



# Long Term Capital Planning

Glenn Barnes

Environmental Finance Center

The University of North Carolina at Chapel Hill

919-962-2789

[glennbarnes@sog.unc.edu](mailto:glennbarnes@sog.unc.edu)



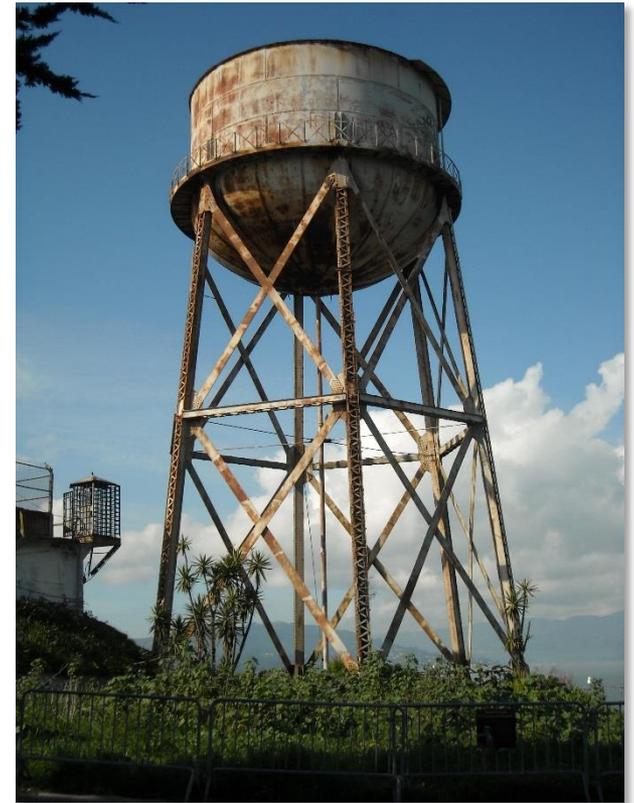
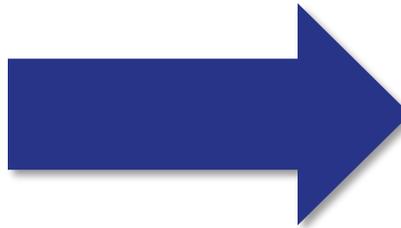
# Session Objectives

- Learn about two aspects of long-term system planning: asset management and capital planning
- Figure out how to pay for the future needs

# Capital Assets



# Infrastructure Wears Out





# In the Old Days...

- Water systems took advantage of the federal government's ambitious construction grants program of the 1970s and 1980s
- Everybody loved their “free” money



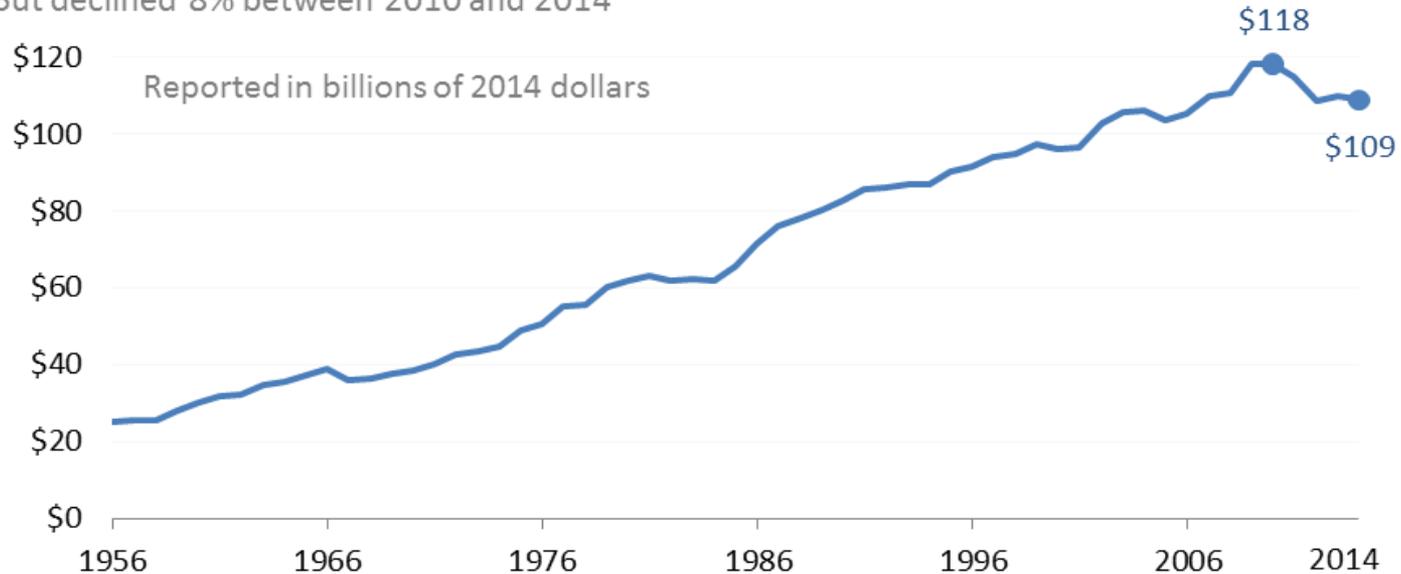
# Capital Finance Today

- The money never really was “free”—it came from tax dollars
- Today, there is a different philosophy of how to pay for water system capital improvements

# Total Public Spending Has Grown...

**Total federal, state and local government spending on water and wastewater utilities grew steadily over time**

But declined 8% between 2010 and 2014



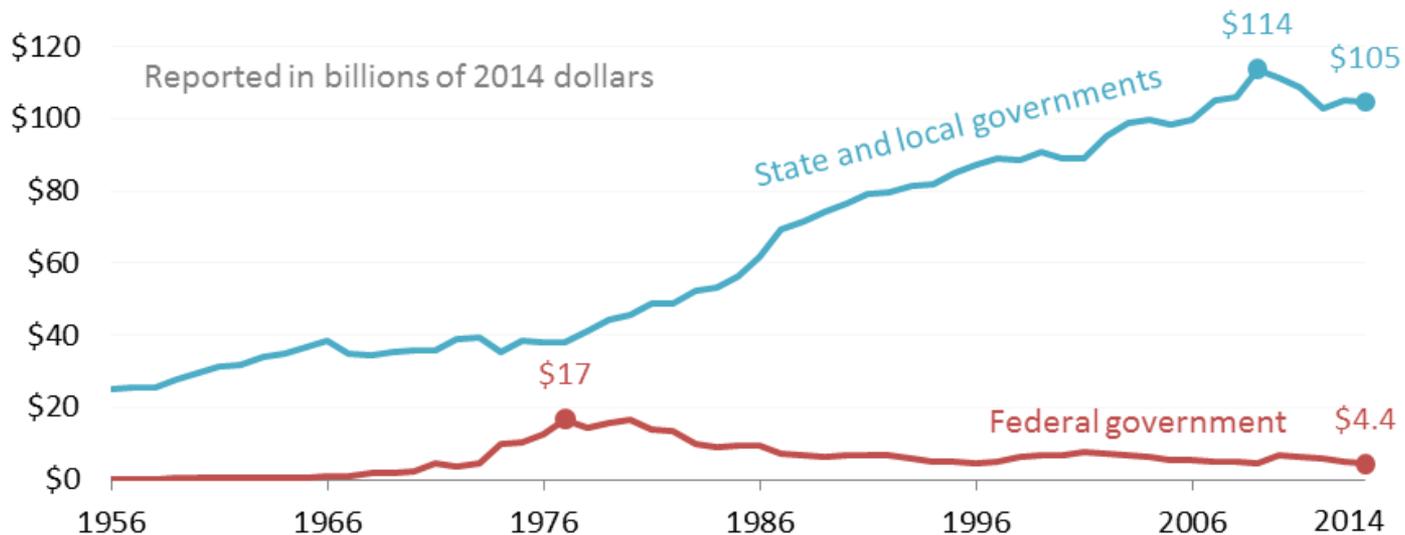
Graphed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.

Source: Congressional Budget Office supplemental data for the *Public Spending on Transportation and Water Infrastructure, 1956 to 2014* report (March 2015). Displays public spending on supply systems for distributing potable water as well as wastewater and sewage treatment systems and plants. Real spending is shown after adjusting nominal spending to their 2014 dollar equivalent using infrastructure-specific price indexes.

# ...Mostly from State and Local Governments

State and local government spending on water and wastewater utilities continued to grow while federal spending declined since the 1980s

State and local governments spent 24 times as much as the federal government in 2014

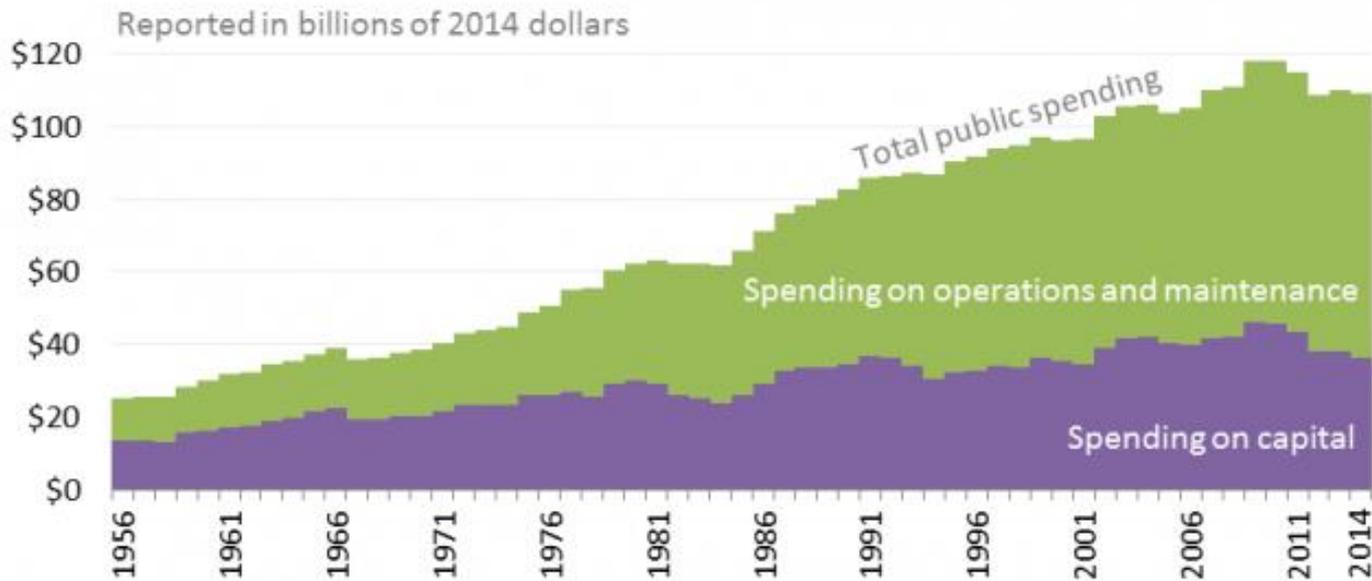


Graphed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.

Source: Congressional Budget Office supplemental data for the *Public Spending on Transportation and Water Infrastructure, 1956 to 2014* report (March 2015). Displays public spending on supply systems for distributing potable water as well as wastewater and sewage treatment systems and plants. Real spending is shown after adjusting nominal spending to their 2014 dollar equivalent using infrastructure-specific price indexes.

# ...And Mostly for O&M, not Capital

Federal, state and local government spending on water and wastewater utilities, 1956 - 2014



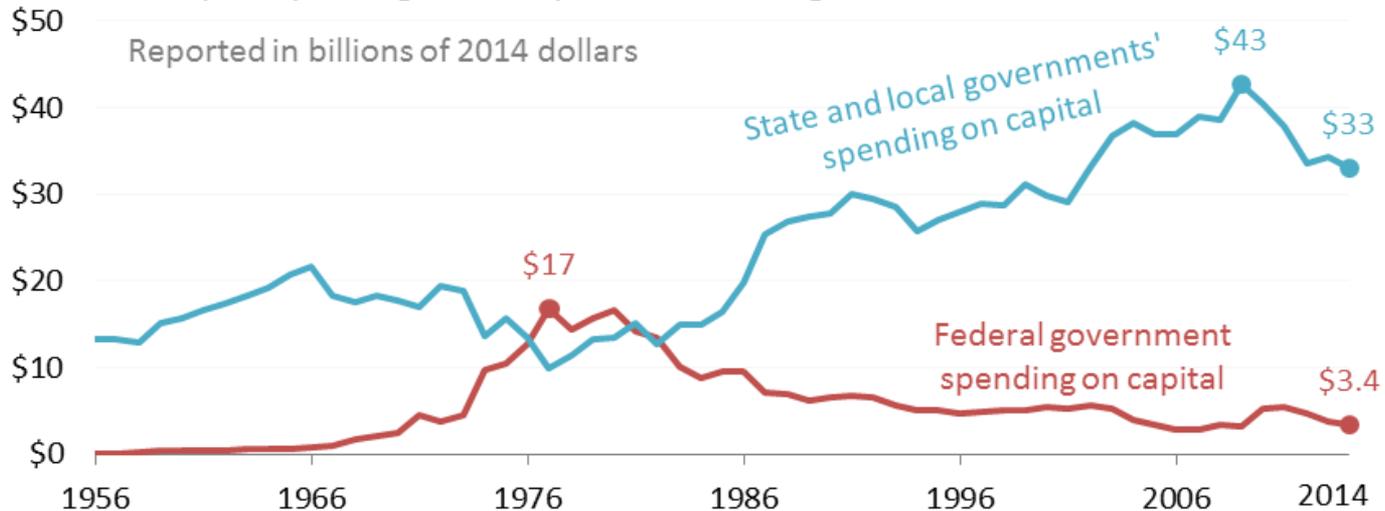
Graphed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.

Source: Congressional Budget Office supplemental data for the *Public Spending on Transportation and Water Infrastructure, 1956 to 2014* report (March 2015). Displays public spending on supply systems for distributing potable water as well as wastewater and sewage treatment systems and plants. Real spending is shown after adjusting nominal spending to their 2014 dollar equivalent using infrastructure-specific price indexes.

# Feds Used to Spend More on Capital

Spending on capital infrastructure for water and wastewater utilities has increasingly been provided by **state and local governments** while **federal spending on capital infrastructure** declined since the 1980s

Over 90% of capital spending occurs by state and local governments



Graphed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.

Source: Congressional Budget Office supplemental data for the *Public Spending on Transportation and Water Infrastructure, 1956 to 2014* report (March 2015). Displays public spending on supply systems for distributing potable water as well as wastewater and sewage treatment systems and plants. Real spending is shown after adjusting nominal spending to their 2014 dollar equivalent using infrastructure-specific price indexes.



# Capital Finance Today

- In other words, you pay (no sense in sugar-coating this)
- The reality is that water and wastewater infrastructure is expensive, regardless of the size of your system. Smaller or poorer systems will likely have a hard time paying for capital improvements



<http://efc.web.unc.edu/2015/09/09/four-trends-government-spending-water/>

Graphed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.  
Source: Congressional Budget Office supplemental data for the *Public Spending on Transportation and Water Infrastructure, 1956 to 2014* report (March 2015). Displays public spending on supply systems for distributing potable water as well as wastewater and sewage treatment systems and plants. Real spending is shown after adjusting nominal spending to their 2014 dollar equivalent using infrastructure-specific price indexes.

# Four Trends in Government Spending on Water and Wastewater Utilities Since 1956

SEPTEMBER 9, 2015 / SHADI ESKAF / 0 COMMENTS

 Print  PDF

According to data collected and published by the Congressional Budget Office (CBO), federal, state and local governments in the United States spent more than \$2.2 trillion in the last 59 years on operations, maintenance and capital infrastructure of water and wastewater utilities. That equates to more than \$4 131 000 000 000 in 2014 dollars adjusting for inflation of infrastructure-

# Poor Investment → Poor Infrastructure

2017  
INFRASTRUCTURE  
REPORT CARD

[Twitter](#) [Facebook](#) [LinkedIn](#) ASCE

[MAKING THE GRADE](#) [AMERICA'S GRADES](#) [STATE BY STATE](#) [SOLUTIONS](#) [THE IMPACT](#) [GET INVOLVED](#) [Search](#)



America's Infrastructure Scores a

**D+**

GET THE FULL STORY



# REPORT CARD

Aviation	<b>D</b>	Ports	<b>e+</b>
Bridges	<b>e+</b>	Public Parks	<b>D+</b>
Dams	<b>D</b>	Rail	<b>B</b>
<b>Drinking Water</b>	<b>D</b>	Roads	<b>D+</b>
Energy	<b>D+</b>	Schools	<b>D</b>
Hazardous Waste	<b>D+</b>	Solid Waste	<b>e+</b>
Inland Waterways	<b>D</b>	Transit	<b>D.</b>
Levees	<b>D</b>	<b>Wastewater</b>	<b>D+</b>



# ASCE Gives Drinking Water a **D**

- Bad news: ... much of our drinking water infrastructure is nearing the end of its useful life. ... estimated 240,000 water main breaks per year in the US. Assuming every pipe would need to be replaced, the cost ... could reach more than \$1 trillion, according to AWWA.



# ASCE Gives Drinking Water a **D**

- Good news: The quality of drinking water in the United States remains universally high. Even though pipes and mains are frequently more than 100 years old and in need of replacement, outbreaks of disease attributable to drinking water are rare. (ASCE)



# Two Related Concepts: Asset Management & Capital Planning





Working **smarter** *not harder* is the  
essence of Effective Management  
/ Asset Management

Let's hear from a practitioner...



Mike Daly, White Cliffs, NM **Video Profile**



Asset management helps you have the most impact in your system by spending your limited dollars in the best way possible



# What does this type of analysis take?

- Nothing more than following a systematic approach for managing the assets
- 5 core components of Asset Management

# Five Core Components of AM



Current State of the Assets



**Level of Service**



Criticality



**Life Cycle Costing**



Long-Term Funding



# Current State of the Assets

- What do I own?
- Where are the assets?
- What condition are they in?
- How much useful life is remaining?
- What is the replacement value?



# Level of Service

Involve  
Customers



Measurable  
Goals: Internal  
and External



Track Progress  
Towards  
Meeting Goals

Involve  
Staff



What would my customers want?

What do customers care about?

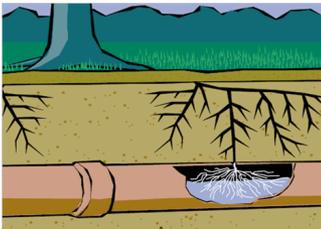


# Asset Criticality

What is the probability or likelihood that a given asset will fail?

How do my assets fail?

What's the condition of my assets?



# Asset Criticality

What is the consequence if the asset does fail?

What is the cost of the repair?

Are there legal consequences, environmental consequences, social consequences?

Are there redundant assets?



# Asset Criticality





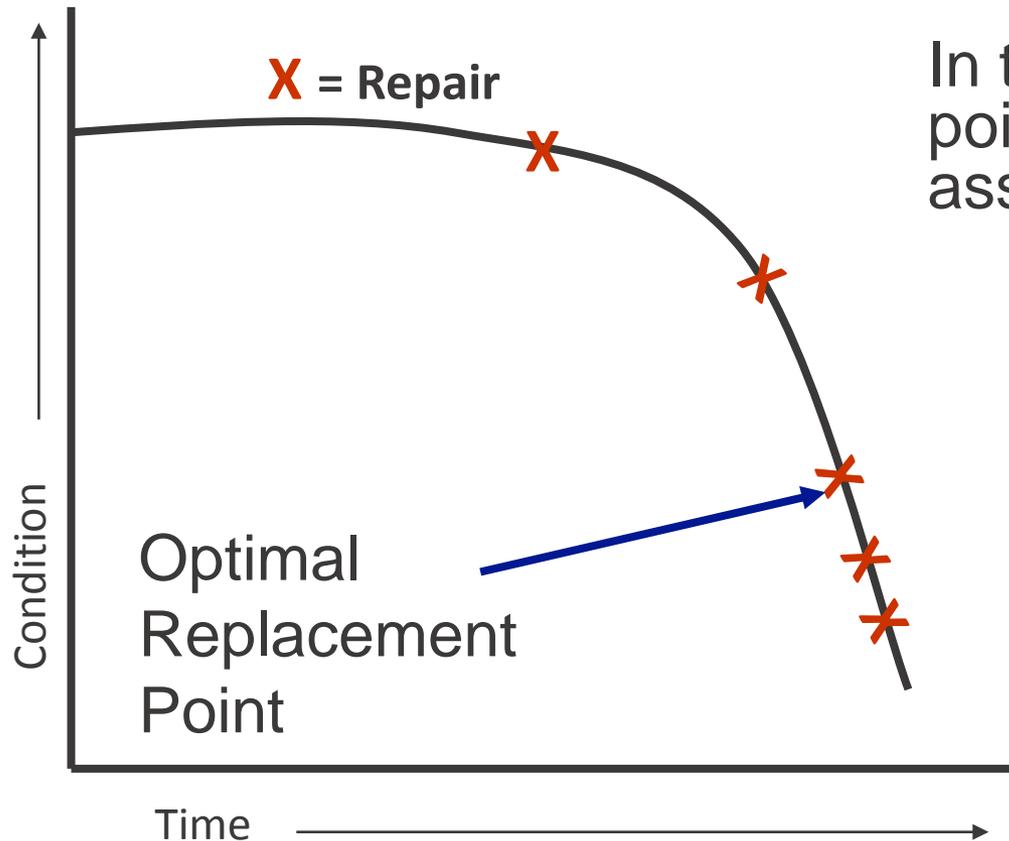
# Quick Exercise—4 Assets

1. Brand new overhead storage tank
2. Aging booster pumps that serve a hospital and neighborhood
3. 20 year old lines on Forest Drive, a typical residential neighborhood
4. 20 year old meters

# Asset Criticality



# Life Cycle Costing: Replacement of Assets



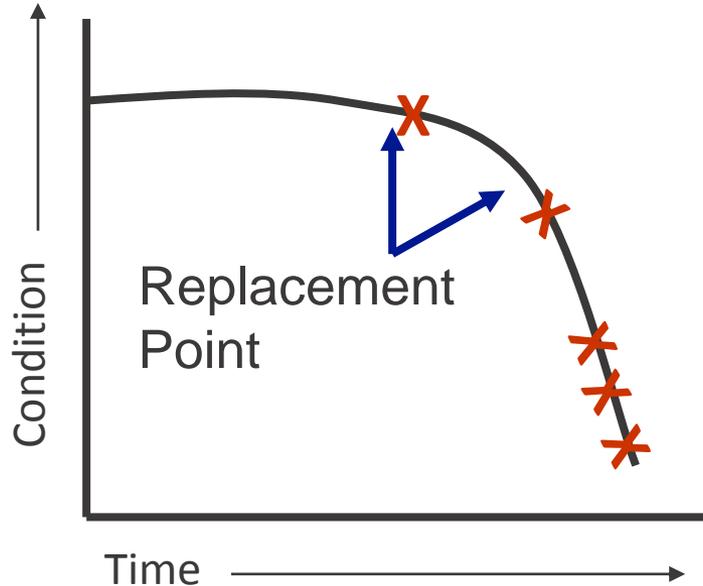
In theory, there is an exact right point at which to replace an asset

Not possible to know the optimal time to replace every asset

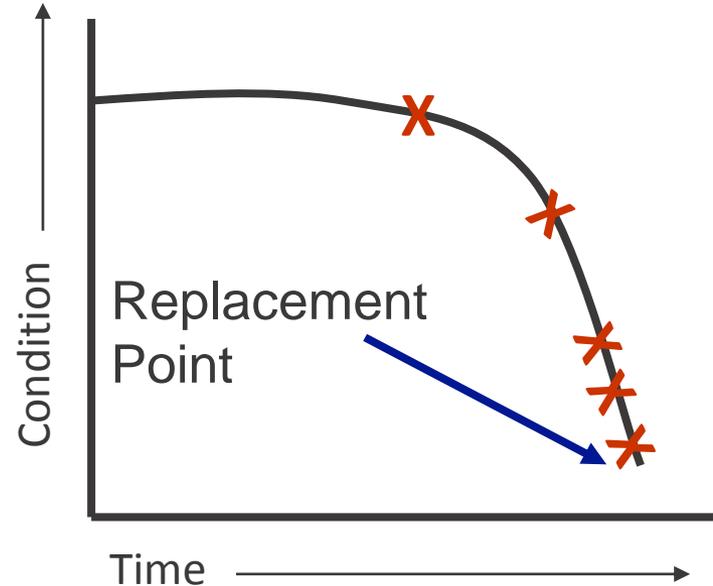
So... need to use the concept of risk

# Life Cycle Costing & Risk

High risk assets:  
replace assets early,  
before failure



Low risk assets:  
run to failure and  
replace afterwards





# Long Term Funding

- This is where capital planning comes in
- Once you figure out how to get the longest life out of your assets, plan to have the money you need to replace them when necessary



# Long Term Capital Planning

- This is strongly related to asset management
- An official multi-year document that identifies and prioritizes capital projects, identifies funding sources, and sets timelines



# Capital Improvement Program

- Identify regulatory deficiencies (discuss with regulatory agencies, look at proposed regulations, talk to consultants) in a 10-20 year window
- Identify population changes (growth, stagnation, decline)
- Identify deferred maintenance problems or where current service is inadequate



# Capital Improvement Program - Timelines

- Use **Asset Management Plan** to plan for capital expenses in the long term (~20 years)

A blue-tinted photograph of industrial machinery, including pipes and valves, is positioned at the top of the slide.

# Capital Improvement Program - Timelines

- Create a **Capital Improvement Plan** with a narrower timeline (~5 years) in more detail. Specify the projects and accurate estimates of cost. Plan where money will come from.



# Capital Improvement Program - Timelines

- Create a **Capital Improvement Budget** with an even narrower timeline (1 – 2 years) committing funds for the planned capital projects. Get it approved/adopted.



# Where Can You Find the Prices?

- Call a vendor. Actually, call a few.
- Ask other systems
- Look at past expenses but adjust for increases in costs

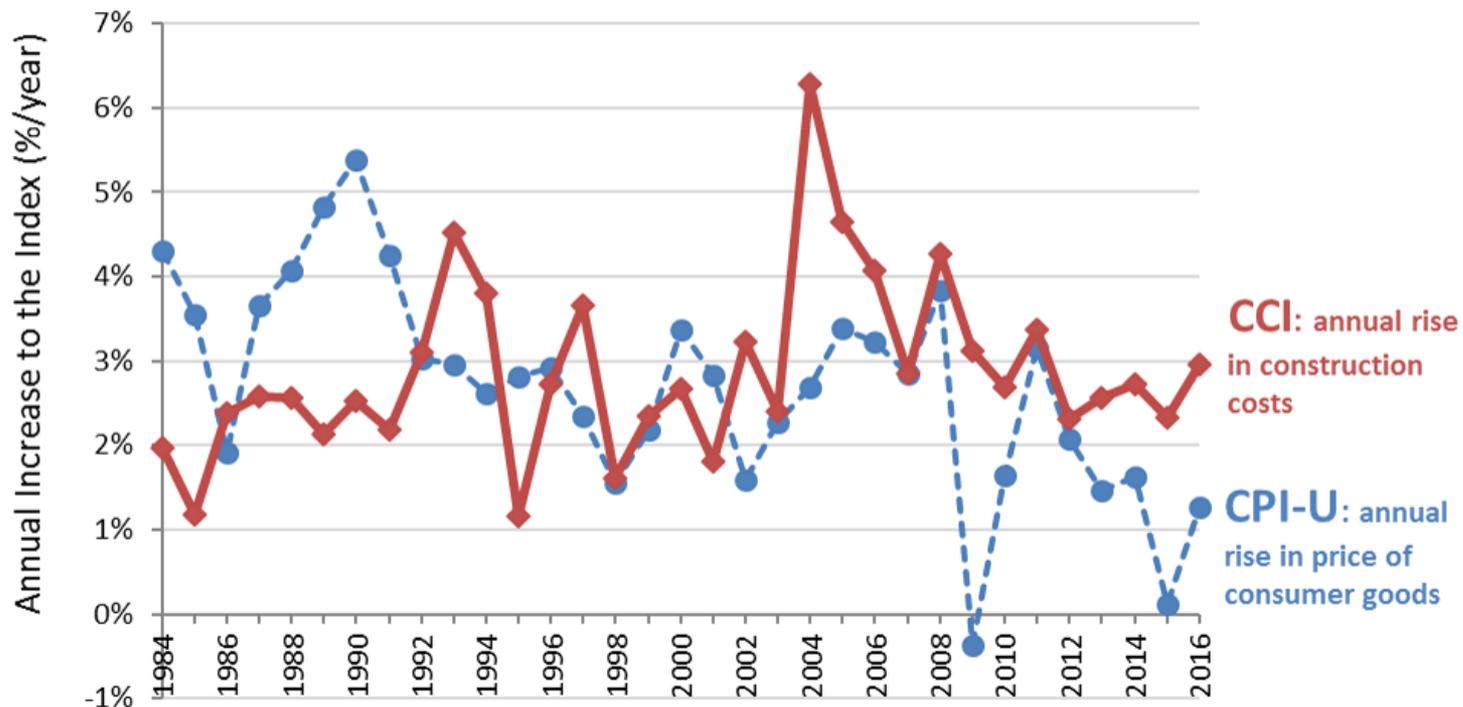


# Measures of Inflation

- **Consumer Price Index (CPI)**—measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services
- **Construction Cost Index (CCI)**—average prices for labor and key construction materials from 20 cities across the United States

## The **Construction Cost Index (CCI)** has been rising faster than the **Consumer Price Index-Urban (CPI-U)** in recent years

Construction costs (CCI) rose on average of **2.6%/year** in the last five years, while consumer goods (CPI-U) only rose an average of **1.3%/year** in the same period



Data graphed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.

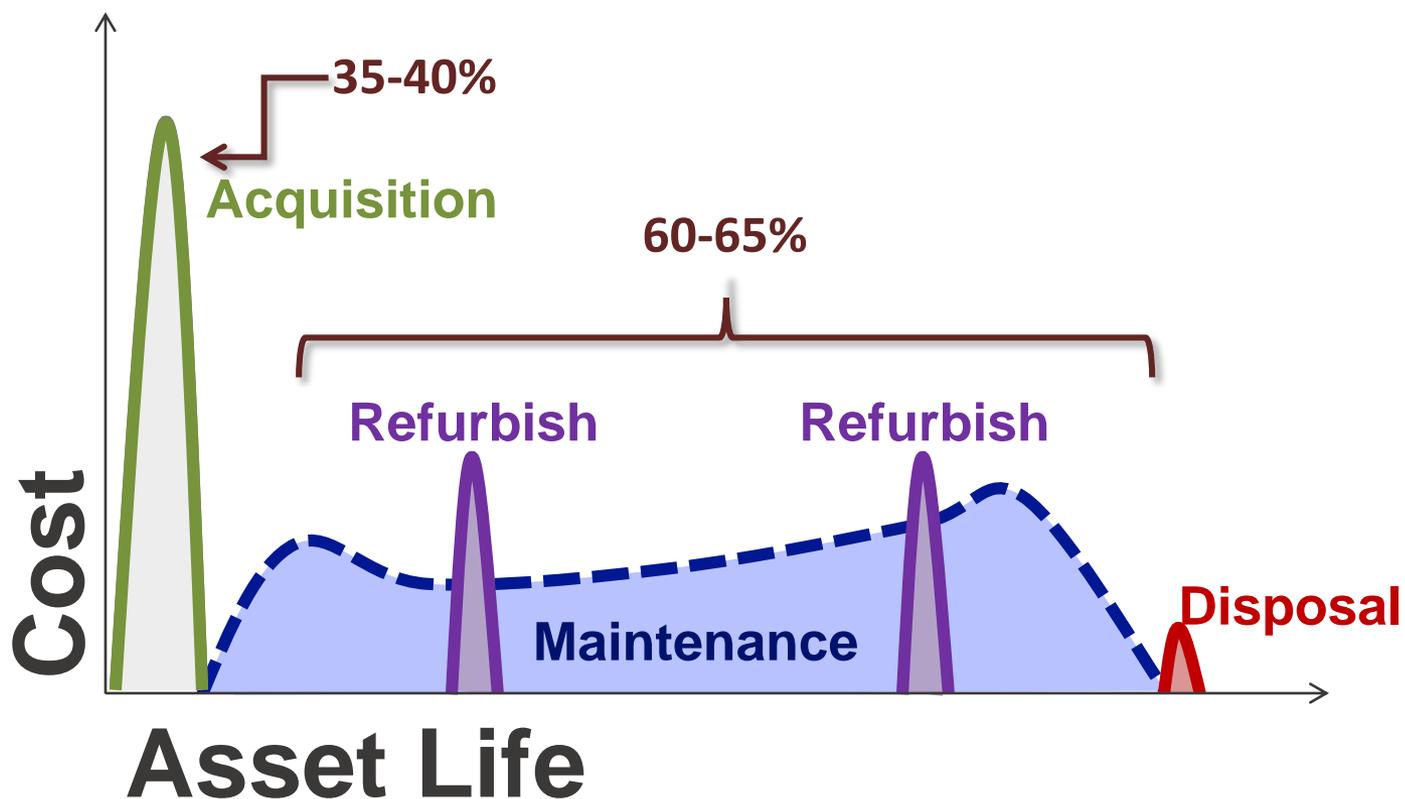
Data Sources: Bureau of Labor Statistics (CPI-U), Engineering News-Record ENR.com (CCI), InflationData.com (CPI-U), USDA Natural Resources Conservation Services (spreadsheet containing CCI and CPI-U).

A blue-tinted photograph of industrial machinery, including pipes and valves, serves as the background for the top portion of the slide.

# Reminder: Life Cycle Costing

- Purchase Price  $\neq$  Total Price

# Capital Investments are Just the Tip of the Iceberg...



# Plan to Pay: Scenarios to Fund your C.I.P.

<http://efc.sog.unc.edu> or <http://efcnetwork.org>

Find the most up-to-date version in Resources / Tools

Free, simplified Excel tool allowing you to list your capital projects and plans for funding them, and automatically estimates rate increases

Tool developed by  
  
**Plan to Pay: Scenarios to Fund your C.I.P. (Capital Improvement Plan)**  
 Version 2.6 (Updated November 2015)

20-year capital planning    Debt and/or capital reserve financing options    Guided data inputs    Simple data needs  
 Financial dashboard outputs    Estimates necessary rate increases over time to pay for capital projects

**Start**

1) Use tabs at bottom of screen and buttons to navigate to different pages.

2) In "Data Input 1", enter utility characteristics, rates and usage information in blue cells.

3) In "Data Input 2", enter details on capital improvement projects in the light blue cells. Each row is a different project.

4) In "20-Year Projections", view your fund balance projections for 20 years and observe the estimated rate increases needed each year to pay for your Capital Improvement. No data entry required on this page.

5) After all your utility information and capital improvement project details are entered, go to the "Dashboard" to view long term trends in your financial reserves, rate increases and average bills, and capital investments.

**INSTRUCTIONS**

Next: Enter C.I.P. Projects    View Fund Balance  
 View Dashboard

Financed: \$ 950,000  
 et: \$ 750,000

Pre-Exist: input amount incurred for

Name of Utility	Monetary Fund Balance Not Allocated to Future C.I.P. Projects
Water	\$ 950,000
Electric	\$ 750,000
Gas	\$ 0
Other	\$ 0

Current Fiscal Year: FY15  
 FY15 for the next 20 years will be modeled in the Capital Improvement Plan.

Water and Sewer Rates in FY15	Expected Revenues and Expenses FY15	Usage billed to Customers in FY15
Input the residential customer water & sewer rates at 5,000 gallons/month of use and 2 customers. Convert to monthly rates.	Annual Operating and Non-operating Revenues: \$ 5,810,000 Annual Non-Capital Expenditures (DM, Admin, etc.): \$ 4,520,000 Expected Annual Balance of Expenditures (PY15): 2.2%	Residential: 2,000 Non-Residential: 2,000 Total Monthly Use (1,000's of gallons): 40,000 Annual Customer Rate (Monthly): 1.2%

Capital Improvement Projects - 20 Years	Project Completion Start Year	Project Expenditures (Construction Period Start)	Estimated Construction Cost (Total Expenditures)	Annual Contribution Cost (Factor (PY15))	Estimated Cost in the Start Year	End Year
Project 1: Sewer main replacement	2015	\$ 1,000,000	\$ 1,000,000	0.2%	\$ 200,000	2015
Project 2: Water main replacement	2016	\$ 1,500,000	\$ 1,500,000	0.3%	\$ 300,000	2016
Project 3: Capital reserves replacement	2017	\$ 2,000,000	\$ 2,000,000	0.4%	\$ 400,000	2017
Project 4: Distribution project, Street main	2018	\$ 1,000,000	\$ 1,000,000	0.2%	\$ 200,000	2018
Project 5: unknown CIP	2019	\$ 3,000,000	\$ 3,000,000	0.6%	\$ 600,000	2019

Estimated Rate Changes Needed to Maintain the Fund Balance	FY15	FY16	FY17	FY18
5 Year Increase (Decrease) in Rate (Base and Incentive)	N/A	0.1%	0.1%	0.1%
Increase (Decrease) in the Monthly Bill for 5,000 Gallons	N/A	\$0.09	\$1.51	\$0.79
Increase (Decrease) in the Monthly Base Charge	N/A	\$0.00	\$0.64	\$0.34
Monthly Base Charge ("Minimum Charge")	\$12.34	\$12.34	\$12.98	\$13.31
Volume Rate at 5,000 gallons/month (5,000 gallons)	\$5.67	\$5.67	\$5.96	\$6.11
Volume Included with the Base Charge (1,000's of gallons)	2	2	2	2
Approximate Monthly Charge for 5,000 gallons (S)	\$29.35	\$29.35	\$30.94	\$31.65

Projected Fund Balance	FY15	FY16	FY17	FY18
Total Assets	\$ 5,132,000	\$ 5,003,589	\$ 5,238,367	\$ 5,364,605
Base Charges	\$ 1,778,860	\$ 1,796,322	\$ 1,907,260	\$ 1,939,720
Usage Charges	\$ 3,329,840	\$ 3,094,595	\$ 3,216,585	\$ 3,292,782
Interest Earned from Previous Year's Positive Balance	\$ 0	\$ 9,405	\$ 9,167	\$ 9,007
Revenues from Other Sources (Reserve Charges)	\$ 103,299	\$ 104,266	\$ 105,364	\$ 106,431

Financial Reserves (End of Year) chart showing trends from FY15 to FY30.

Rate Increases chart showing trends from FY15 to FY30.

Total Capital Expenses chart showing trends from FY15 to FY30.

Total Cumulative System Investment chart showing trends from FY15 to FY30.

# Software: CUPSS (EPA)

<http://www.epa.gov/cupss/>



**CUPSS** Check Up Program for Small Systems Set-up | Switch Utility | Create User | Help | Training | Exit

[My Home](#) [My Inventory](#) [My O & M](#) [My Finances](#) [My Check up](#) [My CUPSS Plan](#)

Welcome Back Helen, Beauty View Acres Subdivision - DW

What would you like to do today?

- [Do Some Training](#)
- [Enter a New Task or Work Order](#)
- [Create or Update My Schematic](#)
- [Search Asset and Maintenance](#)
- [Create or Update My Inventory](#)
- [Enter My Finances](#)
- [Print My Check Up Reports](#)
- [Work on My CUPSS Plan](#)

**My Calendar**

April 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10

**My Messages and Alerts**

Popup Messages Are Off. Click To Turn On.

Reminder - Today's Tasks	8
Tasks Currently Past Due	160
Assets Needing Update	0
Number of High Risk Assets	2