Water utility pricing and affordability

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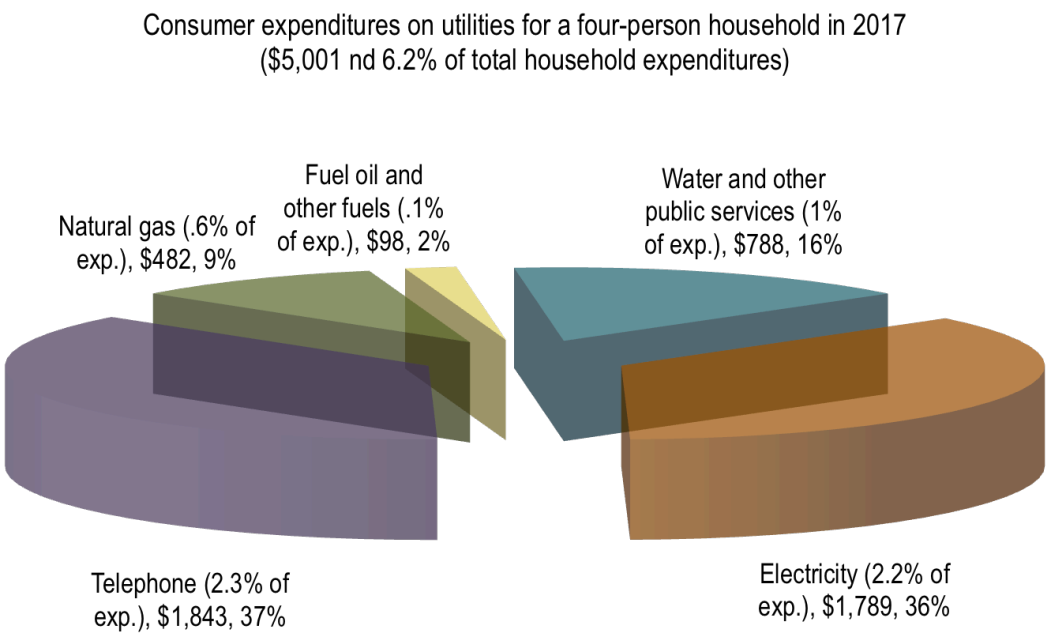
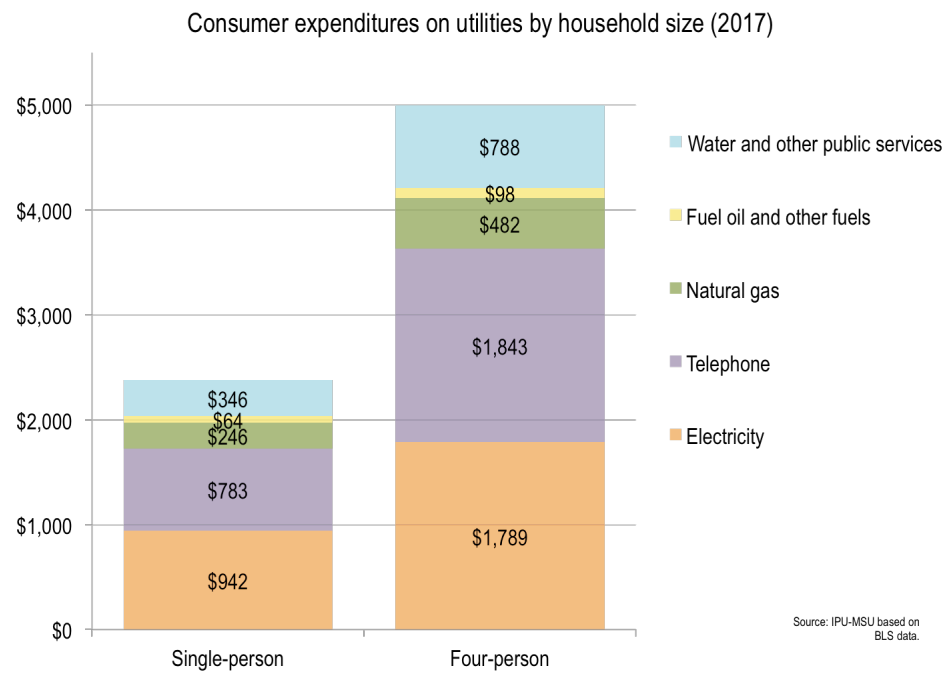
Revised 7/25/19 – DRAFT

MICHIGAN STATE UNIVERSITY

Household expenditures on utilities in the U.S.

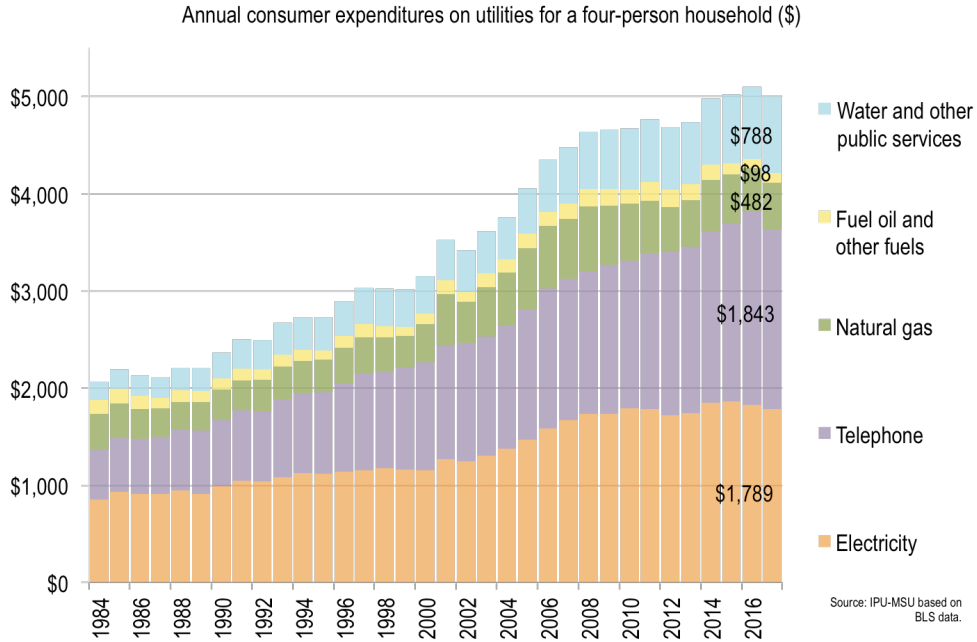


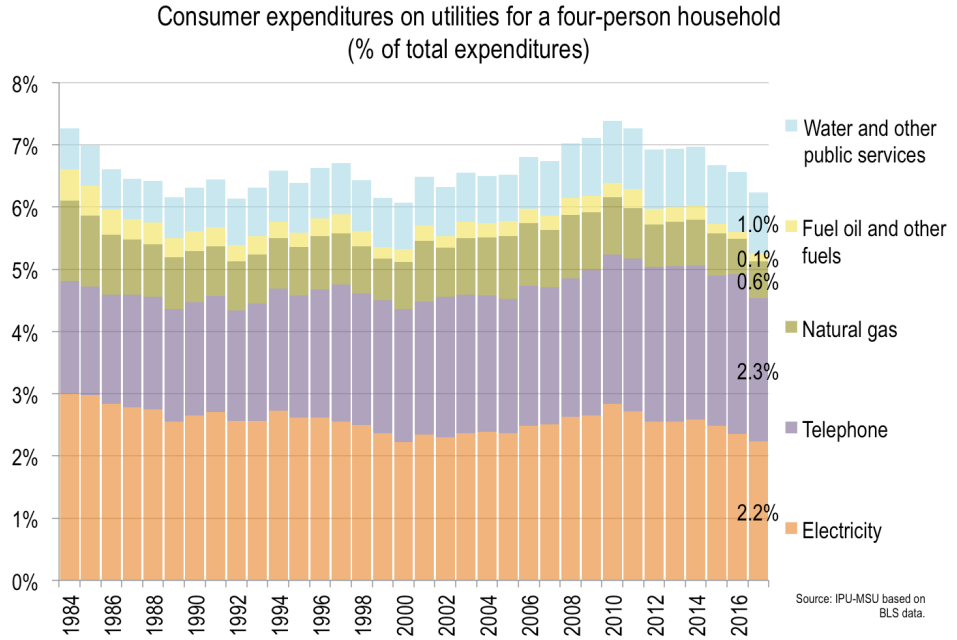
Source: IPU-MSU based on BLS data.



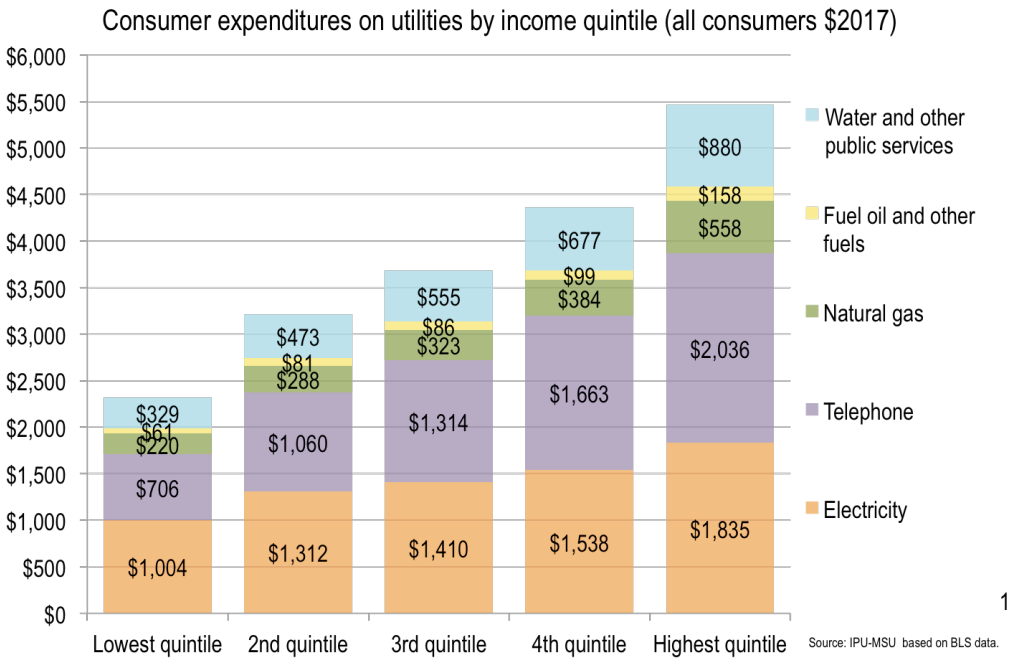
Source: IPU-MSU based on BLS data.

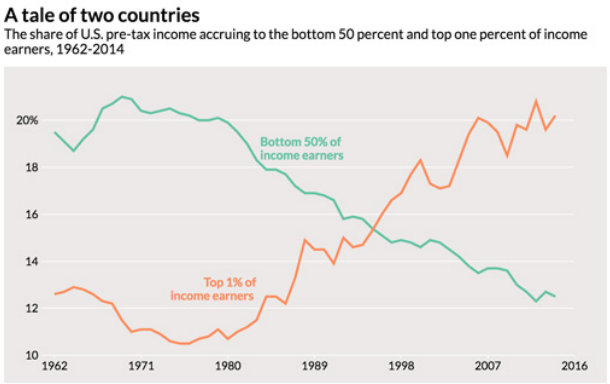
Household expenditures on utilities over time



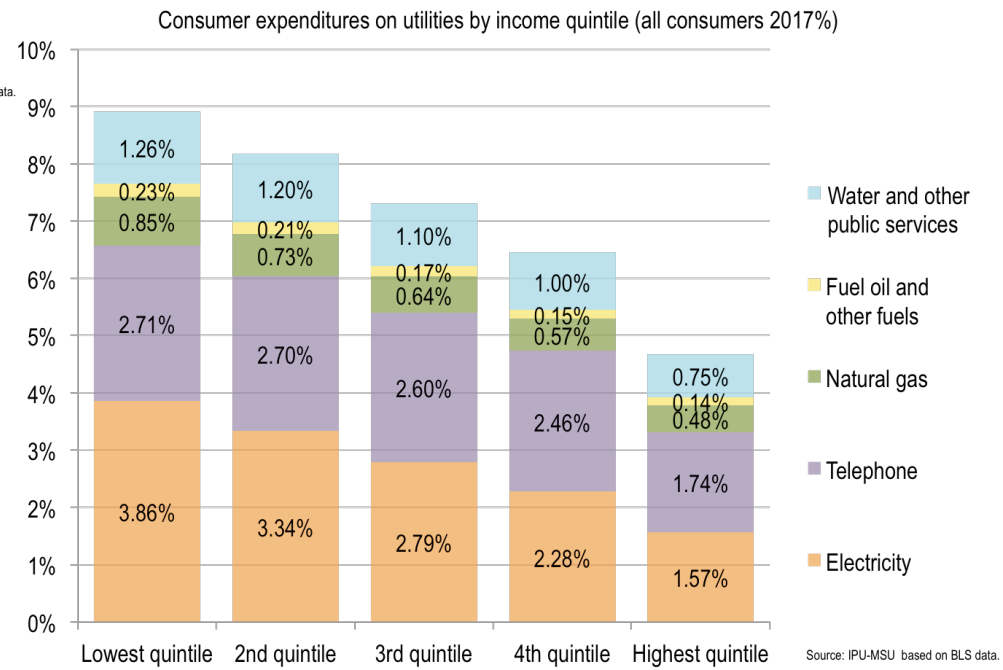


Utilities expenditures by income level and regressivity

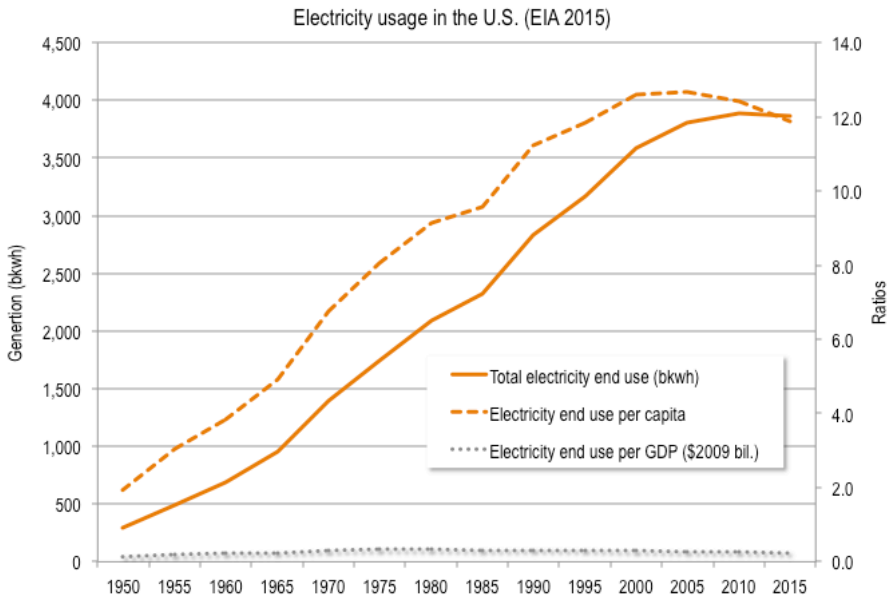


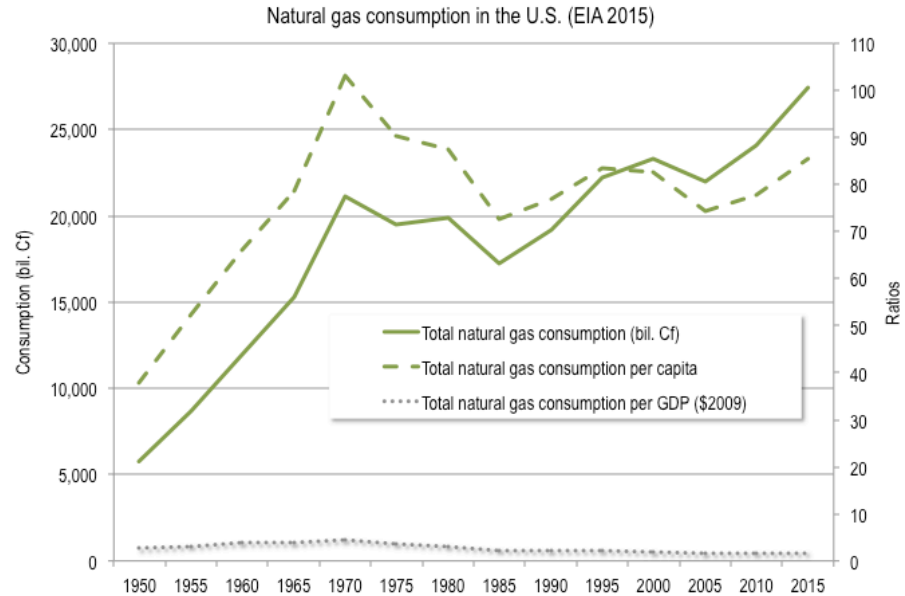


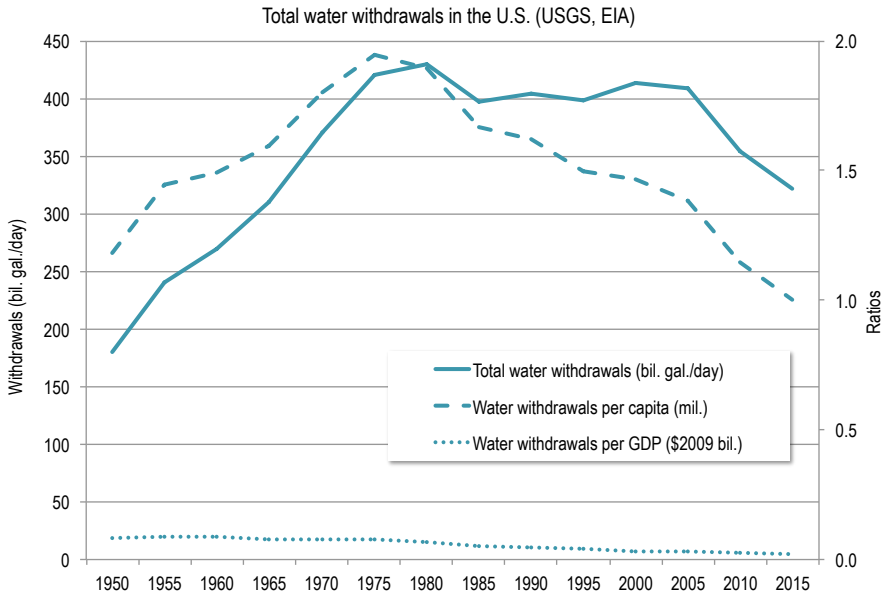
Note: ratepayer funding of any social program – including affordability assistance - is also regressive, meaning the near-poor will be asked to subsidize the poor.



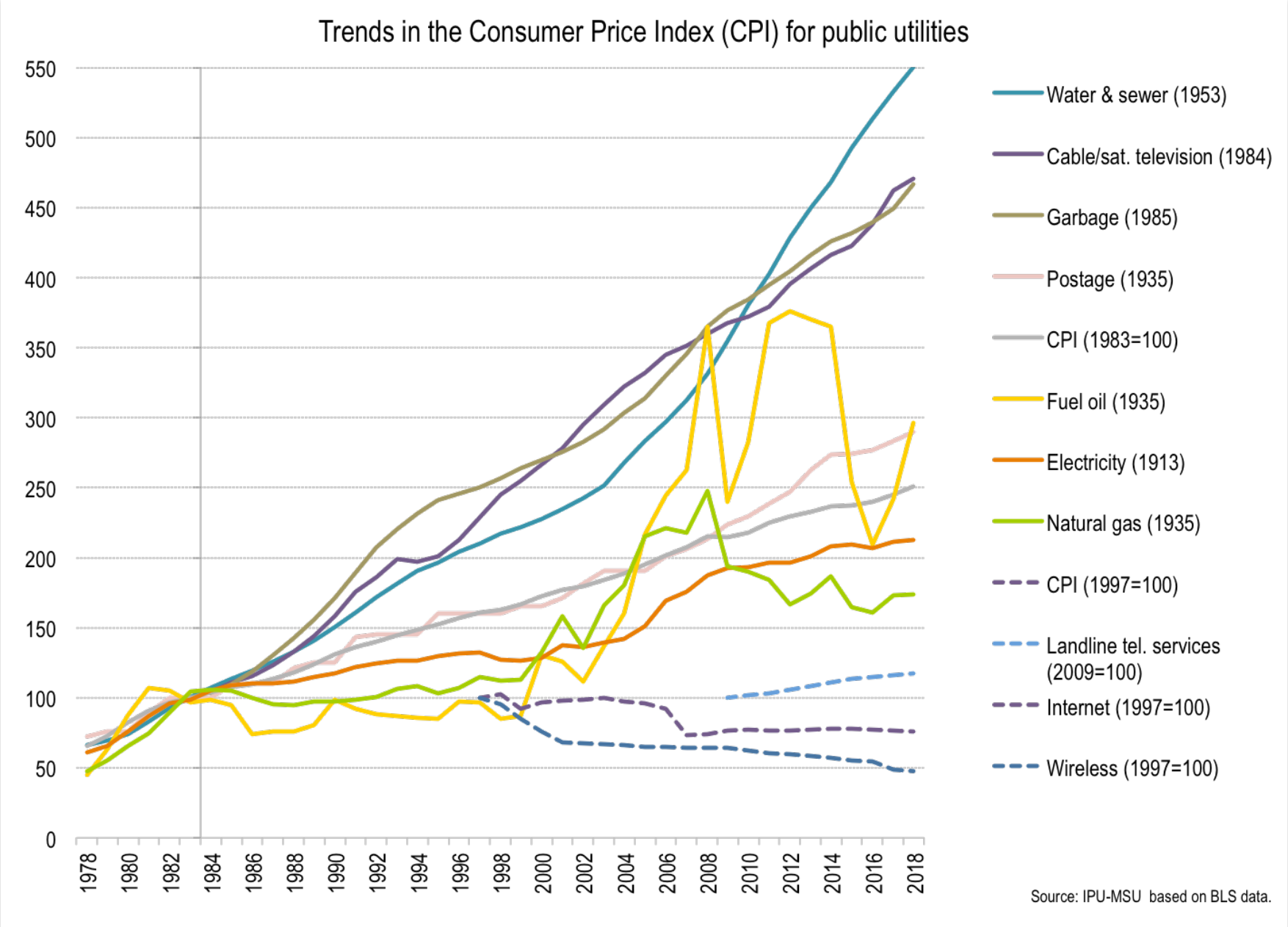
Aggregate trends: electricity, gas, and water



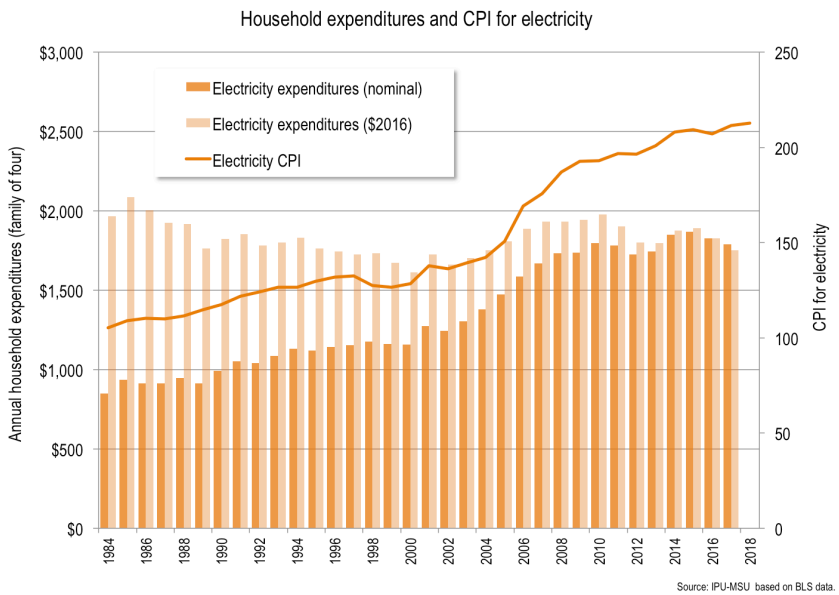


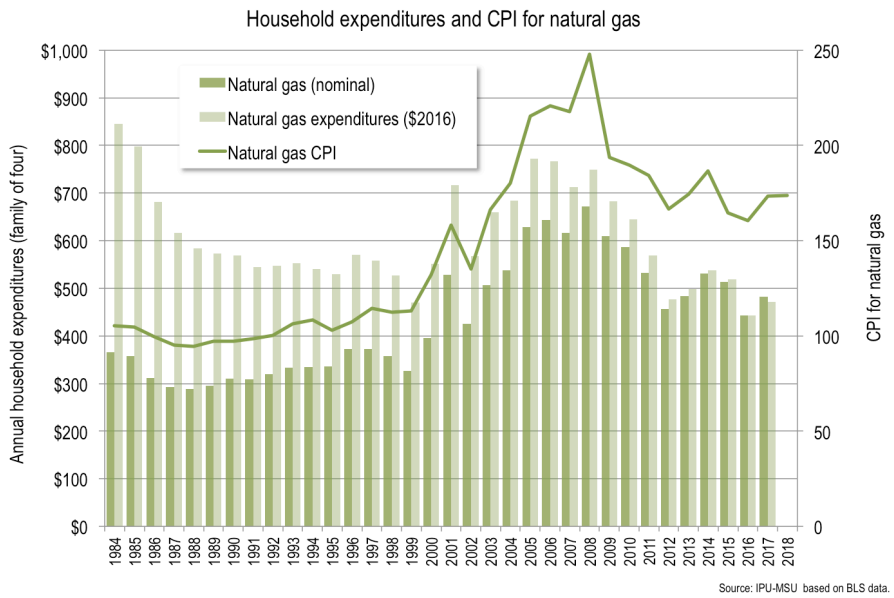


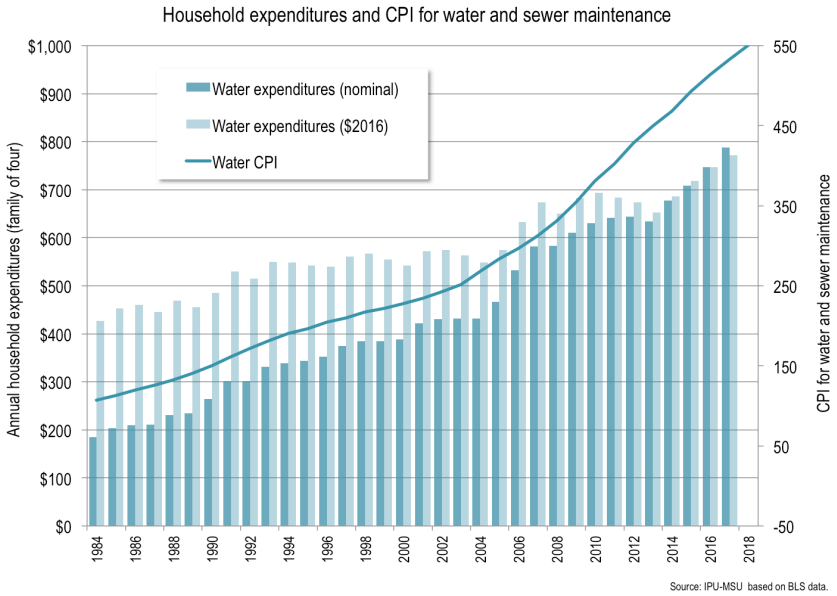
CPI trends for utilities (US)



Expenditure and price trends combined







Water infrastructure needs

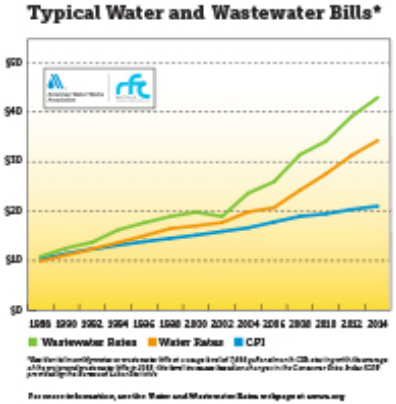
Investment Gaps and Potential Sources of Funding

	Transportation	Water	Communications	Energy
Forecasted Annual Investment Gaps	$2.7 billion	$1 billion	$70 million	N/A Largely private utility investment
Forecasted Investment Gaps Over the Next 20 Years	$40 billion	$19 billion*	$600 million	N/A
Potential Sources of Funding	- Federal funding - Mileage-based user fee - Gas tax increase - Registration fee increase - Local revenue options expansion - Public and private partnerships	- Water rates aligned with investment needs - Water infrastructure user fees	- Private investment - Federal funding - Provider rights-of-way fee increases - Subscriber surcharges	- Private investment - Continual improvements and updates in the state and federal decision-making processes
	• Dedicated sales tax for infrastructure • Dedicated statewide property tax			

* This figure includes an estimated $800 million annual gap in water and sewer infrastructure needs. This is considered a conservative estimate using the best information available. As condition assessments are completed, this estimate is expected to increase.

Inflationary pressure on water costs and prices

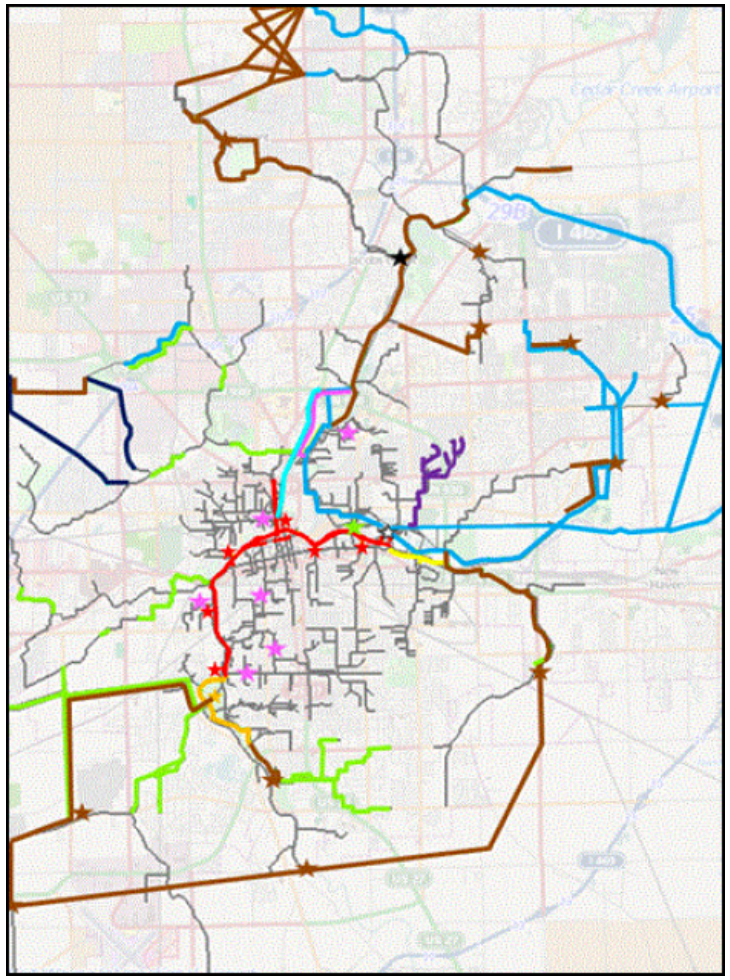
- Water system cost and price profiles vary substantially
  - By system type, age, and location
  - Water, wastewater, and stormwater costs may be combined
  - Prices of
  - ly owned systems are higher (taxes, returns, practices)
- Capital cost pressures
  - Combined infrastructure needs of $1 trillion need over the next 25 years
  - Asset valuation at fair value for acquisitions – a major threat
- Operating cost pressures
  - Labor, energy, chemicals, and purchased water
  - Quality standards and compliance costs
  - Lead service line replacement
  - New contamination threats
  - Water supply constraints
  - Population growth (locational)



- Flat or declining water usage (pricing, programs, population, recession)
- Move to full-cost pricing as a fiscal necessity for local government (vs. taxes)
  - Promoted by economists, consultants, and regulators (including EPA)
  - Investor-owned utilities invariably charge full cost, including overhead, taxes, & returns

Closing the funding gap

- Closing the funding gap from the top:
  - Efficiency practices
  - Technological innovation
  - Market-based approaches (bidding)
  - Industry restructuring
  - Integrated resource and asset management
  - System (re)optimization relative to demand
- Closing the funding gap from the bottom:
  - Public funding for infrastructure
  - Cost-based rates for water service
  - Comprehensive economic regulation by PUCs address costs and rates
  - EPA's four pillars: management, efficiency, pricing, watershed protection

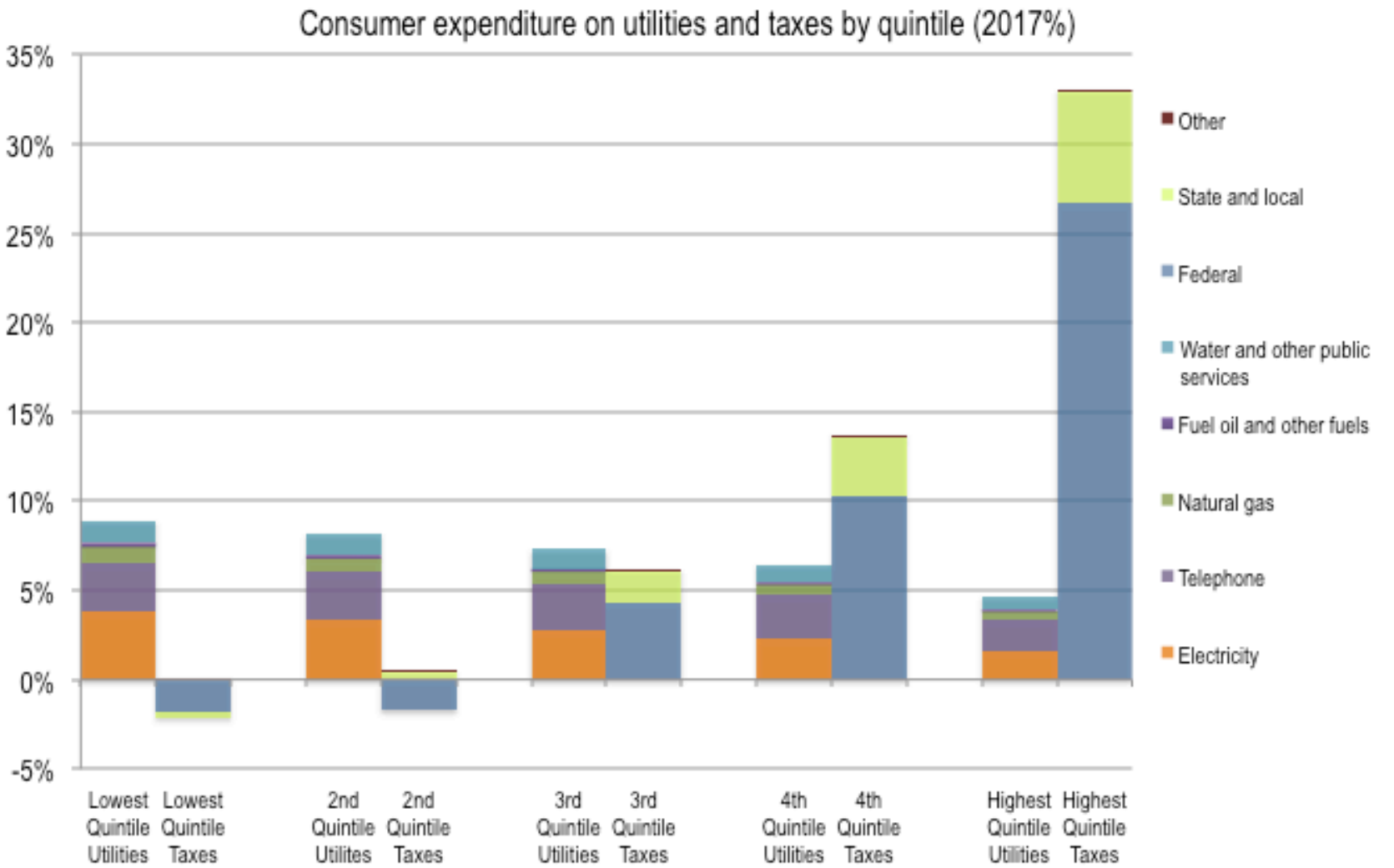


Infrastructure funding vs. financing

- Funding for infrastructure is from taxpayers (federal, state, or local) or ratepayers (user fees, charges) – increasing emphasis on ratepayers
  - Rates are more regressive and taxes can be less regressive
  - Capital financing comes from debt or higher cost private debt and equity
  - Funding & financing options can be combined - privatization is not a source of “funding”
- Utility enterprise model and full-cost pricing are strongly favored over taxes
  - Regardless of economic or social basis – compare to historical experience
  - Institutional constraints undermine investment and pricing (MI’s Headlee and Bolt)

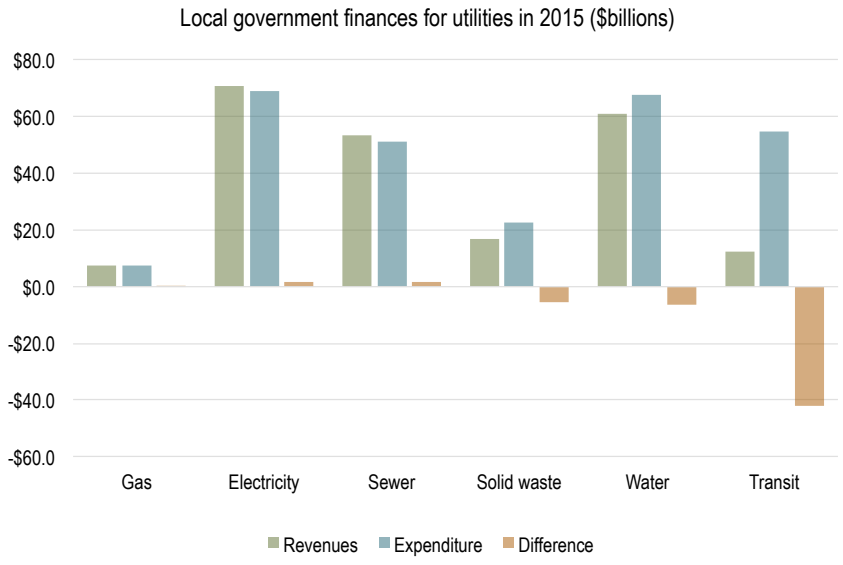
		Capital financing	
		Public (debt)	Private (debt and equity)
Capital funding	User fees	Public enterprise	Private enterprise
	Taxes	Public service	Private partnership

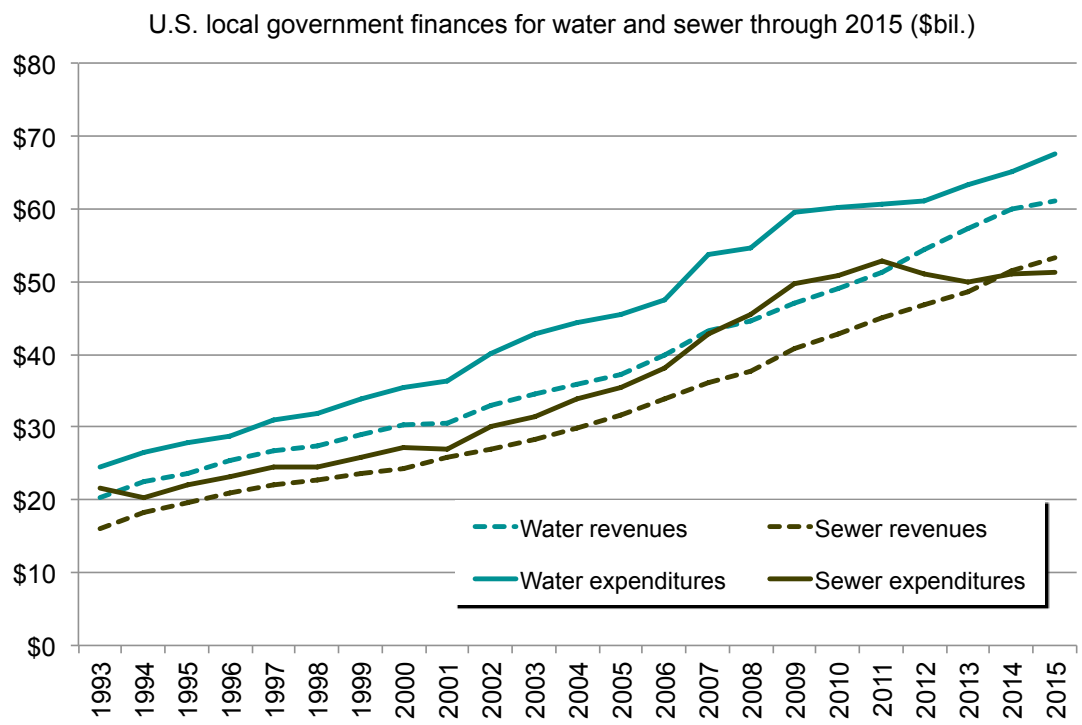
Differential effects of utility rates and taxes



Source: IPU-MSU based on BLS data.

Publicly owned utilities: local finances





Sustainable utility enterprises

System revenues relative to expenditures	System 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 revenues are below expenditures (“price avoidance”)	Deficient system	Subsidized system	Budget-deficit system
= 1 revenues are equal to expenditures	Underinvesting system	SELF-SUSTAINING SYSTEM	Overinvesting system
> 1 revenues are above expenditures (“profit seeking”)	Revenue-diverting system	Surplus system	Excessive system

Cost of service and its recovery

<table>
<tr><th colspan="2">Societal level</th><th colspan="3">System level</th><th>Ratepayer level</th></tr>
<tr><th>Full social cost</th><th>Full economic cost</th><th>Full-cost accounting</th><th>Full-cost recovery</th><th>Full-cost pricing</th><th>Fully allocated pricing</th></tr>
<tr><td>Environmental, economic, social externalities (spillovers)</td><td>|
|
|
|
v</td><td></td><td></td><td>|
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|
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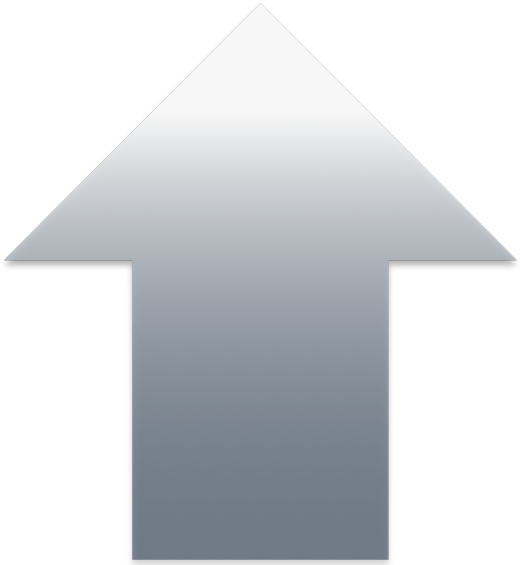
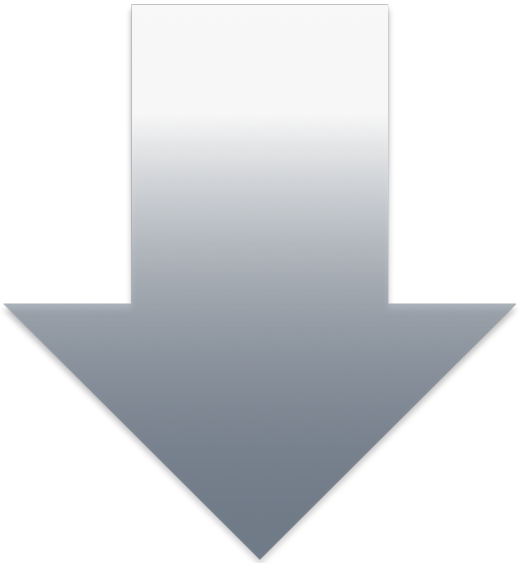
v</td><td></td></tr>
<tr><td colspan="2">Opportunity and avoided costs</td><td></td><td></td><td>|
v</td><td></td></tr>
<tr><td colspan="2" rowspan="2">Accounting costs</td><td rowspan="2">• Capex (debt and equity)
• Opex
• Depreciation
• Taxes
• Reserves</td><td>• Federal and state grants
• Lease and other income
• Property taxes
• General fund transfers</td><td>|
|
|
|
v</td><td></td></tr>
<tr><td colspan="2">• Customer rates
• Other user fees and charges
• System development charges (growth)</td><td>Individualized based on cost causality</td></tr>
</table>

Economics of price signals and welfare effects



Prices too high

Extracts rents from essential usage (Ramsey pricing)
Regressive deprivation and endangerment
Drag on the local economy (income effect)
Excess capacity and stranded investment
High reserves and transfers from system
Foregone revenues (lost sales, theft, bypass, defection)

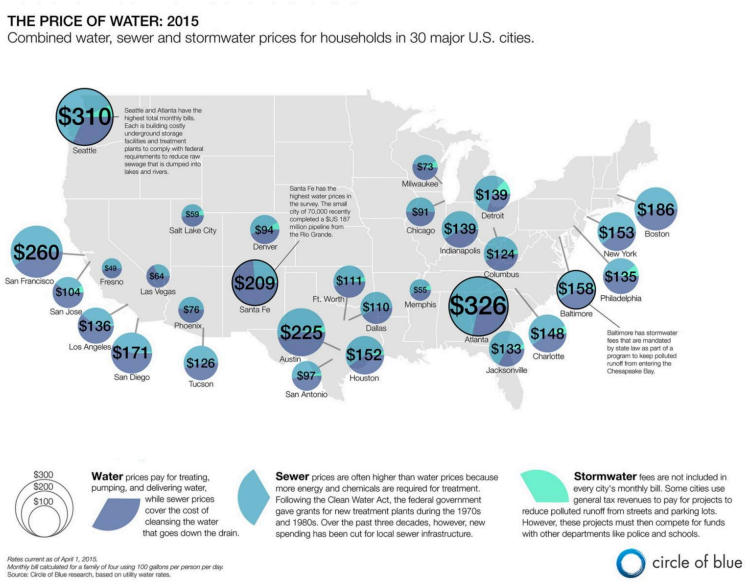


Prices too low

Weakens price signals for discretionary usage
Excessive and wasteful use of resources
Inadequate infrastructure investment
Poor capacity utilization and congestion
Low reserves and subsidies to system
Financial effects of revenue inadequacy

Modern criteria for evaluating utility rates*

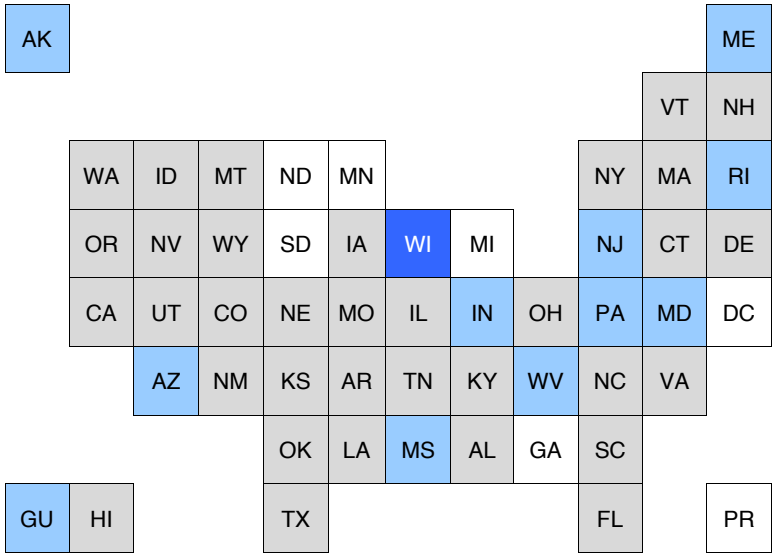
- Criteria
  - Financial viability
  - Economic efficiency
  - Equitable allocation
  - Operational performance
  - Network optimization
  - Environmental stewardship (social equity)
  - Distributive justice (social equity)
- Constraints and considerations
  - Understandable, unambiguous, and transparent
  - Technically feasible and cost effective
  - Legally defensible and politically acceptable



*Building on Bonbright (1961)

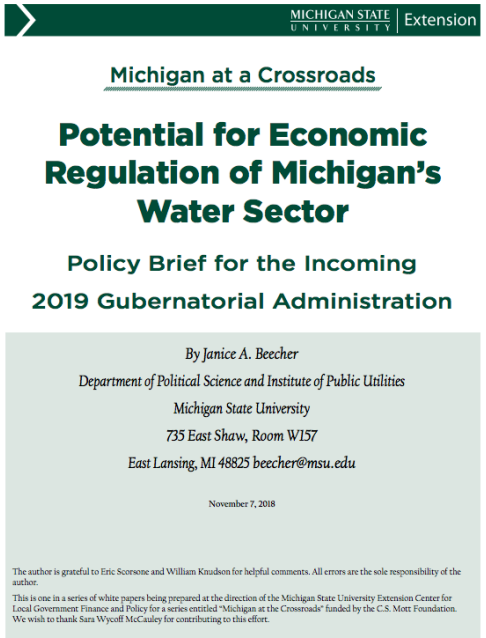
Economic regulatory jurisdiction for water

- Michigan is one of six U.S. jurisdictions that has no economic regulatory jurisdiction for the water sector
- Regulation "in the public interest"
  - substitutes both for competitive market and governmental provision of the monopolies providing essential services at just and reasonable rates
  - Regulation is protective of both utilities and ratepayers



Private only
Private and more
Comprehensive

IPU**MSU**
Source: Surveys by IPU and Wisconsin PSC.



MICHIGAN STATE UNIVERSITY | Extension

Michigan at a Crossroads

Potential for Economic Regulation of Michigan's Water Sector

Policy Brief for the Incoming 2019 Gubernatorial Administration

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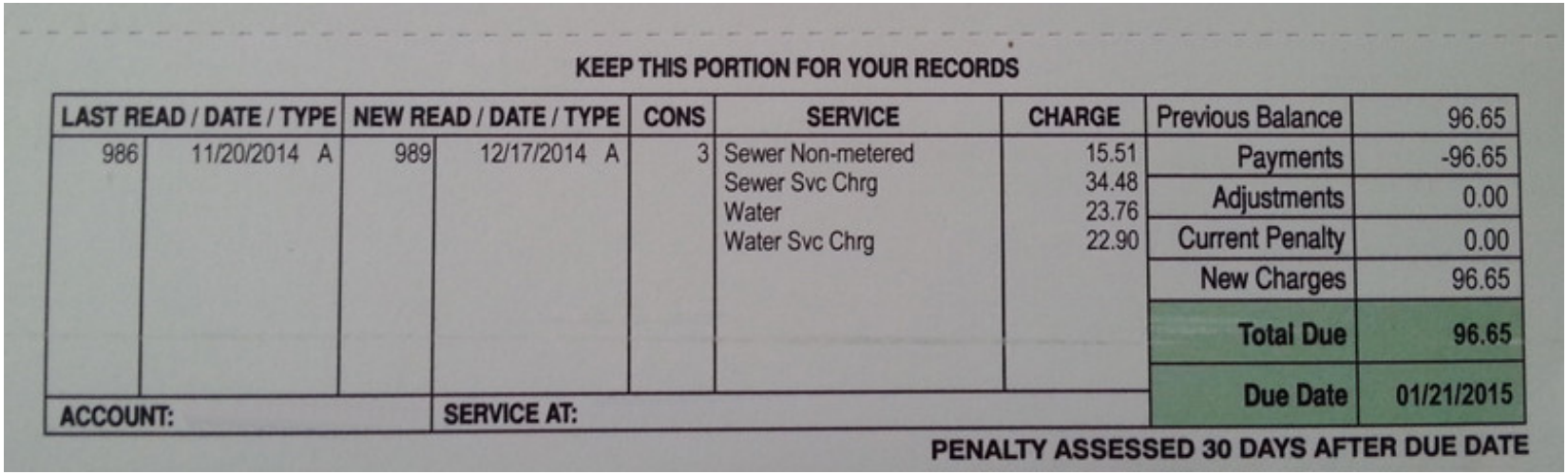
November 7, 2018

The author is grateful to Eric Scorsone and William Knudson for helpful comments. All errors are the sole responsibility of the author.

This is one in a series of white papers being prepared at the direction of the Michigan State University Extension Center for Local Government Finance and Policy for a series entitled "Michigan at the Crossroads" funded by the C.S. Mott Foundation. We wish to thank Sara Wycoff McCauley for contributing to this effort.

Defining affordability for water (AWWA, M1)

- Affordability may be defined in terms of the ability of
  - Poorest households in the service area to afford their water and wastewater bills.
  - Average or median household in the service area to afford its water and wastewater bill.
  - An unconnected household or business to afford connection
  - Community to bear the total costs of providing water infrastructure and services.
  - Community to afford these costs as measured by the USEPA or other relevant entities.
- How EPA measures affordability for regulatory purposes (currently debated)
  - Water at 2.5% of MHI and wastewater: 2% of MHI (4.5% total)
  - Infers a combined annual water and wastewater bill of 4.5%
  - AWWA and others have also adopted similar metrics



KEEP THIS PORTION FOR YOUR RECORDS

LAST READ / DATE / TYPE		NEW READ / DATE / TYPE		CONS	SERVICE	CHARGE
986	11/20/2014 A	989	12/17/2014 A	3	Sewer Non-metered	15.51
					Sewer Svc Chrg	34.48
					Water	23.76
					Water Svc Chrg	22.90

Previous Balance	96.65
Payments	-96.65
Adjustments	0.00
Current Penalty	0.00
New Charges	96.65
Total Due	96.65
Due Date	01/21/2015

ACCOUNT: SERVICE AT:

PENALTY ASSESSED 30 DAYS AFTER DUE DATE

Alternative metrics (Teodoro, 2018)

- Convention methods are flawed and may be misleading
- Proposed method
  - Measures household-level affordability (rather than the entire utility's financial capability)
  - provides for basic water needs (rather than average consumption)
  - Focuses on low-income households (not average- or median-income customers)
  - Accounts for essential costs other than water and sewer
- Two complementary metrics
  - AR = affordability ratio
  - AR_{20} = at the 20th income percentile
  - HM = hours of labor at minimum wage

TABLE 2 Affordability metrics for Dallas, Tex.[a]

A. Basic monthly water and sewer cost	$59.82
AR	
B. AR_{20} annual income	$18,585.00
C. Monthly income (B ÷ 12)	$1,548.75
D. Estimated monthly essential expenses[b]	$864.11
E. Monthly disposable income (C – D)	$684.64
AR_{20} (A ÷ E)	8.74%
HM	
F. Minimum wage per hour	$7.25
HM (A ÷ F)	8.25

AR—affordability ratio, AR_{20}—affordability at the 20th income percentile, HM—hours of labor at minimum wage

[a]Based on 2017 rates
[b]Estimates based on regression analysis of 2015 Consumer Expenditure Survey. See appendix.

Affordability policy options

- Payment credits or assistance (including voluntary funding)
- Tax exemption for water bills
- Arrearage forgiveness
- Budget billing
- Bill timing (monthly)
- Payment convenience (kiosks)
- Lifeline and other rate structures
- Smart meters (tamper resistant)
- Service limiters (time or flow limited)
- Coordinated outreach and counseling
- Disconnection policies (including prohibition)
- Prepaid meters (self-rationing, self-disconnection)
- Tailored efficiency programs and dynamic pricing
- Fixed charges calibrated to property values with usage allowance (water)

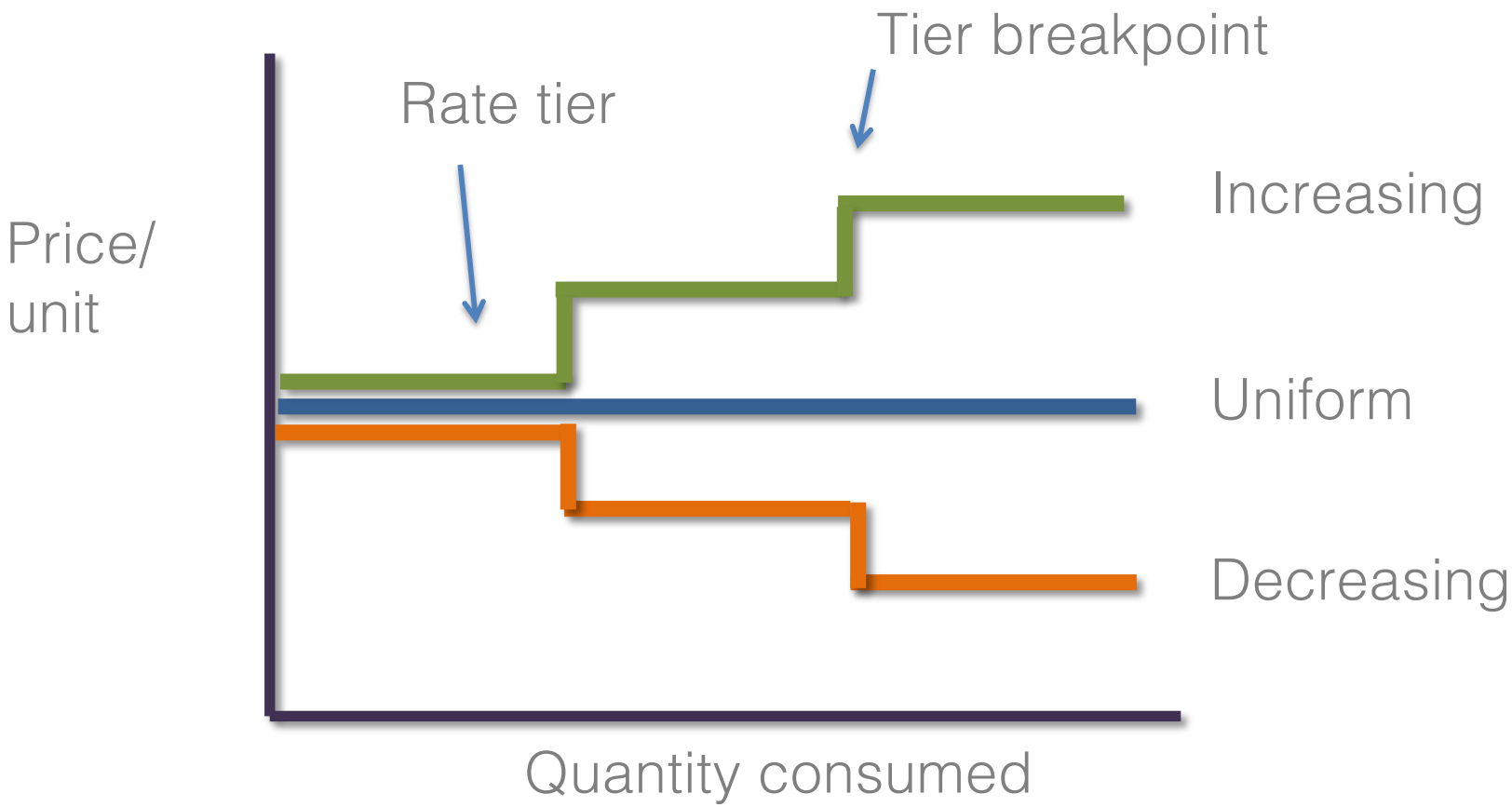
Options identified for Michigan (Detroit and Flint)

February 8, 2016

The rationale for customer assistance programs

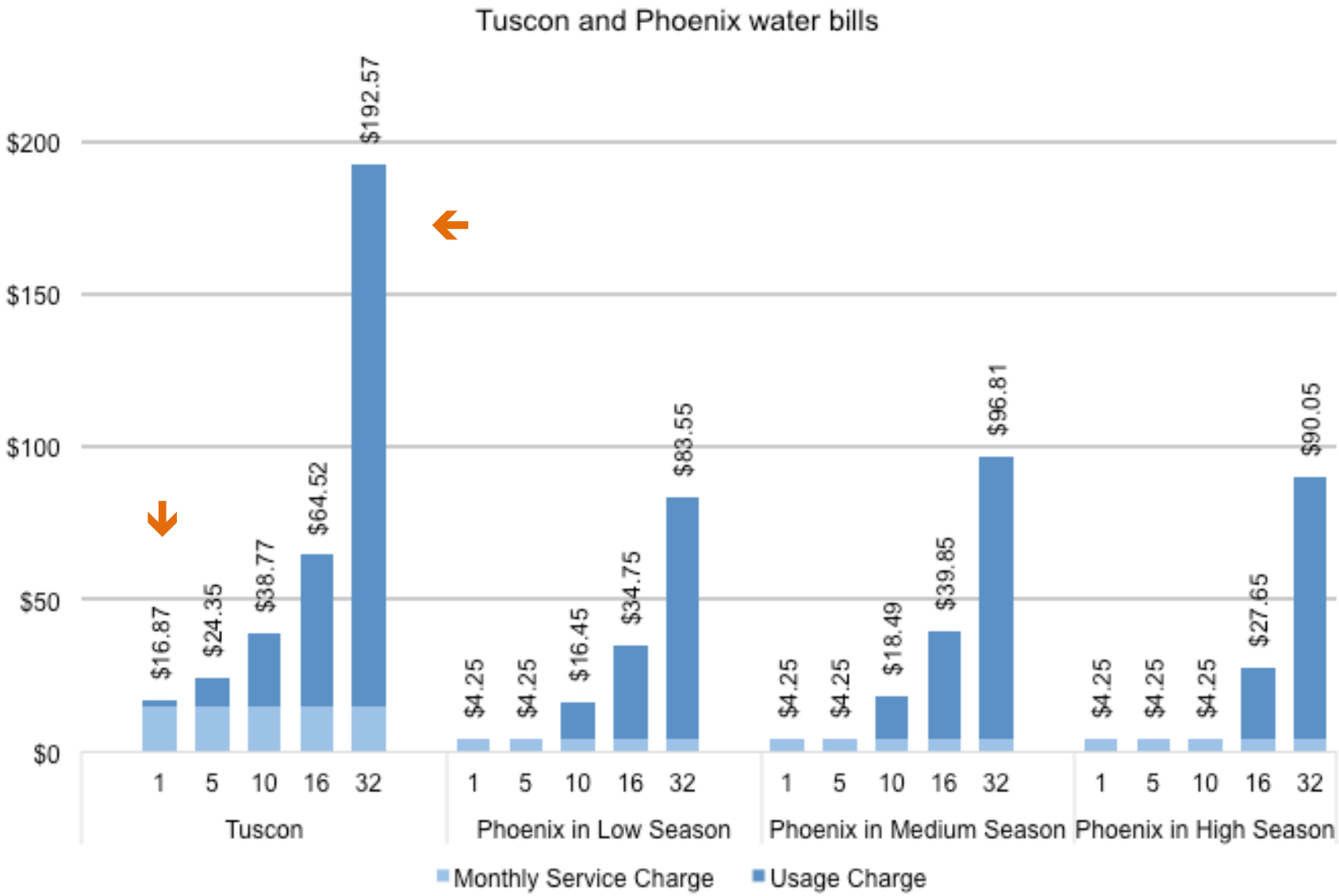
- Utility funded customer assistance programs
  - Emphasize an enterprise model based on full-cost recovery and pricing without subsidy
  - Presume public tax support will be prohibited by law, unavailable, or insufficient
  - Easier for larger systems with a diverse customer base, lower costs, and lower poverty
- Business case
  - "Frequent service shut-offs and resolving bad debt from customers who cannot afford their rates can be more expensive for a utility than instituting a CAP and assisting customers in paying their bills."
  - "Utilities might use this argument that differences in rates based on income are justified, not only because it is socially responsible but because it helps the utility operate more efficiently."
  - "The benefit to the utility of having discounts or lower rates for low-income customers is the increased likelihood of collecting payment from these customers; the subsidy makes it possible for these customers to pay more of their bills more regularly and promptly"(Curley 2014)." (Mehan and Gansler, 2017)
- Regulatory issues
  - Cost recovery from ratepayers is also regressive and will impact the near poor
  - Program audits to ensure proper use of funds and program effectiveness (metrics)
  - Expansion, enhancement, and consolidation of existing programs (i.e., LIHEAP)

Basic rate design options



Note: rate blocks can be understood like income taxes, that is, rates usually are incremental or marginal and the customer's bill reflects cumulative calculations.

Progressive design depends on details and perspectives

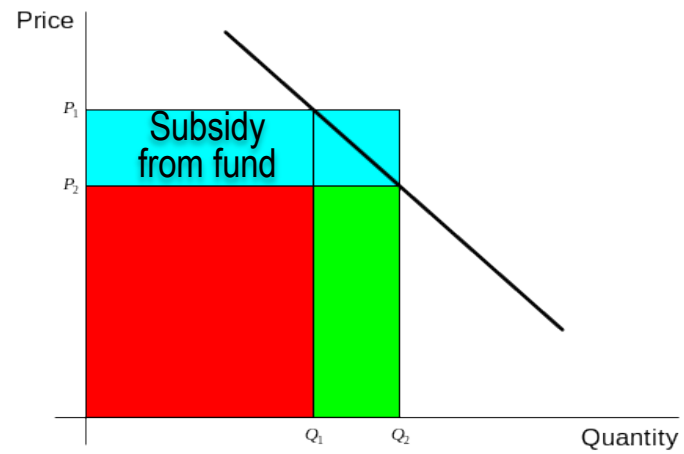


Fixed vs. variable charges: tradeoffs

Recovering more costs from fixed charges	Recovering more costs from variable charges
Static view of infrastructure (more sunk costs)	Dynamic view of infrastructure (less sunk costs)
Enhances revenue stability (less sales revenue risk to utility)	Reduces revenue stability (more sales revenue risk to utility)
Weakens price signals (less resource efficiency)	Strengthens price signals (more resource efficiency)
Familiar & understandable but less acceptable (more predictable and less controllable)	Familiar & understandable but more acceptable (less predictable and more controllable)
Less affordable for low-income households (more regressive)	More affordable for low-income households (less regressive)
Encourages self supply and grid defection (may raise some costs)	Preserves grid supply and participation (may lower some costs)
Possible advantage for combined households (one fixed customer charge)	Possible stability from first blocks (relatively inelastic usage)

Pricing to promote access and affordability

- Pricing and affordability
  - First usage block is highly price-inelastic: use standards, programs, assistance, lifelines
  - Additional blocks of usage are price-elastic: set prices to encourage efficiency
- Lifeline rates
  - Limited by policies and practices related to price discrimination and subsidies
  - Programmatic discounts to qualified customers (low-income, seniors)
  - Low-priced first block, sometimes including a quantity allowance
- Income-based rates and rates based on family size
  - Does not comport with legal and practice frameworks (discrimination not based on cost)
  - Intuitive but complicated and expensive to administer and not necessarily equitable



Water usage by income level

- Low income does not always mean low usage
- Low-income customers are unlikely to drive peak demand and related costs
- Low-income customers can be price sensitive, even for essential usage

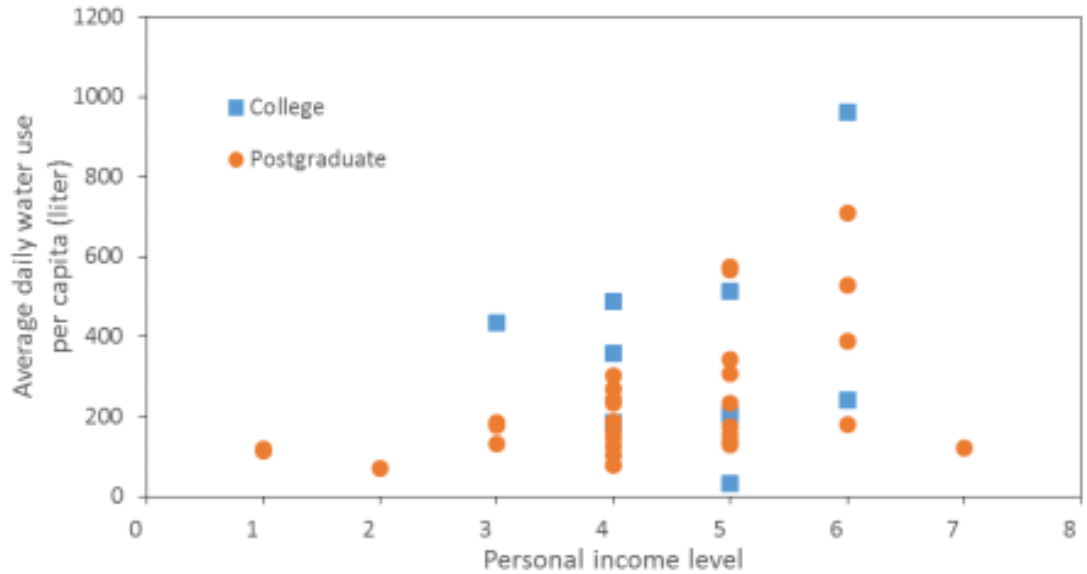


Fig. 7 Average DWU *per capita* with personal income and education

Source: LBL (2017).

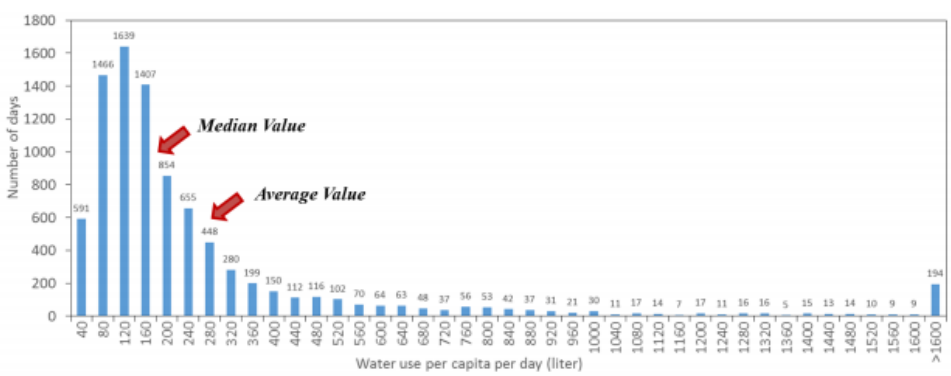


Fig. 8 Frequency distribution of DWU among 50 houses

Why not income-based rates?

- Communities should have discretion to design their rates and address equity
  - Income-based and “lifeline” rates have intuitive appeal – e.g., Philadelphia Water Dept.
- Implementation issues
  - Depart from prevailing legal and practice frameworks (cost-based pricing, efficiency)
  - Resistance from consultants, utilities, ratepayers, regulators, politicians
  - Subject to legal challenge based on undue discrimination (based on cost of service)
  - Complicated and expensive to administer and consumer privacy issues (income data)
  - Income is an imperfect measure – can be distorted, gamed, and does not reflect wealth
  - Averages and medians for costs and income mask wide variations
  - Thresholds are arbitrary and at any level (e.g., 2%), the near-poor will subsidize the poor
  - Price signals remain relevant for discretionary water usage
- An inclusive progressive rate structure can ensure affordability for essential use
  - Can be reconciled with cost-of-service principles
  - Lower cost of implementation and less distortion
  - May be perceived as more fair and equitable (vs. “targeting”)
- Considering family size in rate design
  - Family size raises issues of choice affecting cost of service
  - Assistance programs take both income and children into account
  - Also imperfect and administratively complicated
  - Utilities can also provide medical exceptions


For low-income residents, Philadelphia unveiling income-based water bills

Updated: JUNE 19, 2017 – 11:11 PM EDT

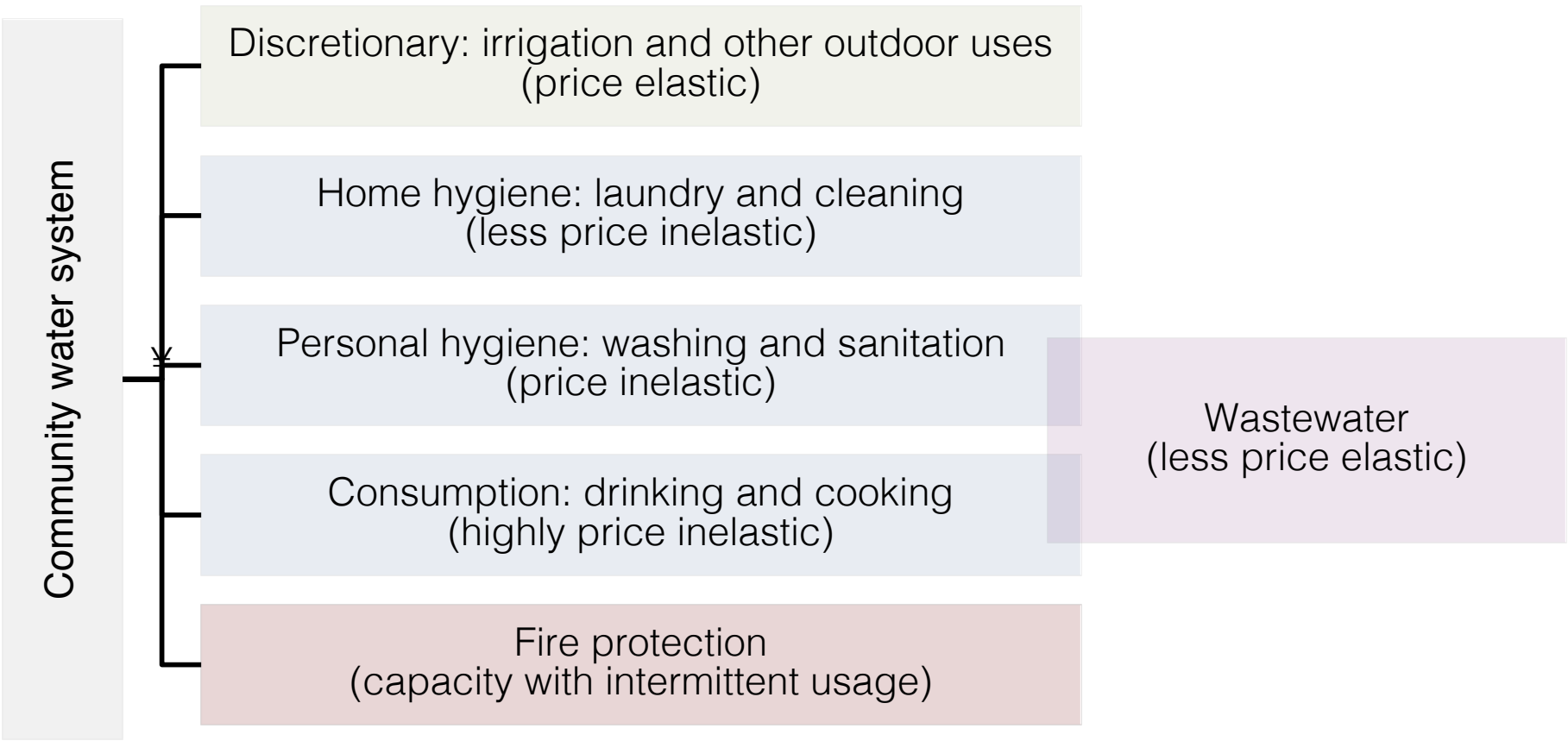
Buy Photo

FILE PHOTO

The Philadelphia Water Department will launch a new low-income assistance program that offers payments starting at $12 per month.

Water systems: five products, one set of pipes

- Water systems are actually service “co-generators” of differentiated products
  - Essential water usage is nondiscretionary – not conducive to private model price signals
  - Water and wastewater services are symbiotic and can be bundled
  - Wastewater is a byproduct and a resource – water, energy, and nutrients



Public fire protection costs (Wisconsin study)

Figure 10. Public Service Commission Cost-of-Service Model

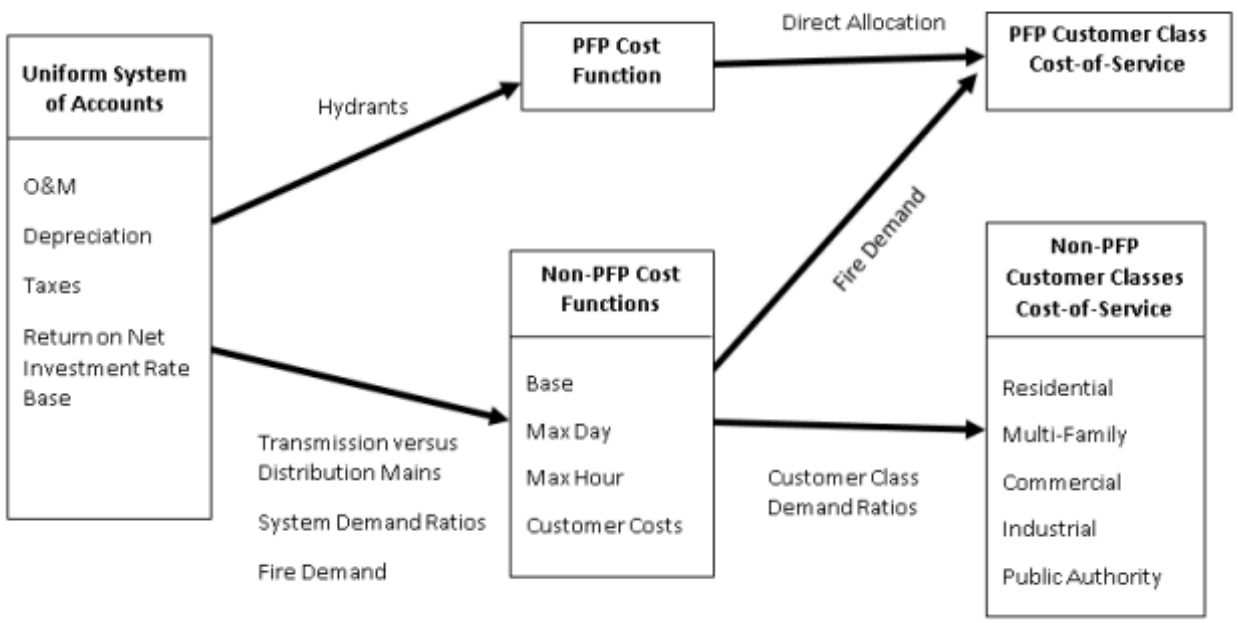


Table 3. Average PFP Cost-of-Service as a Percentage of Total Cost-of-Service (n=218)

Utility Class	Averge PFP Cost-of-Service as Percentage of Total Cost-of-Service
AB	18%
C	29%
D	34%

A new paradigm: universal equity-efficiency rate (Beecher)

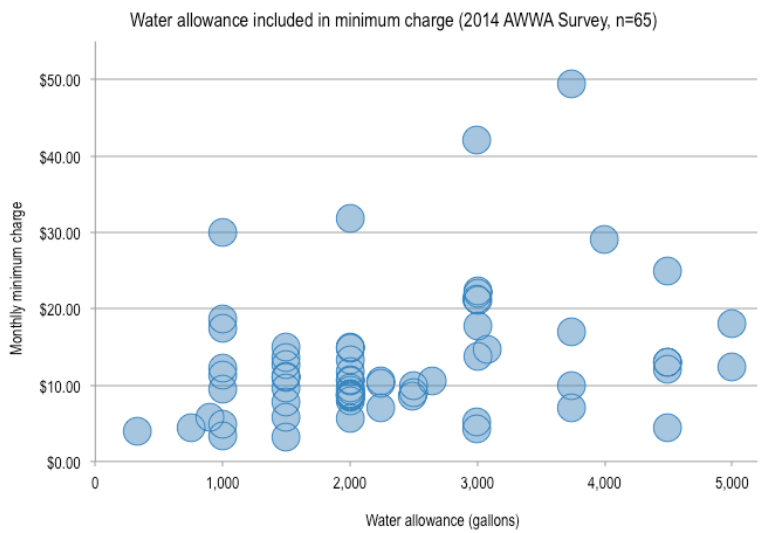
- Universal, principled, and defensible – applicable to all water customers
  - May become more relevant for network-intensive industries
  - Theoretical, practical, and normative support – possible stakeholder appeal
- Minimum bill (tax-exempt) calibrated to assessed property value
  - Constitutes a demand-correlated network capacity charge
  - Includes an essential usage allowance for all households
  - Additional customer assistance may be needed
- Three water usage blocks
  - First: essential usage based on public health criteria (included in minimum bill)
  - Second: basic usage priced with a uniform volumetric rate
  - Third: discretionary usage priced for efficiency based on marginal cost
- Prohibit water service disconnection
  - Disconnection is not good business, governmental, or social practice
  - Implement service (flow) limiter instead of disconnection (shutoff)
  - Flow, volume, or time-limiting (tamper-proof valves, meters)

A new paradigm: rationale (Beecher)

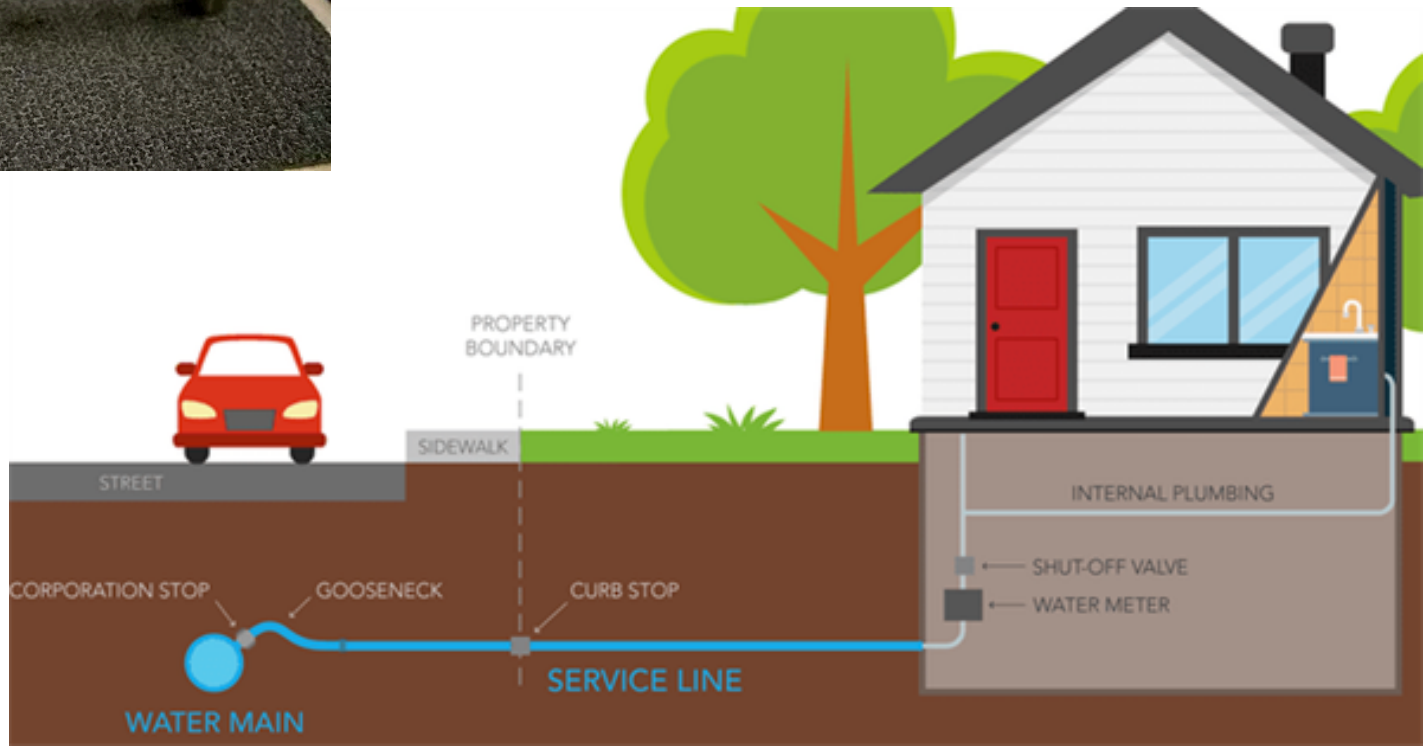
- Theoretical rationale
  - Reconciles theory and conceptions of efficiency and equity (cost of service)
  - Consistent with full-cost recovery and enterprise model for utilities
  - Provides a mechanism for supporting network capacity based on demand
  - Maintains economic price signals for discretionary usage (where they matter)
  - Recognizes non-allocable cost and value of public fire protection
  - Added theoretical support: insurance, taxation, social-good, historical pricing models
- Practical rationale
  - Co-benefits of “base” capacity for system health, public health, fire protection
  - Mitigates effects of rising costs and declining usage on low-income & low-volume users
  - Cost-effectiveness and implementation ease (vs. disconnection, income-based rates)
  - Provides revenue and rate stability to maintain the distribution network
  - Makes use of tax information but is still a user fee and not a tax
  - Adaptable as to details (allowance based on family size, block pricing, prepayment)
- Normative rationale
  - Consistent with broad principles of social equity and fairness
  - Human right to water and sanitation (security) and protection of innocents (children)
  - Not just a business case for compassion – but a compassion case for compassion

Usage allowance

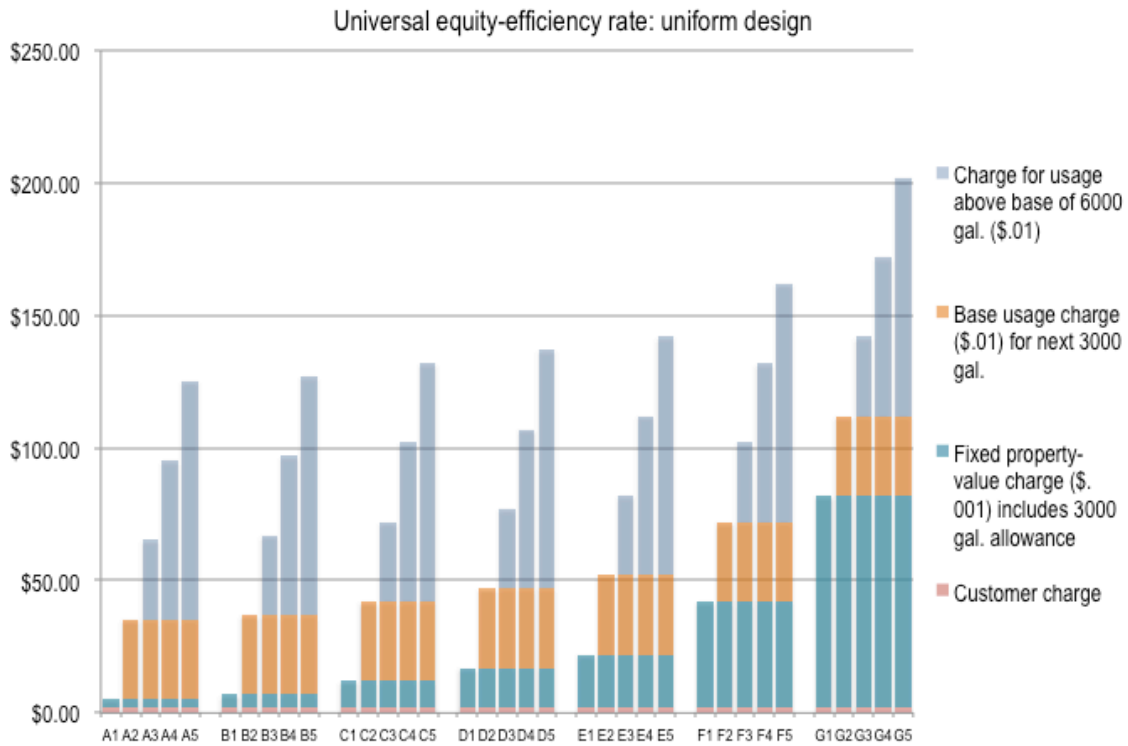
- Inclusion of a usage allowance in a fixed tax-exempt minimum bill
  - Useful in satisfying preference for universal equity (fairness)
  - Distorts end-use efficiency incentives only if usage is discretionary
  - May be more appropriate for water given storability, renewability, and externalities
- World Health Organization recommendations
  - Minimal provision of 50-100 liters per person per day for human health
  - Consider default at 25 gpcd (100 liters) or about 3,000 gal. per family per month
  - Indoor household usage in the U.S. varies but generally exceeds this amount
- Timely metered consumption data would facilitate self-rationing

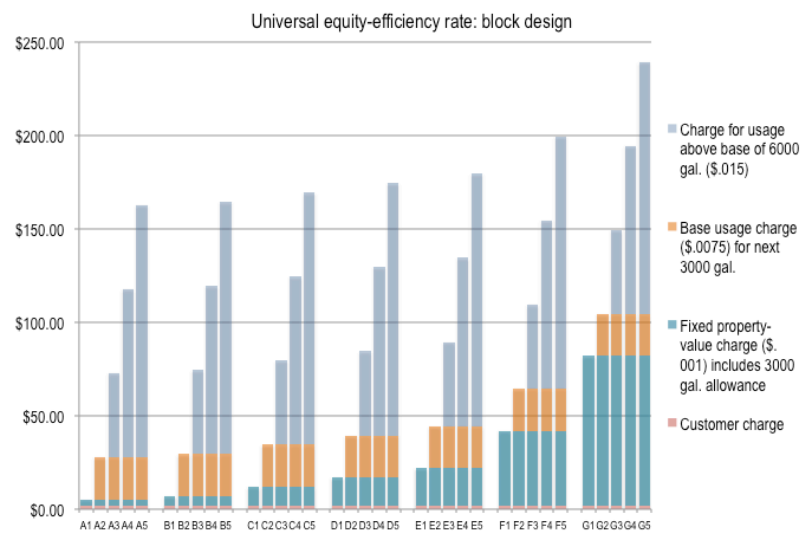


Flow restriction



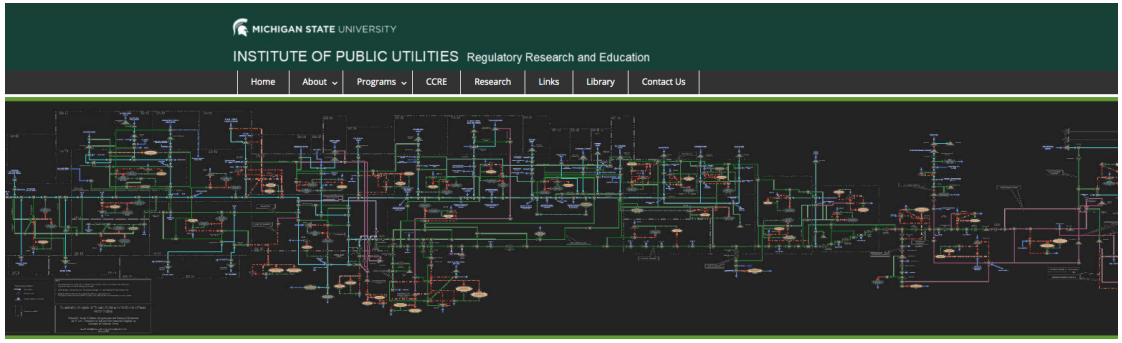
Universal equity-efficiency rate (Beecher)





IPU's Ratemaking Course

- Focusing on the financials for a high-performing regulated water utility
  - University sponsored and professionally designed and delivered
  - Comprehensive but concise (2.5 days)
- Topics covered
  - Foundations of Public Utility Ratemaking
  - Capital Expenditures (Capex)
  - Operating Expenditures (Opex)
  - Financing Utility Infrastructure
  - Cost Allocation and Rate Design



IPU Ratemaking Course – New for 2019!

A concise and comprehensive introduction to public utility accounting, financing, and pricing to ensure sustainability and protect ratepayers. Interactive exercises make use of data for an actual water company and rate case.

WHAT

IPU Ratemaking Course 2019: Agenda and Faculty

Open to everyone but space is limited to 90 attendees to ensure an optimal learning experience.
Eligible for continuing education credits, including IPU's CCRE.
Please note that this is the only CCRE eligible ratemaking course.

WHEN

Sep. 30-Oct. 2, 2019
The program begins at 8:15 am on Monday (Sep. 30) and ends at 2:00 pm on Wednesday (Oct. 2).

April 13-15, 2020
The program begins at 8:15 am on Monday (April 13) and ends at 12:30 pm on Wednesday (April 15).

Ratemaking Course

- REGISTRATION ONLINE
- Registration PDF
- Program Agenda and Faculty
- Program materials
- Evaluation
- Visiting MSU