

APS Peak Demand and Energy Forecast

February 15, 2008

Objective

- Describe APS outlook for electricity demand through 2027
- Focus on key assumptions driving the outlook
- Explain the APS forecast methodology

Forecast Trends

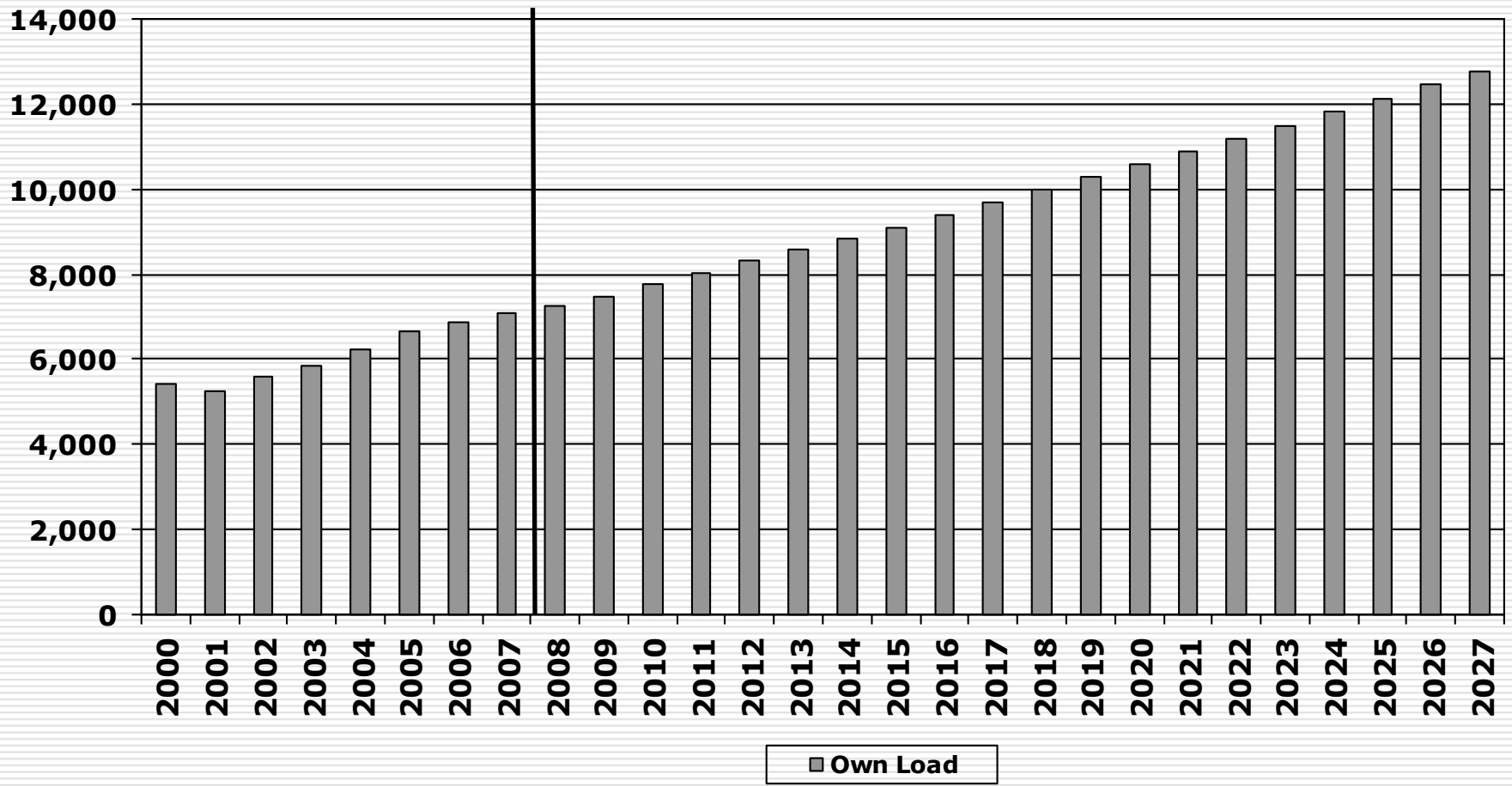
- Peak Demand and Energy Grow Substantially Over the Next 20 Years
- Population Growth Fed by Continued Net immigration is the Largest Single Source of Growth
- Energy Usage Trends Depend Greatly on Segment Type; Modeled Accordingly
- Naturally-occurring Efficiency Gains Offset Some of the Growth

Forecast for 2027

- System Peak Demand Grows to 12,772 MW (7,100 MW in 2007)
 - Before Energy Efficiency and Distributed Energy Program Impacts
 - 3.0% AGR , 280 MW per year
- Energy Consumption Grows to 55,000 gWh from 31,000 in 2007
- Arizona Population Reaches 9.8 million from 6.2 in 2007
- Retail Customers Increase to 1.85 million from 1.1 million in 2007

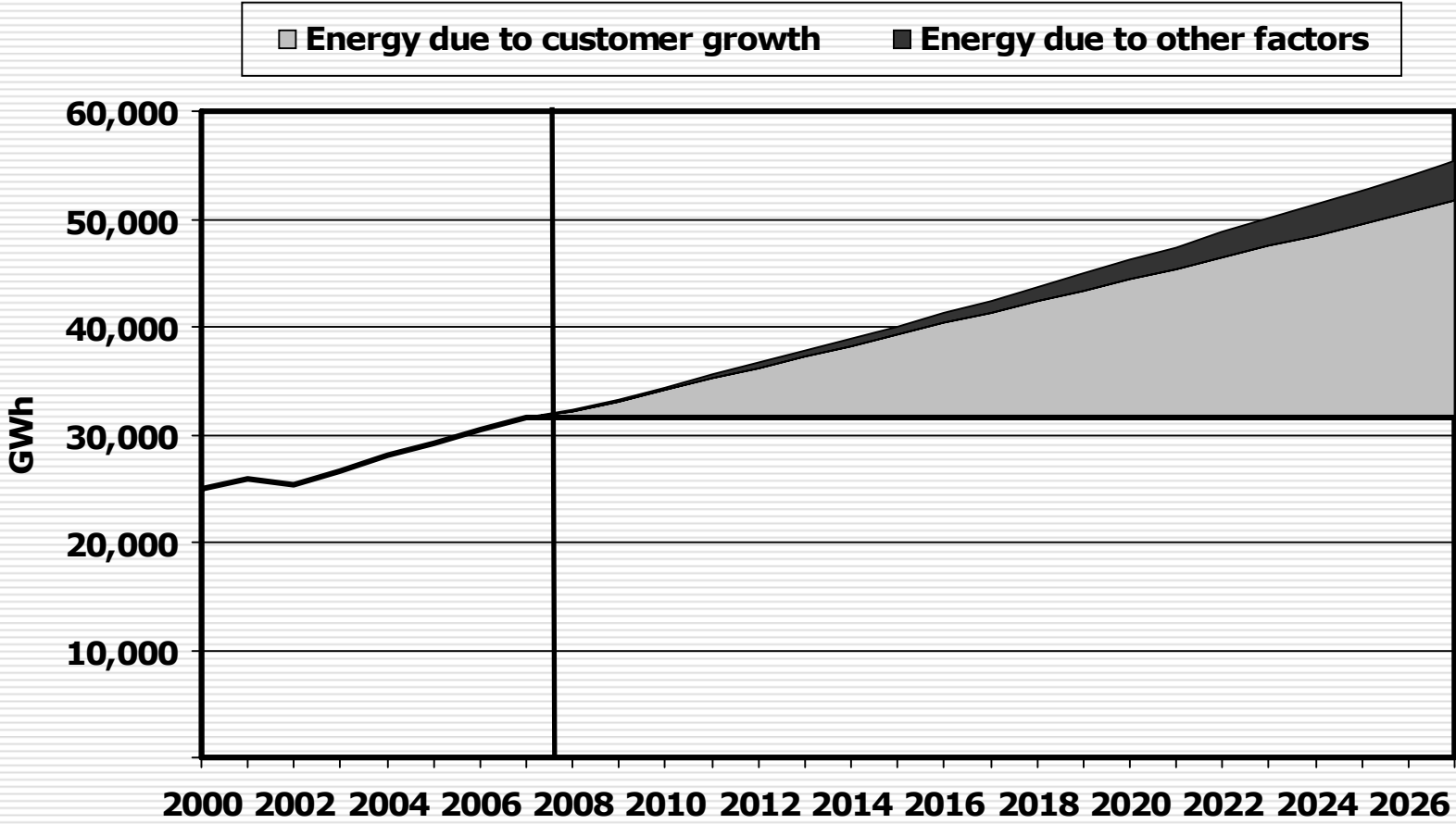
Annual System Peak Load (MW)

Weather Normalized



Load Growth Drivers

Weather Normalized



Peak Forecast (MW)

Before DSM & DE

	<u>2008</u>	<u>2012</u>	<u>2017</u>	<u>2027</u>
Residential	3,504	4,068	4,831	6,595
Small C&I	2,523	2,906	3,371	4,378
Large C&I	388	388	388	388
Irrg. & Stlights	6	5	4	3
Line Losses	758	868	1,012	1,335
Traditional Wholesale	67	68	70	72
Own Load	7,247	8,304	9,676	12,772

Components of Forecast

- Customers
- Use per customer
- Losses
- Load Factor
- Wholesale contracts

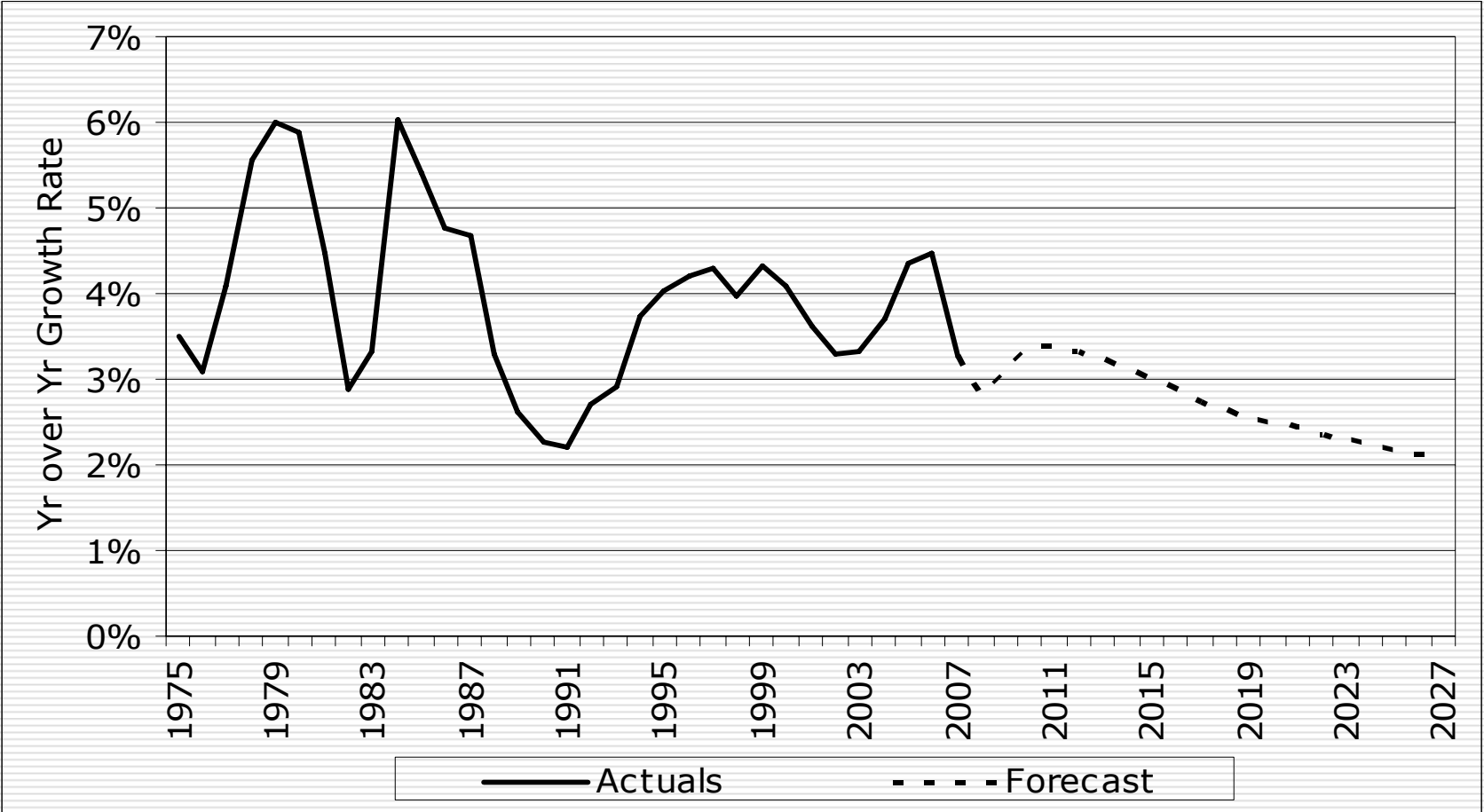
Peak and Energy Growth

	<u>'08 to '12</u>	<u>'08 to '17</u>	<u>'08 to '27</u>
System Peak Demand	3.2%	3.2%	3.0%
Own Load Energy	3.1%	3.0%	2.8%
Retail Customers	3.2%	3.1%	2.7%
Use per Customer			
-Residential	0.7%	0.6%	0.7%
-C&I < 3 mW	0.0%	0.1%	0.3%
Population (Arizona)	2.7%	2.5%	2.1%
-Net Migration	1.9%	1.7%	1.3%
-Natural Increase	0.8%	0.8%	0.8%

Customer Forecast

- Residential Customers Derived From:
 - Population x Persons Per Household x APS Territory Share
- Business Customers Follow Residential Growth
- Arizona Population Forecast
 - Most Important Factor in Customer Growth
 - Migration, Net Natural Increase
- Persons Per Household
 - Critical for Residential Customer Forecast
 - Historic Householder Rates by Age Cohort
- APS Territory Share
 - Driven by Historic Share, Known Building Patterns

Residential Customers

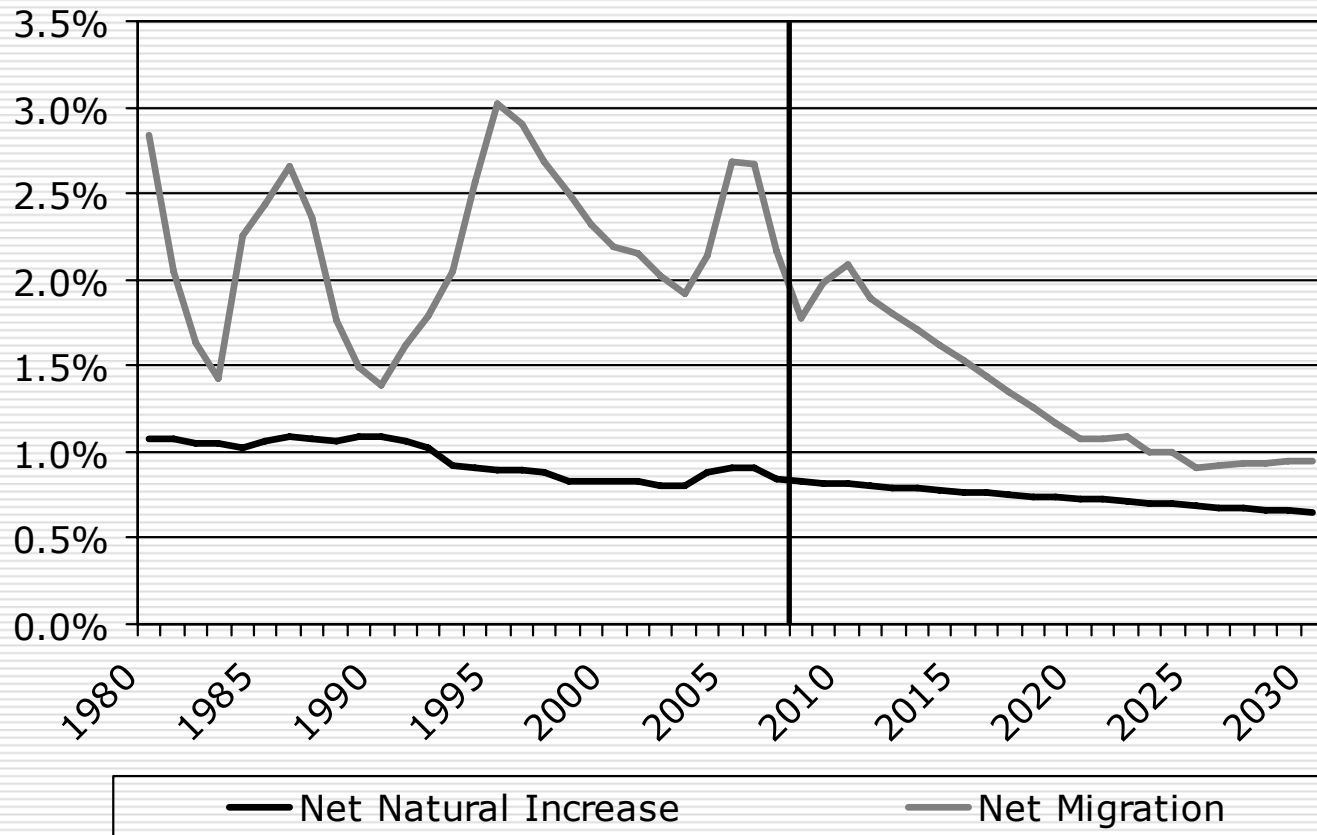


Population/Household Forecast

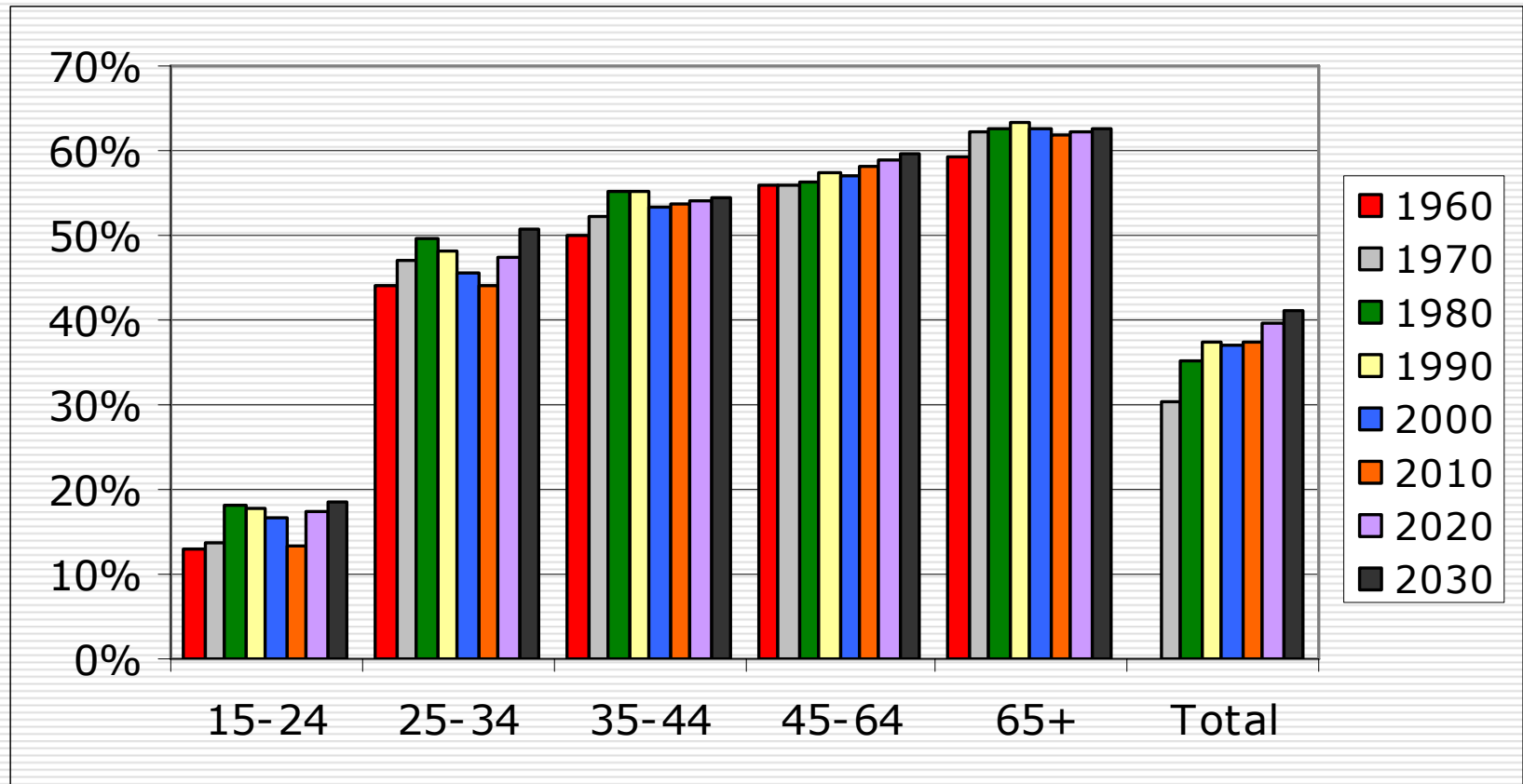
- Net migration remains significant but slowing
 - Business cycle volatility likely, but long-term fundamentals positive
 - Consistent with external forecasters
- Natural increase stable and predictable
- Persons per household continues to decline as population ages

Arizona Population Growth

APS Projections by Component

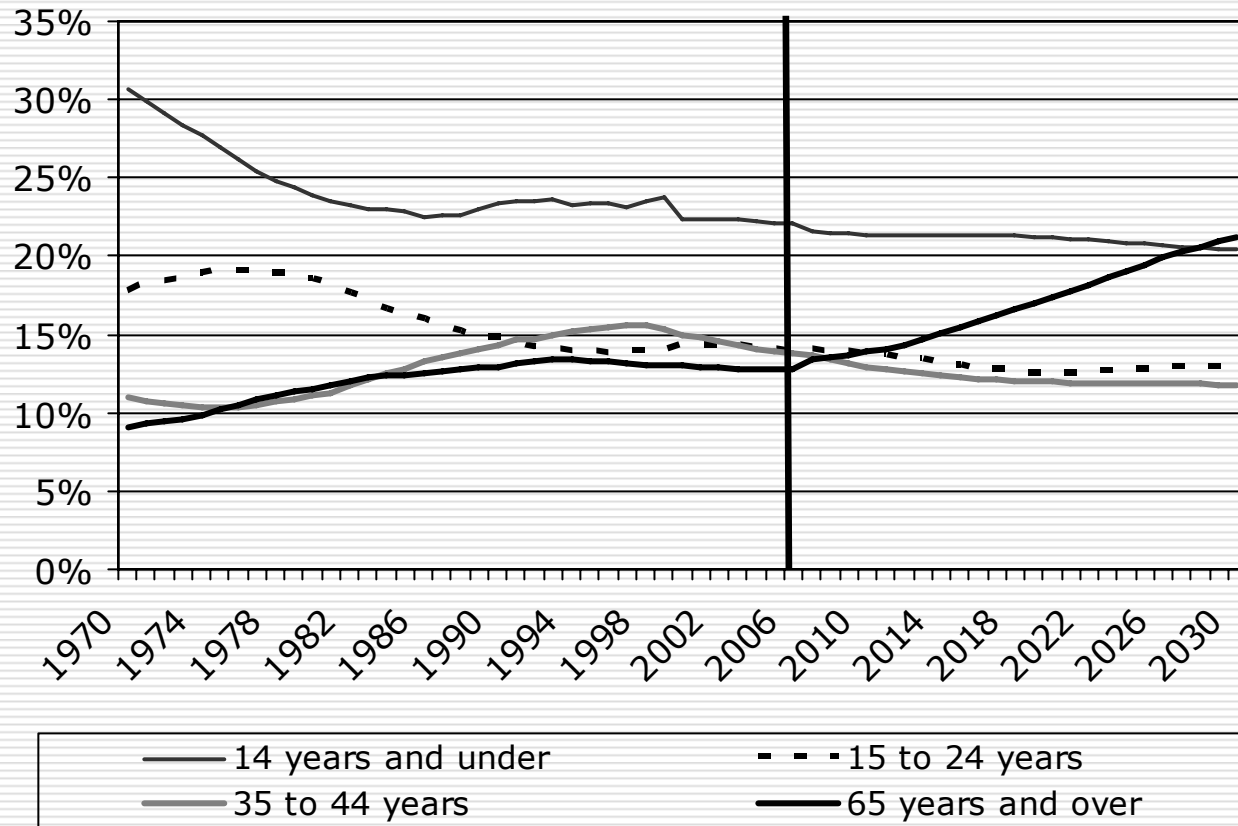


Arizona Householder Rates by Age



Note: The householder rate is the share of an age group that heads a household

Population Shares by Age



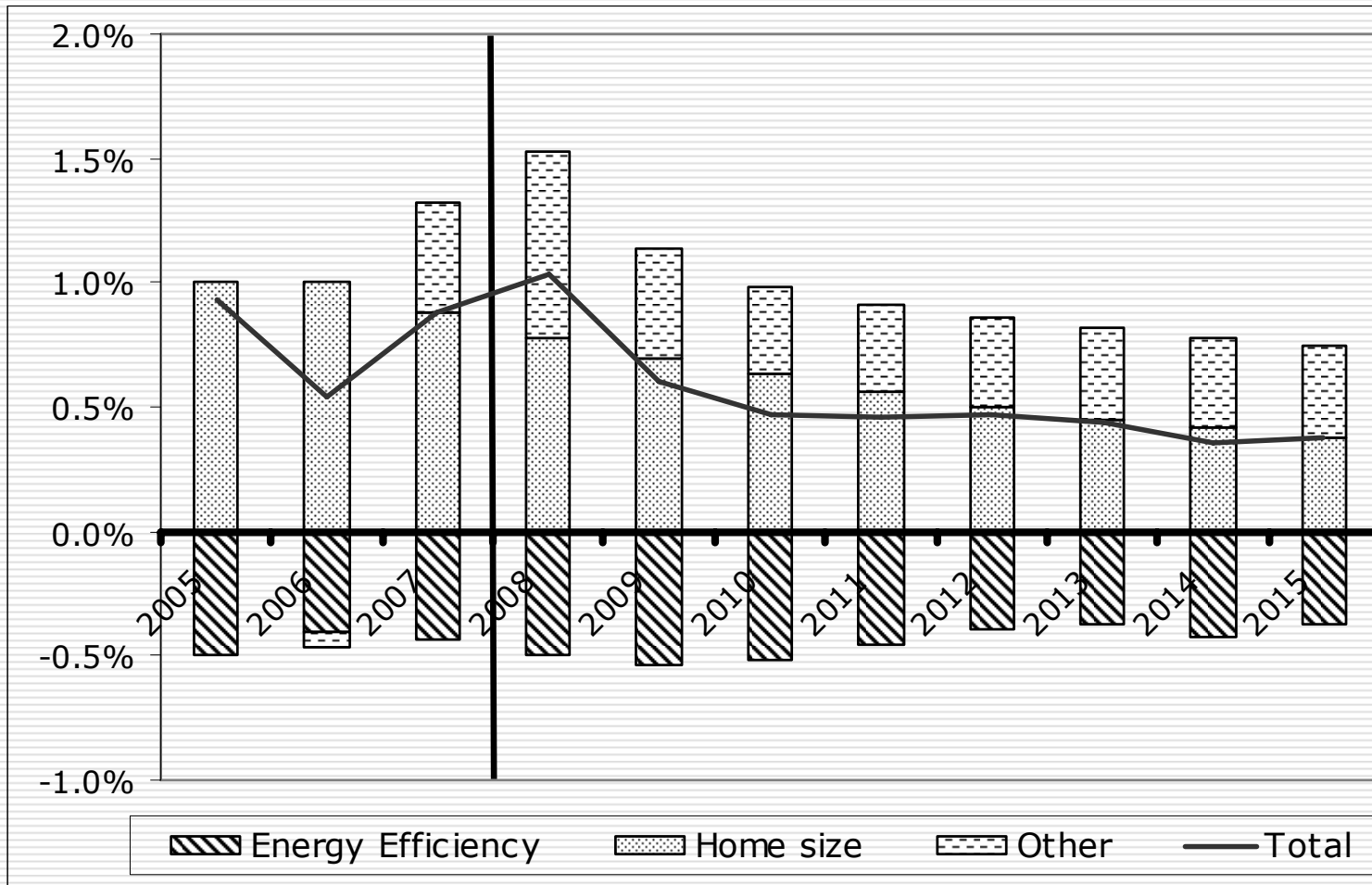
Residential Use per Customer

- Use per Customer Continues to Grow
 - 0.7% 2008 to 2027
 - 1.0% 1980 – 2007 (Weather Normalized)
- Principal Drivers
 - Home size for new customers
 - More household electronics
 - Increasing desert share
- Naturally-occurring efficiency offsets growth (partially)

Residential Usage Forecast

- Residential End Use Model
 - 5 End Uses + Base
 - Appliance Saturation by End Use
 - ◆ Historical Estimates Trended
 - ◆ Estimated From Survey of 3,000 Households Every 3-4 Years (most recently in 2005)
 - Electricity vs Natural Gas Share
 - ◆ Trended & existing building practices
 - Appliance Efficiency
 - ◆ Federal Efficiency Standards, Current Sales, Installations
 - ◆ Naturally Occurring Efficiency Upgrades Without DSM Incentives (New Customers and Appliance Replacements)
 - Total Household Usage = Sum of End Uses

Residential Usage Growth



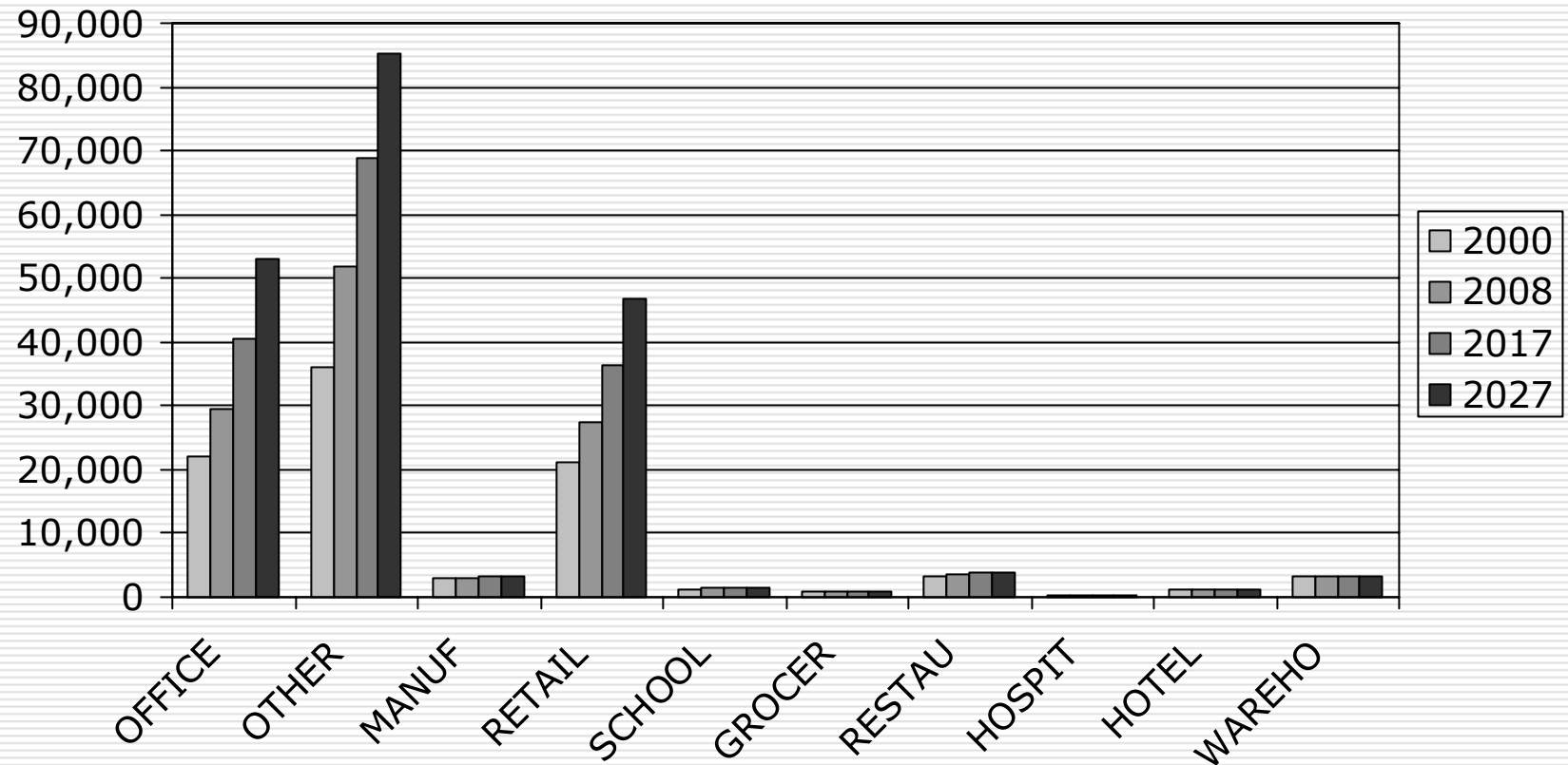
Commercial & Industrial Use per Customer

- C&I Use per Customer Declining Modestly
 - -0.1% per year 2008 – 2027
 - -0.2% per year 1980 – 2007 (weather normalized)
- Principal drivers are mix of business segments
 - Faster customer growth in less energy-intensive segments
- Methodology
 - Small C&I (< 3 mW) segmented into 10 building types
 - Large C&I (> 3 mW) projected individually

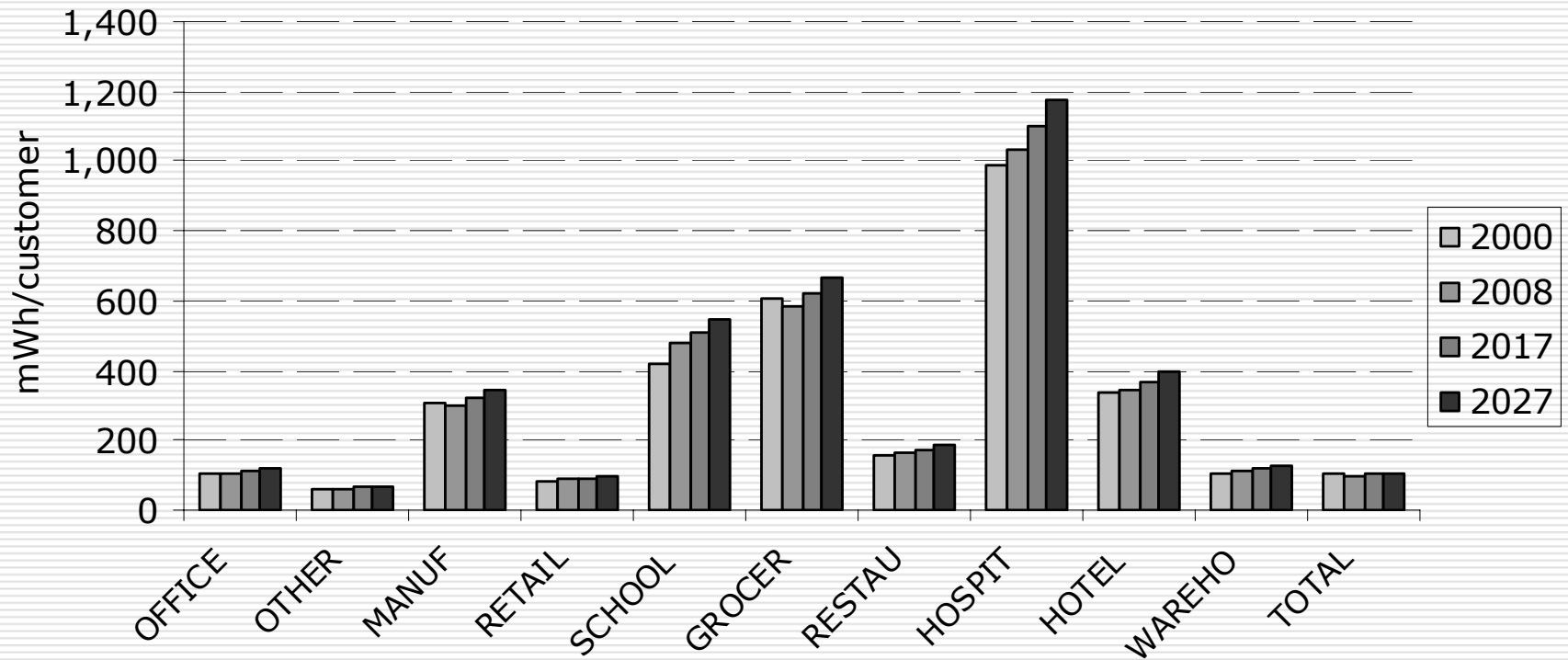
Small C&I Sales Important Factors

- 10 Building Types or “Segments” are Very Different in Size and Usage Behavior
- Usage Within Building Types Observed To Be Very Stable
- Mixture of Building Types is Primary Cause of Usage Change over Time

Small C&I Customers by Segment



Small C&I Use per Customer by Segment



Large Customer Forecasts

- Large C&I Accounts (> 3MW) Forecast Individually From Historic IDR data
- Each Large Customer is Unique
 - Weather Sensitivity
 - Business Cycle Vulnerability
 - Industrial Classification
- Wholesale Accounts Forecast Individually

System Peak Forecast

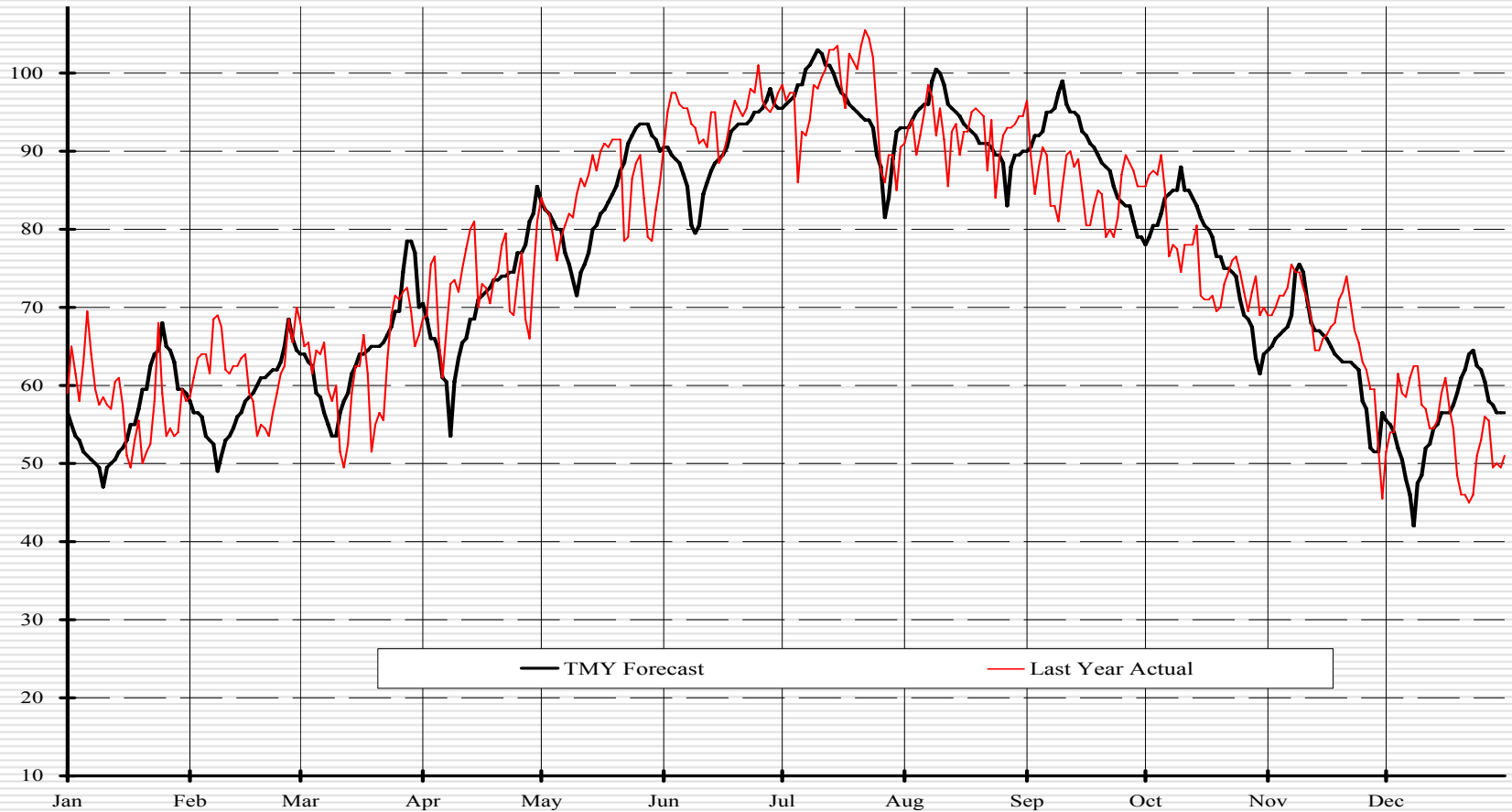
- Sum of Class Peaks
 - Residential
 - Small C&I
 - Large C&I (Individually for 90 Accounts)
 - Irrigation
 - Line Losses (11.7%)
 - Wholesale (Individually for 13 Contracts)

Shaping

- Monthly Shape Via 5 Year Average
 - Monthly Load Factor
 - Monthly Peak Ratio

- Daily & Hourly Shape Via an Historic Pattern
 - Daily Energy = $f(\text{Daily Weather, Day of Week})$
 - ◆ Daily Weather from 10 Year Sampling Method
 - ◆ Ensures Correct Range of Daily Weather for Each Month
 - Hourly Load MW = $f(\text{Daily Energy, Temp})$
 - ◆ 48 Models (24 winter, 24 summer)

Daily Average Temperature Forecast



Load Duration for 2008

