

# Utility Rate Making

## Brian Browne

### Components of a rate

- Numerator (\$)
  - divided by
- Denominator (volumes/flow)  
= Quotient \$/Ccf, \$/MGD, \$/AF  
(AKA a rate)

# Utility Rate Making

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- Revenue requirements approach to rate making
- Assumes revenues will be equal to all allowable and reasonable costs
- Revenues equal rates times quantity
- This method usually subsumes effective oversight as to allowable and reasonable
- Costs pertain to human and non-human capital – contracts, equipment acquisitions, employment (resume misfits) – the whole nine yards

# Utility Rate Making

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American Water Works Association in 1991 identified two algebraic methods for calculating revenue requirements

- Revenue requirements for investor owned utilities
- Revenue requirements for municipal utilities

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### Utility Regulation

California (generally throughout the USA)

- Investor owned utilities are regulated by the California Public Utilities Commission (CPUC)
- Municipal utilities, San Francisco Public Utilities Commission (SFPUC), are self-regulating
- A note worth exception – The Master Water Sales Agreement (1984-2009) between SFPUC and the suburban customers represented by the Bay Area Water Supply and Conservation Agency (BAWSCA) uses the CPUC regulatory model.

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- Method 1 -- Investor Owned Utilities
- $R = O + D + T + rB$
- Where:
- $B = \text{Rate base } (V - d)$   
 $V = \text{Rate base valuation}$   
 $d = \text{Accumulated depreciation}$   
 $R = \text{Revenue requirements''}$   
 $O = \text{Operations and maintenance expenses}$   
 $D = \text{Annual depreciation charges}$   
 $T = \text{Taxes}$   
 $r = \text{Permitted rate of return (cost of capital)}$

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### Method 1 – continued

- The permitted rate-of-return “ $r$ ” equals the weighted sum of the cost of debt capital and cost of equity capital:
  - $r = k(E/C) + i(I/C)$
  - Where:
  - $k$  = Cost of equity capital
  - $E$  = Total equity capital
  - $i$  = Cost of debt capital (a weighted average)
  - $I$  = Total debt capital
  - $C$  = Total equity and debt capital

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### Weighted Average Cost of Capital (Example/No Tax)

Computing the Weighted Average Cost of Capital (no tax)

	Percent Return	Percent	Percent WACC
Equity	7.50%	80.00%	6.00%
Debt	6.50%	20.00%	1.30%
WACC			7.30%

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- Method 2 - Self-regulating publicly owned utilities is:
- $R = O + T + D + C$
- Where:
- $R$  = Revenue requirements
- $O$  = Operations and maintenance expenses
- $T$  = Tax equivalents (other)
- $D$  = Debt-service payments (interest charges and principal)
- $C$  = Capital expenditures not financed by debt



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General milestones in constructing a rate

Step 1. Capitalization of build (construction) costs (\$K)

Step 2. Amortization of capitalized build costs  
level annual cost factor (LACF).

$$\text{LACF} = i * (1+i)^t / (1+i)^t - 1$$

Where  $i$  = coupon/interest rate and  $t$  = time in years

Step 3. Add in O&M costs & other costs for each  
year

Step 4. Divide total capital + O&M, + other costs by  
volumes

Step 5. Compute \$/Unit

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Calculating The Annual Capital Costs by  
 Multiplying the Total Capitalized Value by the  
 Level Annual Cost Factor (LACF)

Dollars MM (10 <sup>6</sup> )					
Capital Costs	0.08				
Amortized Period	10				
	Year Minus	Year Minus	Year minus	Year minus	Capitalized
	4	3	2	1	Value
Capital Costs					Start-Up
Planning	\$100	\$20			\$158
Environmental	\$10	\$10	\$30		\$60
Design/Build/Award		\$100	\$100	\$100	\$347
Construction/Closeout				\$30	\$32
Total	\$110	\$130	\$130	\$130	\$598
Level Annual Cost factor	0.14569				
Annual Capital Costs	\$87.18				

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Dollars MM (10%)	
Amortization of	\$598.38
Period	10
Coupon Rate	7.50%

Year	Principal	Interest	Total	Remaining Principal
1	\$42.30	\$44.88	\$87.18	\$556.08
2	\$45.47	\$41.71	\$87.18	\$510.61
3	\$48.88	\$38.30	\$87.18	\$461.74
4	\$52.55	\$34.63	\$87.18	\$409.19
5	\$56.49	\$30.69	\$87.18	\$352.70
6	\$60.72	\$26.45	\$87.18	\$291.98
7	\$65.28	\$21.90	\$87.18	\$226.70
8	\$70.17	\$17.00	\$87.18	\$156.53
9	\$75.44	\$11.74	\$87.18	\$81.09
10	\$81.09	\$6.08	\$87.18	-\$0.00

# O&M Costs

Operating Costs	Inflation	0.05									
\$ MM	\$Constant 07	Yr	Yr	Yr	Yr	Yr	Yr	Yr	Yr	Yr	Yr
O & M Costs		1	2	3	4	5	6	7	8	9	10
Operating wells	\$10.40	\$10.92	\$11.47	\$12.04	\$12.64	\$13.27	\$13.94	\$14.63	\$15.37	\$16.13	\$16.94
Pipeline transport cost	\$11.90	\$12.50	\$13.12	\$13.78	\$14.46	\$15.19	\$15.95	\$16.74	\$17.58	\$18.46	\$19.38
\$ MM	\$7.40	\$7.77	\$8.16	\$8.57	\$8.99	\$9.44	\$9.92	\$10.41	\$10.93	\$11.48	\$12.05
Other costs	\$4.80	\$5.04	\$5.29	\$5.56	\$5.83	\$6.13	\$6.43	\$6.75	\$7.09	\$7.45	\$7.82
Total O&M Costs	\$34.50	\$36.23	\$38.04	\$39.94	\$41.93	\$44.03	\$46.23	\$48.54	\$50.97	\$53.52	\$56.20

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### Total Revenue Requirements Capital, O&M and Other Costs

Assume 5 percent inflation

\$ MM	Yr	Yr	Yr	Yr	Yr	Yr	Yr	Yr	Yr	Yr
	1	2	3	4	5	6	7	8	9	10
O & M Costs										
Operating wells	10.92	11.47	12.04	12.64	13.27	13.94	14.63	15.37	16.13	16.94
Pipeline transport cost	12.5	13.12	13.78	14.46	15.19	15.95	16.74	17.58	18.46	19.38
Other annual costs – not capital	7.77	8.16	8.57	8.99	9.44	9.92	10.41	10.93	11.48	12.05
Other costs	5.04	5.29	5.56	5.83	6.13	6.43	6.75	7.09	7.45	7.82
Total O&M Costs	36.23	38.04	39.94	41.93	44.03	46.23	48.54	50.97	53.52	56.2
Annual Capital Costs	87.18	87.18	87.18	87.18	87.18	87.18	87.18	87.18	87.18	87.18
Total Costs = Revenues Required	123.41	125.22	127.12	129.11	131.21	133.41	135.72	138.15	140.7	143.38
Volumes	100	100	100	100	100	100	100	100	100	100
Dollars per Unit	1.23	1.25	1.27	1.29	1.31	1.33	1.36	1.38	1.41	1.43
Line loss 10 percent –Price at tap price	1.37	1.39	1.41	1.43	1.46	1.48	1.51	1.54	1.56	1.59

# Utility Rate Making

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### Rate Design

- Fixed or meter charges
- Commodity or flow charges
- Customer classes
  - Residential
  - Industrial
  - Commercial
  - Other
- **These charges must be designed so as to cover all reasonable and allowable costs. A separate and complex topic, including off peak/on peak and seasonal pricing, geographical, etc. etc.**

# Utility Rate Making

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- SFPUC claims that on completion of the CIP/WSIP that the Hetch Hetchy system will deliver on average 300 MGD/year
  - Historically SFPUC Claims 85 percent of HH system water comes from Tuolumne River and 15 percent from local sources.
- Is the SFPUC correct?

# Utility Rate Making

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Period		Local	Regional	Total		
		MGD	MGD	MGD		
1960-61-2005-2006	Average	94.05	144.98	239.03		
	Srd. Dev	11.16	30.72	28.17		
	Max	114.6	197.1	292.7		
	Min	76.3	65.6	167.6		
		Local	Regional	Total	Total TR	Ratio
		MGD	MGD	MGD	MGD	MGD
1970-71-2006-2006	Average	90.92	156.97	247.89	198.45	0.80
	Std. Dev	10.57	19.03	21.26	29.98	0.1
	Max	114.6	197.1	292.7	295.33	1.05
	Min	76.3	108.2	191.5	144.31	0.59



# Utility Rate Making

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### Historical Hetch Hetchy Deliveries vs CIP (WSIP)

