



National Association of Water Companies

Water Utility Executive Council

March 19, 2007

Weather Sensitive Customer Demands

Guastella Associates, Inc.

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Residential Water Demands

- Geography – North v. South
 - Cold Winters, Hot Summers
 - Warm Winters, Hot Summer

- Winter/Summer Extremes
 - Non-Weather Sensitive Consumption (year-round indoor use)
 - Personal Hygiene (shower, baths, tooth brushing)
 - Clothes Washing
 - Cooking
 - Dish Washing
 - Toilet Flushing
 - House Cleaning
 - Drinking
 - Indoor Plants & Flowers
 - Weather Sensitive Consumption (mostly outdoor use)
 - Irrigation – Lawns & Shrubs
 - Car Washing
 - Pools
 - Extra Clothes Washing and Showers/Baths



Factors Affecting Non-Weather Sensitive Consumption

- Number of People per Household
- Legislation
 - Energy Conservation Act of 1987, 1988, 1994
 - Energy Performance Standards for Clothes Washers and Dishwashers
 - Energy Policy Act of 1992 (Effective 1994)
 - Performance Standards for Showerheads, Faucets, Toilets and Urinals
- Conservation
 - Gallons Per Capita Water Use – Typical Single Family Home

<u>Use</u>	<u>Water Conserving Fixtures</u>	
	<u>Without</u>	<u>With</u>
Showers	12.6	10.0
Clothes Washers	15.1	10.6
Dishwashers	1.0	1.0
Toilets	20.1	9.6
Baths	1.2	1.2
Leaks	10.0	5.0
Faucets	11.1	10.8
Other Domestic Uses	<u>1.5</u>	<u>1.5</u>
	72.6	49.7
Overall Reduction 30%	74.0	51.9



Factors Affecting Weather Sensitive Consumption

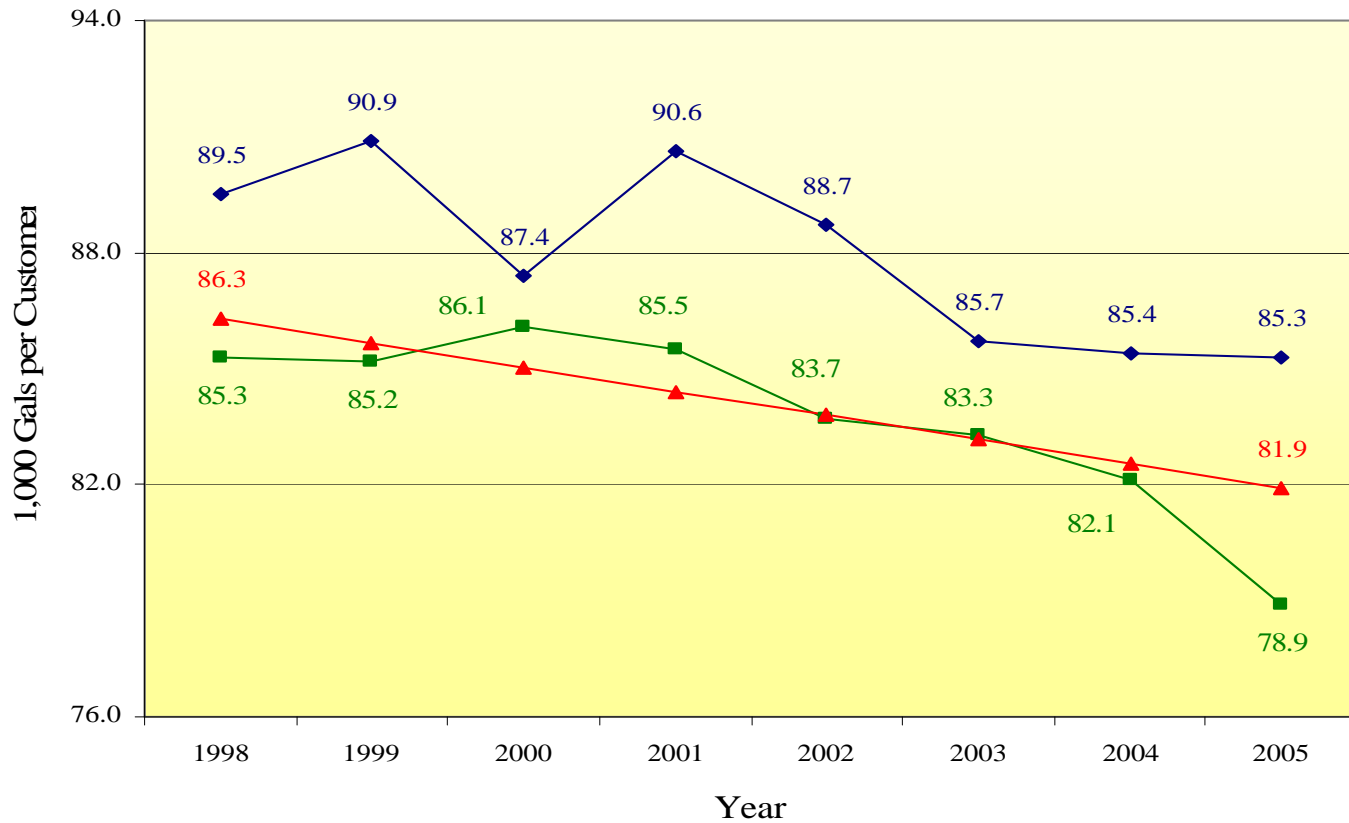
- Weather
 - Rainfall
 - Quantity
 - Incidence (quantity/percolation, time, temperature)
 - Temperature
 - Humidity
 - Cloud Cover
- Soil Conditions
 - More or Less Permeable (sand, clay, etc.)
 - Evaporation (liquid to vapor)
 - Transpiration (lose moisture from surface of plants)
 - Evapotranspiration (total loss of moisture from soil due to evaporation and transpiration)
- Conservation
 - Landscape (Xeriscape)
 - Timers
 - Sensitivity
- Price Elasticity (percentage increase in price produces an equal or greater percentage decrease in consumption)
- Economics



Methods of Normalizing Residential Consumption

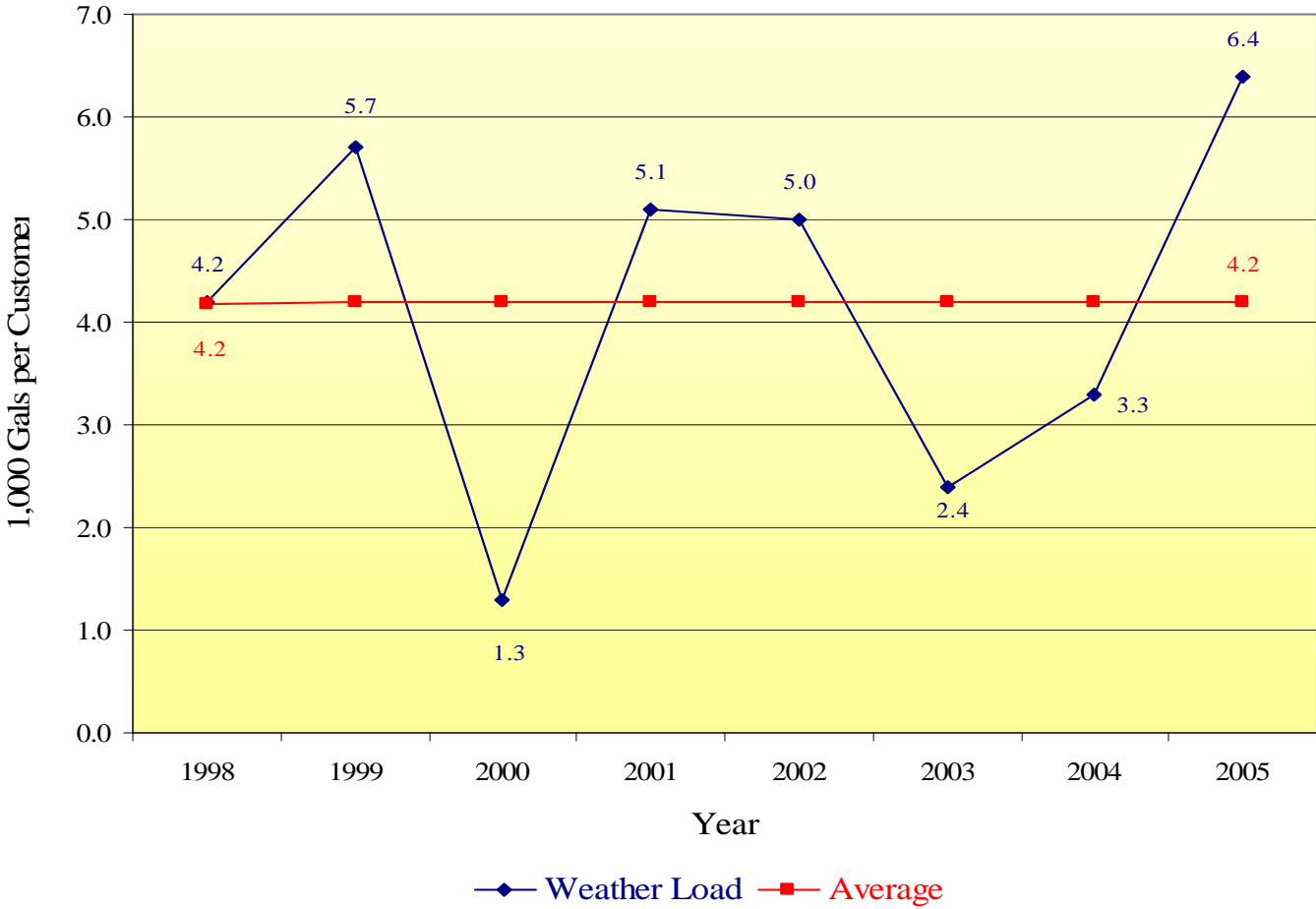
- Averaging Method
 - Simple
 - Possibly most prevalent during 70's & 80's
- Direct Statistical Correlations
 - Rainfall and Consumption
 - Temperature and Consumption
 - Multiple Correlation of Average Consumption with Independent Variables of Time, Temperature & Precipitation (California's "Bean" or "Modified Bean" Method)
- Base and Weather Load Analysis of Consumption
 - Determine Non-Weather Sensitive (Winter) "Base" Load (Annualize Winter Consumption)
 - Trend Base Load
 - Determine Weather Load (Subtract Base Load from Total Consumption)
 - Average Weather Load
 - Determine Normal Consumption (Trended Base Load Plus Average Weather Load)

Birmingham Utilities, Inc. Total Consumption & Base Load



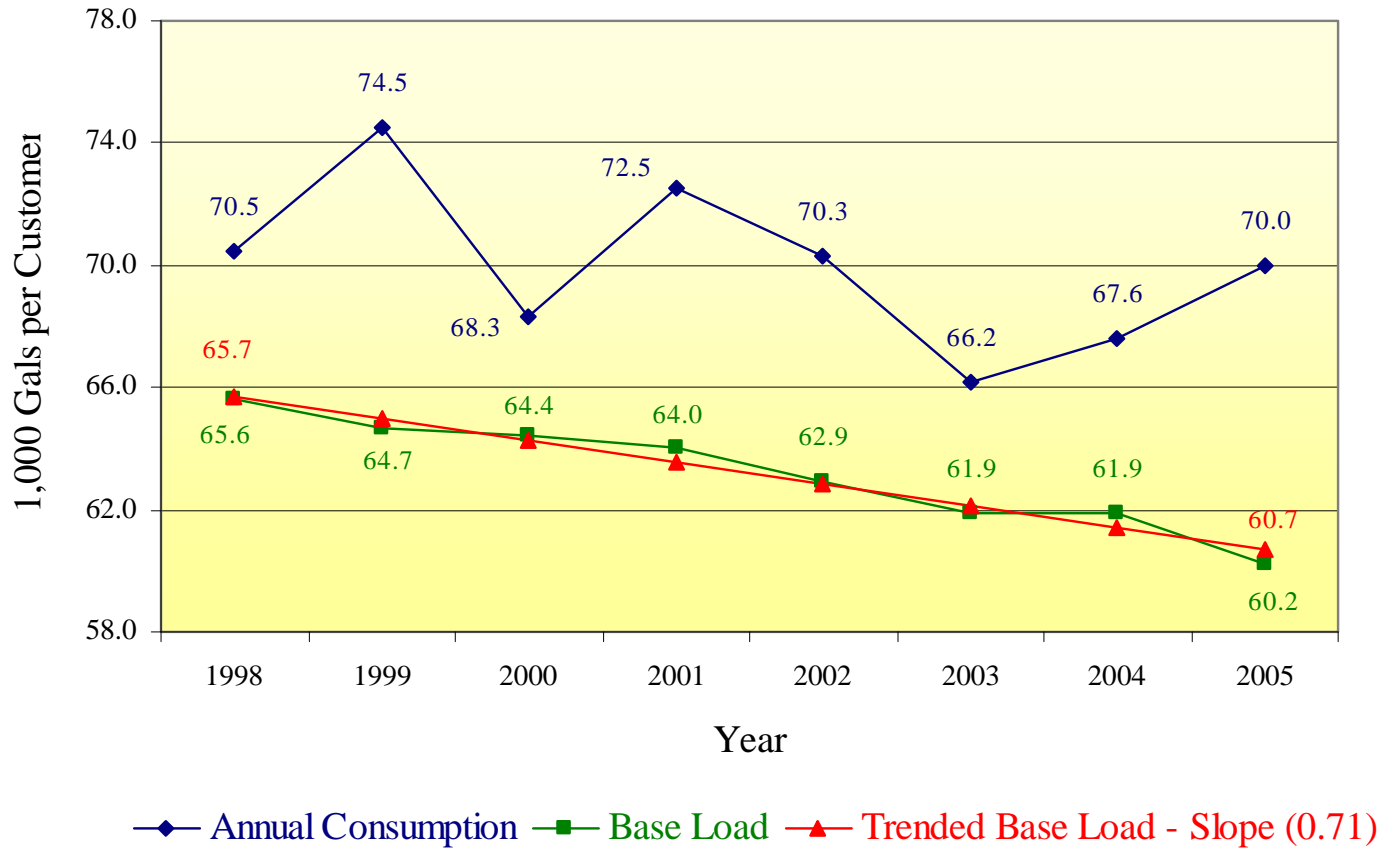
◆ Annual Consumption ■ Base Load ▲ Trended Base Load - Slope (0.62)

Birmingham Utilities, Inc.
Weather Load

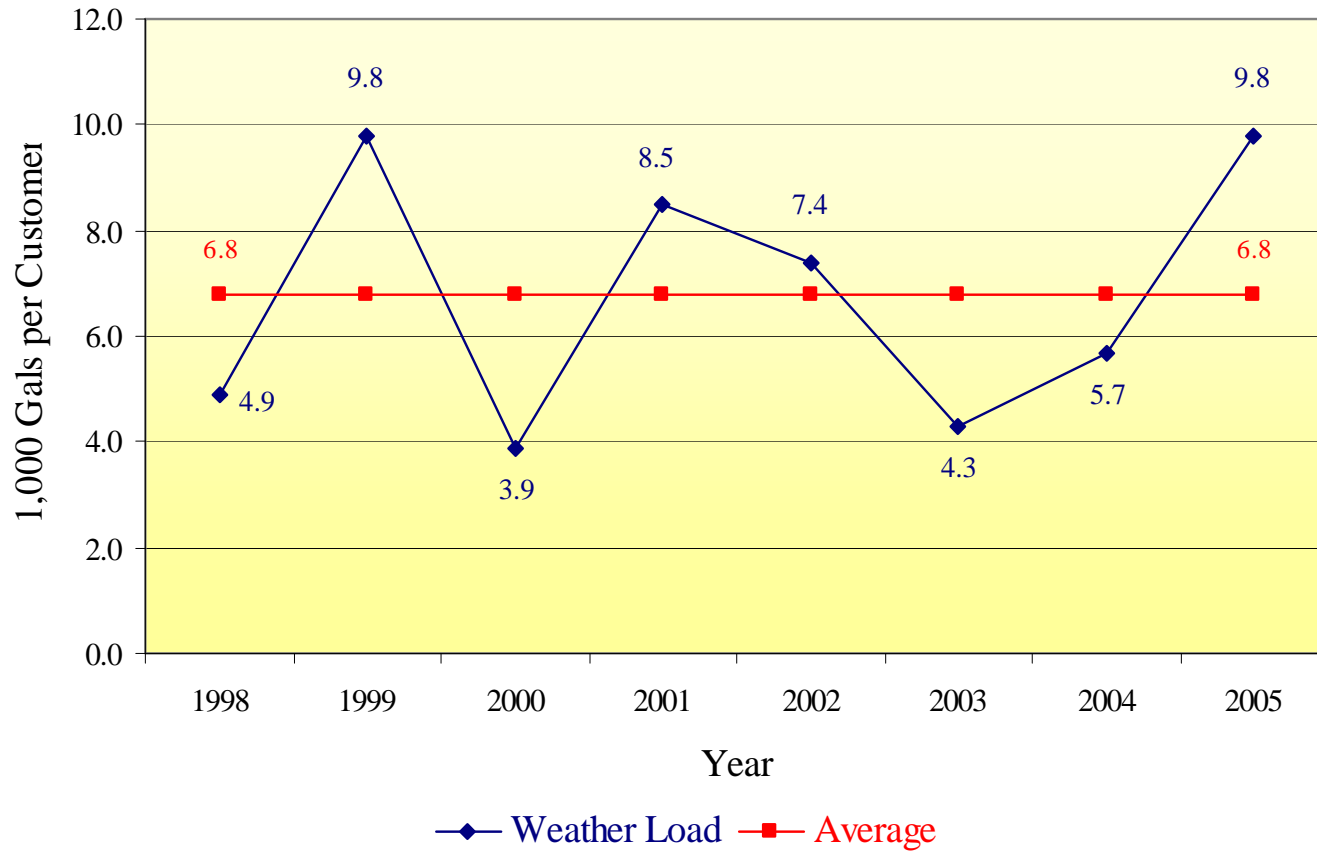


Normalized Consumption $81.9 + 4.2 = 86.1$

Connecticut Water Company
CWC System
Total Consumption & Base Load

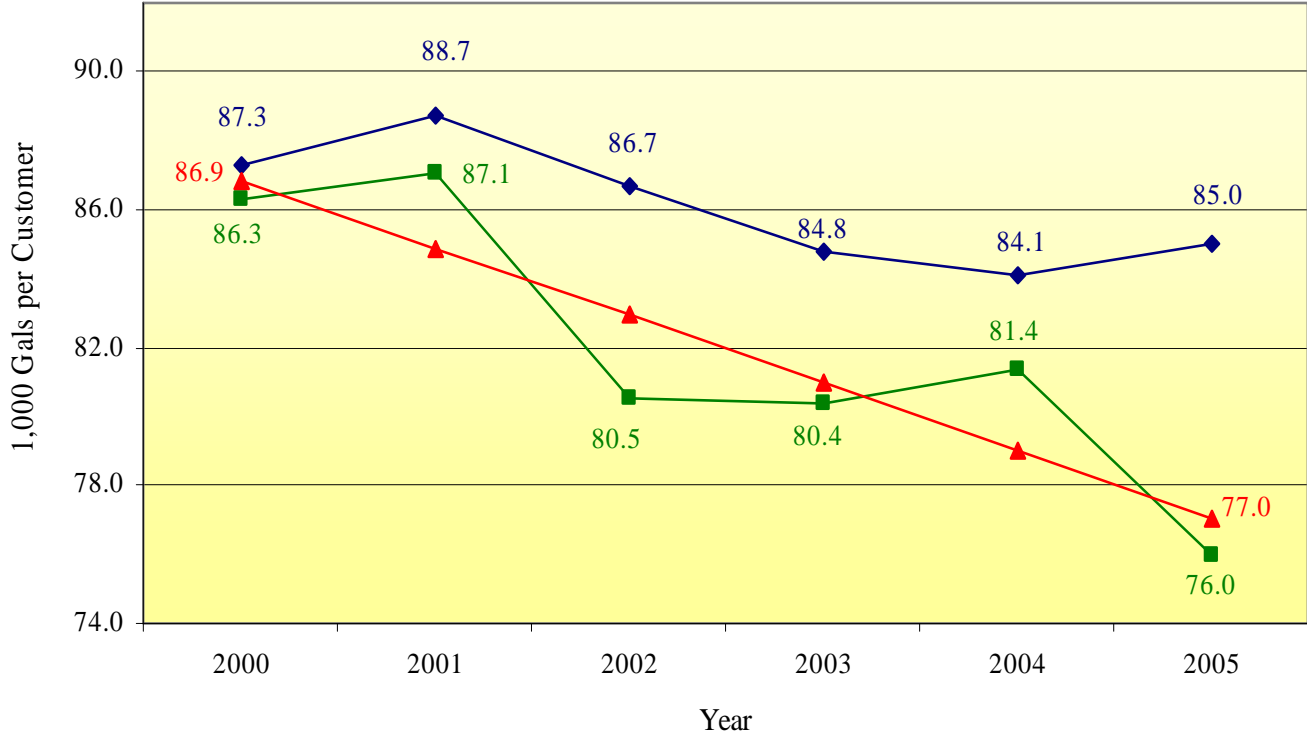


Connecticut Water Company
CWC System
Weather Load



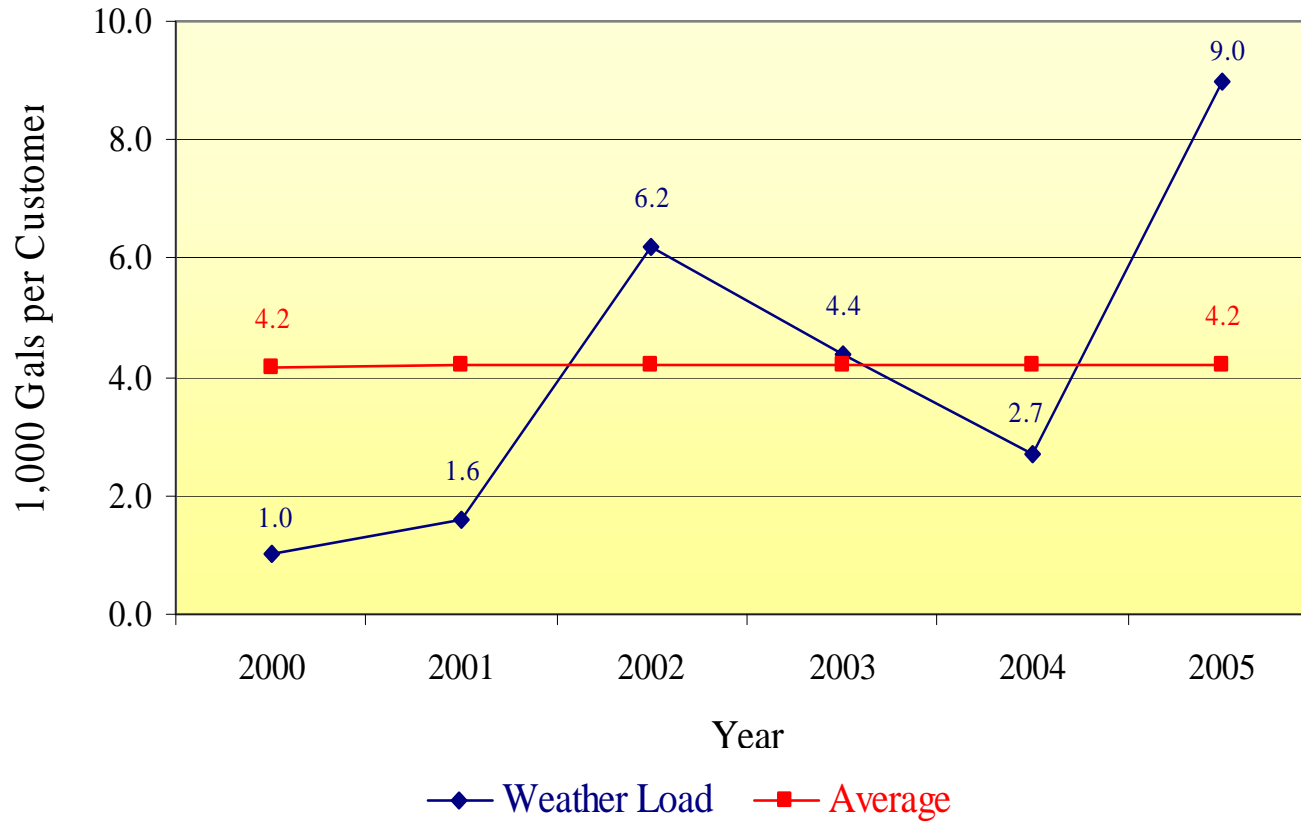
Normalized Consumption $60.7 + 6.8 = 67.5$

Connecticut Water Company
Crystal System
Total Consumption & Base Load



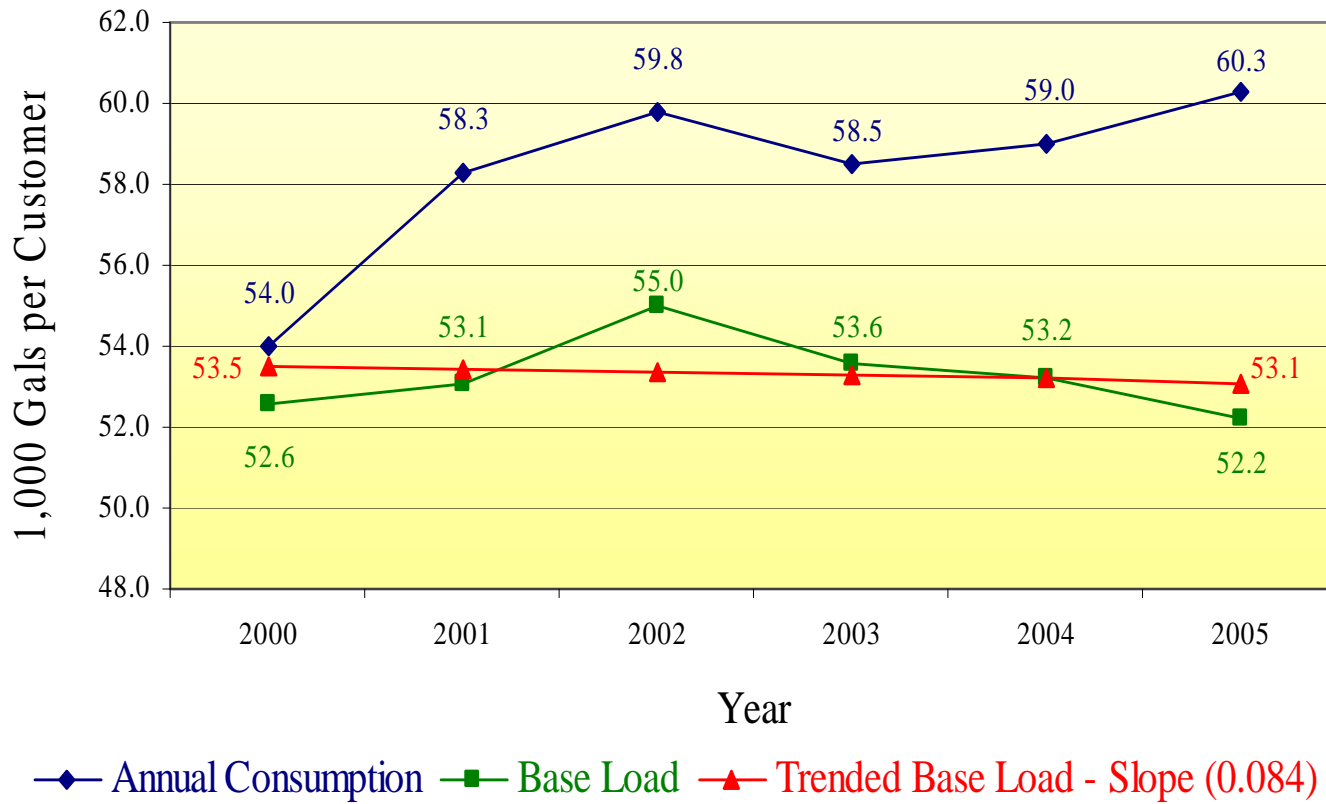
◆ Annual Consumption ■ Base Load ▲ Trended Base Load - Slope (1.97)

Connecticut Water Company
Crystal System
Weather Load

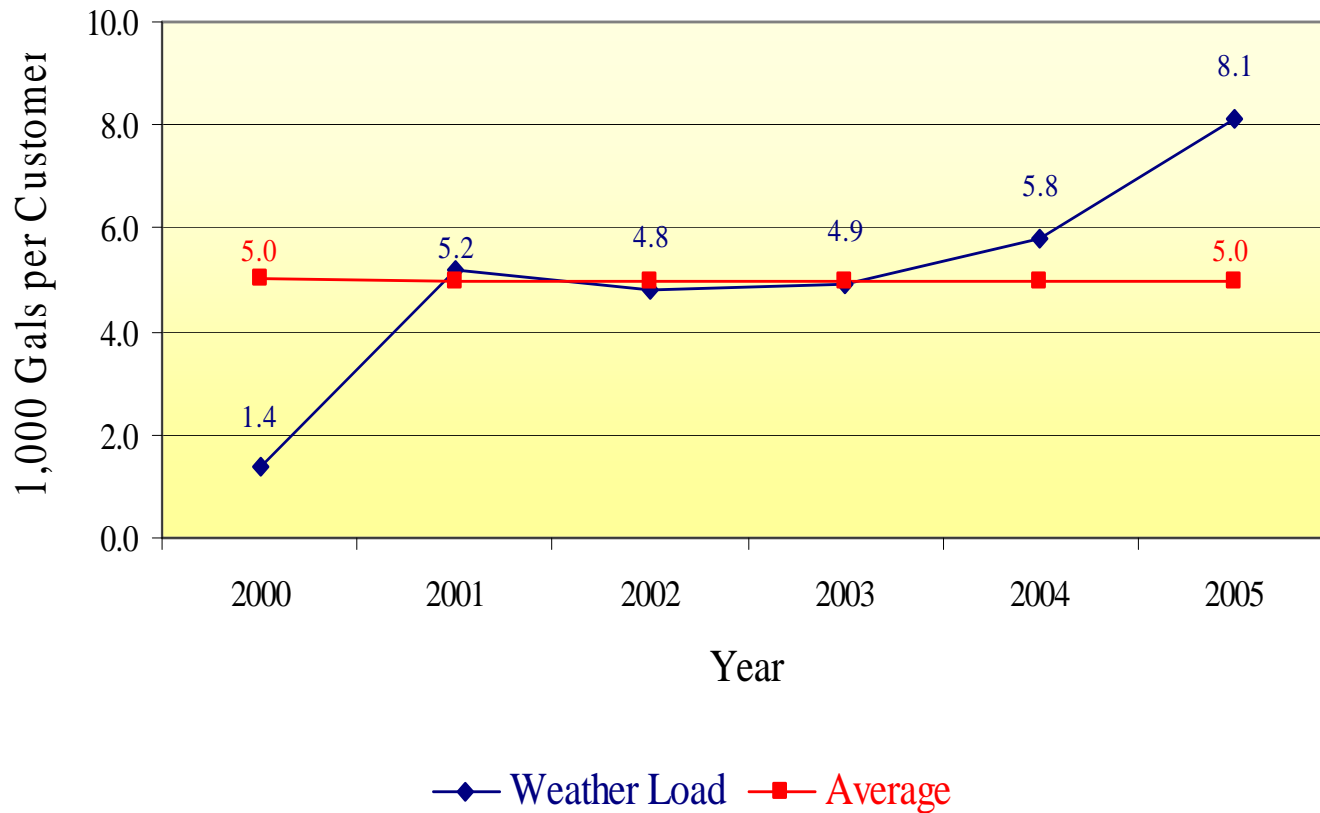


Normalized Consumption $77.0 + 4.2 = 81.2$

Connecticut Water Company
Gallup System
Total Consumption & Base Load

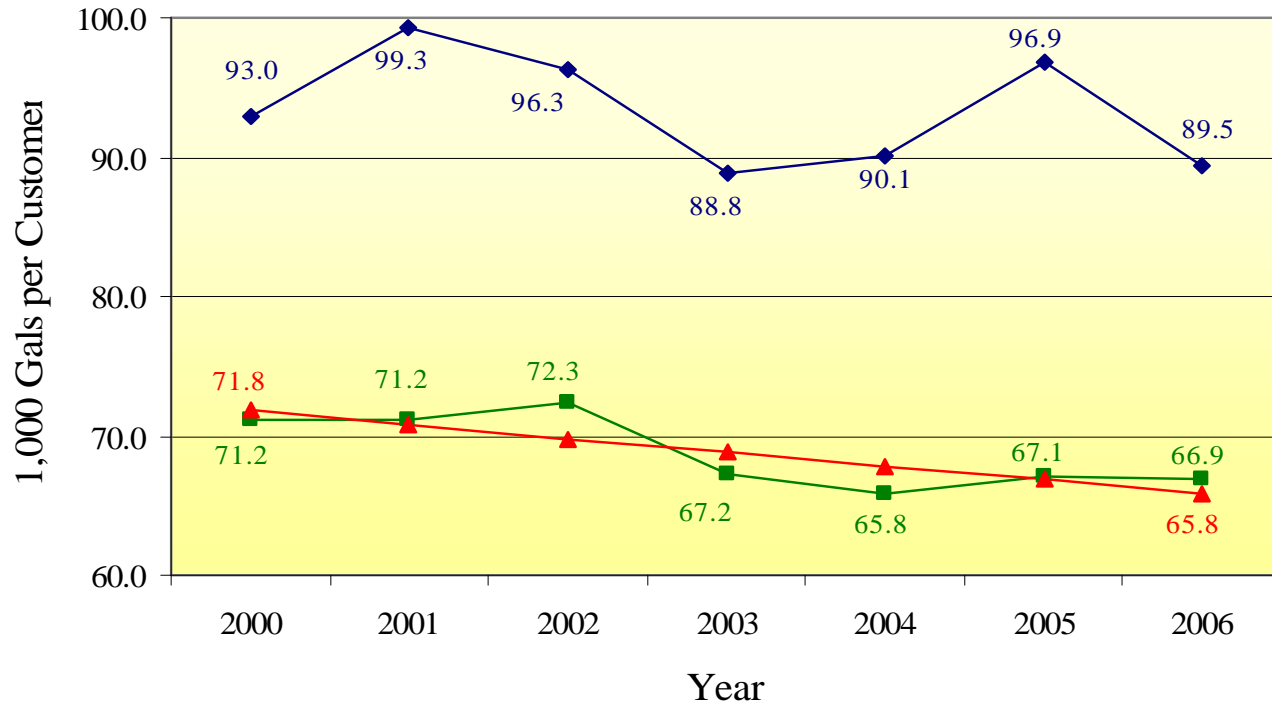


Connecticut Water Company
Gallup System
Weather Load



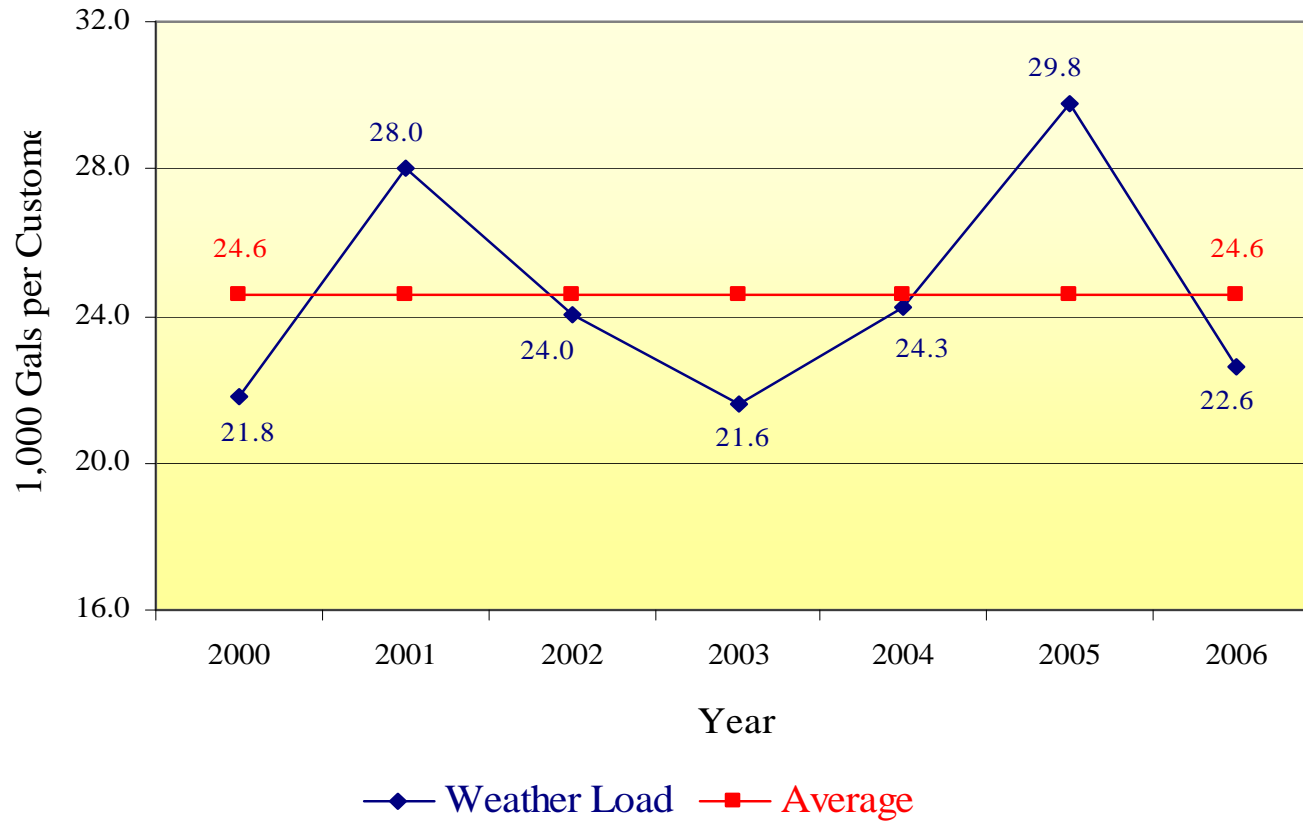
Normalized Consumption $53.1 + 5.0 = 58.1$

Aquarion Water Company - CT
Eastern Division
Total Consumption & Base Load



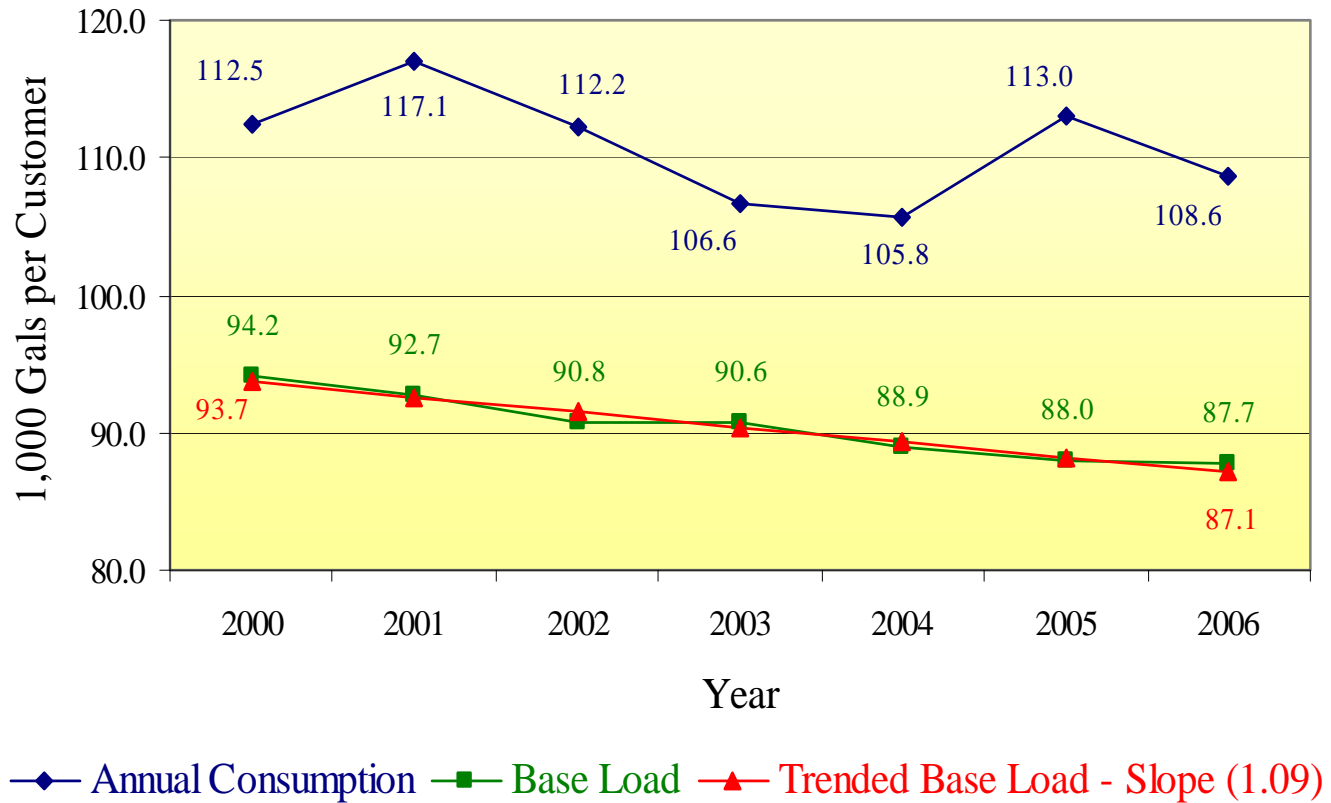
◆ Annual Consumption ■ Base Load ▲ Trended Base Load - Slope (0.989)

Aquarion Water Company - CT
Eastern Division
Weather Load



Normalized Consumption $65.8 + 24.6 = 90.4$

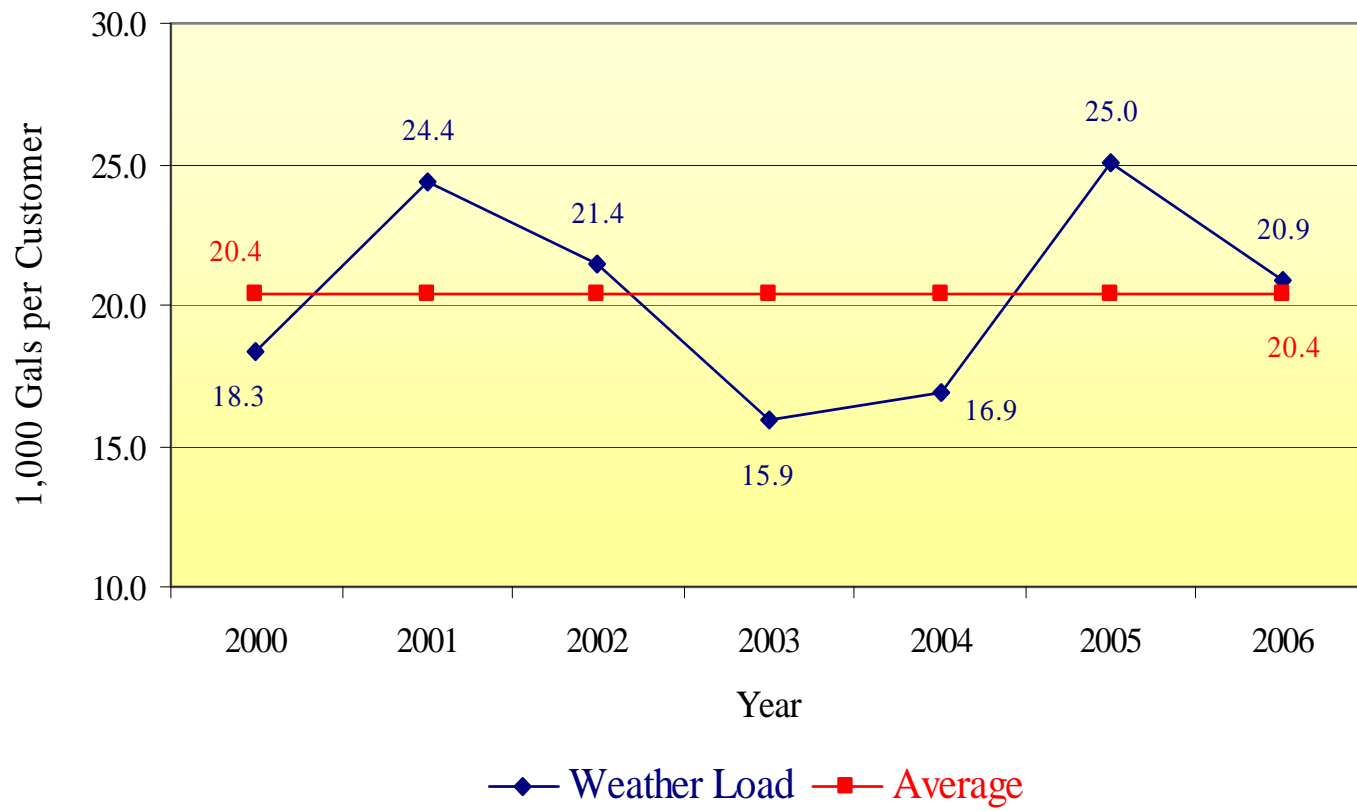
Aquarion Water Company - CT
Western Division
Total Consumption & Base Load



Aquarion Water Company - CT

Western Division

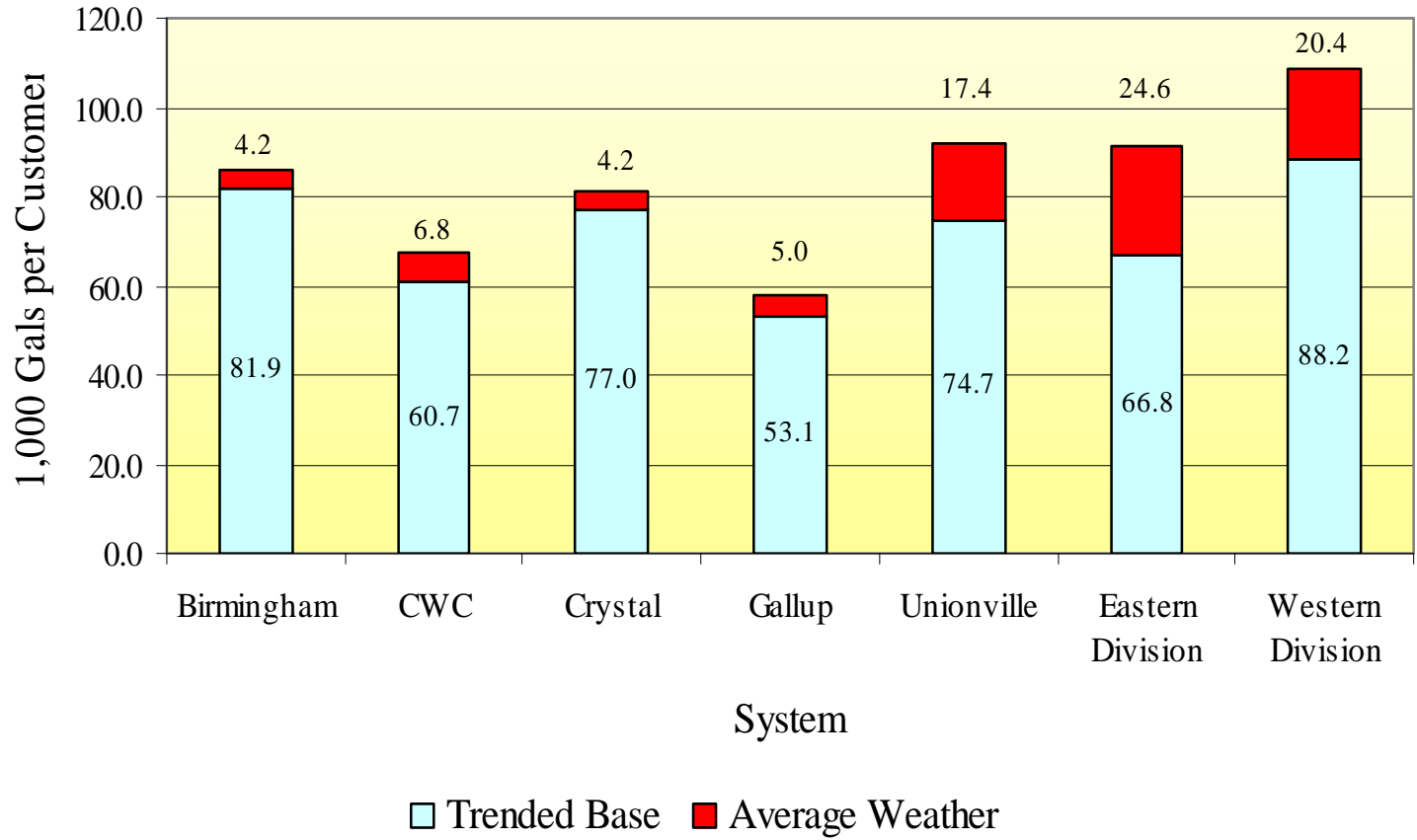
Weather Load



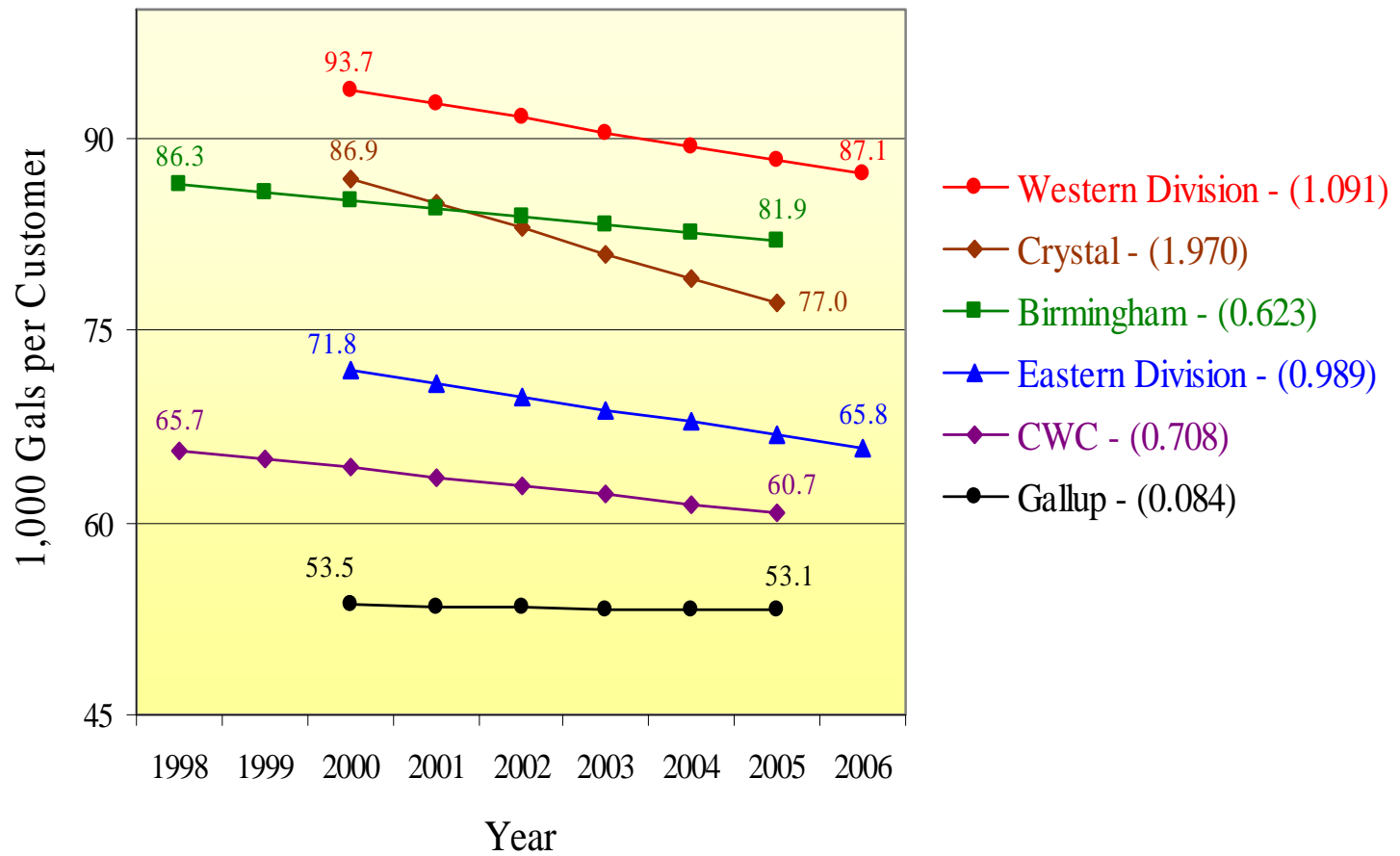
Normalized Consumption $87.1 + 20.4 = 107.5$

Total Consumption in 2005

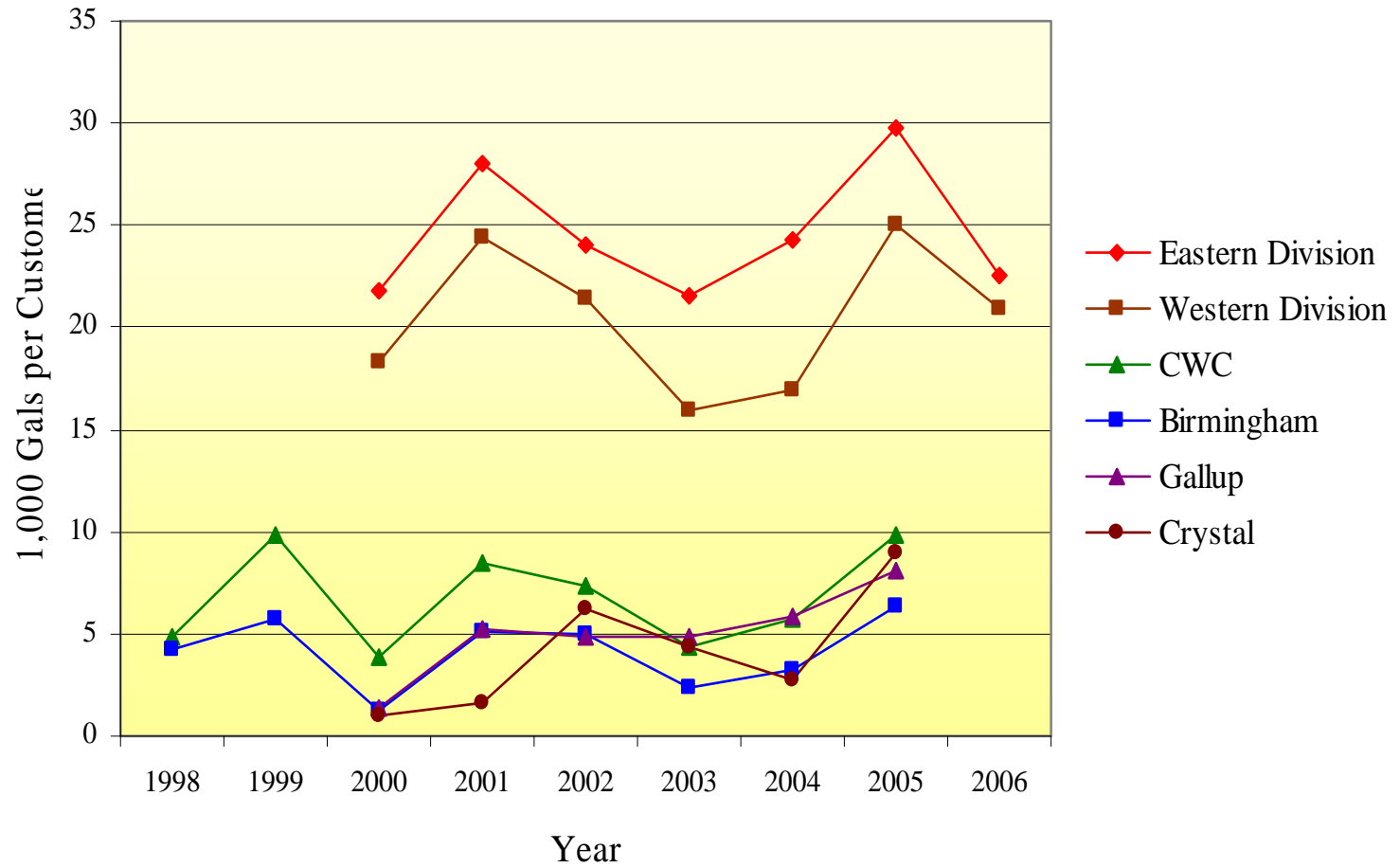
Relationship of Base & Weather Load to Total

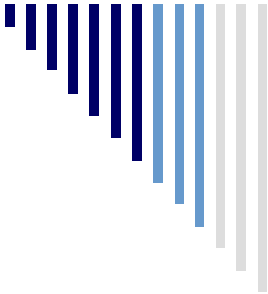


Trended Base Loads



Weather Load





Data Requirement Form

Residential Consumption Normalization Study
DATA REQUIREMENTS - QUARTERLY BILLINGS

Year	January		February		March		Annual	
	Number of Bills	Consumption (1,000 Gallons)	Number of Bills	Consumption (1,000 Gallons)	Number of Bills	Consumption (1,000 Gallons)	Number of Bills	Consumption (1,000 Gallons)
1999								
2000								
2001								
2002								
2003								
2004								
2005								
2006								
2007							X	X

Company:

System:

Location:

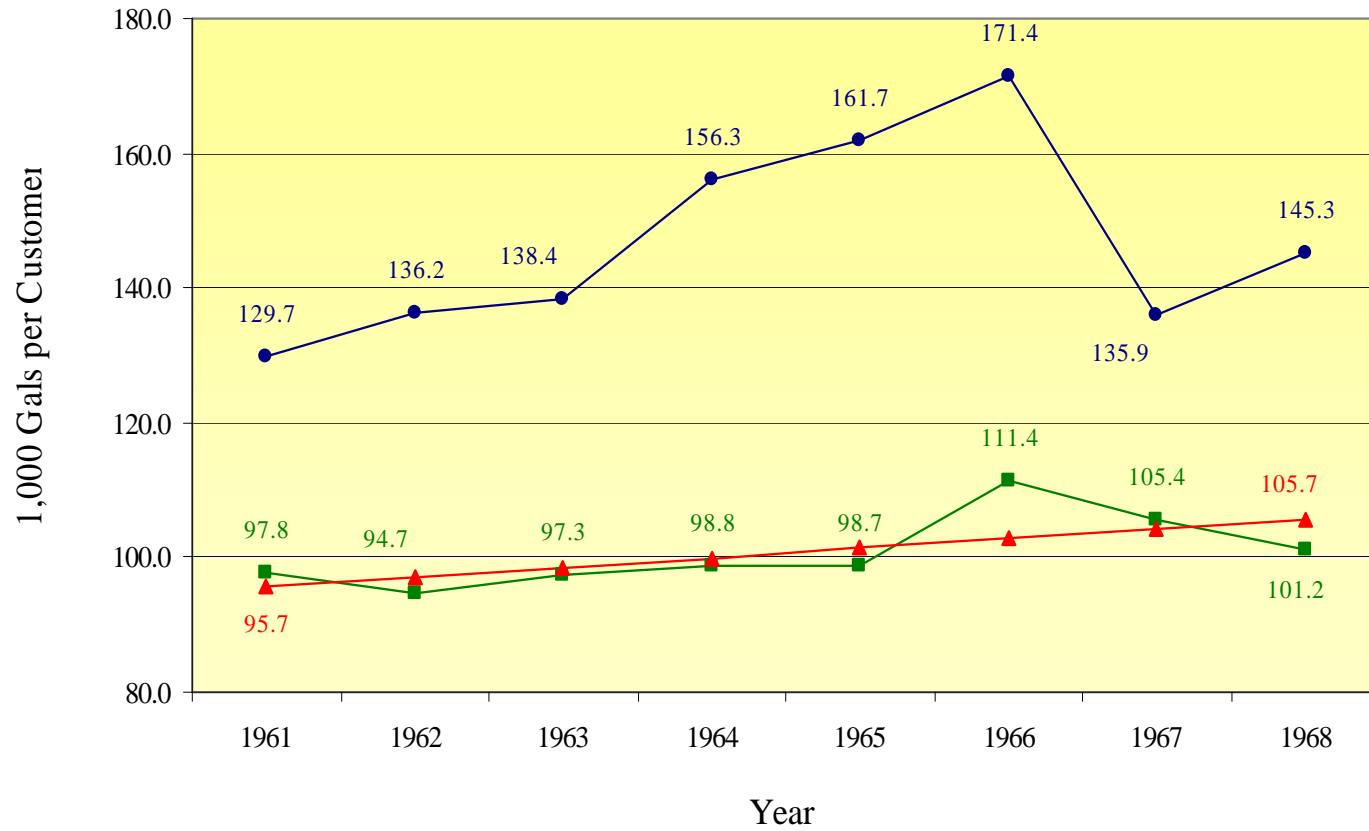
Contact Name:

Tel. No.

Prepare data in an Excel
file and send in E-mail to: jfg@guastella.com

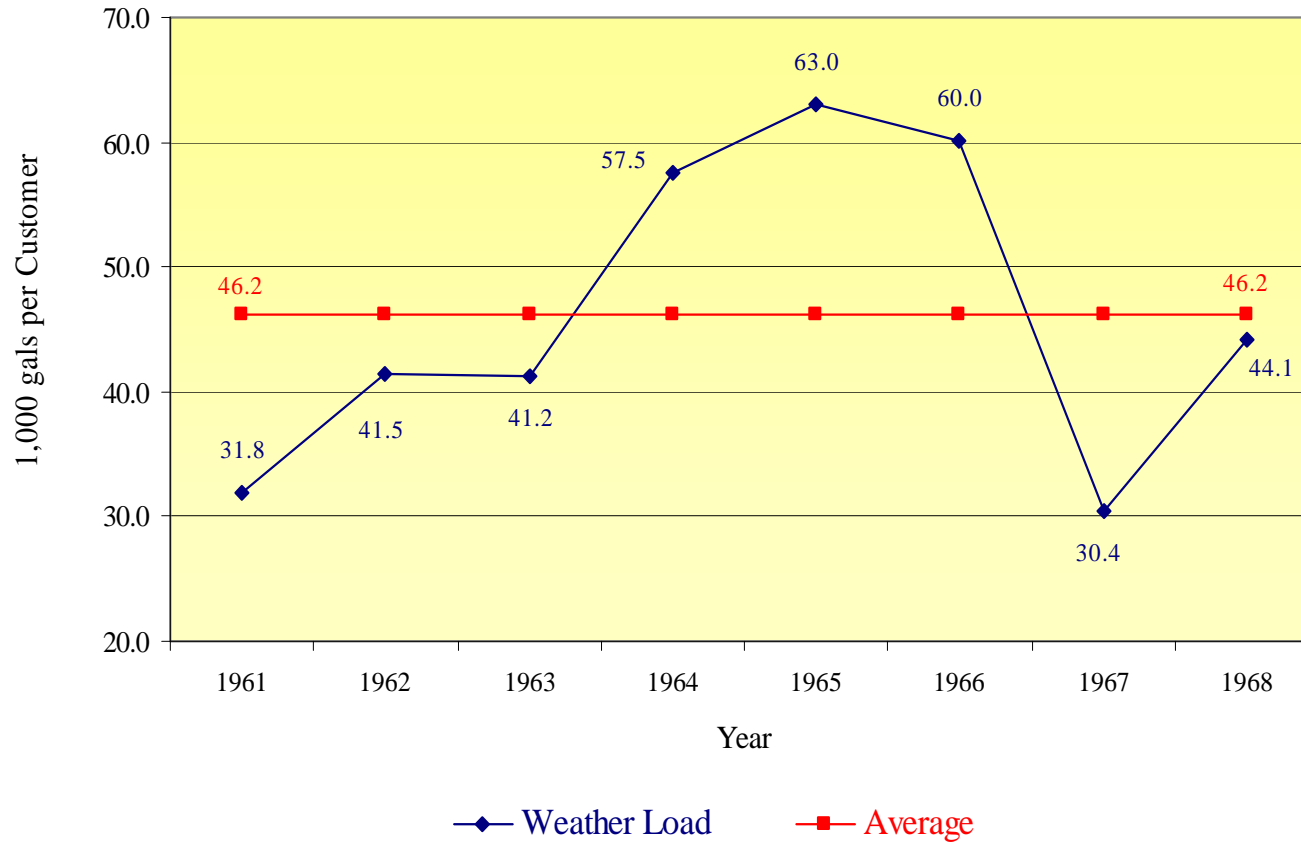
For assistance: John F. Guastella
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Fax (617) 423-2929

Citizens Water Supply Company of Newtown Weather Load



—●— Annual Consumption —■— Base Load —▲— Trended Base Load - Slope 1.43

Citizens Water Supply Company of Newtown Weather Load



Normalized Consumption $105.7 + 46.2 = 151.9$



Conclusions

- Base Load/Weather Load Analysis is Preferable
- Revenue Adjustments are More Important Than is Obvious
 - Relationship to Revenues
 - Relationship to Net Income
- Correct Rate Setting Methodology and Principles
 - Important for Earnings
 - Important for Future Cost of Capital
 - Best Interest of Customers