

Regulation of Private Water and Wastewater Companies

Natural Monopoly Theory and Need for Regulatory Oversight

Natural Monopoly

- Monopoly - Presence of a single seller of a good or service legally protected from entry of potential competitors.
- Natural Monopoly - A firm whose costs decline as output increases such that one firm is more efficient than two or more could be.

Candidates for Natural Monopoly Treatment

- Utilities - Required to serve all comers at reasonable rates.
- Granted a monopoly service area.
- Regulatory authorities established to:
 - Protect ratepayers
 - Protect Investors
 - Ensure an opaque and fair process

Natural Monopoly Theory (Caveat)

- With a decline in information and transaction (monitoring) costs the level and type of regulatory oversight changes
- Rail, Air, Road, Communications and Power, Motor Freight
- Water and Wastewater Services are still considered natural monopolies

Economic Regulation of Water and Wastewater Systems

- Most states regulate investor owned water and wastewater companies
- Regulatory entities are generally called Public Utility Commissions (PUCs) or Public Service Commissions (PSCs)
- Most municipal water and wastewater companies are self regulating
- There are exceptions where both private and public utilities are regulated.

Case Study - California

- California investor owned utilities (IOUs) are regulated by the California Public Utilities Commission (CPUC)
- CPUC regulates service quality (rules) and rates for IOUs.
- Rates and service rules constitute regulatory tariffs.

California - Laws and Rules

- An example of a long-established regulatory system is the California Public Utilities Commission (CPUC). The CPUC draws its powers from the state constitution and various legislative bills. It regulated a broad spectrum of utilities.
- CALIFORNIA CONSTITUTION - ARTICLE 12 PUBLIC UTILITIES SECTION
- State of California, Public Utilities Code
- Chapter 3 Rights and Obligations of Public Utilities
- SPECIFIC UTILITIES Water Companies (2701-2714)* provides details on the regulatory authority vested in the CPUC


Major Elements of Regulation

- Regulatory system expectations
- Rate Making
- Rules - Operating standards
- Planning - future supplies
- Health standards
- Maximize benefits at least cost to ratepayers and ensure a fair return on investment

In California investor-owned utilities are regulated by the CPUC

- ⇒ In California state, water/wastewater services are provided to the public by over the 250 utilities, among which only 10 small IOUs which provide only wastewater services
- ⇒ The investor-owned utilities (IOUs), among which water and wastewater utilities, are regulated by the California Public Utilities Commission (CPUC)





The CPUC regulates service quality and rates of IOUs

The CPUC regulates service quality and rates of investor-owned water and sewer system utilities in California.


- The CPUC regulates privately-owned telecommunications, electric, natural gas, railroad, rail transit, and passenger transportation companies.
- The Commission has no jurisdiction over mutual water corporations or municipal water companies or districts.
- Mutual water utilities (corporations in which each customer owns one share of stock) or companies owned by homeowner associations are exempt also, if they serve only their stockholders or members (no outside parties).

Regulating the service quality

- The CPUC issues Service Rules which must be contained in the "tariff" sheets or "service agreements" between an investor-owned utility and its customers.
- These Service Rules cover aspects like quality of the service, billing, discontinuance and restoration of service, measurement of service,...


Regulating the rates (*next slide*)

It is important to note that the word "tariff" is used in two different ways: either it can mean "rate" or it can be used in a broader sense meaning the written terms, conditions, rules and rates governing a utility's conduct in providing public service.




The process of rate regulation at the CPUC

- Rate making is the administrative process by which prices are established in regulated industries:
 - The Commission has quasi-legislative power to hold hearings and adopt rules.
 - Before any regulated company can change its service or rates, it must be approved by the Commission.
 - In a first stage the company has to prepare a filing in which it explains the reasons for a request of rate change.
 - The Commission investigates the company's request.
 - During public hearings, which are formal legal proceedings, the company (supported by its experts) defends its point of view.
 - The main parties in most such rate cases are the Commission Staff, the company, and ratepayers, who are represented by a special Attorney General.
 - The Commission takes the decisions, balancing the interests of the company and the public.
 - These decisions are embodied in written Orders, which summarize the issues in the case, parties and their positions on issues, and findings of fact and conclusions.
- Rate changes occur every 3 to 6 years when the business environment justifies a rate change.




The principles behind the rate regulation at the CPUC

- The rate regulation of IOUs is based on the principle that a firm should be able to generate sufficient level of revenues to cover "allowable" costs and to have a certain return on invested capital. Both "allowable" costs and return on invested capital are determined by the Commission.
- The determination of "allowable" costs is thus integral to rate-making. It is the Commission that defines what "allowable" costs are based on her expertise. During the public hearings the "allowable" costs are discussed together with the other regulated aspects.
- The basic revenue requirements are determined as $R = O + D + T + r \cdot V$, with:
 - R = "revenue requirement"
 - O = operations and maintenance expenses
 - D = annual depreciation charge
 - Depreciable depreciation is typically around 2.9% per year.
 - Depreciable amount for utilities is subject to a range of 1.0 to 3.0 years.
 - T = taxes
 - r = permitted rate of return (cost of capital) = weighted sum of the cost of debt capital and the cost of equity capital
 - Actual rates of return are typically 10% for large investor-owned companies.
 - Cost of debt capital is the normal market rate.
 - WACCs at the CPUC varied from 9.2% to 11.1% the past 7 years for water utilities, which is a good approximation for water utilities.
 - The ratio debt/capital/equity varied in the industry 40%-60%.
- B = rate base = $V - d$
 - V = rate base valuation
 - d = accumulated depreciation



The principles behind the rate regulation at the CPUC

- All the components of the above formula (like the operations and maintenance expenses for example) must be argued by the company at the public hearings
- The prices needed to generate R must be designed so that the sum revenues from all customer classes equal the cost components
- Sewer rates can be roughly estimated at 0.5 BEF per m³ discharged water. Sewer billing is based on a discharged quantity which is 70% of the quantity of metered input water.



The organisation of the CPUC

- The Governor appoints five Commissioners, who must be confirmed by the Senate, for six years. The Governor appoints one of the five to serve as Commission President.
- The CPUC employs economists, engineers, administrative law judges, accountants, lawyers, and safety and transportation specialists.
- The Office of Ratepayer Advocates is an independent arm of the CPUC that represents consumers in Commission proceedings, pursuant to statute.
- The Commission also has a Public Advisor who assists the public in participating in Commission proceedings, and a unit that is charged with informally resolving consumer complaints.

Rate Design

- Establish system revenue requirements (RR)
- Assign amount of RR due fixed costs
- Number of customers for each Connection size
- Forecasted annual sales (water produced and purchased less unaccounted for water)
- Determine percentage of fixed costs to be recovered in service charge (50%, 60%, 100%)

Meter Size And Ratios

Meter Size	Ratio
5/8x3/4 inch	1
3/4 inch	1.5
1 inch	2.5
1-1/2 inch	5
2 inch	8
3 inch	15
4 inch	25
6 inch	50
8 inch	80
10 inch	115
12 inch	165
14 inch	225

Apportioning Revenues by Service and Commodity Charges

- Calculate the service for company by determining revenue requirements attributable to fixed costs (50%, 60%, 100%)
- Service charges = Multiply the dollar amount by percentages then spread dollars using meter size ratios
- Commodity charge - Recovers rest of revenues divided by expected annual sales (physical units)

Sewer Rate Design

- Similar to a flat rate design - all similar customers should pay same rate
- Differing rates should be based on differing costs incurred by the utility to provide these services.

Example Wastewater Rates

- Residential rates are based on water use times a factor apportioned to treatment needs. Apartments pay 90% of water rates times. Residential customers with lawns as low as 70% - based on treatment costs
- Industrial, commercial customers pay rates based on cost to process sewer content.

- Wastewater Systems in the U.S.
- Environmental Regulation of Wastewater Systems
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- Case study: California
- Annex: Service Rules set by the CPUC for water supply utilities

Wastewater treatment in the U.S.



- In the U.S. wastewater is treated by Publicly-Owned Utilities (POUs) and Investor-Owned Utilities (IOUs)
- Each POU and IOU is given an exclusive (monopoly) service area wherein it is responsible for providing wastewater treatment services
- Service areas are geographical areas which do not necessarily correspond with political boundaries
- Within its service area a POU or IOU owns and operates both the wastewater collection as the wastewater treatment infrastructure
- Wastewater treatment services and water supply services can be combined in one IOU or POU but not necessarily

Wastewater systems in the U.S. are largely publicly-owned

- More than 90% of wastewater customers are supplied by Publicly-Owned Utilities
 - There are approx. 16,000 publicly-owned treatment works (POTWs) which are owned and operated by Publicly-Owned Utilities
 - Publicly-Owned Utilities are called "municipalities" or "districts" (for example: the Eastern Municipal Water District in California)
 - The POTWs treat domestic sewage from houses, other sanitary wastewater, wastes from commercial and industrial facilities (storm water may be collected by municipal separate or combined sewer systems)
 - The POTWs can be designed to provide primary, secondary or tertiary treatment. The level of treatment is dictated by the conditions of a POTW's NPDES (National Pollutant Discharge Elimination System) permit. POTWs typically do not include tertiary nutrient removal.
- The rest of the wastewater services are supplied to the public by Investor-Owned Utilities (for example: California Water Service Company)
- Beside the treatment works owned by the POU and IOU there are small-scale domestic treatment plants which are not owned by municipalities

There is an on-going discussion about privatization of publicly-owned utilities

- There is a move to privatization of federally funded wastewater treatment facilities
 - construction of public wastewater treatment projects (including sewage treatment plants, pumping stations, and collection and intercept sewers; rehabilitation of sewer systems; and the control of combined sewer overflows) has been financed in the 1970's and 1980's by federal government grants and since 1987 by low cost-loans
- The role of the public sector is evolving in the context of budgetary constraints, contractual outsourcing and tough environmental laws
- Some states encourage degrees of private sector involvement, others are neutral, and some discourage it
- Privatization can be in the form of asset acquisition or contract operations
- First changes are mainly in the contract and operations field, rather than in asset transfers (reluctance to transfer assets from the public to the private sector)
- Contracting and out-sourcing are preferred methods of achieving some privatization

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Environmental Regulation of Wastewater Systems in the U.S.

- In the U.S. environmental regulation is very complex as a result of regulation existing at different levels:
 - Federal level (EPA=Environmental Protection Agency)
 - State level (EPA)
 - Local authorities level
- Both public and investor-owned utilities are subject to environmental regulations
- The Clean Water Act (1972, last amended in 1987) (also known as the Federal Water Pollution Control Act) addresses the release of pollutants to surface waters. It regulates discharges to waterways from wastewater (sewage) treatment facilities which are officially called publicly-owned treatment works (POTW).
- EPA (Office of Water) is responsible for implementing the Clean Water Act and Safe Drinking Water Act (the latter addresses the quality of tap water)
- Both private sewerage works and POTWs are regulated under NPDES, but are subject to different regulations, even if their output is identical. NPDES (National Pollutant Discharge Elimination System) Permit Program controls water pollution by requiring point sources that discharge pollutants into waters of the US:
 - Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.
 - Individual homes that are connected to a municipal system, that use a septic system or that do not have a surface discharge, do not need an NPDES permit.
 - The NPDES program is administered by the states (after they have been authorized)
- The EPA issues effluent guidelines for wastewater discharges to surface waters and for wastewater discharges to POTW.

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Who is regulated and who is regulating ?

- Regulation is not uniform throughout the U.S. due to the fact that the governance of local utilities is a function of the interplay of local ordinances and federal and state statutes. Regulation is a function of the interplay of local ordinances and federal and state laws.
- Most of the states (46 of the 50) have an entity which regulates private (investor-owned) wastewater utilities: these are the Public Utility Commissions (PUCs) and the Public Service Commissions (PSCs)
- In most states, with major exceptions, the (publicly-owned) municipal or district systems are self-regulating with regard to rates and service conditions
- By exception, PUCs regulate publicly-owned utilities (for example: the Colorado PUC)
- The NARUC (National Association of Regulatory Utilities Commissioners) represents the governmental agencies (PUCs and PSCs) in the fifty States that regulate the activities of telecommunications, energy, and water/wastewater utilities. The NARUC has a representative role but has no impact on the way the regulation takes place.
- The PUCs arose about 100 years ago to prevent the abuse of power by companies and utilities due to monopoly position

Role of the Public Utility Commissions

- The regulating commissions have a dual role:
 - to ensure the establishment and maintenance of services as required by the public convenience and necessity, and
 - to ensure that these services are provided at rates and conditions that are just, reasonable and nondiscriminatory for all consumers.
- It is important to note that although the regulation is not exactly the same in every state, all PUCs have very similar regulating activities
- In general, the PUCs role of economic regulator consists of:
 - authorizing utility rate changes
 - approving tariffs that set out rules and regulations for receiving service (tariffs are the written terms, conditions, rates and rates governing a utility's conduct in providing public service)
 - supervising service quality
 - resolving complaints by customers against utilities
 - prosecuting unlawful utility marketing and billing activities
 - overseeing the merger and restructure of utility corporations
 - reviewing annual reports
 - monitoring the safety of utility and transportation operations
 - implementing energy efficiency programs, low-income rates and telecommunications services for disabled customers
- The concept of rate regulation, as detailed in following slides for the California PUC, varies slightly from state to state

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- ⇒ The investor-owned utilities (IOUs), among which water and wastewater utilities, are regulated by the California Public Utilities Commission (CPUC)



The CPUC regulates service quality and rates of IOUs

The CPUC regulates service quality and rates of investor-owned water and sewer system utilities in California.

- The CPUC regulates privately owned telecommunications, electric, natural gas, railroad, rail transit, and passenger transportation companies.
- The Commission has no jurisdiction over mutual water corporations or municipal water companies or districts.
- Mutual water utilities (corporations in which each customer owns one share of stock) or companies owned by homeowner associations are exempt also, if they serve only their stockholders or members (no outside parties).

Regulating the service quality

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Regulating the rates (*next slide*)

It is important to note that the word "tariff" is used in two different ways: either it can mean "rate" or it can be used in a broader sense meaning the written terms, conditions, rules and rates governing a utility's conduct in providing public service.

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 - R = "revenue requirements"
 - O = operations and maintenance expenses
 - D = annual depreciation charge
 - Depreciate expenditures are typically around 2-3% per year
 - Depreciate also from the accumulated expenditures in the range of 10 to 20 years
 - T = taxes
 - r = permitted rate of return (cost of capital) = weighted sum of the cost of debt capital and the cost of equity capital
 - Actual rates of return are typically 10% for large investor-owned companies
 - Cost of debt capital is the actual interest rate
 - Because at the CPUC voted from 9:00 to 11:00 the past 7 years for water utilities, which is a good opportunity for wastewater utilities
 - The ratio debt capital/equity capital is typically 40%-60%
 - B = rate base = $V - d$
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OPTIMAL

Regulation of Private Water and Wastewater Companies

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 - Depreciation is typically around 2.5% per year
 - Depreciation term for unimproved infrastructure is in the range of 50 to 66 years
 - T = taxes
 - R = permitted rate of return (cost of capital) = weighted sum of the cost of debt capital and the cost of equity capital
 - Actual rates of return are typically 10% to 14% (average annual requirement)
 - Cost of debt capital is the actual interest cost
 - Example: if the CPUC valued debt at 5% and 11.3% (at 7 year fire water system, which is a good approximation for unimproved system)
 - The return on debt capital (equity capital) is typically 4.0%-6.0%
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 - Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.
 - Individual homes that are connected to a municipal system, that use a septic system or that do not have a surface discharge, do not need an NPDES permit.
 - The NPDES program is administered by the states (after they have been authorized)
- The EPA issues effluent guidelines for wastewater discharges to surface waters and for wastewater discharges to POTW.

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Who is regulated and who is regulating ?

- Regulation is not uniform throughout the U.S. due to the fact that the governance of local utilities is a function of the interplay of local ordinances and federal and state statutes. Regulation is a function of the interplay of local ordinances and federal and state laws.
- Most of the states (46 of the 50) have an entity which regulates private (investor-owned) wastewater utilities: these are the **Public Utility Commissions (PUCs)** and the **Public Service Commissions (PSCs)**
- In most states, with major exceptions, the (publicly-owned) municipal or district systems are self-regulating with regard to rates and service conditions
- By exception, PUCs regulate publicly-owned utilities (for example: the Colorado PUC)
- The NARUC (National Association of Regulatory Utilities Commissioners) represents the governmental agencies (PUCs and PSCs) in the fifty States that regulate the activities of telecommunications, energy, and wastewater utilities. The NARUC has a representative role but has no impact on the way the regulation takes place.
- The PUCs arose about 100 years ago to prevent the abuse of power by companies and utilities due to monopoly position

Role of the Public Utility Commissions

- The regulating commissions have a dual role:
 - to ensure the establishment and maintenance of services as required by the public convenience and necessity, and
 - to ensure that those services are provided at rates and conditions that are just, reasonable and nondiscriminatory for all consumers.
- It is important to note that although the regulation is not exactly the same in every state, all PUCs have very similar regulating activities
- In general, the PUCs role of economic regulator consists of:
 - authorizing utility rate changes
 - approving tariffs that set out rules and regulations for receiving service (tariffs are the written terms, conditions, rules and rates governing a utility's conduct in providing public service)
 - supervising service quality
 - receiving complaints by customers against utilities
 - prosecuting unlawful utility marketing and billing activities
 - overseeing the merger and restructure of utility corporations
 - reviewing annual reports
 - monitoring the safety of utility and transportation operations
 - implementing energy efficiency programs, low-income rates and telecommunications services for disabled customers
- The concept of rate regulation, as detailed in following slides for the California PUC, varies slightly from state to state

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In California investor-owned utilities are regulated by the CPUC

- In California state, water/wastewater services are provided to the public by over the 250 utilities, among which only 10 small IOUs which provide only wastewater services
- The investor-owned utilities (IOUs), among which water and wastewater utilities, are regulated by the California Public Utilities Commission (CPUC)



The CPUC regulates service quality and rates of IOUs

The CPUC regulates service quality and rates of investor-owned water and sewer system utilities in California.

- The CPUC regulates privately-owned **telecommunications, electric, natural gas, railroad, rail transit, and passenger transportation** companies.
- The Commission has no jurisdiction over mutual water corporations or municipal water companies or districts.
- Mutual water utilities (corporations in which each customer owns one share of stock) or companies owned by homeowner associations are exempt also, if they serve only their stockholders or members (no outside parties).

Regulating the service quality

- The CPUC issues Service Rules which must be contained in the "tariff" sheets or "service agreements" between an investor-owned utility and its customers.
- These Service Rules cover aspects like quality of the service, billing, discontinuance and restoration of service, measurement of service, ...

Regulating the rates (*next slide*)

It is important to note that the word "tariff" is used in two different ways: either it can mean "rate" or it can be used in a broader sense meaning the written terms, conditions, rules and rates governing a utility's conduct in providing public services.

The process of rate regulation at the CPUC

- Rate-making is the administrative process by which prices are established in regulated industries.
 - The Commission has quasi-legislative power to hold hearings and adopt rules.
 - Before any regulated company can change its service or rates, it must be approved by the Commission.
 - In a first stage the company has to prepare a filing in which it explains the reasons for a request of rate change.
 - The Commission investigates the company's request.
 - During public hearings, which are formal legal proceedings, the company (supported by its experts) defends its point of view.
 - The main parties in most such rate cases are the Commission Staff, the company, and ratepayers, who are represented by a special Attorney General.
 - The Commission takes the decisions, balancing the interests of the company and the public.
 - These decisions are embodied in written Orders, which summarize the issues in the case, parties and their positions on issues, and findings of fact and conclusions.
- Rate changes occur every 3 to 6 years when the business environment justifies a rate change.

The principles behind the rate regulation at the CPUC

- The rate regulation of IOUs is based on the principle that a firm should be able to generate sufficient level of revenues to cover "allowable" costs and to have a certain return on invested capital. Both "allowable" costs and return on invested capital are determined by the Commission.
- The determination of "allowable" costs is thus integral to rate-making. It is the Commission that defines what "allowable" costs are based on her expertise. During the public hearings the "allowable" costs are discussed together with the other regulated aspects.
- The basic revenue requirements are determined as $R = G + D + T + E$ with
 - R = "revenue requirements"
 - G = operations and maintenance expenses
 - D = annual depreciation charge
 - Usable depreciable is typically around 2.5% per year
 - Depreciable base for underground infrastructure is on the range of 50 to 80 years
 - T = taxes
 - E = permitted rate of return (cost of capital) = weighted sum of the cost of debt capital and the cost of equity capital
 - A cost of return are typically 10% for large investor-owned companies
 - Cost of debt capital is the actual interest cost
 - WACC of the CPUC ranged from 7.5% to 11.1% for past 7 years for water or storm, which is a good approximation for wastewater systems
 - The ratio debt capital/equity capital is typically 45%-60%
- B = rate base = V - d
 - V = rate base valuation
 - d = accumulated depreciation

The principles behind the rate regulation at the CPUC

- All the components of the above formula (like the operations and maintenance expenses for example) must be argued by the company at the public hearings
- The prices needed to generate R must be designed so that the sum revenues from all customer classes equal the cost components
- Sewer rates can be roughly estimated at 0.5 BEF per m³ discharged water. Sewer billing is based on a discharged quantity which is 70% of the quantity of metered input water.

The organisation of the CPUC

- The Governor appoints five Commissioners, who must be confirmed by the Senate, for six years. The Governor appoints one of the five to serve as Commission President.
- The CPUC employs economists, engineers, administrative law judges, accountants, lawyers, and safety and transportation specialists.
- The Office of Ratepayer Advocates is an independent arm of the CPUC that represents consumers in Commission proceedings, pursuant to statute.
- The Commission also has a Public Advisor who assists the public in participating in Commission proceedings, and a unit that is charged with informally resolving consumer complaints.

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