);
  - **Utility basis** (used by privately owned water systems); and
  - **Operating-ratio** method is used in some regulatory jurisdictions for small private systems (a variation of the utility basis).

Cash Basis v. Utility Basis

	Cash Needs	Utility Basis
Capital-related costs	Capital expenditures (major and recurring) Debt service on bonds	Depreciation Return on asset debt and equity)
Taxes	Payment in lieu of taxes	Taxes
Operation and maintenance	Same	

- For the **cash-needs basis,** the major categories of costs are:
  - Capital-related costs
  - Operation and maintenance
  - Payment in lieu of taxes
- For the **utility basis,** the major categories of costs are:
  - Capital-related costs
  - Taxes
  - Operation and maintenance
- Note that **capital-related costs** vary
  - Depreciation
  - Return on assets



- The **cash-needs basis** for determining revenue requirements (used by many publicly owned water systems) adds capital-related costs, operation and maintenance expense, and payments in lieu of taxes (if applicable).
- According to the method:
  RR = CC + O&M + PILT
  where:
  CC = capital-related costs
  O&M = operation and maintenance expense
  PILT = payments in lieu of taxes

Utility Basis (Privately Owned Systems)

RR = r(RB - d) + O&M + D + T

where:

RR = revenue requirements

r = authorized return

RB - d = ratebase less depreciation

O&M = operation & maintenance expense

D = depreciation expense

T = taxes

- The **utility basis** for determining revenue requirements (used by privately owned systems and some publicly owned systems) provides an authorized rate of return on the utility's depreciated investment (ratebase), plus expenses for operation and maintenance, depreciation, and taxes.
- Utilities and regulators follow a system of accounts and other **procedures** for determining each of these elements, all of which may be subject to a regulatory deliberation in which various parties participate.
- According to the method:

  RR = r(RB - d) + O&M + D + T

  where:

  RR = revenue requirements

  r = authorized return

  RB - d = ratebase less depreciation

  O&M = operation & maintenance expense

  D = depreciation expense

  T = taxes

Utility Basis (Operating-Ratio Method)

RR = r(O&M + D) + O&M + T + D

where:

(O&M + D) substitutes for RB

- Used for very small water systems with little or no ratebase on which to earn a return

- Some regulatory agencies have used a **"operating ratio" method** for very small (often privately owned) water systems.
- The method was developed because many small systems have little or **no ratebase** on which to earn a return or profit.
- The value of operation and maintenance expenses are used as **substitute** for the ratebase in the revenue requirements formula.
- According to the method:

  RR = r(O&M + D) + O&M + T + D

  where:

  (O&M + D) substitutes for RB

Cash Basis Example
(publicly owned system)

Capital-related costs	
Bond debt service	$214,000
Major capital improvements	150,000
Recurring improvements	140,000
Total capital-related costs	$504,000
Operation and maintenance	$259,000
Payment in lieu of taxes	$189,000
Total revenue requirement	**$952,000**

Source: Banker (1973)

- Example of **cash basis** for determining revenue requirements.
- The **major categories** of costs are:
  - Capital-related costs;
  - Operation and maintenance; and
  - Payment in lieu of taxes.

Utility Basis Example
(privately owned system)

Capital-related costs	
Depreciation	$126,000
Return on assets	$378,000
Total capital-related costs	$504,000
Operation and maintenance	$259,000
Taxes	$189,000
Total revenue requirement	**$952,000**

Source: Banker (1973)

- Example of **utility basis** for determining revenue requirements.
- The **major categories** of costs are:
  - Capital-related costs;
  - Operation and maintenance; and
  - Taxes.
- Note that **capital-related costs** vary:
  - Depreciation; and
  - Return on assets.

Sample Calculation of Ratebase

Line	Item	Amount ($)
a	Plant in service (w/o CWIP)	$320
b	Construction work in progress (CWIP) (+)	35
c	Plant acquisition adjustment (+)	10
d	Plant held for future use (+)	0
e	Materials and supplies (+)	15
f	Cash working capital (+)	20
g	Accumulated depreciation (-)	30
h	Customer advances & contributions in aid of construction (net) (-)	20
i	Deferred income taxes (-)	50
j	Ratebase (a + b + c + d + e + f - g – h - i)	$300
k	Operating revenues (+)	$80
l	Income and other taxes (-)	8
m	Depreciation expenses (-)	10
n	Operation and maintenance expense (-)	32
o	Net operating income (k - l – m - n)	$30
p	Rate of return (o/j)	10%

- A **sample calculation** of revenue requirements for a regulated water utility.

Sample Calculation of Revenue Requirements

Line	Item	Amount ($)	Percent of total (%)
	Ratebase = $300		
	Cost of equity *(Line 1 *.50 *.12)*	$18	23%
	Income tax *(Line 2 * .43)*	8	10%
	Subtotal *(Line 2 + Line 3)*	26	32%
	Interest expense *($300 * .5 *.08)*	12	15%
	Depreciation expense *($300 * .0333)*	10	12%
	Operation and maintenance expense	32	40%
	Total *(Lines 4 through 7)*	80	100%

- A **sample calculation** of revenue requirements for a regulated water utility.

Depreciation

- Many systems do not adequately charge for depreciation
- Recognizes the depletion of capital assets over time
- Depreciation expense provides a source of internal cash flow
- Reserves usually are used for reinvestment
- Depreciation studies and guidelines can be helpful

- Because of the capital intensity of the water industry, **depreciation** is an important concept.
- Many water systems do not **adequately charge** for depreciation or build a depreciation reserve.
- Accounting depreciation recognizes the **depletion** of capital assets over time.
- Depreciation expense provides a source of internal **cash flow;** accelerating depreciation can bring in additional resources but must be done in accordance with accepted practices.
- Depreciation reserves generally are used for reinvestment in the water system to maintain its **value and service capability;** however, a private water utility is not formally obligated to **reinvest** depreciation expense; however, to maintain its franchise, it must reinvest as necessary to meet its obligation to serve.
- A **depreciation study** can be helpful to the water system in establishing a schedule for all depreciable assets; alternatively, some systems use a simple composite rate of depreciation (e.g., 2-3 percent).
- Some state public utility commissions provide **guidelines** for depreciation (for example, the Florida Public Service Commission).

Reserves

- Water systems can use reserve accounts to fund repairs during emergencies and avoid interruptions of service
- The amount placed in reserve should be based on reasonable planning assumptions
- Regulatory requirements and ratepayer equity are important considerations

- Water utilities can establish **reserve accounts.**
- Water systems can use reserve accounts to fund repairs during **emergencies** and avoid interruptions of service.
- The amount of funds placed in reserve should be based on **reasonable planning assumptions.**
- **Regulatory requirements and ratepayer equity** and are important considerations; one generation of ratepayers should not benefit from the reserve to the detriment of another generation of ratepayers.

Cost Increases and Returns

- An increase in costs will reduce the water utility's rate of return
- For an investor-owned utility, large amounts of contributed capital will accentuate the effect of cost increases on returns

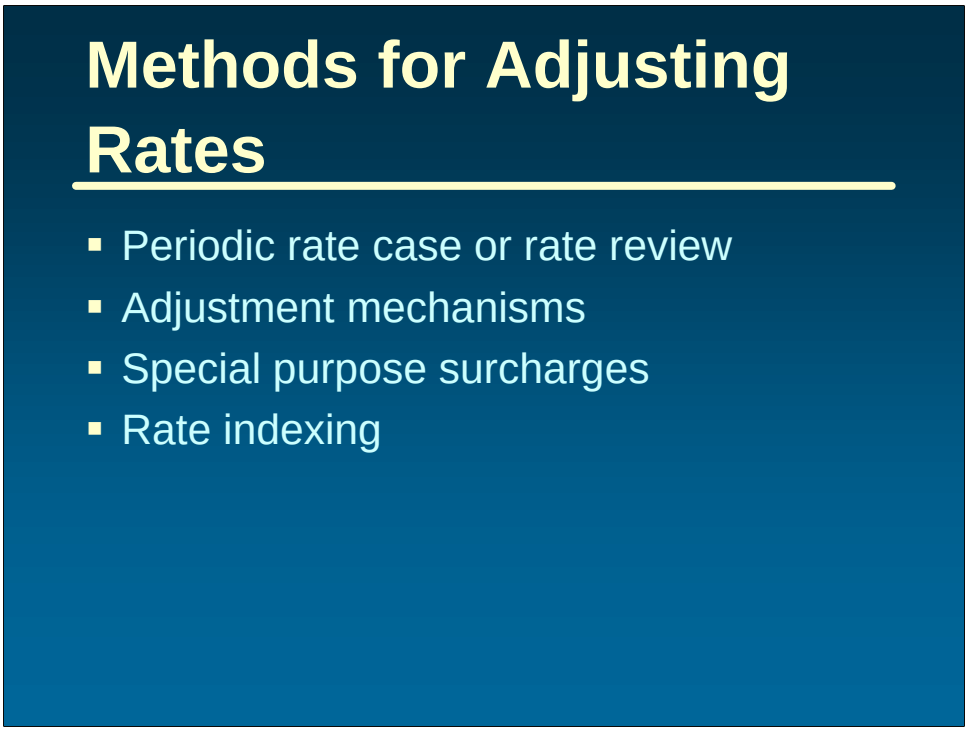
- For any water system following the utility basis of ratemaking, an **increase** in costs will reduce the system's rate of return.
- For an investor-owned utility, large amounts of **contributed capital** will accentuate the effect of cost increases on returns (as illustrated in the following examples).

Impact of Rate Increase on Rate of Return		
		10% increase in O&M and taxes
Revenues	500,000	500,000
O&M	190,000	209,000
Depreciation	20,000	20,000
Taxes other than income	163,000	179,300
Income taxes (34%)	27,000	14,900
Expense subtotal	400,000	423,200
Net income	100,000	76,800
Rate base	1,000,000	1,000,000
Debt (60%)	600,000	600,000
Equity (40%)	400,000	400,000
Interest on debt (8%)	48,000	48,000
Equity return	52,000	28,800
Rate of return	10.0%	7.7%
Return on equity	13.0%	7.2%

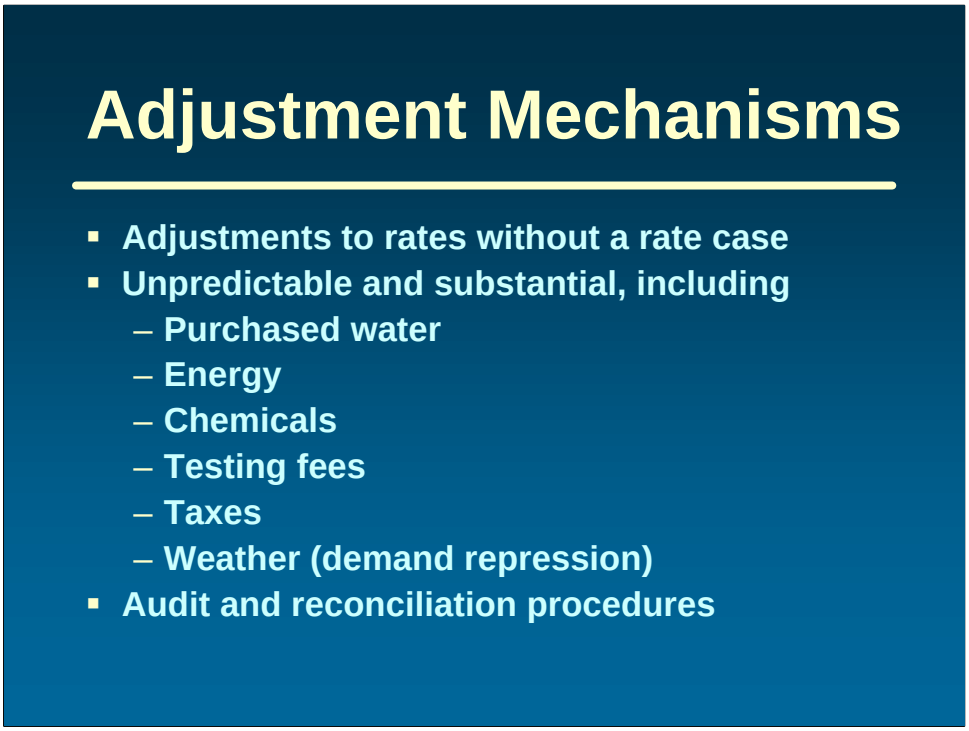
- Illustration of the impact of a cost increase on the water utility's **rate of return** (courtesy of John Guastella).
- The overall rate of return supports the utility's **debt and equity.**
- **Assumes** a debt/equity ratio is 60/40 (thus, the capital structure is $600,000 debt and $400,000 equity. For overall rate of return, or weighted cost of capital, the calculation is weighted cost of debt of 4.8 percent (60 percent x 8 percent) plus weighted cost of equity of 5.2 percent (40 percent x 13 percent), or 10.0 percent. The income tax rate is 34 percent income tax rate. The gross-up calculation is based on the equity return of $52,000 ($400,000 x 13 percent) divided by 0.66 (1 - .34) and multiplied by 34 percent, or $26,788 which I rounded to $27,000. For the increase, taxes are calculated directly (not grossed up). The taxable income is calculated by taking revenues of $500,000 less total deductions of $456,300. The taxable income of $43,700 is multiplied by the 34 percent tax rate to produce $14,900.

Impact with 50% Contributed Capital		
		10% increase in O&M and taxes
Revenues	426,400	426,400
O&M	190,000	209,000
Depreciation	10,000	10,000
Taxes other than income	163,000	179,300
Income taxes (34%)	13,400	1,400
Expense subtotal	376,400	399,700
Net income	50,000	26,700
Rate base	500,000	500,000
Debt (60%)	300,000	300,000
Equity (40%)	200,000	200,000
Interest on debt (8%)	24,000	24,000
Equity return	26,000	2,700
Rate of return	10.0%	5.3%
Return on equity	13.0%	1.4%

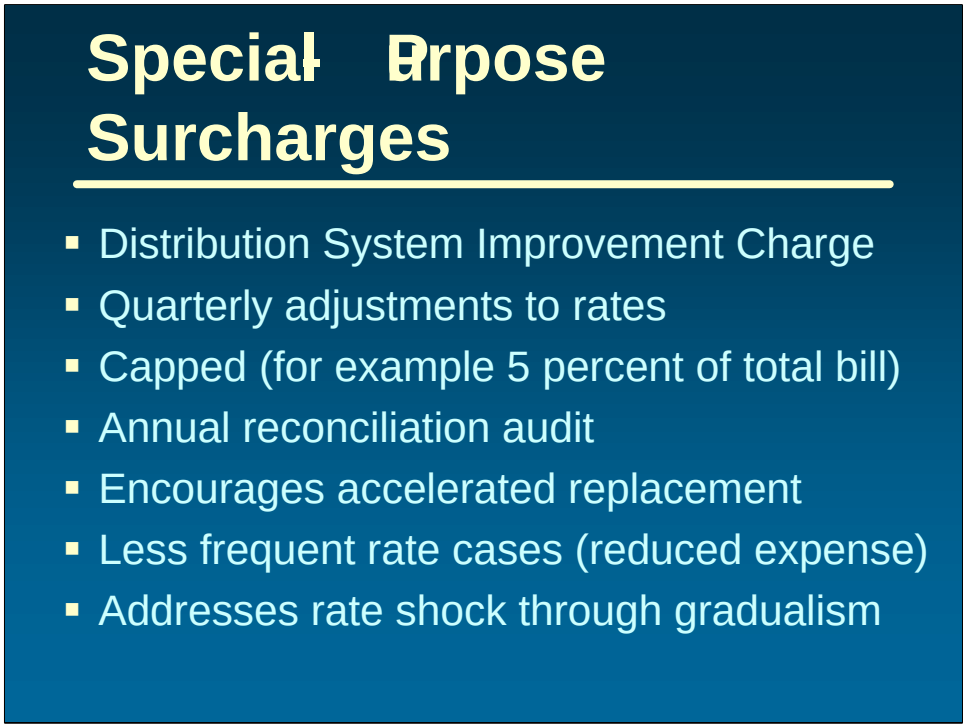
- Illustration of the impact of a cost increase on the water utility's rate of return with 50 percent **contributed capital in ratebase** (courtesy of John Guastella).
- The overall rate of return and the return on equity are **significantly affected** by a cost increase when contributions account for a substantial share of the ratebase.
- Same **assumptions** as in previous illustration (except for contributions).



- Methods for **adjusting rates** include:
  - Periodic **rate case** or rate review, in which revenue requirements are established for a test year;
  - **Adjustment mechanisms** that adjust rates based on changes in major cost categories;
  - Special purpose **surcharges** used to finance capital improvement projects; and
  - **Rate indexing** to adjust rates periodically based without a comprehensive rate case or rate review.

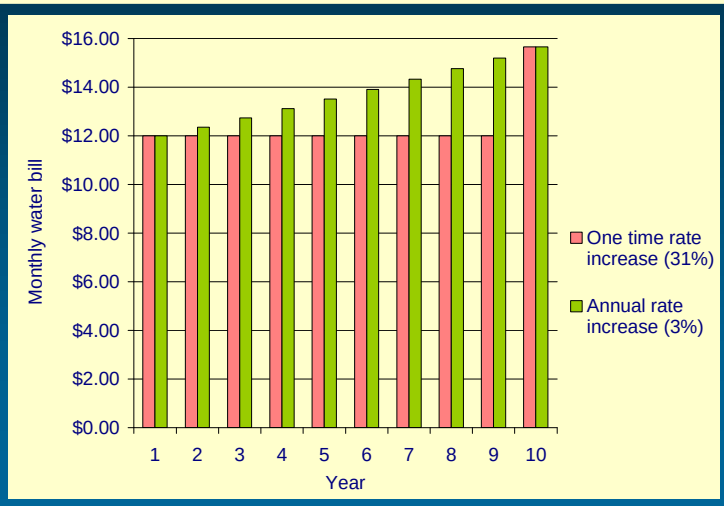


- **Adjustment mechanisms** (or adjustment clauses) allow water utilities to change rates as certain types of costs change.
- Unpredictable and substantial **expenses** for which an adjustment mechanism my be useful and appropriate include:
  - Purchased water;
  - Energy;
  - Chemicals;
  - Testing fees;
  - Taxes; and
  - Weather (demand repression).
- Use of an adjustment mechanism usually is conditioned on **audit** and reconciliation procedures.



- Special-purpose surcharges include the **Distribution System Improvement Charge** (DSIC), developed by investor-owned water utilities in Pennsylvania (with the approval of regulators).
- The DSIC generally **involves:**
  - A quarterly rate adjustment;
  - A cap (for example, 5 percent of the total bill); and
  - An annual reconciliation audit.
- **Benefits** of the DSIC include:
  - Accelerated system remediation;
  - Less frequent rate cases and reduced expenses; and
  - Ability to address rate shock through gradualism.

Rate Indexing



- Once rates are established, based on a thorough review of costs, **rate indexing** can help avoid a full review of revenue requirements.
- Rate indexing ties rate changes to **changes** in consumer prices (CPI), producer prices (PPI), or some other metric
- If well justified by costs, a **fixed** annual percentage increase may be used.
- Indexing **simplifies** the ratemaking process and reduces administrative and regulatory expenses once the base is established.
- Simplification through indexing may be especially useful for **smaller systems.**
- Indexing can be used in conjunction with incentive regulation for **larger systems.** Price caps (used in Great Britain) often include an indexing feature.
- Indexing can present a problem if true and unavoidable **costs exceed** the rate of inflation based on the specified index.

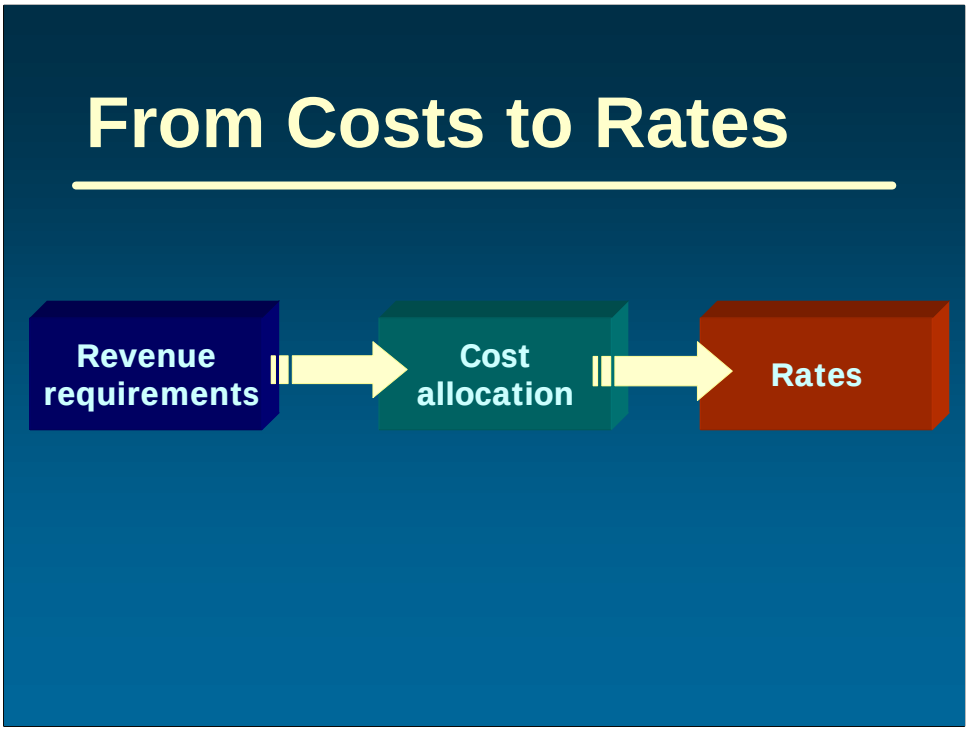
Rate Changes and Water Usage (Price Elasticity)

- Water use in general is relatively price inelastic
- Indoor use is less price responsive than outdoor use
- Residential use is less price responsive than nonresidential use
- Even small price responses can be meaningful
- "Demand repression" adjustments account for changes in usage caused by changes in price or other factors

- Water use in general is relatively **price inelastic;** that is changes in price do not induce big changes in water usage.
- **Indoor use** is less price responsive than outdoor use.
- **Residential use** is less price responsive than nonresidential use.
- However, even **small** price responses can be meaningful in terms of water utility revenues.
- **"Demand repression"** adjustments account for changes in usage caused by changes in price or other factors.

Cost Allocation

- Cost Allocation

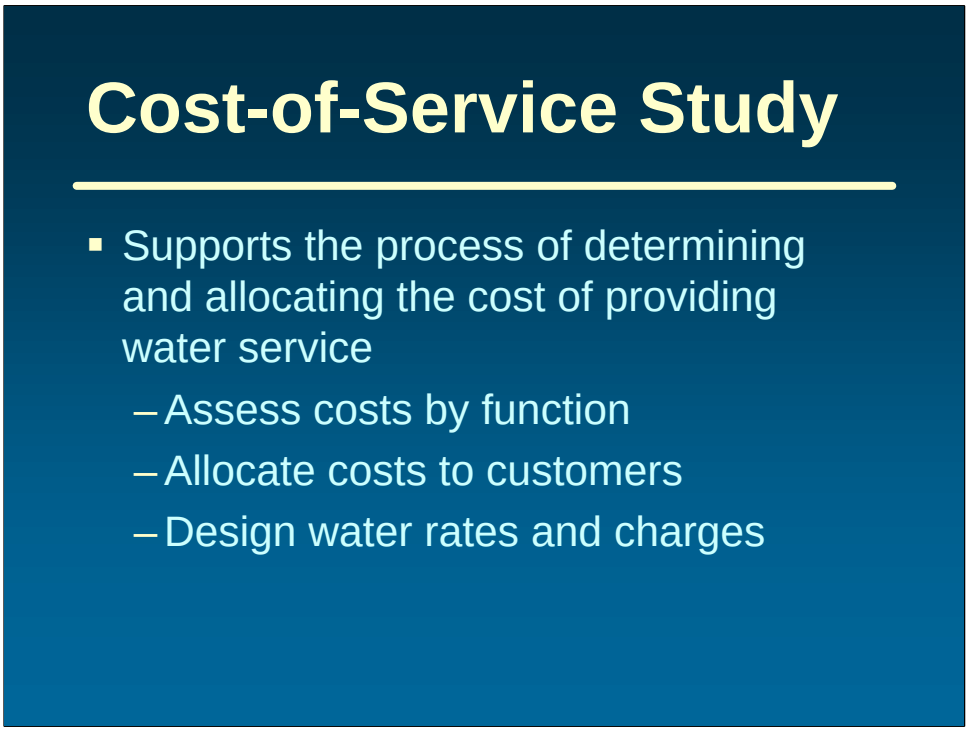


- **Cost allocation** translates revenue requirements (costs) to rates.

Cost Allocation

- Revenue requirements are allocated to classes of customers based on their use of water system facilities
- Costs are allocated to *revenue-producing water* that is sold to customers
- A degree of cost averaging is required
- Various methods are available
- Cost-of-service studies are used

- Specifically, cost allocation is the process of **allocating** revenue requirements to classes (groups) of customers based on their estimated use of water system facilities.
- **Revenue-producing water** is water that is produced and sold to customers
- Some degree of **cost averaging** is required for all ratemaking (rates are not "individualized" except under special circumstances).
- **Various methods** are available for allocating costs.
- **Cost-of-service studies** are very useful for the process of cost allocation.



- A **cost-of-service study** supports the process of determining and allocating the cost of providing water service.
- A cost-of-service study **involves:**
  - Assessing costs by function (source, treatment, distribution, services);
  - Allocating costs to customers by pattern of usage; and
  - Designing water rates and charges to collect revenue requirements.

Steps in Cost Allocation

1. Functionalization
2. Classification
3. Allocation by usage
4. Assignment to classes
5. Design of rates and charges

- Cost allocation consists of several distinct but interrelated **steps:**
    1. **Functionalization** of cost (e.g., source, treatment, transmission).
    2. **Classification** of costs (customer, capacity, commodity).
    3. **Allocation** of costs according to types of usage.
    4. **Assignment** of costs to water users (residential, nonresidential).
    5. **Design** of rate and charges (tariffs).

Cost Functionalization

- Source of supply
- Water treatment
- Transmission and distribution
- Customer services
- Administration

- Water system costs can be separated into **functional categories:**
  - Source of supply;
  - Water treatment;
  - Transmission and distribution;
  - Customer services; and
  - Administration.
- **Cost functionalization** is useful both for understanding and estimating revenue requirements and for cost allocation (because different types of water usage are associated with different water supply facilities).

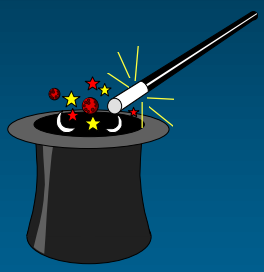
Water Plant and Demand

- **Average-day** demand ⇒ source-of-supply facilities, including raw water storage (such as reservoirs)
- **Maximum-day** (peak) demand ⇒ treatment plants and major transmission lines
- **Maximum-hour** demand (maximum-day demand plus fire-flow requirements) ⇒ treated water storage, distribution mains, pumping stations

- Different types of **water demand** are associated with different types of facilities:
  - **Average-day** demand ⇒ source-of-supply facilities, including raw water storage (such as reservoirs).
  - **Maximum-day** (peak) demand ⇒ treatment plants and major transmission lines.
  - **Maximum-hour** demand (maximum-day demand plus fire-flow requirements) ⇒ treated water storage, distribution mains, pumping stations.

- **Cost classification** is the process of separating three types of costs:
  - **Customer costs** that do not vary with usage;
  - **Commodity costs** that vary with usage; and
  - **Capacity costs** that vary with aggregate usage over time.
- **Separate charges** for customers can be developed for each of these types of costs, although most water systems use a simple two-part rate with a customer charge and a commodity charge (capacity costs are included in these charges).

Methods of Cost Allocation



- Functional or average use
- Peak responsibility
- Commodity-demand
- Base-extra capacity or average-excess
- Embedded-direct
- Fully-distributed
- Marginal-cost

- **Cost allocation** methods are used to assign the various types of costs to customers according to patterns of usage.
- **Methods** used in cost allocation include:
  - Functional or average use;
  - Peak responsibility (coincident and noncoincident);
  - Commodity-demand;
  - Base-extra capacity or average-excess;
  - Embedded-direct;
  - Fully-distributed; and
  - Marginal-cost.

Customer Classes

Residential
- Single family
- Multi-family

Nonresidential
- Industrial
- Commercial
- Wholesale
- Public authorities
- Fire protection

- **Water-system customers** can be separated into classes:
  - **Residential**
    - Single family
    - Multi-family
  - **Nonresidential**
    - Industrial
    - Commercial
    - Wholesale
    - Public authorities
    - Fire protection (public and private)
- Many small water systems serve only **residential** customers.
- A simple **two-class** system (residential and nonresidential) also is used by many systems.

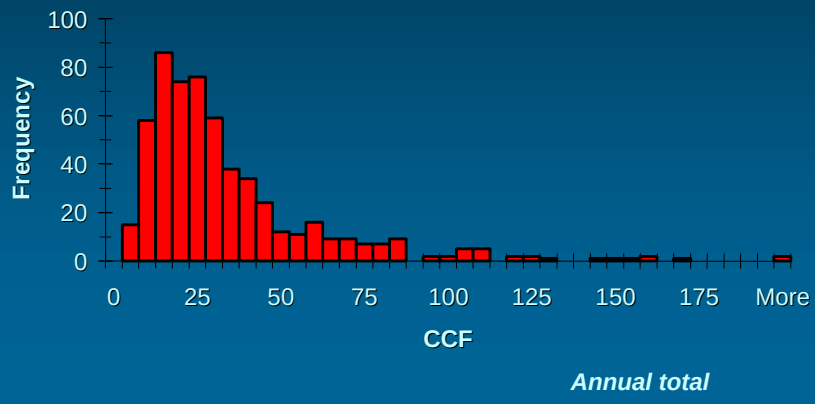
Median Percentage of Residential Customers

Population	Median
< 100	100 percent
100 – 500	98
500 – 1,000	90
1,000 – 3,300	75
3,300 – 10,000	69
10,000 – 50,000	63
50,000 – 100,000	60
> 100,000	55

Median for publicly owned systems

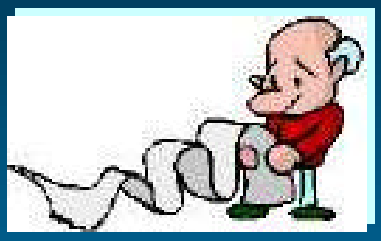
- For most water utilities, the majority of water sales are to **residential** customers.
- Most **very small** water systems (<500 population) sell all of their water to residential customers.
- The larger the system, the greater the percentage of sales to the **nonresidential** sector.
- The same basic pattern holds for both **publicly and privately owned** water systems.

Customer Distribution



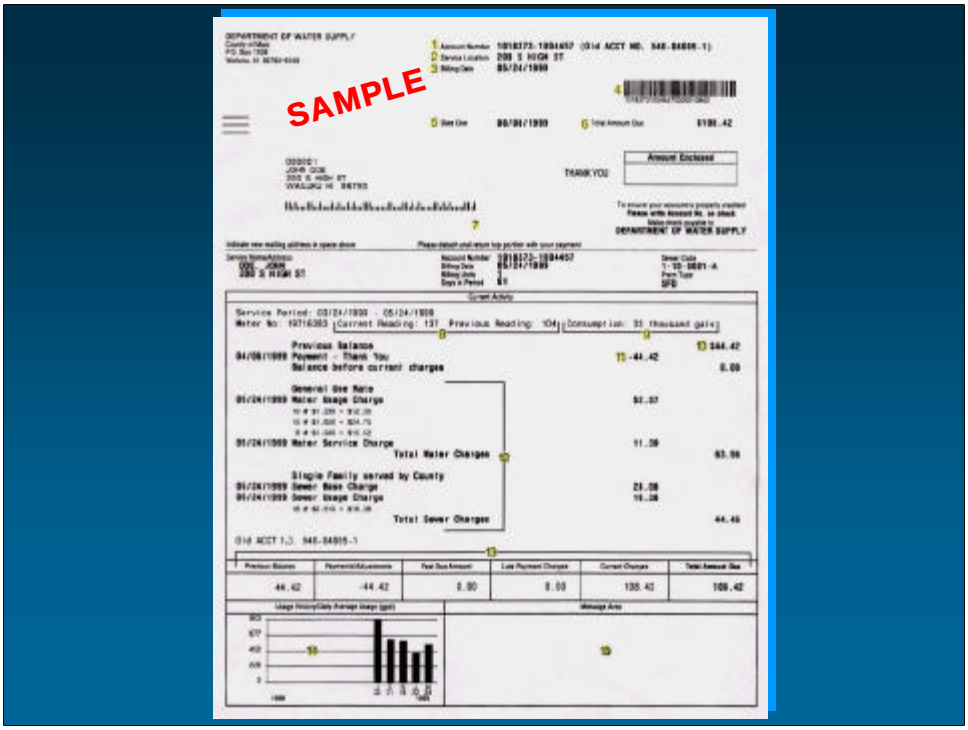
- Example of a customer **distribution** based on customer billing data.
- Most customers will fall within an **expected range** of typical water usage.
- A **customer-bill or customer-impact analysis** is used to assess the distribution of water consumption across the customer base.
- The results of the bill analysis are used to **assess how costs can be recovered** through variable charges under alternative rate-design scenarios.
- A **bill analysis** also can be used to predict how total water bills and water usage might change with changes in rates (impact analysis)

Cost Assignment: The Water Bill



- Fixed charges
- Variable charges
- Other charges
- Information for customers

- The **typical** water bill consists of:
  - **Fixed charges** (that do not vary with water usage);
    - The fixed charge may also cover a water allowance or first block of usage but practices vary widely (sometimes the water included in the fixed charge is incorrectly called “free water”);
  - **Variable charges** (that vary with water usage based on per-unit price);
  - **Other charges** (such as surcharges and penalties); and
  - **Information** for customers (e.g., water quality, conservation).



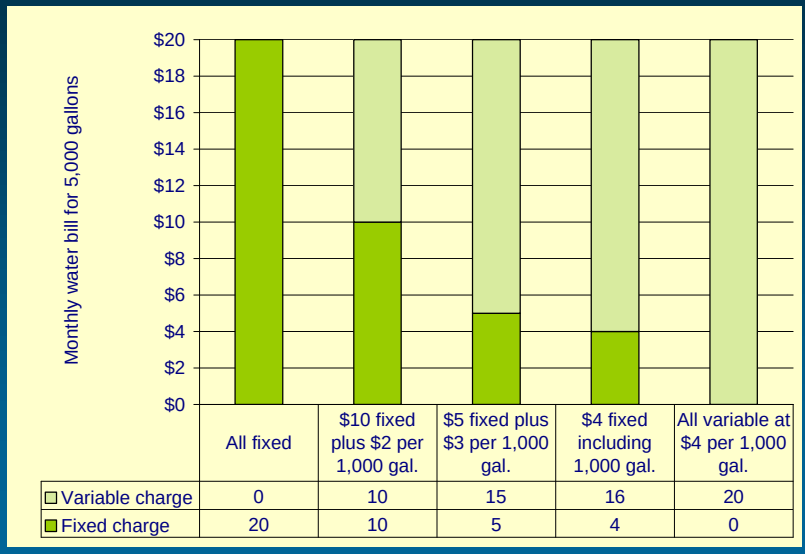
- A sample **water bill.**

Fixed Versus Variable Charges

- Do *not* necessarily correspond to fixed and variable costs
- Recovering more costs through fixed charges enhances revenue stability but can cause affordability concerns
- Recovering more costs through variable charges can promote conservation and efficiency, but increase revenue instability

- **Fixed and variable charges** that appear on the water bill do not necessarily correspond to **fixed and variable costs.**
  - Many water utilities do not try to collect all of their fixed costs through fixed charges.
  - Some water utilities, for example, impose no fixed charges.
- Recovering more costs through fixed charges enhances **revenue stability** but can cause affordability concerns.
- Recovering more costs through variable charges can promote conservation and efficiency, but can add to **revenue instability** due to variations in usage (including weather-related variations).
- The variable charge may or may not include a water **allowance.**

Rates Design Options for $20



- This **illustration** shows the variety of rate design options that might be used to collect a $20 monthly bill from customers, based on an assumption of 5,000 gallons of usage.
- The **five examples** are:
  - All fixed
  - $10 fixed plus $2 per 1,000 gallons
  - $5 fixed plus $3 per 1,000 gallons
  - $4 fixed including 1,000 gallon allowance plus $4 per 1,000 gallons
  - All variable at $4 per 1,000 gallons

Simplified Illustration for Small System

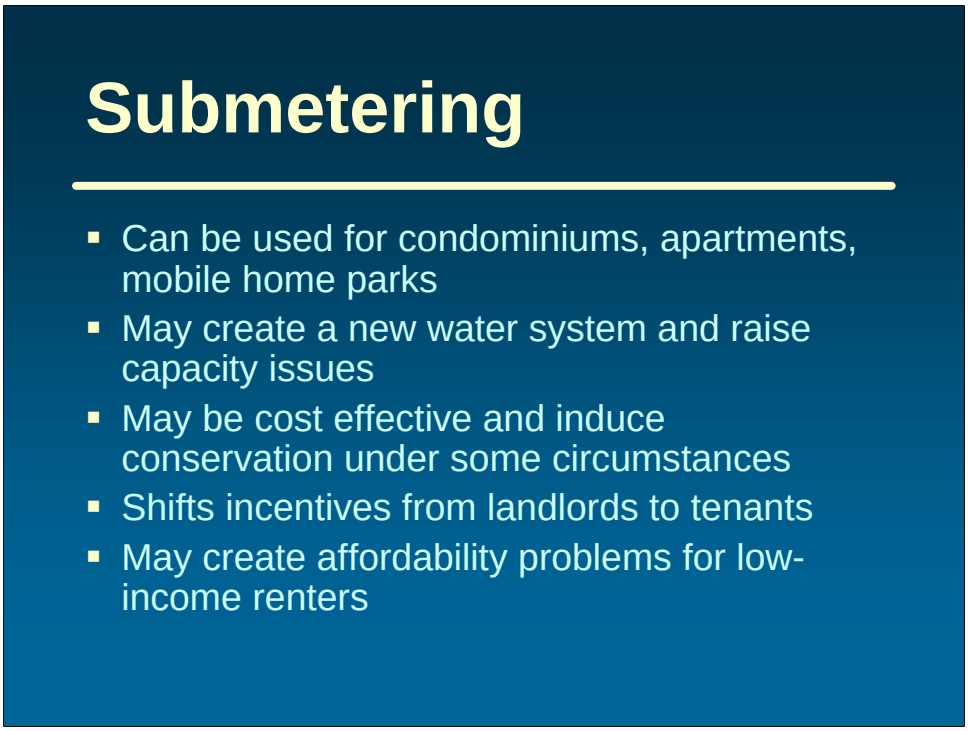
Revenue requirement	$36,000
Customers	200
Total usage	12 mil. gallons
Average customer usage	5,000 gal. per mo.
Fixed charge	
– $5 per customer per month	$12,000
Variable charge	
– $2 per 1,000 gallons	$24,000

- A highly **simplified illustration** of ratemaking for a small water system serving 200 customers.
- The revenue requirement should include **all appropriate costs** for the test year.
- Together, the **fixed and variable** charges recover the total revenue requirement.
- In reality, the allocation of costs requires a method for determining fixed and variable charges and allocating costs across **more complex** patterns of usage.

Metering and Billing

- Most systems meter and bill quarterly or monthly
- Administrative costs are a consideration
- Metering is considered essential for sound ratemaking

- Most water systems read **meters and bill** customers on a monthly or quarterly basis.
- **Administrative costs** to the system are a consideration.
- Water usage can be **estimated** in between meter readings, but actual and estimated usage must be reconciled.
- While many smaller systems do not meter, metering is considered **essential** for sound ratemaking (where variable charges are used to enhance the price signal to customers).



- **Submetering** involves putting separate meters on properties or units otherwise served by a master meter.
- **Submetering:**
  - Can be used for condominiums, apartments, mobile home parks;
  - May create a new water system and raise capacity issues;
  - May be cost effective and induce conservation under some circumstances;
  - Shifts incentives from landlords to tenants; and
  - May create affordability problems for low-income renters.

Types of Water Rate Structures

- Types of Rate Water Structures

Rate Design

- Ratemaking is the process of allocating revenue requirements to customers through the price of water
- Water systems, regulators, courts, and policy analysts follow several accepted ratemaking principles

- Rate design is the process of **allocating** the water system's revenue requirements to customers through the price charged for water service.
- Water systems, regulators, courts, and policy analysts follow several accepted ratemaking **principles** when setting rates for water service.

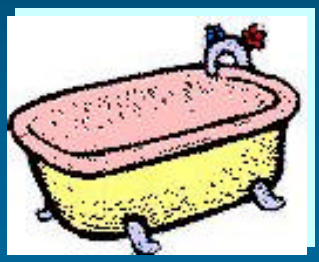
Evolution of Rate Design

- Unmetered rates
- Metered rates
- Alternative rates
- Complex rates
- Other charges

- **Water rates have evolved** over the years as technologies and policies have changed:
  - Unmetered rates
  - Metered rates
  - Alternative rates
  - Complex
  - Other charges

Unmetered Rates

- Flat fees
- Fixture rates (proxy for use)

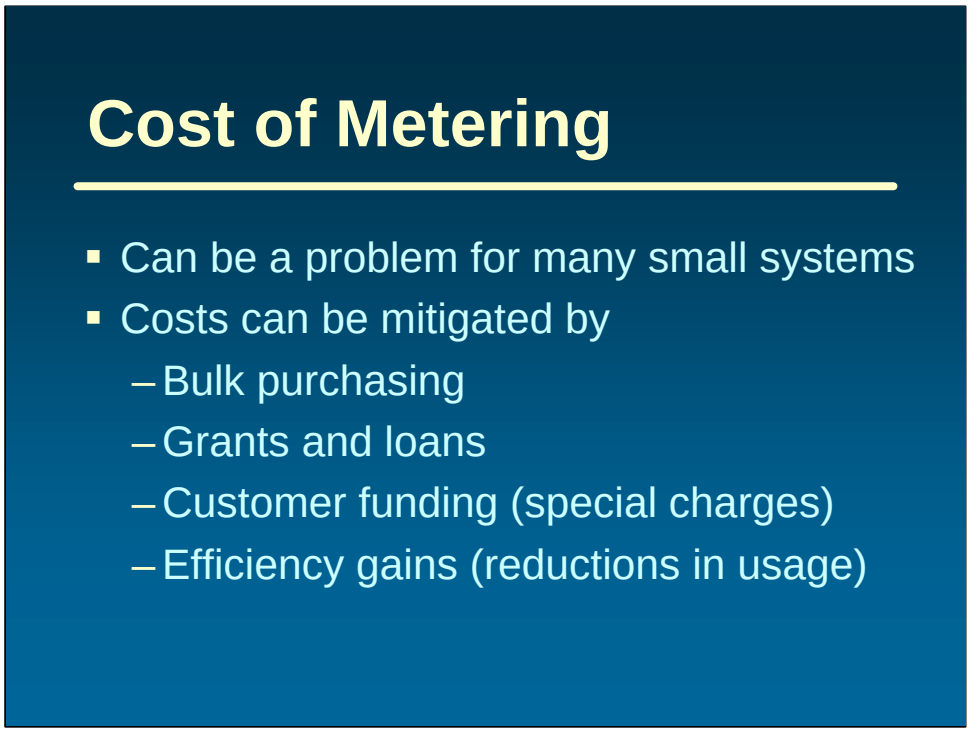


- Two types of **unmetered** water rates are:
  - **Flat fees** that do not vary by customer characteristic or water usage; and
  - **Fixture rates,** which provided a crude proxy for water use based on the number of kitchen, bathroom, and other water-using fixtures on the customer's premises.

Metered Rates

- Metering is essential for **volumetric** rates
- Meter accuracy is important
- More frequent metering and billing improve the rate signal and encourage efficient use
- Metering can induce a short-term reduction in usage

- Most larger water systems charge rates that are based on the **metered** quantity of water delivered to the customer.
- Metering is essential for **volumetric** or usage-based rates.
- **Meter accuracy** (and reconciliation with estimated usage) is important to the integrity of the ratemaking process.
- More frequent metering and billing improve the **rate signal** and encourage efficient water use.
- Changing from unmetered to metered rates can cause a short-term **reduction in usage** (an "elasticity effect") -- as much as 25 percent, but usage may increase over time.

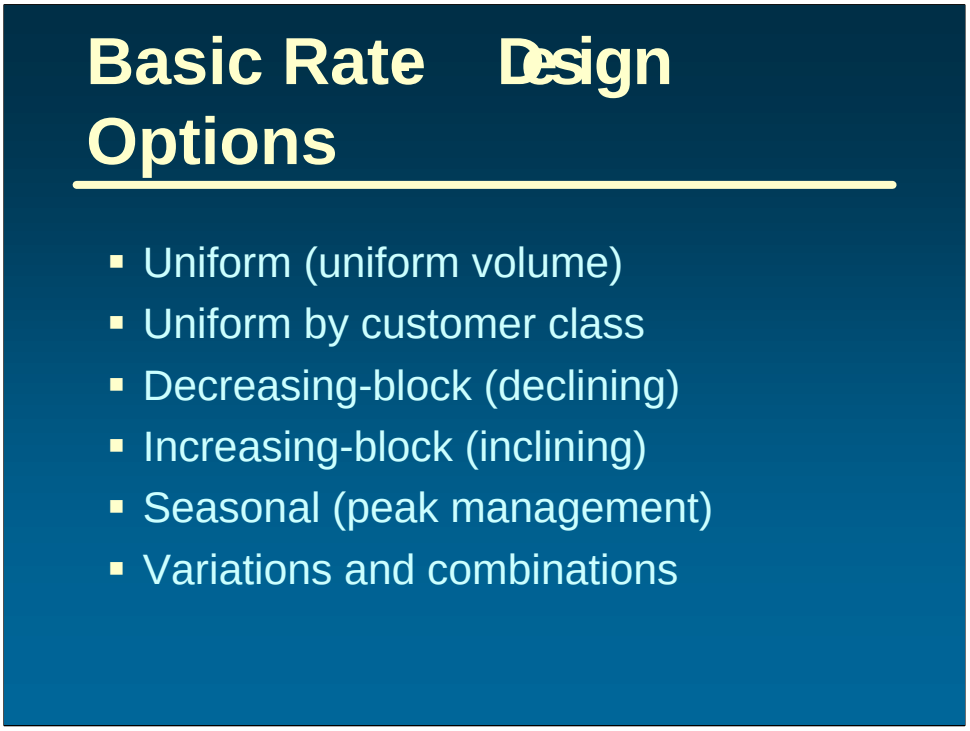


- The **cost of metering** can be a problem for many small water systems.
- The cost of purchasing and installing meters can be **offset** by:
  - Bulk purchasing;
  - Grants and loans;
  - Customer funding (special charges); and
  - Efficiency gains (reductions in usage).

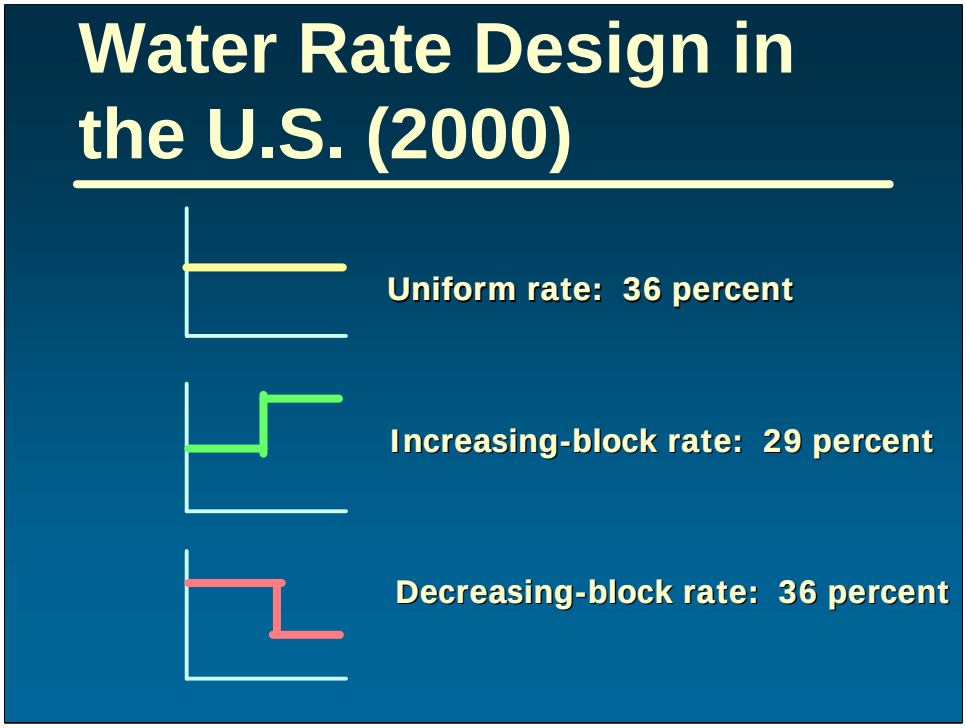
Other Charges

- Adjustments
- Special-purpose surcharges
- System-development charges
- Penalties and fees
- Direct charges

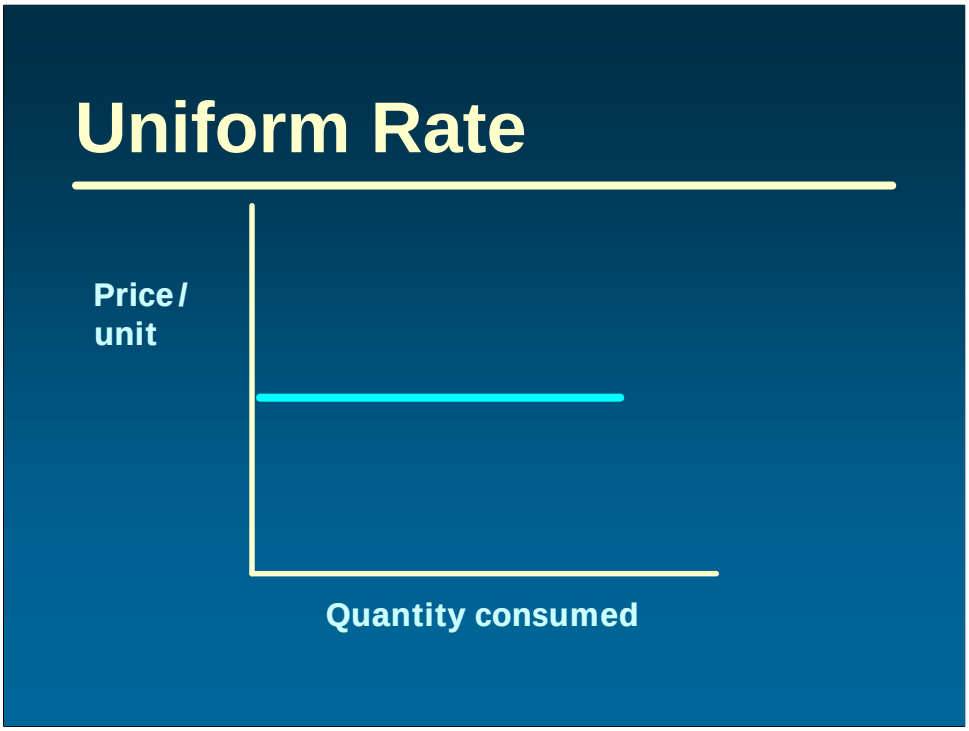
- **Other types of charges** that water systems sometimes use include:
  - **Adjustments** (based on adjustment mechanisms)
  - **Special-purpose surcharges** (including system improvement charges and support for programs);
  - **System-development charges** (charged to new customers and pay for growth-related costs);
  - **Penalties and fees** (for late payments and other purposes); and
  - **Direct charges** (to recover the actual cost of special services, such as repairs or extensions).



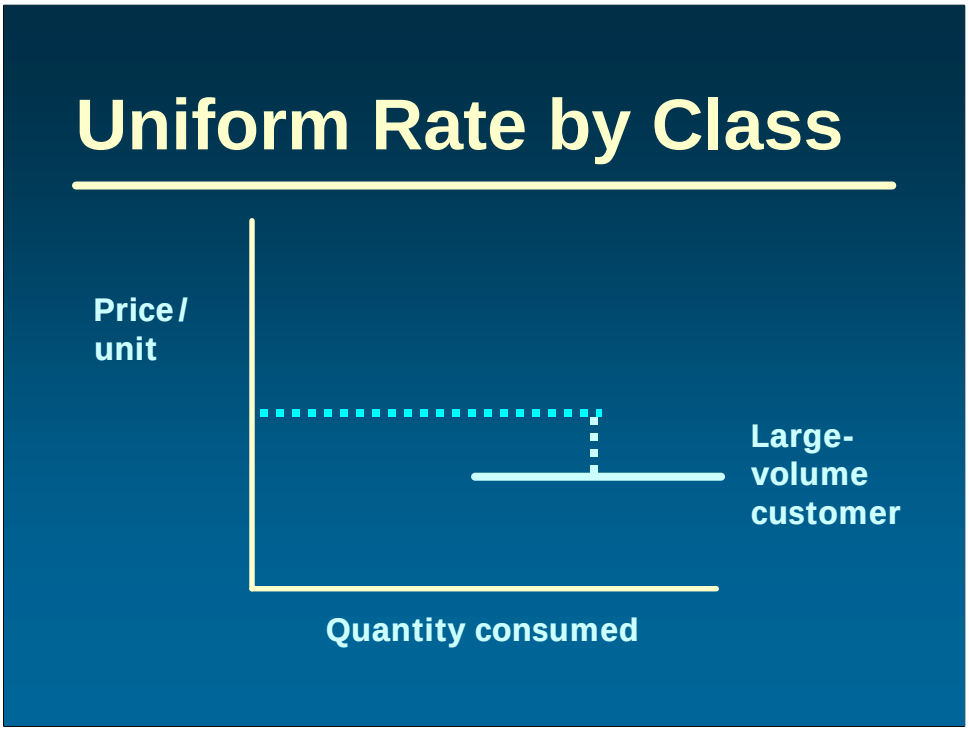
- The basic **options** for recovering costs on a variable (metered volumetric) basis are:
  - Uniform rates (uniform volume);
  - Uniform rates by customer class;
  - Decreasing-block rates (declining);
  - Increasing-block rates (inclining);
  - Seasonal rates (peak management); and
  - Variations and combinations of different types of rates.



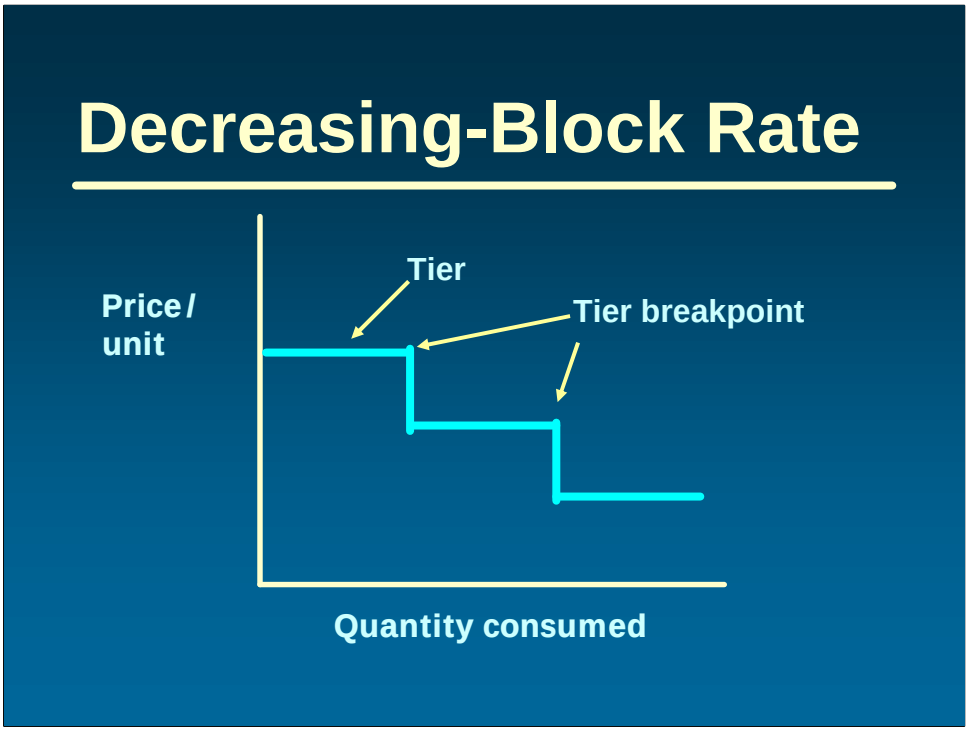
- In the United States, the **three prevailing methods** of rate design are uniform rates (used by 36 percent of systems surveyed), increasing-block rates (29 percent of systems), and decreasing-block rates (35 percent of systems). (Raftelis 2000)
- Given the rising **marginal cost** of water, the rationale for providing decreasing-block rates has declined.
- Uniform and increasing-block rates, along with seasonal, excess-use, and other types of rates, are considered more **conservation-oriented.**
- **EPA data** from the 1995 Community Water System Survey (a broader sample) indicate that about half of all water systems use a uniform rate; many systems use more than one type of rate.



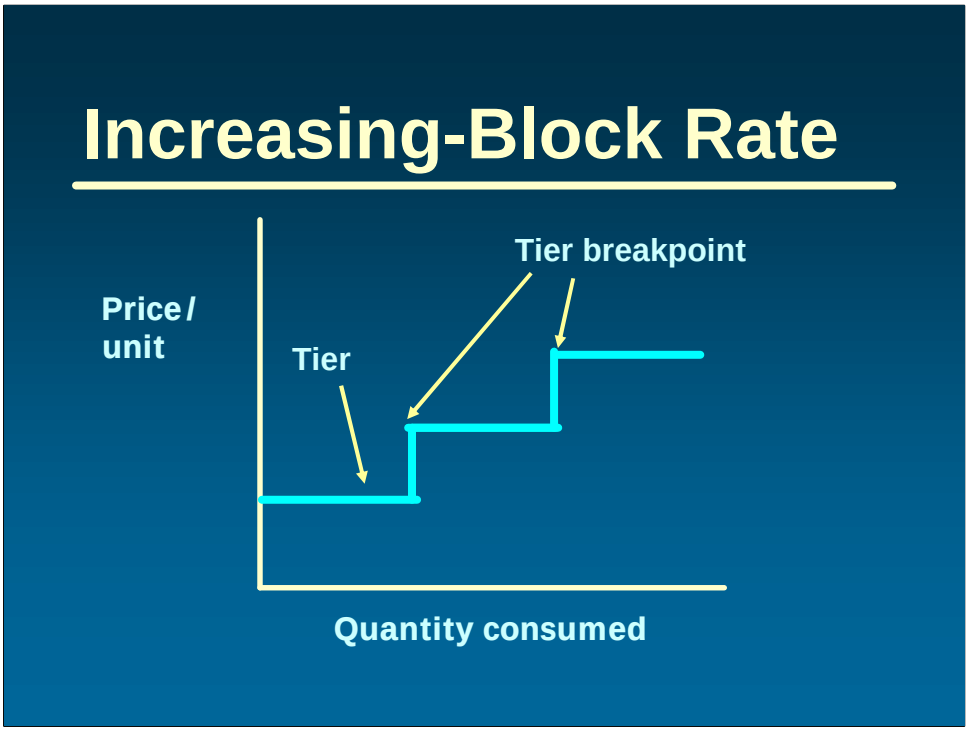
- A **uniform rate** charges the same price per unit (for example, $2.50 per 1,000 gallons) for water usage beyond that include the the fixed customer charge.
- The **total water bill** still varies by the amount of water used.
- The customer usually will also pay a **fixed monthly** (or quarterly) customer charge to cover some fixed costs. Some water usage may be included in the customer charge.
- The form is **administratively simple** and sends a price signal because the water bill will vary by usage.



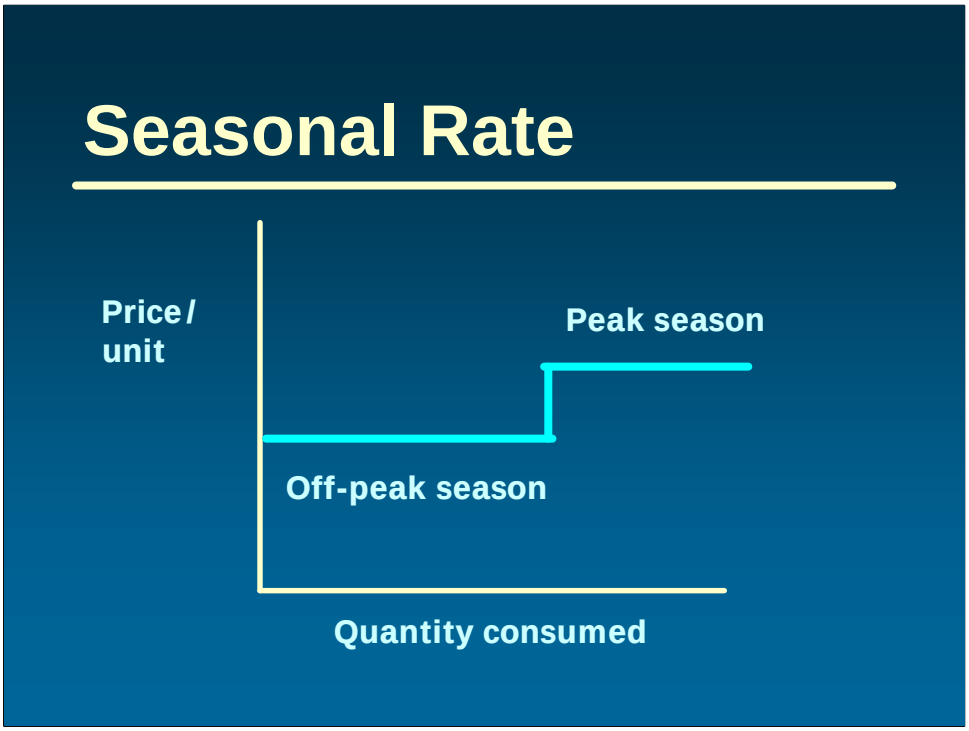
- A **uniform rate by class** charges the same price per unit for all customers within a customer class (such as residential and nonresidential).
- Sometimes a **uniform rate by class** is implemented with a decreasing-block rate where all customers in a class fall within a block of usage (see discussion of decreasing-block rate).
- Fine tunes the uniform rate recognizing **cost differences** among classes.



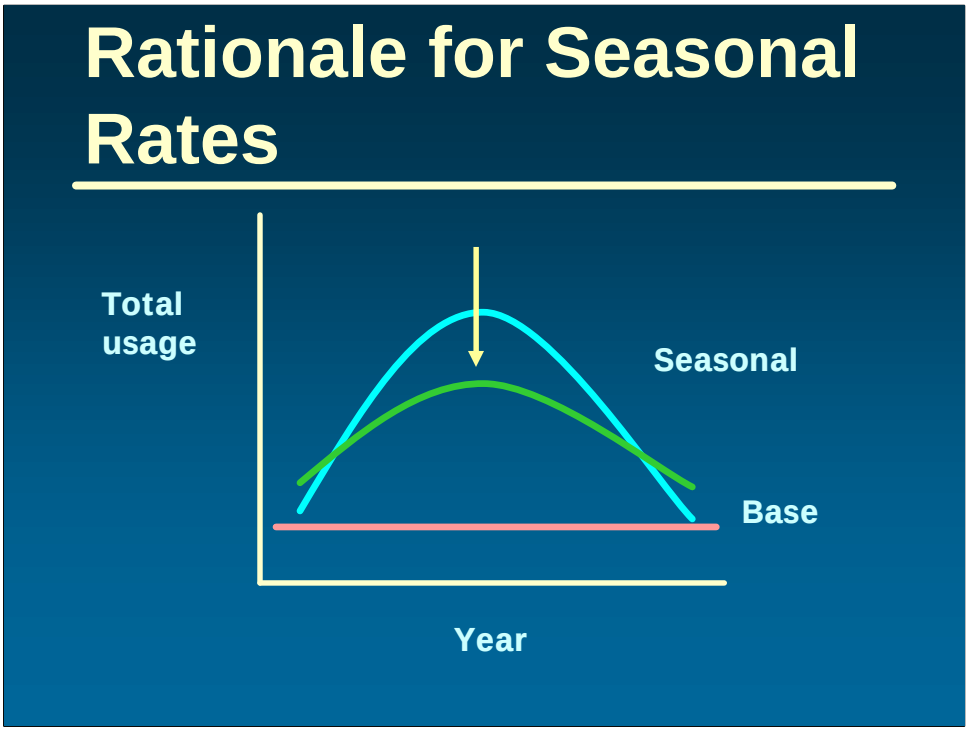
- A **decreasing-block rate** charges a lower price per-unit for successive blocks of water usage or "tiers."
- Different rates are associated with different tiers, defined by **tier breakpoints.**
- The **quantity of usage** within each block or tier is charged at the rate for that block or tier.
- **The rate enhances revenue stability, by recovering costs in early blocks,** but appears to discount later blocks, and is generally not considered consistent with conservation goals.



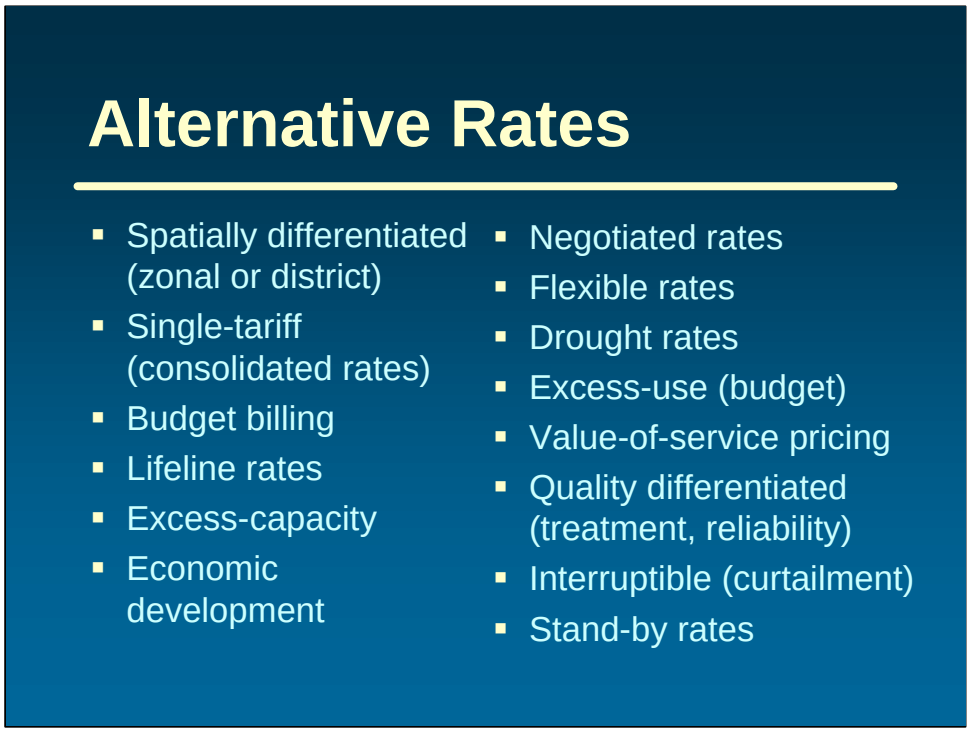
- A **increasing-block rate** charges a higher price per-unit for successive blocks of water usage or "tiers."
- It recovers costs from successive blocks and can introduce a degree of **revenue instability.**
- The rate is considered a **conservation-oriented** rate and useful for load management.



- **Seasonal rates** charge different per-unit prices for water usage during peak and off-peak seasons.
- **Peak-water usage** is a key driver of many types of costs.
- The higher peak season rate allocates a greater share of costs to peak season users and can encourage more **efficient** water use and conservation.



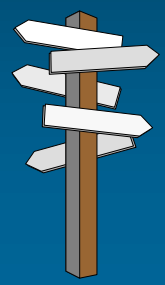
- Suppressing peak water usage through rates and other management techniques, allocative **efficiency** is improved and some capital and operating costs can be avoided.



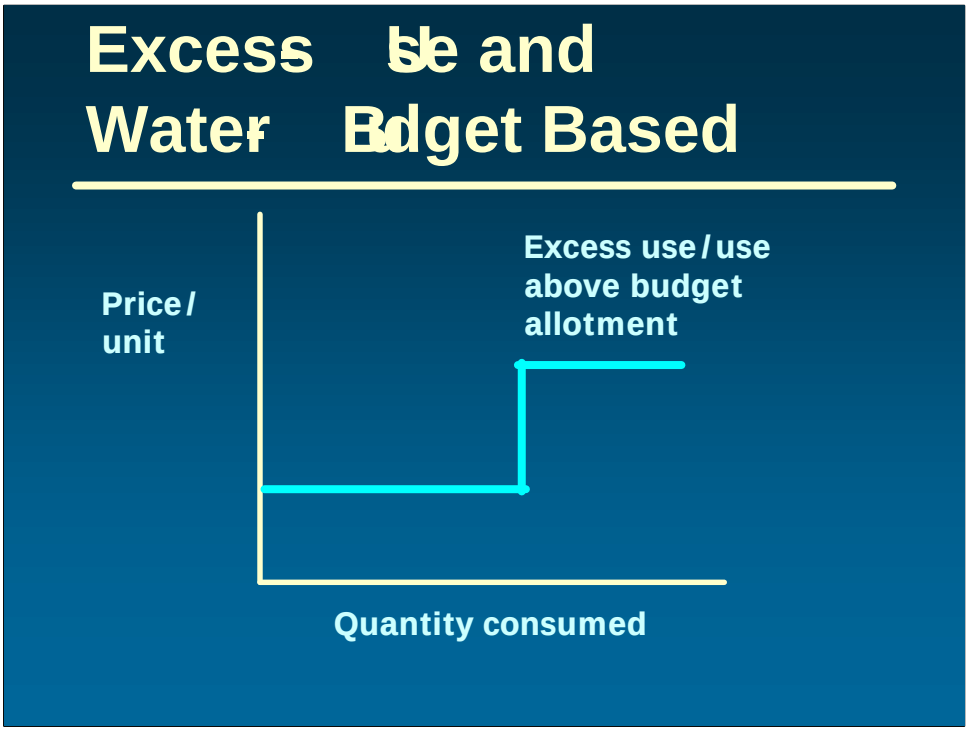
- Water systems also use a variety of **alternative rates** to a limited degree, including:
  - Spatially differentiated (zonal or district according to cost differences);
  - Single-tariff pricing (consolidated, regional, or equalized rates);
  - Budget billing (equalized payments);
  - Lifeline rates (first block priced affordably, often below marginal cost);
  - Excess-capacity rates (discounts water);
  - Economic-development rates (price breaks for economic activity);
  - Negotiated rates (for large-volume users);
  - Flexible rates (for large-volume users);
  - Drought rates (during water shortages);
  - Excess-use (based on an allowable water budget per customer);
  - Value-of-service pricing (can be based on property value);
  - Quality differentiated (level of treatment or reliability);
  - Interruptible (or curtailment rates for large-volume users); and
  - Stand-by rates (for self-supply customers).
- Most of these rate structures are used by **larger** water systems and many are designed specifically for large-volume customers.

Complex Rates

- Excess-use or water-budget rate
- Marginal-cost pricing
- Multi-tiered rates



- **Complex** rate structures include:
  - Excess-use or water-budget rate;
  - Marginal-cost pricing; and
  - Multi-tiered rates.

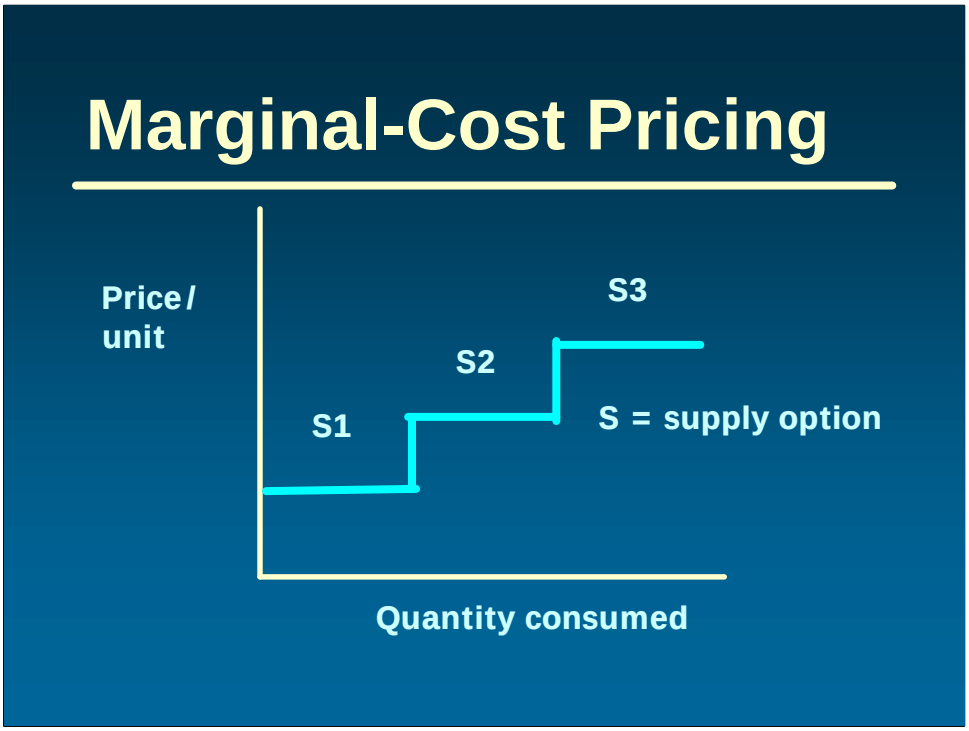


- An **excess-use rate** assigns a substantially higher price for usage considered in excess of budgeted or estimated need.
- **Various methods** and formulas are used to estimate base and excess amounts.

What is Marginal-Cost Pricing?

- Economic theory emphasizes marginal-cost pricing, which sets prices equal to the marginal cost of production
- The marginal cost is the cost of next unit of production
- Example: the value of gasoline you use in your car is not what you last paid to fill it but what you will pay to refill it

- Economic theory emphasizes **marginal-cost pricing,** which sets prices equal to the marginal cost of production.
- The marginal cost is the cost of **next unit** of production.
- An **example** can help illustrate the concept of marginal-cost pricing: the value of gasoline you use in your car is not what you last paid to fill it but what you will pay to refill it.



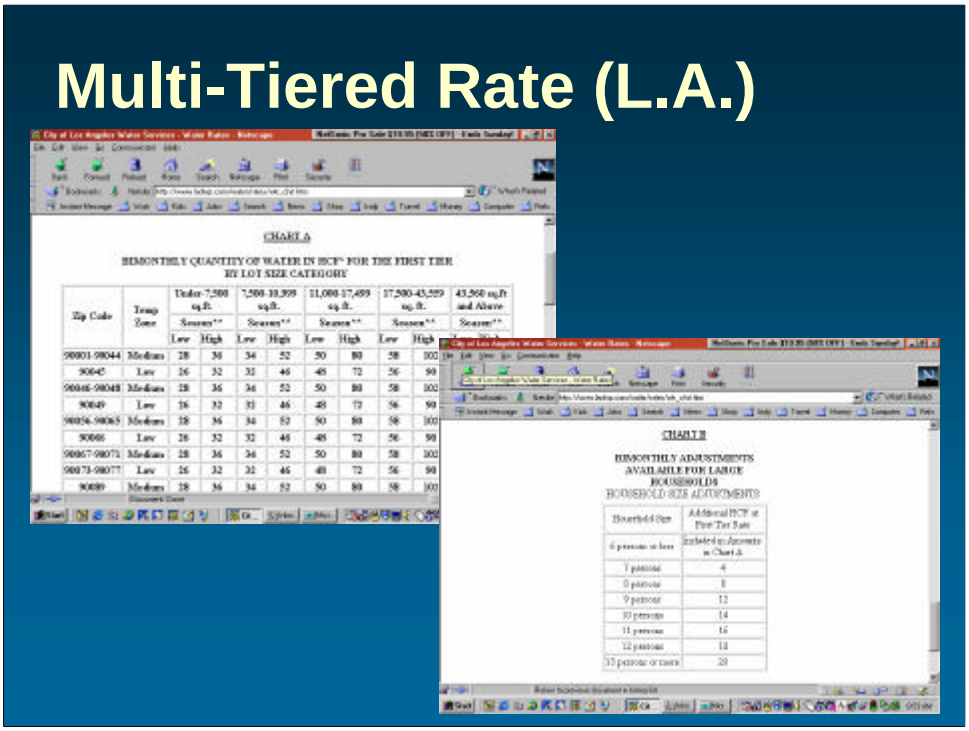
- **Marginal-cost rates** are favored by economists because they improve the economic efficiency of the rate signal.
- A price based on marginal costs reflects the cost of providing the **next unit of water** to customers.
- One very rough approximation method is to set rate tiers based on the costs associated with **incremental additions** to water supply capacity based on the available options.
- Each successive water **supply option** is more costly, as reflected in the rates.
- **For example:**
  - Alternative conventional supply (S1)
  - Imported water (S2)
  - Desalination (S3)

Exercise

- What should be included in the marginal cost of drinking water?

- The purpose of this **exercise** is to explore the concept of marginal-cost pricing.
- What should be included in the **marginal-cost of water?**

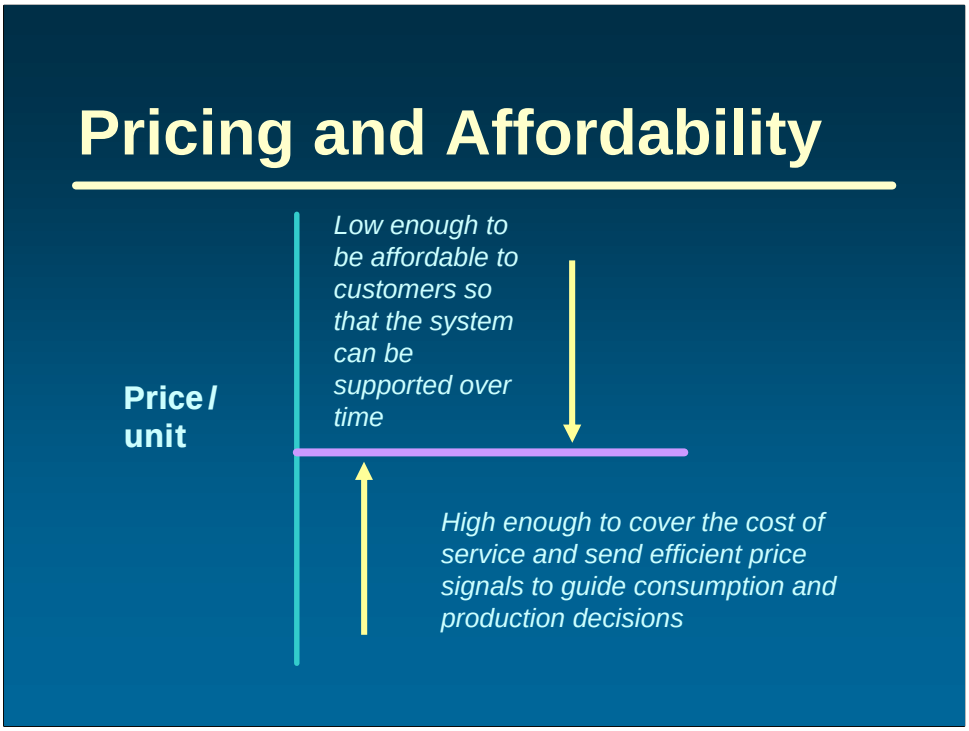
Multi-Tiered Rate (L.A.)



- Illustration of City of **Los Angeles** water rates.
- The rate is a **complex,** two-tier increasing-block seasonal rate.
- The **second tier** is based on the marginal cost of reclaimed water, varies by season.
- For residential customers, the **tier breakpoint** is based on:
  - Lot size (five categories);
  - Temperature zone (three zones); and
  - Household size (sliding scale for households with up to 13 members).
- **Nonresidential** customers with high seasonal variations can apply to have 95 percent of their usage in peak period billed at the first-tier rate

Rates and Affordability

- Rates and Affordability

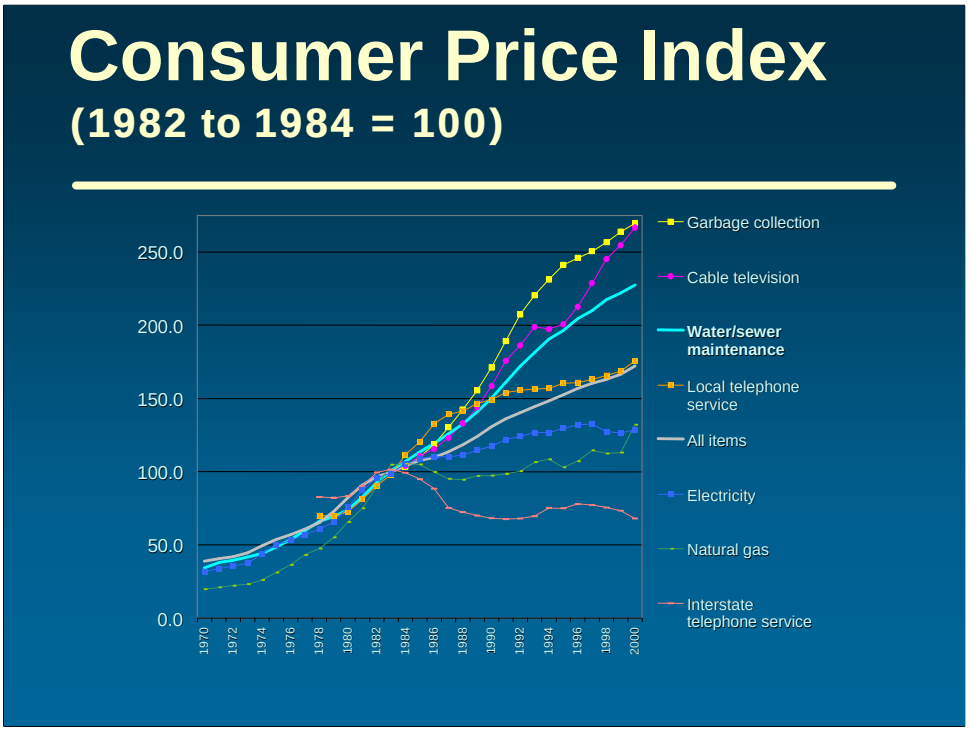


- The **price of water** must be:
  - **Low enough** to be affordable to customers so that the system will have adequate capacity and can be sustainable over time; and
  - **High enough** to cover the cost of service and send efficient price signals to guide consumption and production decisions.

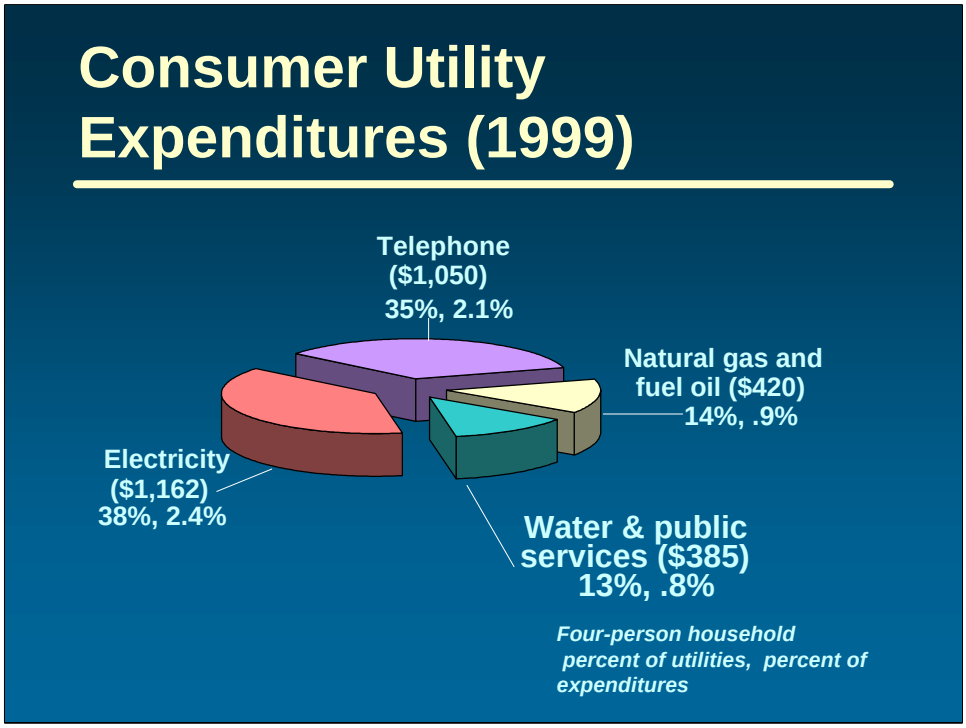
Affordability

- Increasing problem as costs rise and subsidies decline
- The *reluctance* to pay is not the same as the *inability* to pay
- Affects eligibility for variances
- Small systems are constrained in terms of affordable solutions
- May require intervention or structural change

- Water affordability is an **increasing problem** for water systems as costs rise and available subsidies decline.
- The **reluctance** to pay (or complaining about rising bills) is not the same as the *inability* to pay
- Affordability can affect whether a water system is eligible for a **variance** and therefore the quality of water people receive.
- Small water systems are **constrained** in terms of solutions because of their small customer base and associated lack of diversity.
- Addressing small system affordability may require **intervention** by the State (including special assistance or incentives) or structural solutions (including reorganization, partnerships, or consolidation).

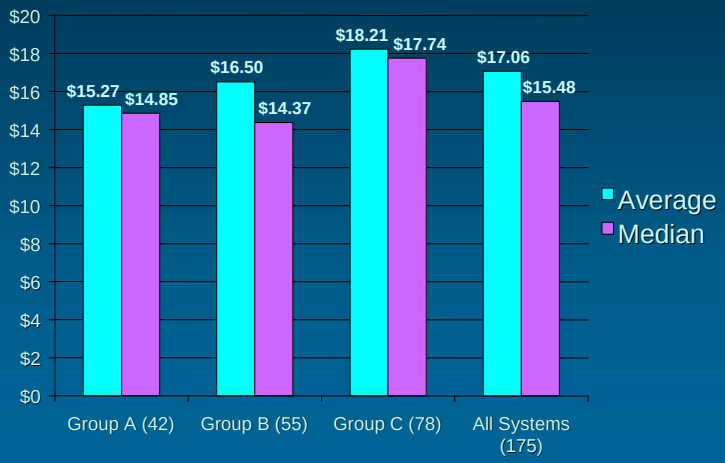


- **Consumer price index** (CPI) data indicate that since the middle 1980s, water rates have increased at a pace greater than the general rate of inflation or the rate of increase for most other utility service (energy and telecommunications).



- **Water and other public services** (sewer and solid waste) account for a relatively small share of the household utility budget ($385 annually, less than .8 percent of total expenditures), particularly in comparison to electricity and telecommunications.
- These **estimates,** which come from the Consumer Expenditure Survey, may underestimate the magnitude of typical water bills because expenditures for households that do not pay directly for water service (such as many renters) are counted as "zero."
- Also, **averages** mask relevant variations and actual expenditures are affected by many factors.

Sample Monthly Water Bills



- Based on a recent survey, monthly household **water bills** for consuming 1,000 cubic feet (7,480 gallons) average about $17 (Raftelis 2000).
- Households served by **larger** systems pay less for water than households served by smaller water systems, which is likely due to both economies of scale and other factors.

Utility Expenditures as a Percentage of Income (1999)

- Utility services have a **regressive** impact on households in terms of income.
- At **lower levels** of income, expenditures take a greater share of total household expenditures.
- At **higher income** levels, more water use is discretionary (that is, used outdoors for irrigation, car washing, swimming pools, etc.).

Exercise

- How much can people afford to pay for water service?
- How much can people afford to pay for water and wastewater service?
- How should water affordability issues be addressed?

- This **exercise** considers affordability thresholds for water service.

Measuring Affordability

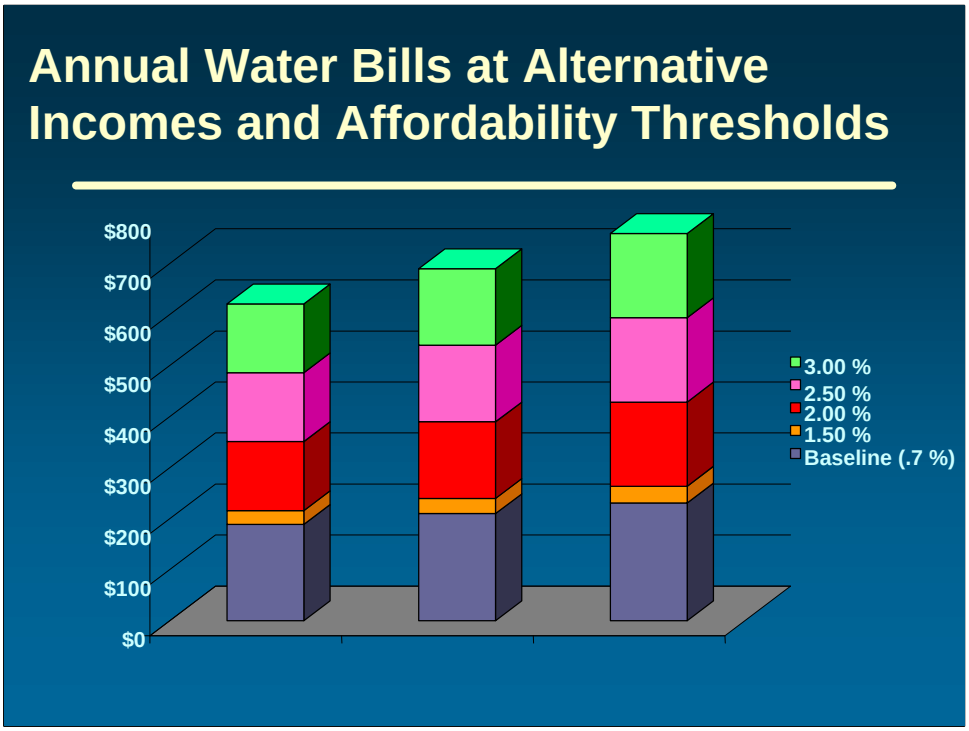
- **Household-level measures:** Water bill relative to income
- **System-level measures:** Financial condition of utility
- **Demographic measures:** Poverty, unemployment, eligibility for assistance
- **Community measures:** Fiscal health of local government

- **Several measures** are used to assess water affordability and potential affordability problems.
- The **leading measures** of affordability include:
  - **Household-level measures:** Water bill relative to income.
  - **System-level measures:** Financial condition of utility.
  - **Demographic measures:** Poverty, unemployment, eligibility for assistance.
  - **Community measures:** Fiscal health of local government.
- All of these present **useful information** for understanding affordability.
- Most programs and policy focus much attention on **household-level** measures.

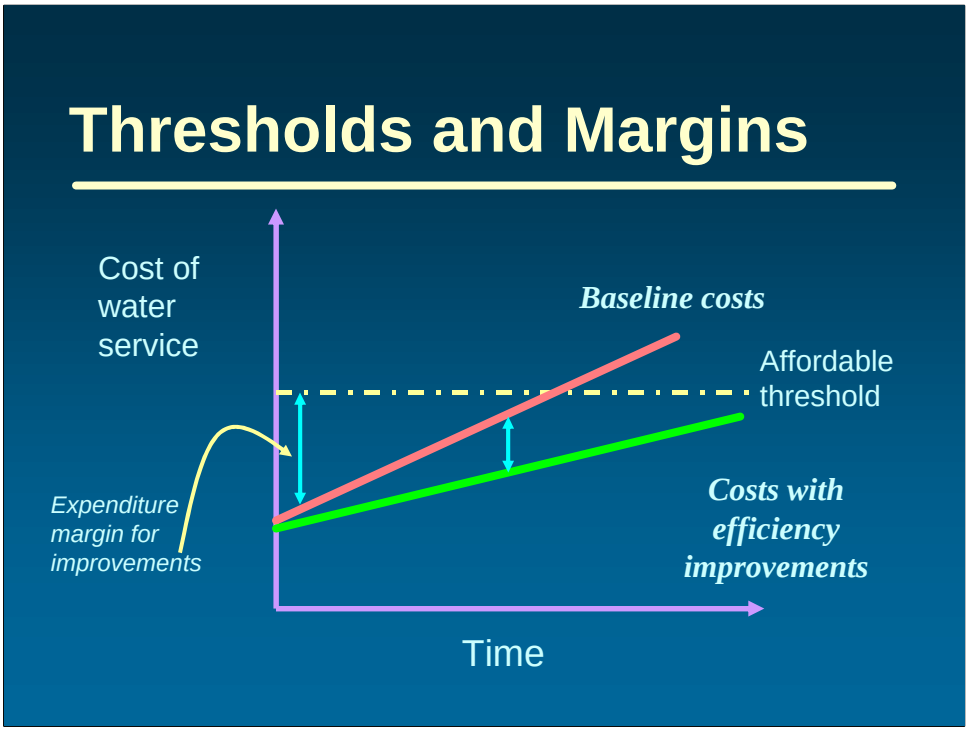
Affordability Threshold

- The percentage of median income that households can afford to pay to the water system through user charges as determined by policymakers

- An **affordability threshold** is the percentage of median income that households can afford to pay to the water system through user charges as determined by policymakers.
- The threshold may consider water charges alone or the combined effect of **water and wastewater charges.**
- Specifying a threshold can be **controversial.**
- A general threshold may be **inappropriate** for a particular population.
- Thresholds or other eligibility criteria can be **adopted** from other programs.
- Customers having **difficulty** paying their water bills are probably having other affordability problems as well.



- A **baseline** level of household expenditures can be compared to alternative affordability thresholds.
- The **difference** between the baseline expenditure level and the affordability threshold is the expenditure margin that is theoretically available to support improvements to the water system.



- In this **example**, efficiency gains would help keep the cost of service below the affordability threshold for a service territory, postponing the time point at which rates might become unaffordable (crossing the threshold).
- **Efficiency gains** can delay the point at which the threshold is reached and rates are considered unaffordable.
- Thresholds are a **useful tool** for analysis, but they are not without problems:
  - The threshold level can seem **arbitrary** and potentially capricious.
  - Thresholds are based on **means or medians** and may mask important variations.
  - Thresholds do not consider the **worst-case** scenario.
  - Thresholds can cause a **subsidy** from the near-poor to the barely poor (for example, a using a 2 percent threshold, the 1.99 percent family will subsidize the 2.01 percent family).
  - **Family size** and other demographics and circumstances affect actual affordability.
  - The use of a threshold for **variances** could create a two-class system for drinking water quality.

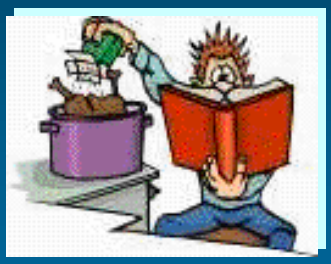
Pressure on Rates

- Rising costs coupled with:
  - Flat or declining demand
  - Inefficiency (macro and micro)
  - Historic underpricing
  - Need to promote conservation

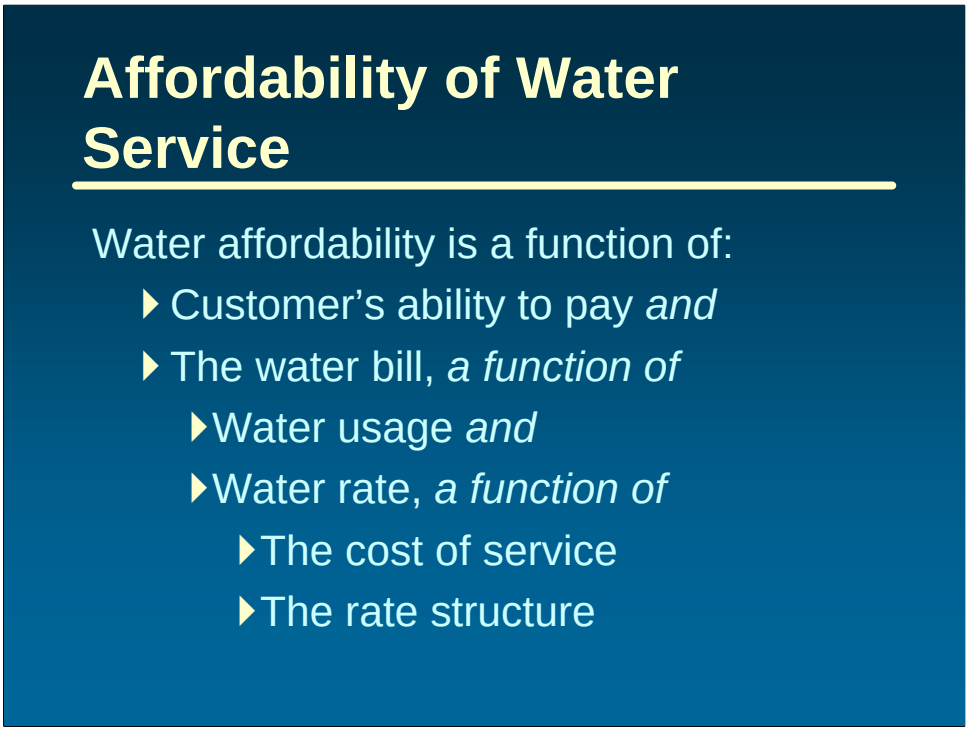
- The upward **pressure on water rates,** and associated problems of affordability, are aggravated by:
  - **Rising costs** (infrastructure investment, compliance with drinking water standards, growth);
  - **Flat or declining demand** for water;
  - **Inefficiency** (macro and micro;)
  - **Historic underpricing** by many systems and associated ratemaking practices; and
  - Need to promote **efficient** water use.
- Cost pressures on **small systems** are particularly significant.

Recipe for Trouble

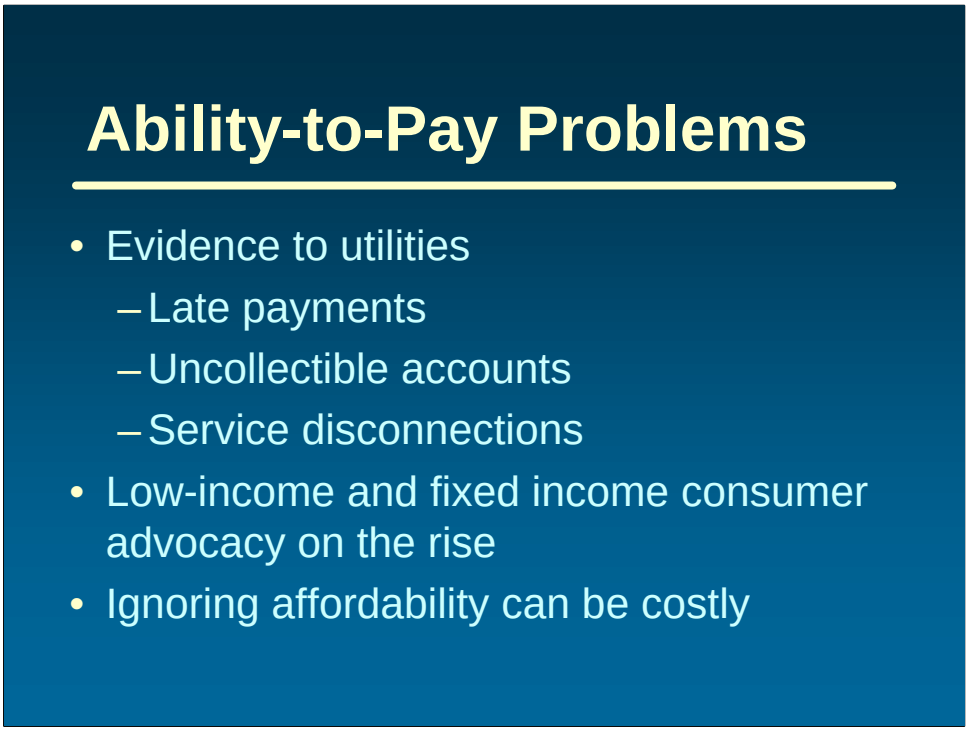
Rising costs + flat or falling demand
= higher water rates



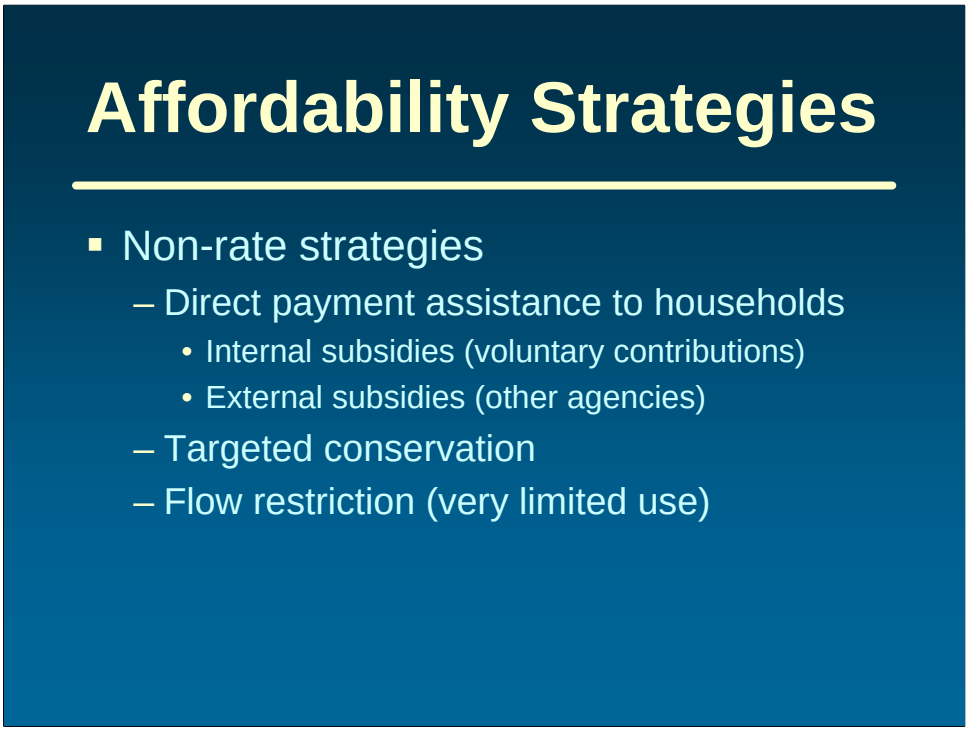
- Particularly problematic for water systems is the **combination** of rising costs and flat or falling demand, which limits the production quantity over which costs can be spread.
- Many water systems will need to **raise rates** to cover costs.
- **Rate shock** is the repression of demand that can result from sharp rate increases.



- The affordability of water service is a **function** of the water bill and the customer's ability to pay.
- Each of these in turn can be separated into the **several factors** affecting the affordability of water service:
  - **Affordability** is a function of the water bill and the customer's ability to pay.
  - **Ability to pay** is a function of socioeconomic conditions, income assistance, total nondiscretionary obligations.
  - **Water bill** is a function of water rate and water usage.
  - **Water rate** is a function of cost of water service and rate structure.
  - **Cost of service** is a function of capital and operating costs.
  - **Rate structure** is a function of cost allocation, rate design, and billing structure.



- Utilities see evidence of **ability-to-pay problems** in a number of areas:
  - Late payments;
  - Uncollectible accounts ; and
  - Service disconnections.
- Low-income and fixed income **consumer advocacy** also is on the rise.
- **Ignoring** affordability can be costly to the utility and its customers.

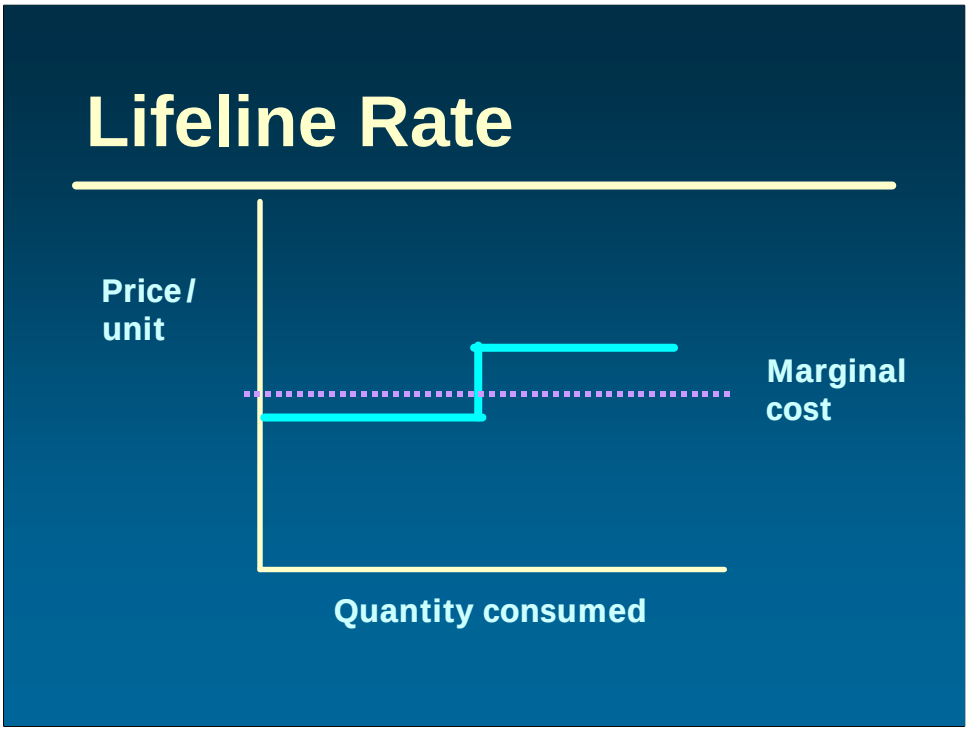


- **Strategies** for addressing affordability include nonrate and rate-design strategies.
- **Non-rate** strategies include:
  - Direct payment assistance to households;
    - Funded with internal subsidies (voluntary contributions); or
    - Funded with external subsidies (other agencies);
  - Targeted conservation; and
  - Flow restriction (very limited use).
- Non-rate strategies can help avoid or reduce the need for **subsidization** through rates charged for water service.

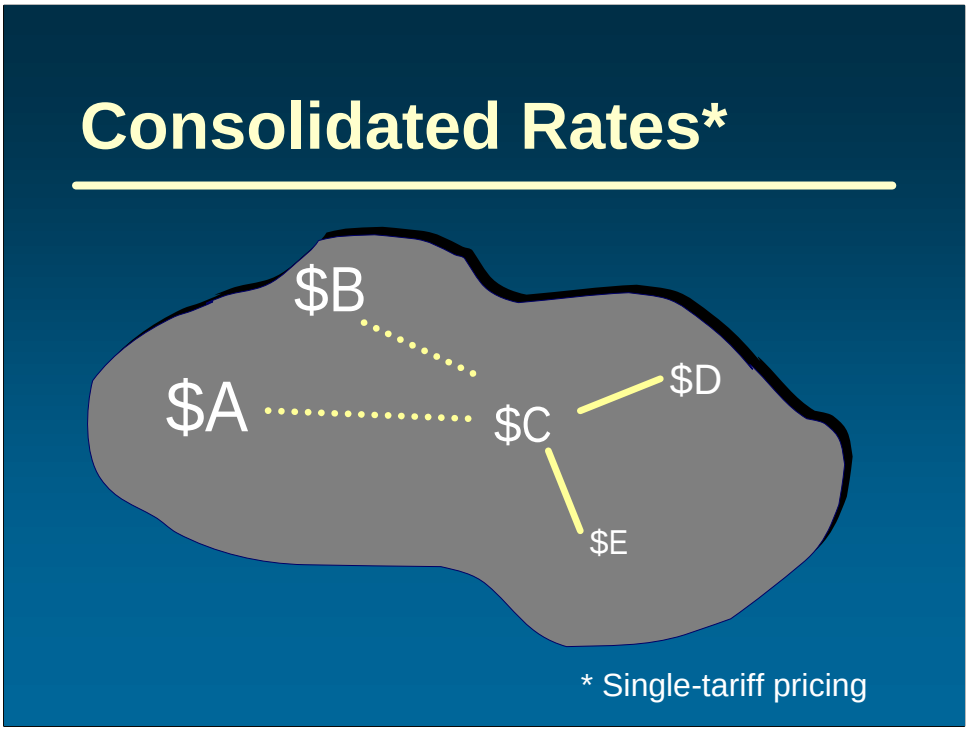
Affordability Strategies

- Rate-design strategies
  - Monthly billing cycle
  - Low or zero fixed charge
  - Peak-period pricing
  - Rate discounts and waivers
  - Low first-tier price (all customers)
  - Lifeline rate (eligible customers)
  - Consolidated rates
  - Prepaid water service

- **Rate-design** strategies involve to the utility's tariff and include:
  - Monthly billing cycle (improves manageability)
  - Low or zero fixed charge
  - Peak-period pricing
  - Rate discounts and waivers
  - Low first-tier price (all customers)
  - Lifeline rate (eligible customers)
  - Consolidated rates
  - Prepaid water service (as in prepaid cellular, limited use)
- **Discretion** in rate design can be used to address affordability for some households, if the customer base is larger and diverse.
- When addressing affordability, total **revenue requirements** ideally should be provided by the customer base (that is, minimal system subsidies).
- **All rates should not be suppressed** in the interest of perceived "affordability" issues (the reluctance to pay and the willingness to charge problems).

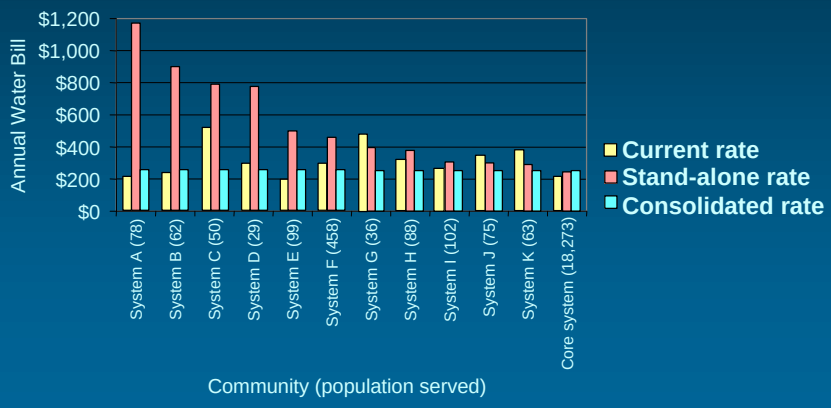


- A **lifeline rate** provides a subsidy to low-income customers who meet specified program criteria.
- The **first block** of water usage, generally considered "essential" usage, is priced below the marginal cost of water service. The rate may be available to all customers or only to eligible customers (usually based on their eligibility for other forms of assistance).
- The **difference** required to fund the subsidy is recovered in subsequent blocks.
- A lifeline rate closely resembles some **conservation-oriented** rates.

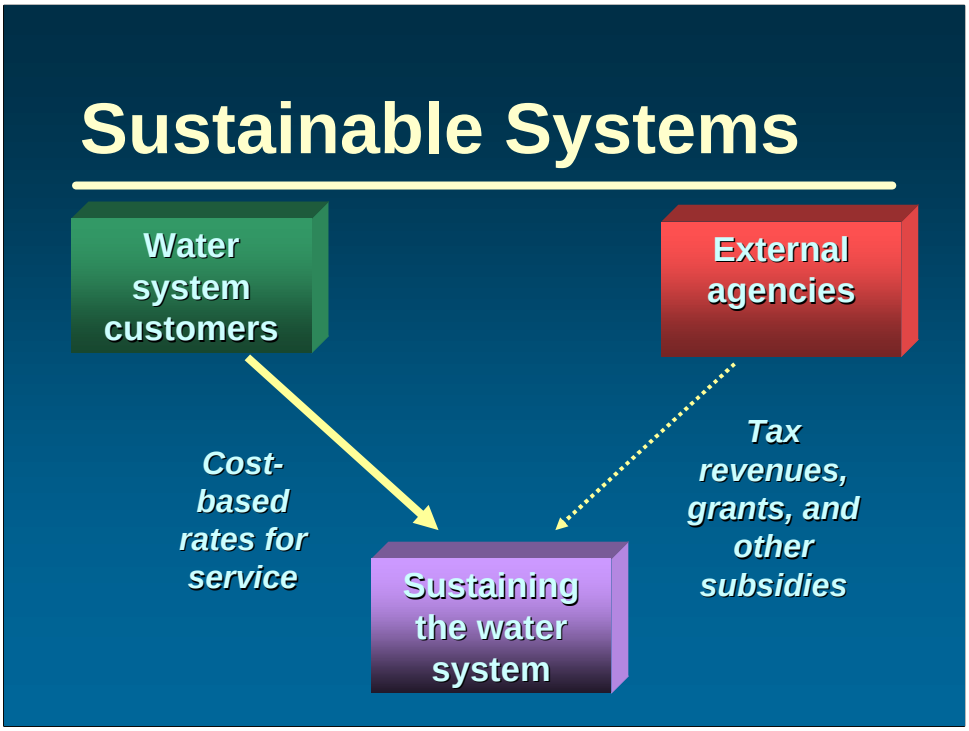


- **A consolidated rate** (or single-tariff pricing) averages the cost of service across multiple water systems owned and operated by the same utility, regardless of differences in stand-alone costs.
- This approach has been advanced by several larger **investor-owned** water utilities in the United States and is also implemented throughout Great Britain by the large, privately owned water utilities.
- **Consolidated rates** can potentially be used by any multi-system water utility.
- The systems are **commonly owned and managed** but may or may not be interconnected.
- **Consolidated pricing provides** rate and revenue stability, administrative simplicity, equity across all customers served by the utility, and improved affordability for customers in high-cost areas (often served by smaller systems).
- Rate consolidation sacrifices a degree of economic **efficiency** for achieving these goals.

Illustration of Consolidated Rate



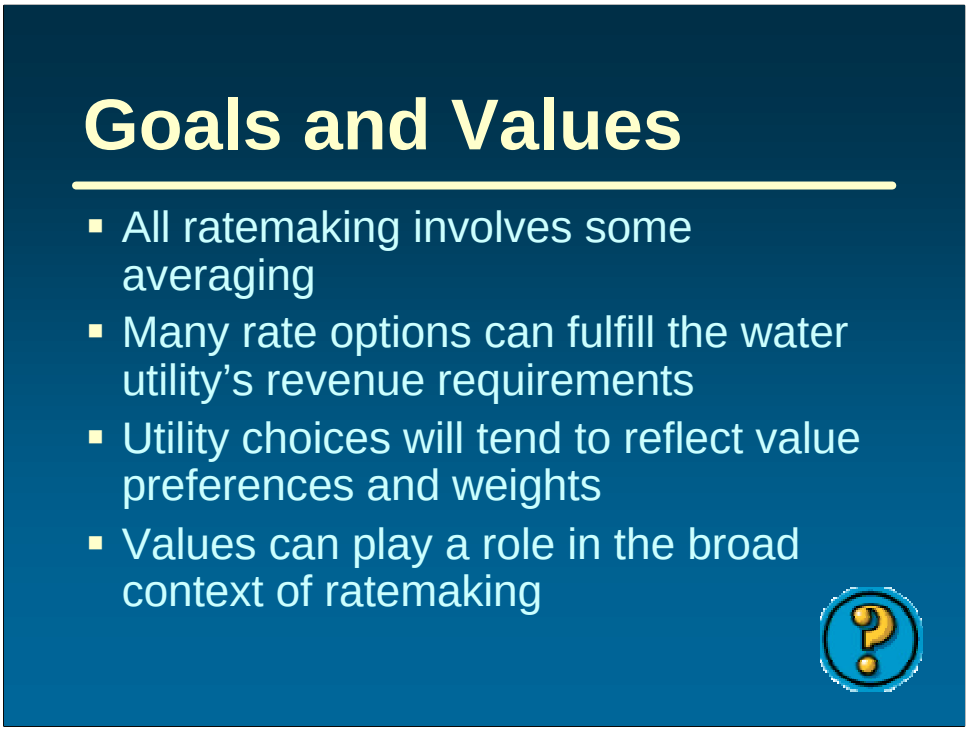
- An **example** where current rates are compared to rates based on the stand-alone cost of service and consolidated rates.
- The consolidated rate improves **affordability** for the smaller, high-cost systems in managed by the utility.
- The state public utility **commissions** have supported the use of single-tariff pricing by multi-system investor-owned water utilities, in part to encourage consolidation, although controversy over this ratemaking method persists.
- Because all ratemaking involves some degree of averaging, a considerable degree of **judgment** is involved in the allocation and sharing of costs.
- When cost sharing becomes subsidization is especially **subjective and controversial.**



- A **sustainable water system** relies, for the most part, on cost-based rates for water service.
- Both **operating and capital costs** are recovered through rates charged to water customers, which improves efficiency.
- Tax revenues, grants, and other **subsidies are minimal** and temporary, so that the system is self-sustaining in the long term.
- **Subsides** in the forms of grants or low-cost loans may be needed on a limited basis to help water systems make the transition to sustainability and address serious affordability concerns.
- Subsidies can be provided in accordance with an assessment of **affordability** (ability to pay).
- In the absence of subsidies, service **abandonment** is possible. In this case, customers would be forced to self supply or relocate.

Designing Water Rates

- Designing Water Rates



- All ratemaking involves some **averaging;** that is, unique rates are not established for individual water users (except for some large-volume users).
- Many **alternative methods** of cost allocation and rate design can fulfill the water utility's revenue requirements.
- The utility exercises a considerable degree of discretion in this area, which will tend to reflect value **preferences and weights.**
- Values can play a role in the broad context of ratemaking as long as the departure from basic principles is **explicit and reasonable.**

Goal Orientation of Different Rates

Rate	Goal
Uniform	Simplicity
Block, seasonal	Load management
Lifeline	Affordability
Marginal cost	Efficiency
Penalties	Conservation
Zonal	Spatial cost allocation
Single-tariff	Regionalization
Negotiated	Development, retention, competition

- Different types of rate structures help water systems achieve different types of **goals.**
- **For example** (generally):
  - Uniform rates accomplish simplicity;
  - Block and seasonal rates promote load management;
  - Lifeline rates improve affordability;
  - Marginal-cost pricing encourages efficiency;
  - Penalties can induce conservation;
  - Zonal rates achieve spatial cost allocation;
  - Single-tariff pricing promotes regionalization; and
  - Negotiated rates address economic development, customer retention, and (sometimes) competition.

Multi-Objective Ratemaking

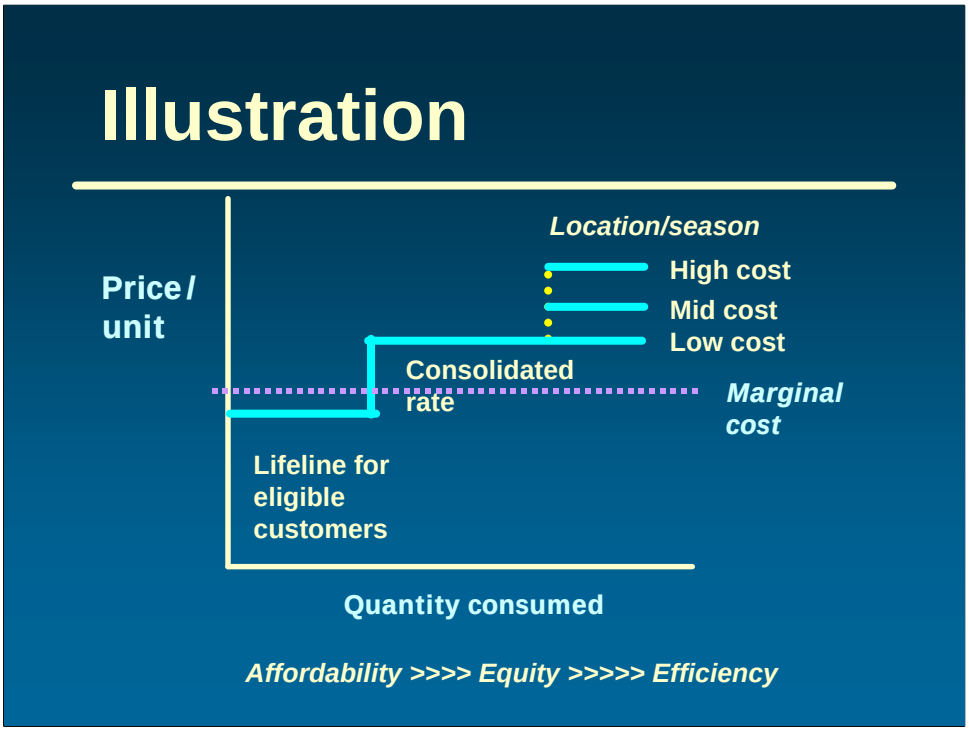
- Incorporate and balance multiple goals and values
- Recognize tradeoffs among competing objectives
- Attempt to optimize based on identified evaluation criteria

- In reality, ratemaking often involves **multiple goals and objectives.**
- A **multi-objective rate:**
  - Incorporates and balances multiple goals and values;
  - Recognizes tradeoffs among competing objectives; and
  - Attempts to optimize based on identified evaluation criteria.

A Multi-Objective Rate

- Affordability
  - Attention to the first block
- Equity
  - Rate averaging across customers and systems to recognize commonality and encourage regionalization
- Efficiency
  - Price variation in the tail block to reflect significant differences in marginal cost

- As an example, a multi-objective rate might jointly consider affordability, equity, and efficiency.
  - **For affordability**, attention is paid in particular to designing the first block.
  - **For equity,** rate averaging can be used across multiple customers and systems to recognize commonality and encourage beneficial regionalization.
  - **For efficiency,** price variation in the tail block to reflect significant differences in marginal cost.



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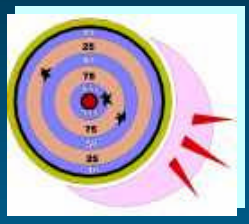
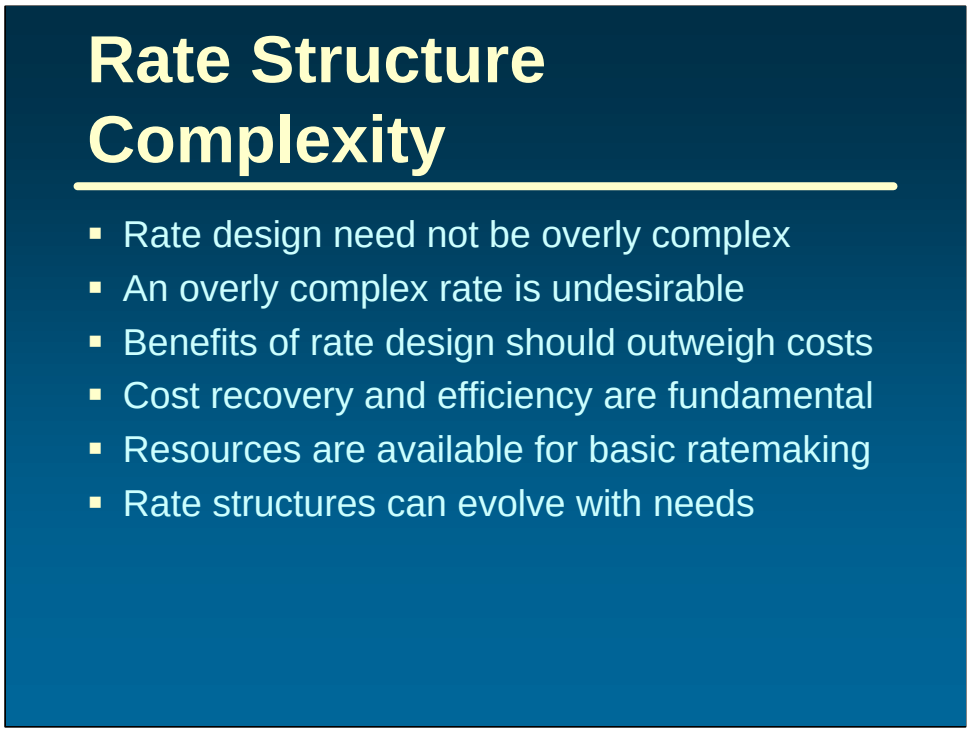
Choosing a Rate

- Establish clear goals, priorities, and preferences
- Select a rate that best achieves objectives
- Involve stakeholders (customers) to the greatest extent possible

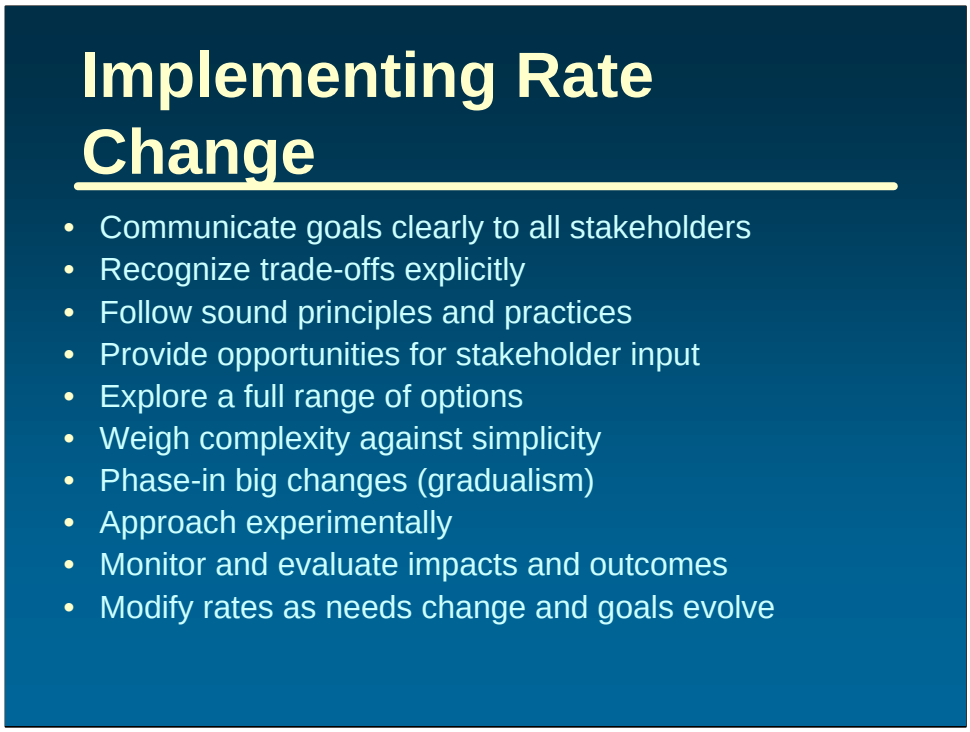


- **Choosing** a rate structure can be a challenge, particularly given the many available options.
- When choosing a rate, water utility **decision-makers** should:
  - Establish clear and explicit goals, priorities, and preferences;
  - Select a rate that best achieves objectives, while maintaining consistency with accepted ratemaking principles; and
  - Involve stakeholders (particularly ratepayers or customers) to the greatest extent possible.

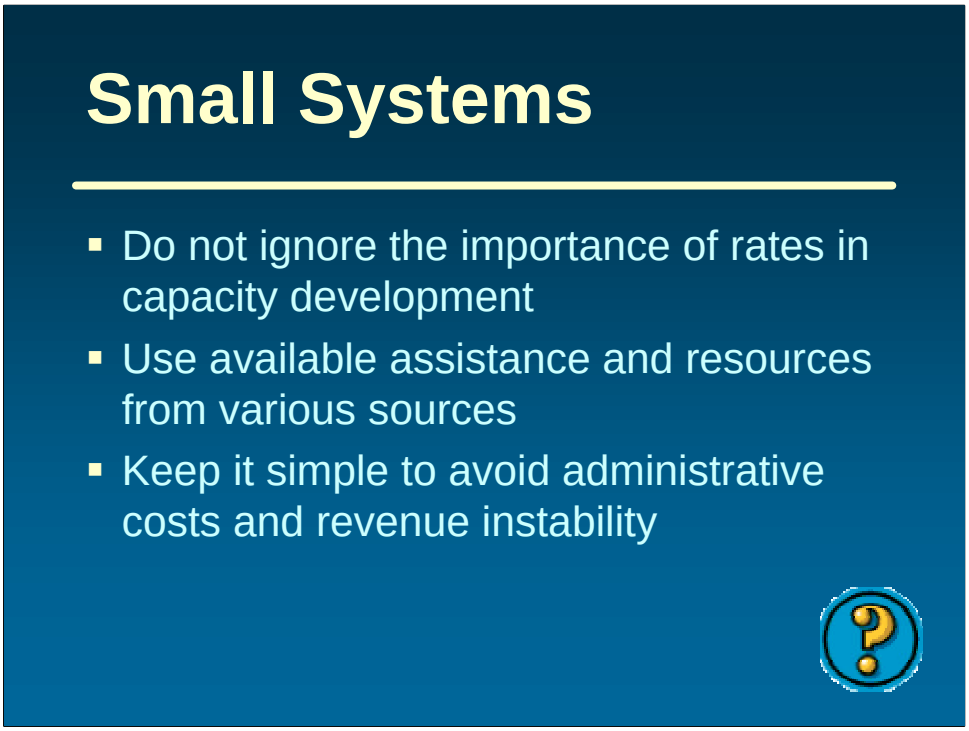
- Involving key stakeholders is an important part of the ratemaking process.
- Some of the relevant **stakeholders** include:
  - Residential customers;
  - Commercial customers;
  - Industrial customers;
  - Consumer advocates;
  - Environmental advocates;
  - Business leaders; and
  - Media representatives.
- Participants may want to **discuss** other potential stakeholders.



- Rate design for water systems need not be overly **complex** to be reasonably efficient or achieve other goals.
- An overly complex rate structure is **undesirable** because it may confuse customers and encumber system administrators.
- The **benefits** of sound rate design should outweigh the costs of implementation.
- Cost recovery and efficiency are the fundamental goals of ratemaking for most water systems.
- **Resources** are available for basic ratemaking, including manuals and workshops.
- Rate structures can **evolve** with the needs and priorities of water systems, as well as their capabilities.



- **Strategies** for implementing a change in rates or the rate structure include:
  - Communication goals clearly to all stakeholders;
  - Recognize trade-offs explicitly;
  - Follow sound principles and practices;
  - Provide opportunities for stakeholder input;
  - Explore a full range of options;
  - Weigh complexity against simplicity;
  - Phase-in big changes (gradualism);
  - Approach experimentally;
  - Monitor and evaluate impacts and outcomes; and
  - Modify rates as needs change and goals evolve.



- **Small water systems** may need special strategies for implementation.
- Some key **strategies** include:
  - Do not ignore the importance of rates in capacity development;
  - Use available assistance and resources from various sources; and
  - Keep it simple to avoid administrative costs and revenue instability.

Discussion and Conclusions