REVENUE REQUIREMENTS AND PRICING FOR SUSTAINABLE WATER SERVICES

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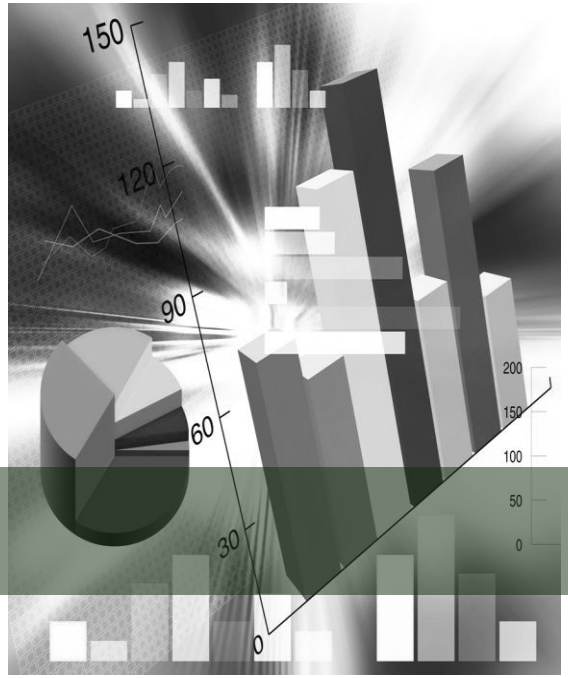


MICHIGAN STATE UNIVERSITY

The Institute of Public Utilities at MSU

- IPU-MSU has served the regulatory policy community since 1965
  - More than 20,000 domestic and international program alumni
  - Celebrated 50 years at MSU in 2015
- IPU's mission
  - To support informed, effective, and efficient regulation of the electricity, natural gas, telecommunications, and water industries
- Neutral and integrative educational programs and research
  - A principled approach to regulatory practice
  - An empirical approach to regulatory analysis
  - A reasoned approach to structural and regulatory change
- We teach the "ideal" of economic regulation in the public interest
  - Interdisciplinary theory, regulatory culture, and critical thinking
  - Commitment to lifelong learning and appreciating what we do not know

Abstract

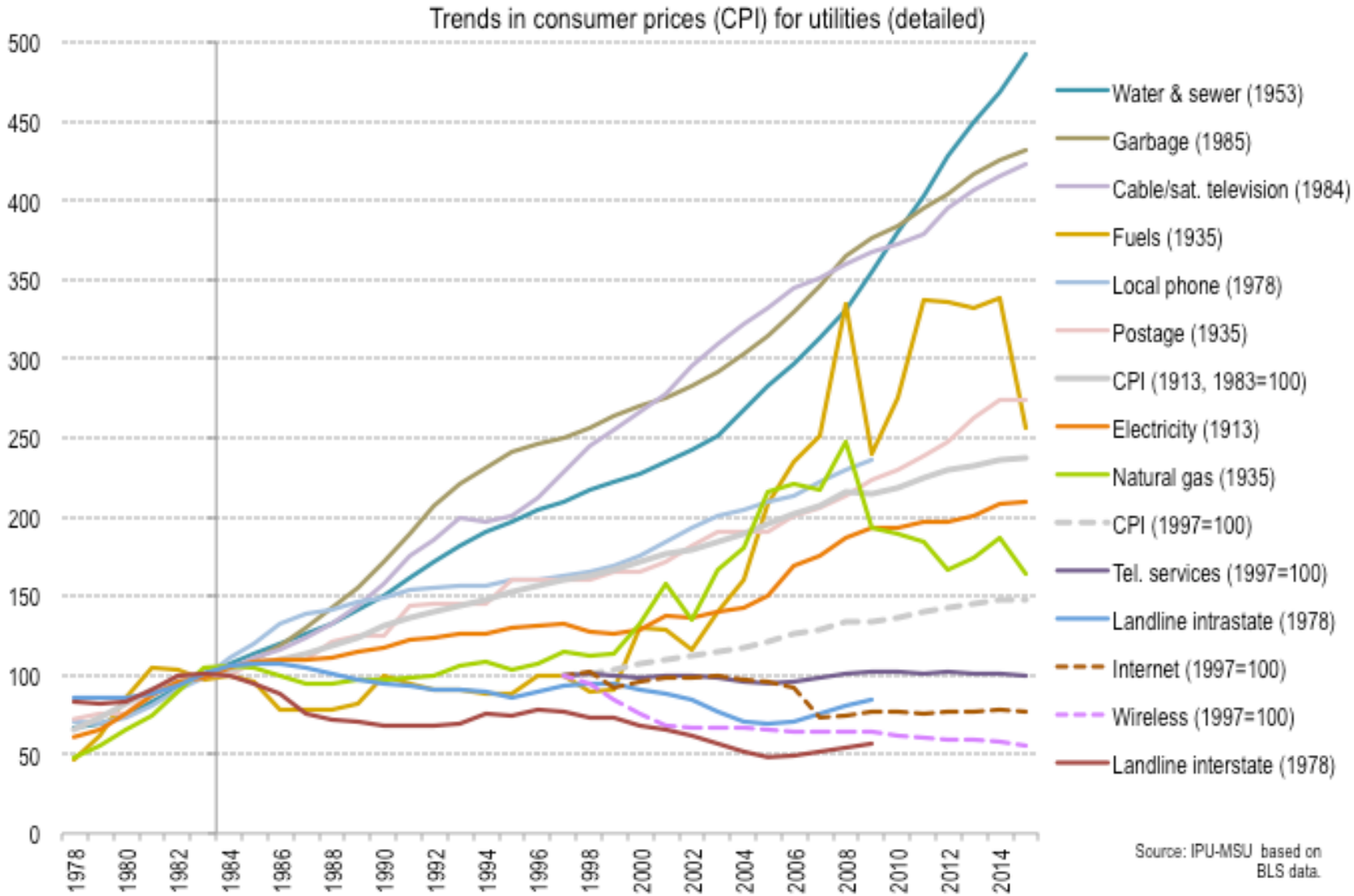
- In the context of the Quebec Water Efficiency Strategy, Prof. Janice Beecher will share her experience with regard to water pricing in the United States. Water prices have risen dramatically in the U.S. due to a combination of rising infrastructure costs and declining usage. For some systems, limits to water availability also drive costs. In the U.S., the water sector is dominated by public ownership and most systems are not subject to state economic regulation.
- Nonetheless, as in the energy sector, enterprise organization and cost-based pricing are encouraged to promote financial and environmental sustainability. Sustainable water utilities spend to an optimal service level (compliant with all standards) and price to that expenditures; that is, transfers and subsidies are minimized. Larger water utilities tend to follow relatively similar accounting and ratemaking practices. Utilities first develop their revenues requirements based on the cost of service for a rate test year; then they allocate costs to types of usage and design rates. Customers are divided into residential, commercial, industrial, and other classes. Water metering is encouraged so that rates can be cost reflective.
- Utility ratemaking in the US follows a variety of well established and generally accepted principles and practices. However, pricing is also goal-oriented and takes place within a political context. In particular, ratemaking for sustainability involves a balanced consideration of economic, ecological, and equity tolerances. Rate regressiveness and water affordability are growing challenges calling for progressive rate and public policy solutions.

Introduction

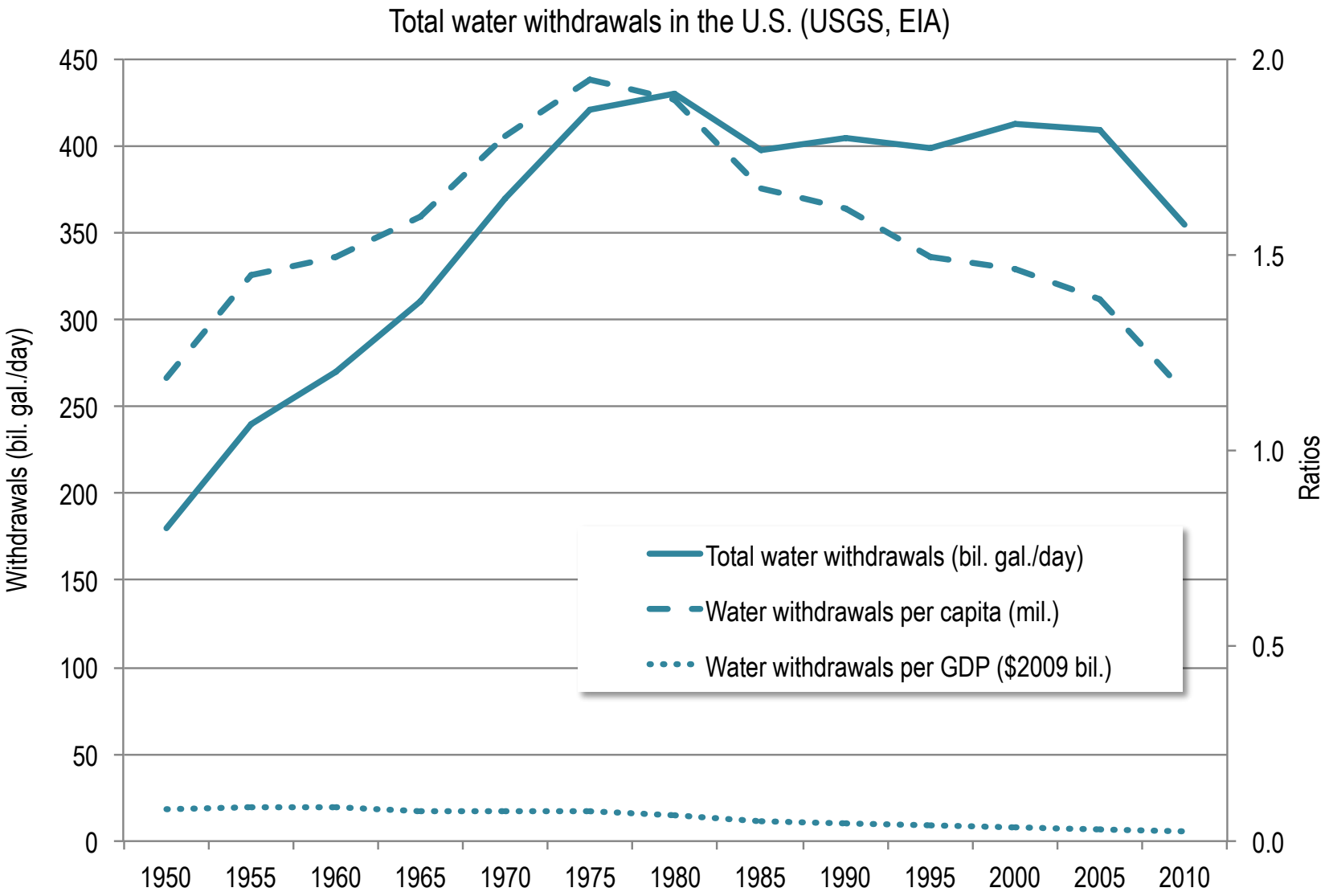
- *"If all goods were free, like air and water, any man could get as much as he wanted without harming others," David Hume (1739)*
- A pricing paradox: should their essential nature make public utility services cheap or expensive?
- Because utility services are not "free" we exact a price for their provision
  - Accurate cost-based prices communicate value, induce efficiency, and enable "self-rationing" (consumer sovereignty)
  - Well-regulated prices based on full-cost accounting may not reflect the true economic or environmental value of utility services (externalities)
  - Price is necessary but not always sufficient for inducing desirable production and consumption behavior
- Rate design is not "the regulatory paradigm"
  - Regulation can accommodate a wide range of pricing policies and methods

"Price is what you pay. Value is what you get."
Warren Buffet, 2008

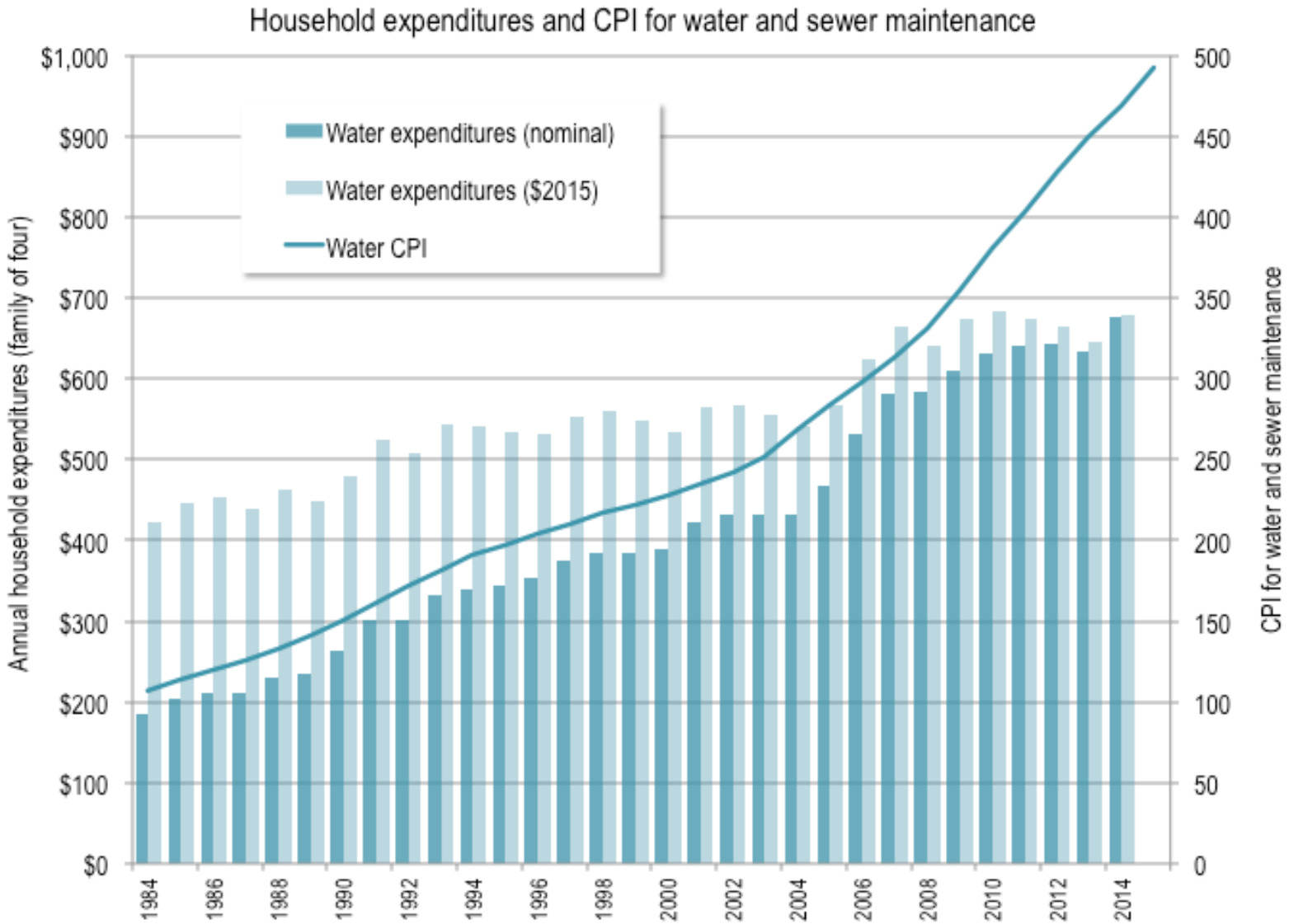
CPI trends for utilities (US)



Aggregate trends in usage

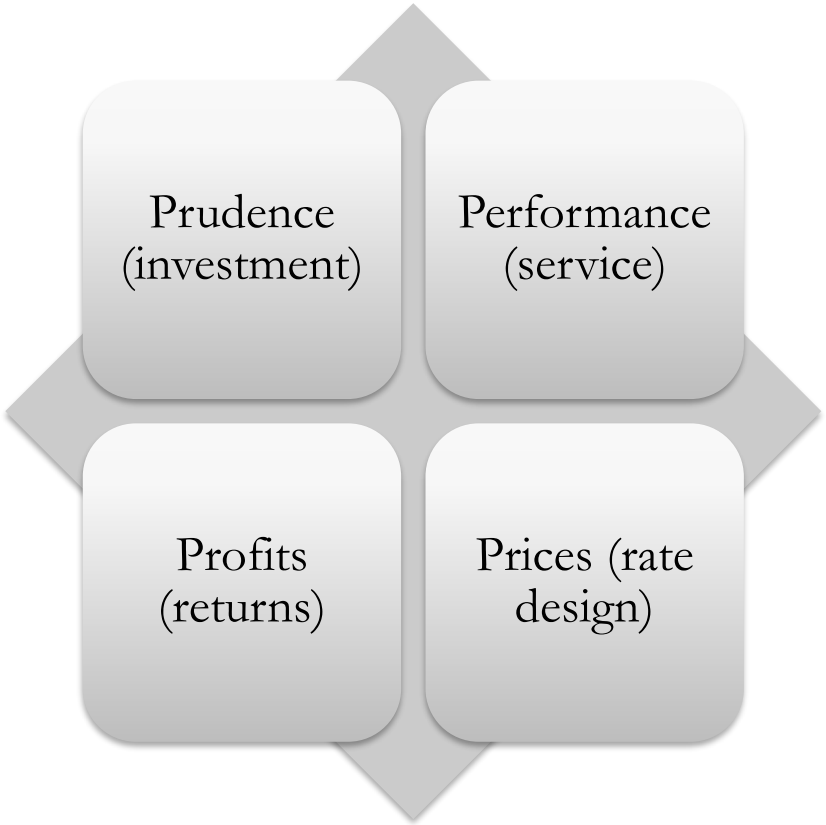


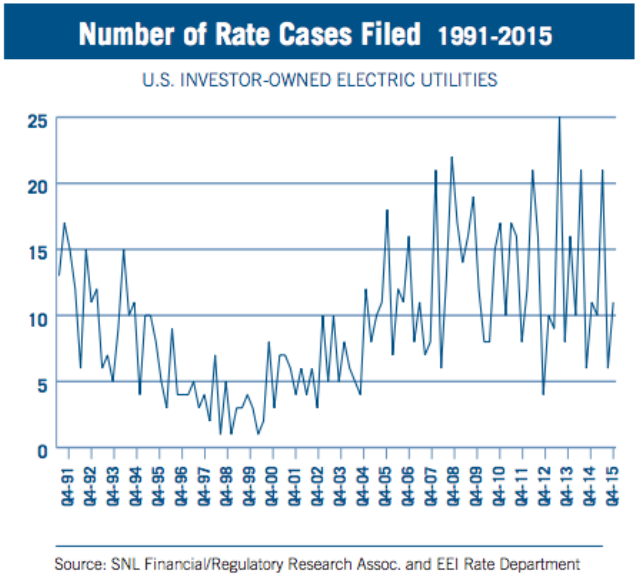
Expenditure and price trends combined



Rate regulation

- Rate regulation focuses on four areas
  - Considerable policy discretion is applied in each step of the process
  - Rate-case workload fluctuates over time – rising over the last decade





What stakeholders want from the ratemaking process

Utilities

- Revenue stability, reasonable certainty, and a fair return to ensure financial viability and attract investors

Customers

- Safe, adequate, reliable, and convenient service, fair, reasonable, and stable rates, and a controllable and affordable bill

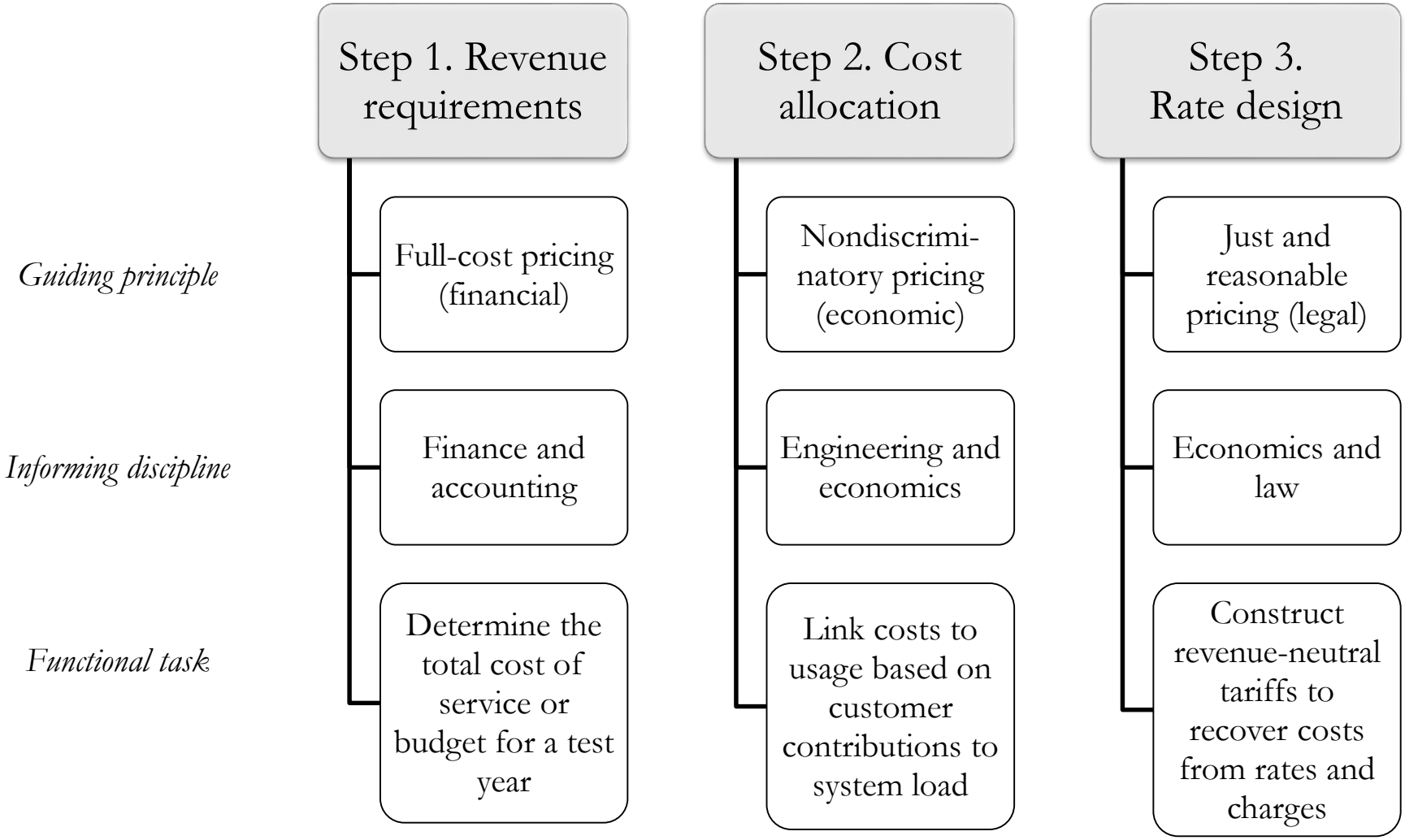
Regulators

- Utility services that serve society and promote the public interest in terms of infrastructure investment, operational efficiency, and other performance goals

Cost allocation and rate design

- Revenue requirements specify the size of the pie and rate design slices it up
  - Cost-of-service studies are used to functionalize, classify, and allocate costs
  - Pricing may or may not "discriminate" (differentiate) among users based on costs
  - Ratemaking typically involves a degree of cost averaging (space and time)
- Rate design should be revenue neutral (rate revenues cover requirements)
  - Cannot compensate for misestimated revenue requirements
  - Should not be used to "generate" revenues (regressive "taxation")
  - Rate blocks and tiers (unit prices) should be informed by cost analysis
- Rate design involves value, judgment, and politics
  - Alternative rate structures (tariffs) can recover revenue requirements
  - Rate options can be evaluated according to various criteria
  - Ratemaking typically involves a degree of cost averaging (space and time)
- Substantial departures from cost-of-service principles are controversial
  - "Socialized costs" (spreading costs widely)
  - "Social ratemaking" (economic development or jobs, poverty, needs)
  - "Socially defined" value of a service or investment (clean energy, efficiency)
  - "Social goals" supported by ratepayer subsidies instead of taxes

Key steps in ratemaking and guiding principles



Ratemaking begins (and ends) with accounting

- *"Accounting may be said to be the backbone of utility regulation" (FPC, 1946)*
- Every regulatory decision implies an accounting (allocation) treatment
  - The "accounting system [associated with John R. Commons] is the central endogenous variable available to regulators… [for distributing wealth]… (Jarrell, 1979, 105)
- Accounting supports cost knowledge and informs ratemaking
  - Fiscal year (annual reports), tax year, and rate years are asynchronous
  - Annual balance sheets relate to ratebase and income statements relate to operating expenses – but revenue requirements are derived for a test year
- Uniform systems of accounts (USOA) – federal, state, NARUC
  - Originally prescribed under the Federal Power Act (1935, effective 1937)
  - Balance sheet: utility plant accounts
  - Income statement: operating revenue and O&M accounts
  - Retained earnings and cash-flow statements

- Regulatory accounting v. GAAP
  - Regulatory accounting prevails over generally accepted accounting principles (GAAP)
  - Accounting and reporting vary for regulators, shareholders, IRS – compare footnotes
  - Regulatory accounting periods will vary from tax accounting periods (reconciliation challenge)
  - In 1938, the SEC delegated to standards to the Financial Accounting Standards Board – FASB 71 for privately owned utilities (and to GASB for publicly owned)
  - XBRL: eXtensible Business Reporting Language

Cost-based/cost-of-service ratemaking

- *"The fixing of future rates always involves an element of prediction" (Market St., 1945)*
- Promoting efficient production, consumption, and resource allocation
  - Principle of "burdens follow benefits" & vice versa (matching)
  - Cost causers should pay (rules for allocating costs based on usage)
  - Costs should not be knowingly or unknowingly shifted to others (subsidies)
  - Social goals may justify cost socialization (stamps) and subsidies (public transportation)
  - Subsidies for broad social goals are ideally supported by taxes v. user rates
- Under RB/ROR, regulators approximate an "efficient" (market-based) price
  - "Cost-plus" (costs plus returns) ratemaking is misleading
  - Prices must include a "fair" rate of return to investors to attract capital
  - Determining and allocating service costs is the essence of ratemaking
  - A "test year" (or base or rate year) is used to establish "base rates"
  - A future test year requires both usage and cost forecasting
- Matching principle for revenues and costs is used to evaluate earnings
  - Utilities have strong incentives to recognize "known and measurable" (supportable) costs and weak incentives to recognize potential cost savings
  - Utilities also have incentives to understate sales so declining sales must also be supported
  - Adjusted historical costs and projected (future) test year costs should be proximate

Revenue requirements: cash-needs basis (publicly owned utilities)

RR = Capex + Opex + DS + Teq + Res

where:

- RR = test year (annualized) revenue requirements
- Capex = capital expenditures not contributed or debt-financed
- Opex = operation & maintenance expenses (incl. admin. & general)
- DS = debt service
- Teq = tax equivalents (gross receipts or PILT) and other payments or returns to cities based on costs and risks
- Res = reserves for capital investments (may be based on depreciation expense and/or replacement criteria)

Rates are a function of both numerator and denominator – neither can be neglected

<u>Revenue requirements (RR)</u>
Estimated usage (billing determinants) = Cost-based rates

Revenue requirements: utility basis (private & some public)

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

where:

- RR = test year (annualized) revenue requirements
- r = authorized (not guaranteed) rate of return to compensate debt holders and equity shareholders
- RB = ratebase (original cost of invested utility plant in service net of accumulated depreciation and adjustments)
- O&M = operation & maintenance expenses (incl. admin. and general)
- D = depreciation and amortization expense
- T = income and other taxes

Rates are a function of both numerator and denominator – neither can be neglected

<u>Revenue requirements (RR)</u>
Estimated usage (billing determinants) = Cost-based rates

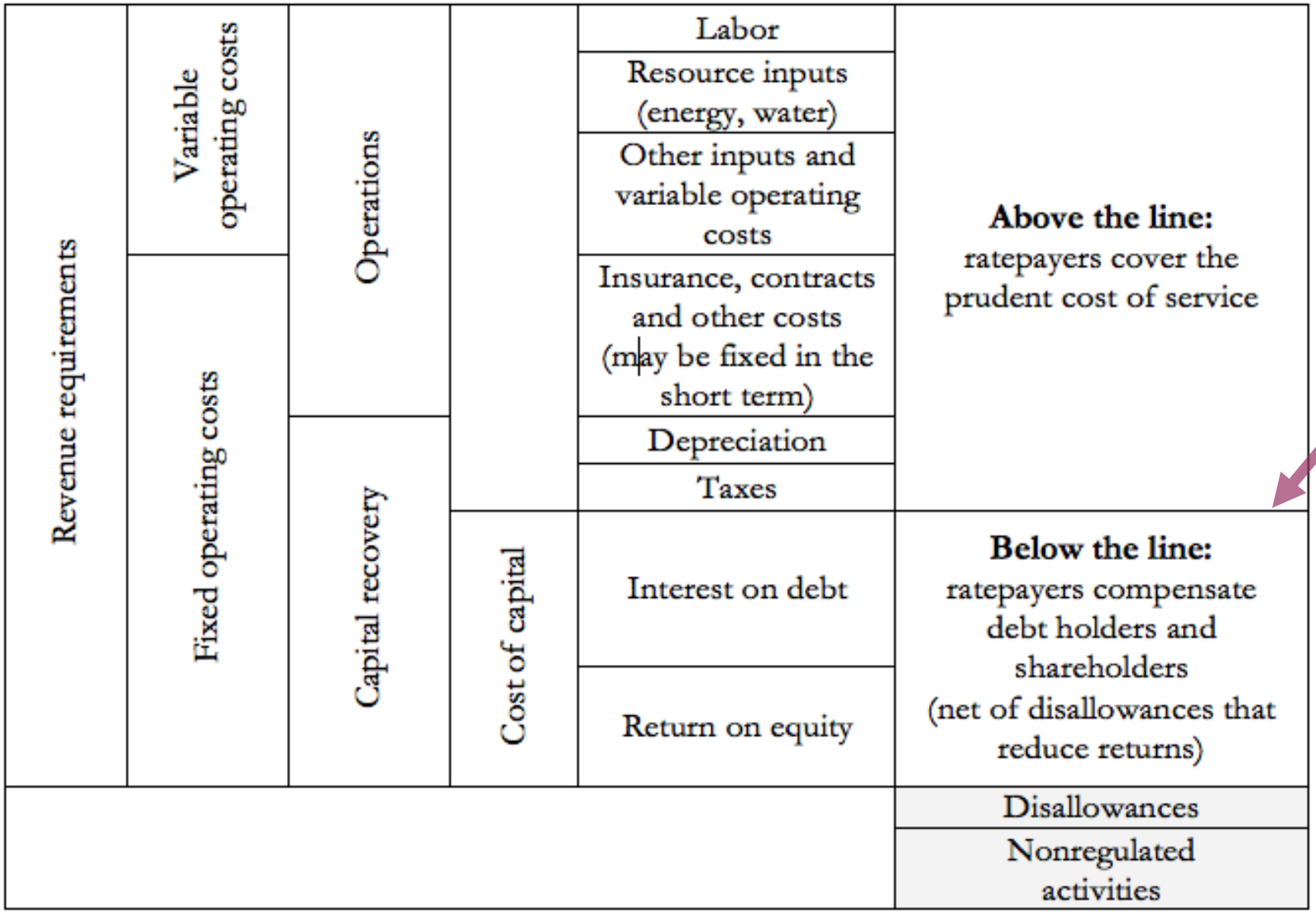
Ratebase

- Ratebase = plant in service + additions - deductions
  - Additions
    - Construction work in progress (CWIP)
    - Plant held for future use
    - Miscellaneous deferred debits
    - Acquisition adjustment
    - Prepayments
    - Fuel stock
    - Materials and supplies
    - Cash working capital
  - Deductions
    - Accumulated depreciation
    - Accumulated amortization
    - Accumulated deferred income taxes
    - Unamortized income tax credits
    - Customer advances, contributions, and deposits

Net operating income

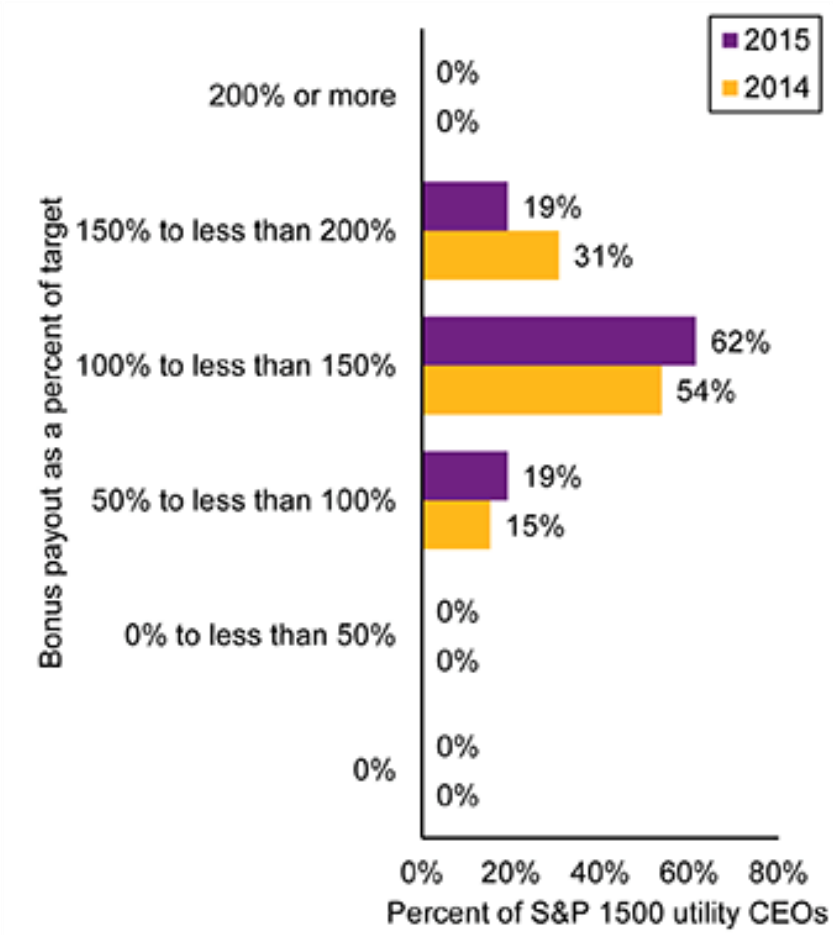
- Net operating income = operating revenues – operating expenses
- Operating expenses
  - Production expenses
  - Transmission expenses
  - Distribution expenses
  - Customer account expenses
  - Customer service expenses
  - Sales expenses
  - Administrative and general expenses
  - Depreciation expense
  - Amortization expense
  - Taxes other than income
  - Federal and other income taxes
  - Investment tax credit adjustment
  - Regulatory expenses

Components of revenue requirements



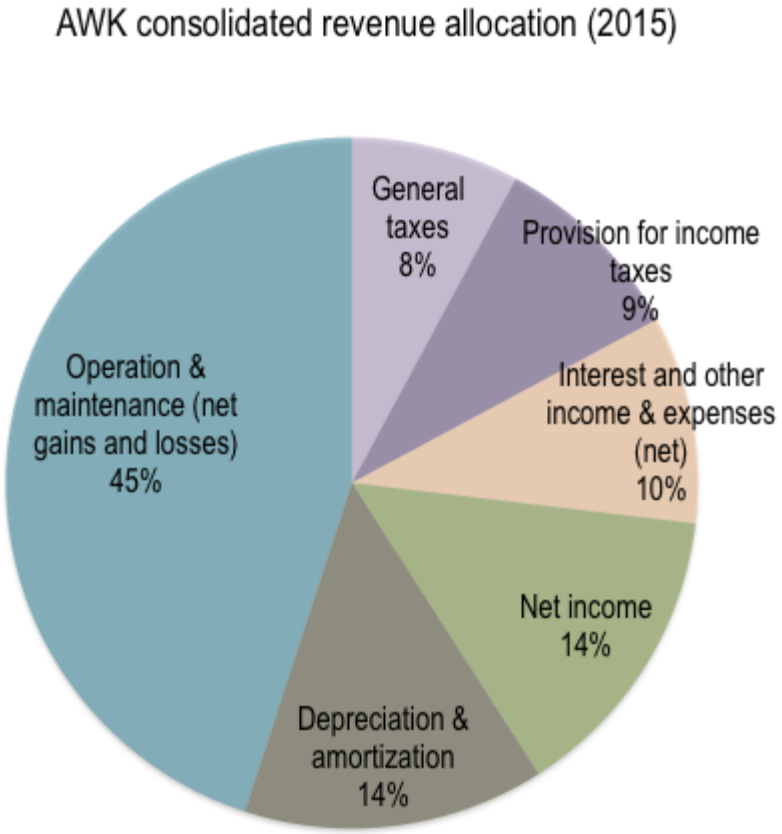
Allowances and disallowances

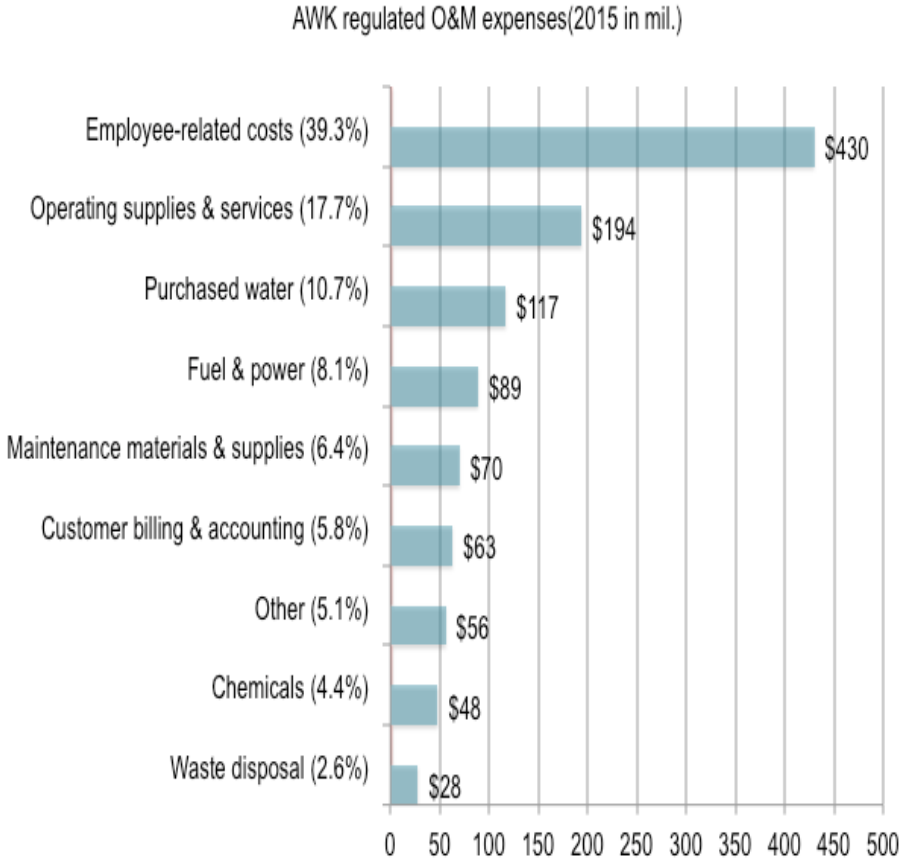
- Allowances
  - Prudent and useful expenditures
  - Government mandated expenditures (still subject to review)
- Disallowances
  - Imprudent expenditures
  - Lobbying expenses
  - Charitable contributions
  - Executive bonuses



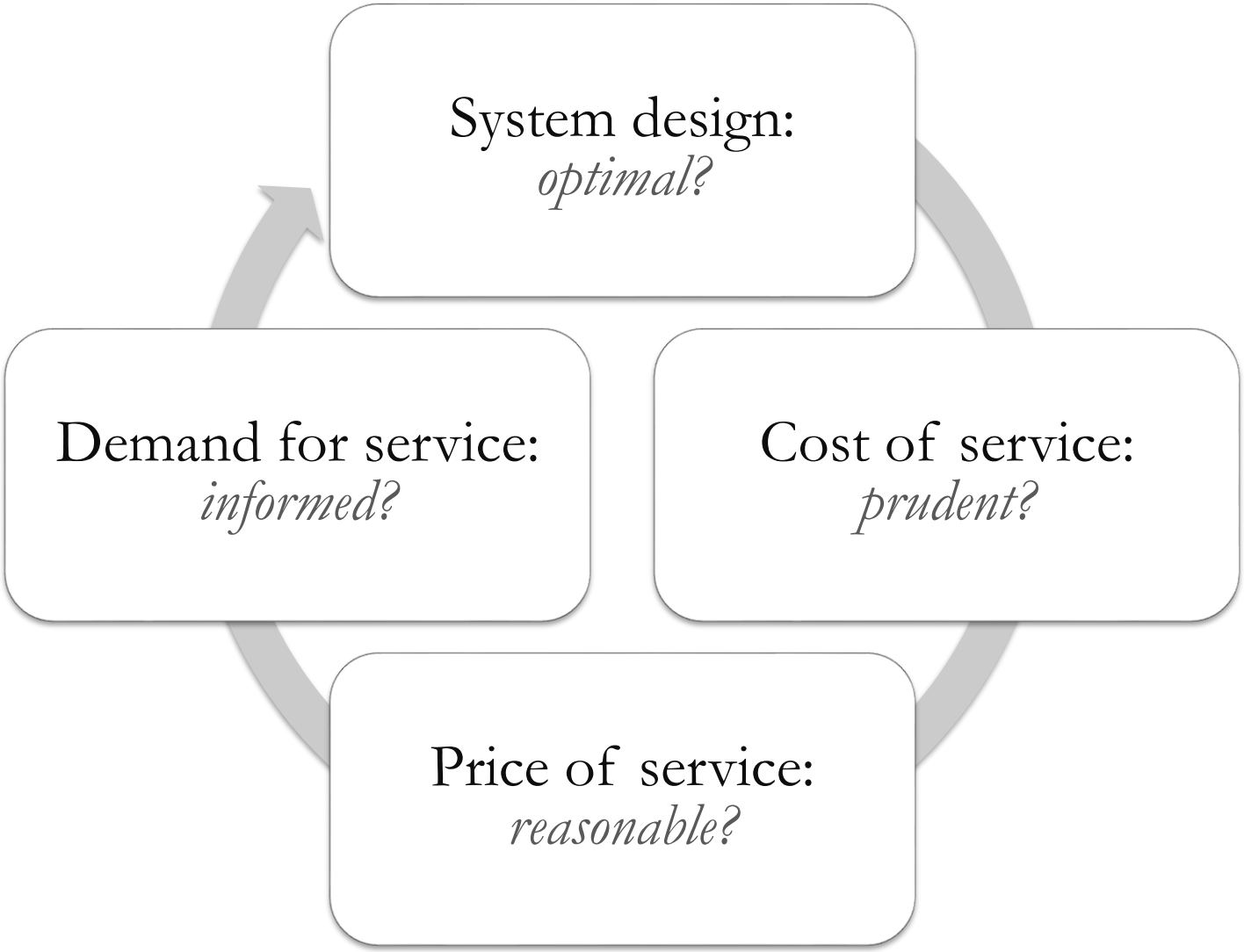
Source: Willis Towers Watson's Executive Compensation Resources, based on 27 S&P 1500 utilities sector companies with the same CEOs in both 2014 and 2015.

Allocation of revenue dollars (American Water)





The dynamic role of utility prices



Pricing goals for public utility services

- Pricing goals
  - Financial sufficiency. To ensure that utility operations are fiscally sustainable
  - Economic efficiency. To achieve an equilibrium of supply and demand
  - Equitable allocation. To allocate costs to usage based on cost causation
  - Operational performance. To manage load for efficient capacity utilization
  - Network optimization. To optimize system design and performance
  - Environmental stewardship *(social equity)*. To preserve resources and mitigate adverse impacts and externalities
  - Distributive justice *(social equity)*. To promote universal service and advance positive impacts and externalities
- Practical considerations – rates must also be
  - Unambiguous
  - Technically feasible
  - Cost effective
  - Legally defensible
  - Politically acceptable

Fiscally sustainable systems ("enterprises")

Rate revenues relative to expenditures	Expenditures relative to optimized compliant service level		
	< 1 expenditures are below optimum ("cost avoidance")	= 1 expenditures are optimal	> 1 expenditures are above optimum ("gold plating")
< 1 rate revenues are below expenditures ("price avoidance")	Deficient system	Subsidized system	Budget-deficit system
= 1 rate revenues are equal to expenditures	Underinvesting system	SELF-SUSTAINING SYSTEM	Overinvesting system
> 1 rate revenues are above expenditures ("profit seeking")	Revenue-diverting system	Surplus system	Excessive system

Economic efficiency

Prices too high
Deprivation and danger
Drag the economy
Excess reserves
Transfer of surplus
Abuse of monopoly

Prices too low
Excessive/wasteful usage
Excess capacity investment
Inadequate reserves
Subsidization of deficit
Financial failure

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- Substantial departures from cost-of-service principles (incentives, subsidies, and transfers) are controversial

Cost classification: three-part approach

Customer costs

- Do not vary with usage (e.g., meters, customer services)

Capacity (infrastructure) costs

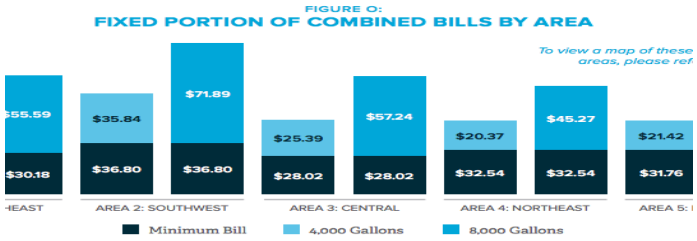
- Fixed in the short term and includes capital and O&M costs
- Demand, availability, readiness-to-serve, and facilities charges
- Vary with aggregate usage over time (e.g., distribution, treatment, storage)

Commodity (resource) costs

- Variable in short term and continuously with usage over time (e.g., energy, water)

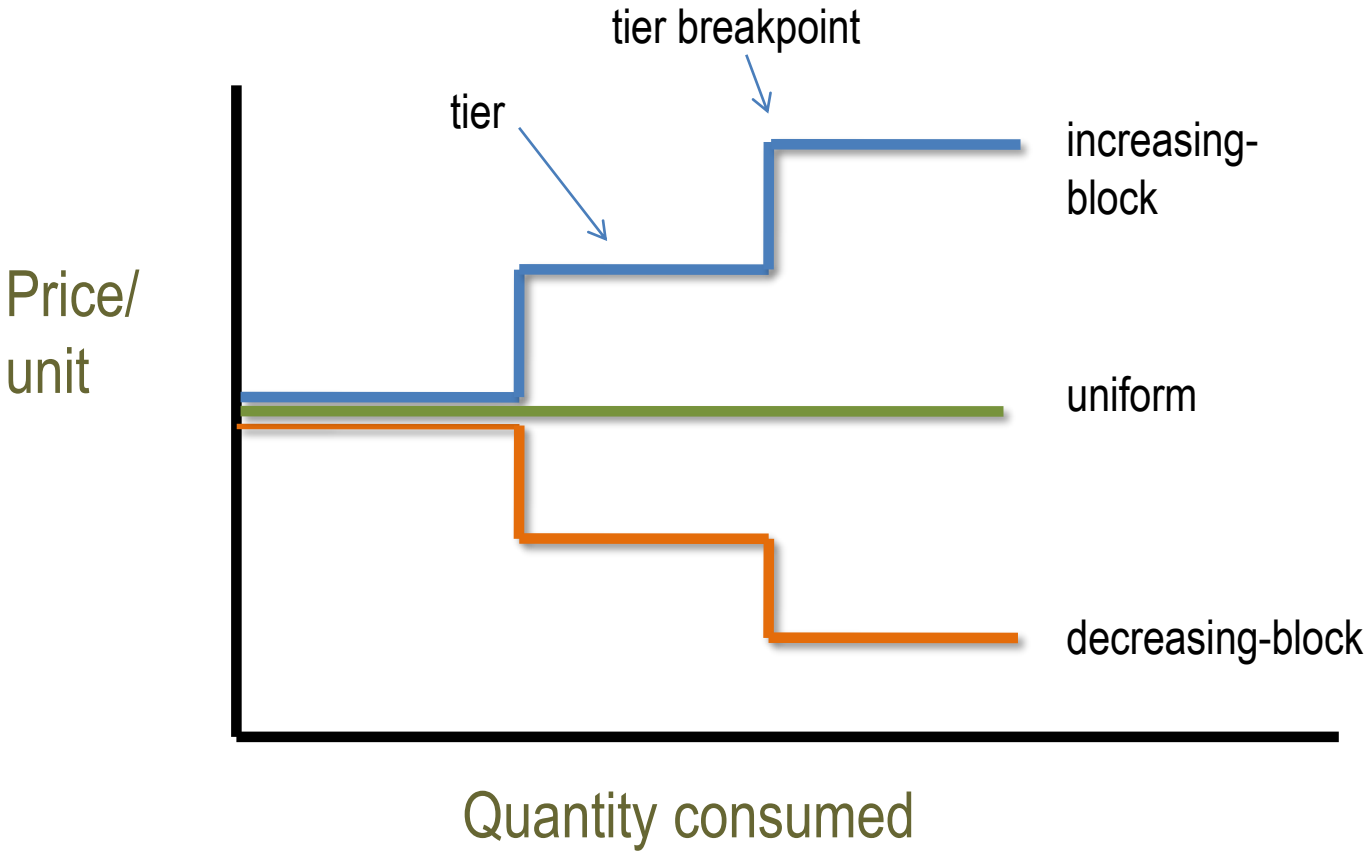
Fixed v. variable charges: tradeoffs

Recovering more from fixed charges	Recovering more from variable charges
In the short run, many costs are fixed (static world view)	In the long run, all costs are variable (dynamic world view)
Enhances revenue stability (less sales risk)	Reduces revenue stability (more sales risk)
Weakens price signals (less resource efficiency)	Strengthens price signals (more resource efficiency)
Less affordable for low-income households (more regressive)	More affordable for low-income households (less regressive)
Possible advantage for combined households (one customer charge)	Possible stability from first blocks (inelastic usage)



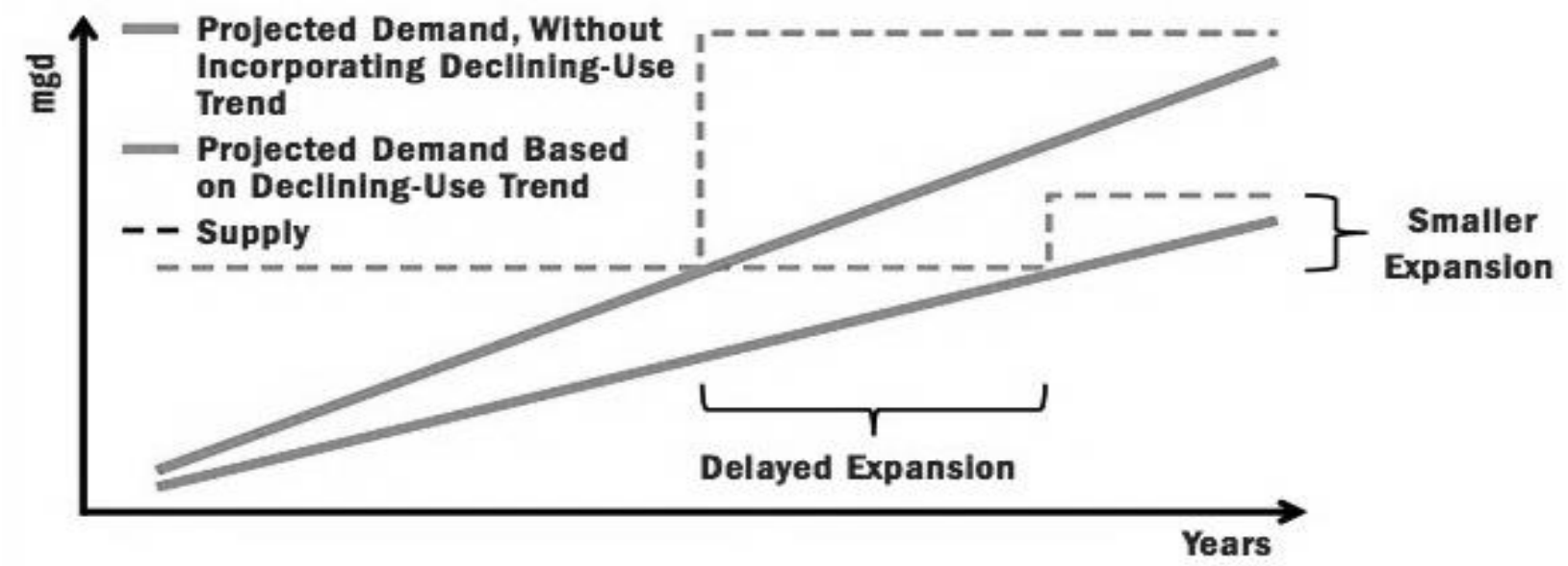
Basic rate-design options

- Economic efficiency calls for volumetric rates
- Volumetric rates require metering and billing



Pricing to induce efficiency

- Value of efficiency varies spatially and temporally based on conditions
  - Efficiency cannot avoid all system costs (particularly in the replacement cycle)
  - Indoor water usage should be treated as a resource (reusing or recharging)
  - Hyper-efficiency/conservation may have deleterious consequences (systems & customers)
- Efficiency reduces revenue and earnings volatility (risk)
  - "Conservation Can Benefit The Bottom Line" (S&P on water, 2012)



Source: Hunter, et al (Opflow, May 2011)

The case for progressive water rates

- Key rationales for progressive and corrective rate design
  - Basic water and wastewater services are essential for individuals and economies
  - Utility services are merit goods with positive externalities (social, individual)
  - Water system costs are influenced by fire-protection specifications
  - Nondiscretionary water and wastewater usage is generally price-inelastic
  - Pricing for demand management should focus on discretionary usage (outdoor)
  - Rates for services embed substantial taxes (sales, income, property, PILT)
  - Goals of economic efficiency and equity can be aligned
  - Universal service and social equity are aspirational goals
  - Public health and welfare should take priority over cost allocation
  - Utilities will not be sustainable if customers cannot afford service (death spiral)
- Structural issues beyond rate design
  - Legitimize and support universal service policies and limit disconnection
  - Allow more flexibility in pricing (affordability considerations)
  - Prohibit transfers from water funds to general funds (regressive taxation)
  - Reform tax system to reduce or eliminate (e.g., gross receipts v. PILT)
  - Impose a fixed charge based on property value (reflecting fire-protection costs)

Complexity in rate design

- Rate design need not be overly complex to recover costs and promote efficiency improvement
- A smarter rate is not necessarily a complex rate
- A highly complex rate structure may be undesirable – potential issue with dynamic pricing
- Customer understanding and acceptance are important for price responsive behavior
- Benefits of rate design and its implementation should outweigh costs
- Resources are available for basic ratemaking (e.g., professional training and manuals)
- Rate structures can and should evolve with changing utility and social values, needs, and goals

Implementing a change in rates

- Follow sound principles and practices for cost-based ratemaking
- Focus more attention on total bill burden as compared to rates
- Communicate policy goals clearly
- Provide opportunities for stakeholder input
- Explore a full range of rate-design options
- Avoid excessive complexity and unnecessary confusion
- Recognize impacts and trade-offs explicitly
- Phase-in big changes with gradualism
- Amplify price signals with information, education, social media
- Approach empirically and experimentally
- Monitor and evaluate marginal and net benefits and costs
- Modify based on impacts, outcomes, and evolving conditions