Appendix G

Determination of Energy Prices for the Approved Residential Rate.

Having determined that the service charges should remain the same and that the 1st energy block should be set at 1000 KWh per Billing Period, the Board set the 1st energy block and run-out block energy prices subject to the following considerations:

1. Prices be such that the approved revenue requirement could be earned over the 12 months of the test year,
2. Progress be made towards eliminating the declining block rate,
3. The intra-class subsidies and surcharges should be as small as possible, subject to the concern for rate shock.

The revenue sufficiency issue (Item 1) was examined by using the 5 years of billing determinant data in evidence to make separate estimates for:

A. The number of service charges likely to be billed in the test year, by linear extrapolation of the 5 year trends for urban, rural and seasonal customers. The trend variable for each group was calculated by computing the number of billing months each invoice represented, rounded to 1 in the case of invoices containing from 1 to 45 billing days and rounded to the nearest integer month otherwise.
B. The 5-year average of the annual fraction of residential energy sales to urban, rural and seasonal customers groups.

C. The 5-year average fraction of sales made to each group that were made in a 1st energy block of 1000 KWh per Billing Period.

The extrapolated estimates for the number of service charges in the test year were multiplied by the approved charges to determine the contribution of service charge revenue to residential class revenue. The relevant data and the estimates appear in Table G.1.

The average annual energy fraction estimates were applied to the forecast energy sales for the test year to determine the anticipated split between urban, rural and seasonal sales. The split between 1st and run-out energy blocks was applied to each of these groups' total sales and summed to find the total 1st and run-out block energy sales to the residential rate class for the test year. The relevant data and estimates for total and 1st block energy sales are shown in Table G.2. The proof of revenue for the residential class is provided in Table G.3

Customer Impact

The Board was concerned with the impact that the proposed and approved rates would have on customers. It therefore spent considerable time and effort to deliberate on this matter.

The billing determinants for each customer for the period of five fiscal years ending on March 31, 2005 were available in evidence and used for this purpose. The Board used this database to calculate the monthly bills for customers under the existing, proposed and approved rates. The monthly bills of all customers that had received a full year of service were then aggregated to form their annual cost under each of the three rates. These annual costs were used to calculate the percentage increase for each customer under the proposed rate and under the approved rate. This percentage increase in annual costs was used as the fundamental measurement of customer impact during deliberations.

The resulting dataset provided more than 1.2 million separate measurements of customer impacts. This exceeds the number of customers because each full year of service resulted in a measurement. Some customers provide 5 years of data, others 4, 3, 2, and 1 year of data. Using multiple years of data means that the effect of natural weather variation between years is included in the "average" impact. It also means that the analysis accords greater weight to the increases experienced by long-term customers than it does to short-term customers, so the data were also examined on a year-by-year basis to confirm that each year had a similar characteristics and they could be legitimately averaged for analysis.

The large number of measurements meant that they could not be examined individually, so the Board used two approaches to examine the measurements collectively:

1. Grouping customers by their annual energy use, and
2. Grouping customers by the increase in annual cost they experience.

Grouped Customer Impact by Annual Energy Use

In this approach, customers are assigned to a group based on a their annual energy use and the percentage change in cost for the group is examined. While this facilitates consideration of customer size in relation to cost impact, it must be appreciated that each customer in such a group can experience a cost increase that is different from that of the group as a whole.[1] As a consequence, one must look at more than the mean rate increase for the group to fully appreciate the impact on customers in the group.[2] This method also suffers from the fact that it does not directly indicate how many customers are subjected to a particular cost increase.

The customer impact using this approach is depicted in Figures G.1 and G.2, for the proposed and approved rates, respectively. The illustrations are limited to customers using up to 60,000 KWh per year. This includes 99.5% of the measurements. Each figure provides three curves. These depict the maximum, average, and minimum annual cost increases borne by the customers in each group. The vertical bars through the average curves represent the dispersion about the centre of the group. Longer bars indicate that

[1] For an extreme example, consider two urban customers, each using 12,000 KWh per year. Both would be in the same group because they have the same annual consumption. Customer A uses their energy evenly throughout the year, 1000 KWh per month, and would pay $1217.28 per year under the existing rate and $1316.88 per year under the approved rate, an 8.2% increase. Customer B uses their energy in 1 month, and pays $1031.70 per year under the existing rate and $1250.88 under the approved rate, a 21.2% increase.

[2] The median or middle value of the rate increases for the group and/or the modal or most probable value will generally be better estimates of the groups' characteristics and must be used if the mean deviates appreciably from them. The dispersion of the group about the mean/median must also be examined.

customers are widely disbursed between the maximum and minimum curves; shorter bars indicate that the customers are clustered close to the average curves.[3]

Proposed Rate

Figure G.1 indicates that 99.5% of customers would have experienced cost increases ranging from 10.4% to 17.9% under the proposed rate. The dispersion is largest in the range of 10,000 to 20,000 KWh per year consumption, but generally indicates that customers are clustered about the mean, or average, curve. The extreme values can deviate significantly from the average. While the mean increase for customers using 10,000 KWh per year is 10.7% (the median is 10.5%), one customer in that group experiences a 16.7% rate increase. Similarly, the mean and median increases for customers using 30,000 KWh per year are 14.7% and 14.6%, respectively, but one customer in that group experiences only a 10.9% rate increase.

Approved Rate

Figure G.2 indicates that 99.5% of customers would have experienced cost increases ranging from 0% to 24.3% under the approved rate. The dispersion is largest at 15,000 KWh per year consumption and becomes smaller only slowly as customer size increases. This indicates that customers are disbursed more widely about the average than in the proposed rate. The extreme values also deviate significantly from the average. While the mean increase for customers using 10,000 KWh per year is 7.9% (median is 7.7%), one customer in that group experiences a 19.5% rate increase. Similarly, the mean and

[3] The error bars represent ±3 standard deviations.

median increases for customers using 30,000 KWh per year are 16.3% and 16.2%, respectively, but one customer in that group experiences only a 7.6% rate increase.

Grouped Customer Impact by Increase in Annual Cost

In this approach, customers are assigned to groups based on the increase in the annual costs they experience and the distribution of increases across all customers is examined. This has the benefit of directly indicating the fraction of customers subject to a given cost increase. It also reveals the dispersion and the nature of deviations between the mean, median and modal values for the rate designs as whole, rather than just sub-groups. The drawback of this approach is that it provides no indication of the customer characteristics that give rise to the cost increase.

The results of this analysis are provided in Figure G.3. Note the highly skewed distributions for both the proposed and approved rates. This is a good indication the mean rate increase for the class as a whole may be misleading to individual customers. The mean, median, modes and ranges of the distributions are also given in the illustration.

The proposed rate increase would have resulted in a year-round customer cost increases averaging 12.4%. The median increase under the proposed rate was 12.0%, indicating that half of the customers would have experienced a higher increase than that, and half would have experienced a lower increase. The most likely rate increase that a customer

would experience is the mode, 10.6%. Cost increases under the proposed rate ranged from 10.4% to 19.8%.

The approved rate increase should result in a customer cost increases averaging 10.95%. The median increase under the approved rate should be 10%, with half of the increases being either above or below that value. The most likely rate increase is 7.8%, and the increases range from 0% to 29.6%.

Figure G.4 presents essentially the same data as Figure G.3, but does so using the cumulative distributions of rate increases. This indicates the fraction of customers that are exposed to a particular range of cost increases. For example, the median is found by moving horizontally from the point marked 50% on the vertical axis until a distribution curves is reached, and then moving vertically down to the horizontal axis. Figure 4 also illustrates that roughly 70% of customers should experience rate increases below 13.5% under either rate design.

Figure G.5 presents the distributions of cost increases for each fiscal year. Note that the shape of the distribution is constant from year to year. The relatively small variations on a year-over-year basis suggest that the average of all years (Figure G.3) provides a reasonable basis for evaluating the expected impact on customers.

Residential Customer Impact Summary

The impact of the changes in approved residential rate can be summarized as follows:

- Small customers that use electricity more-or-less uniformly throughout the year will experience the smallest increases in their bills.
- Large customers with usage that varies significantly over the year will experience the largest increases in their bills.
- The approved rate should result in lower cost increases than the proposed rate for approximately 70% of customers and higher cost increase for 30% of customers.

Table G.1

Number of Residential Service Charges by Fiscal Year

Rate Group / Year	Urban		Rural		Seasonal		Total	
	Actual	*Residual*	*Actual*	*Residual*	*Actual*	*Residual*	*Actual*	*Residual*
2001	1,576,727	4138	1,635,015	1267	210,124	-480	3,421,866	4925
2002	1,593,402	-2478	1,645,479	-69	213,614	521	3,452,495	-2026
2003	1,613,997	-5174	1,655,172	-2176	215,815	233	3,484,984	-7116
2004	1,643,690	1228	1,668,636	-512	217,963	-108	3,530,289	609
2005	1,668,038	2285	1,682,437	1489	220,393	-166	3,570,868	3608
2007	***1,712,335***		***1,704,548***		***225,537***		***3,642,420***	

Table G.2

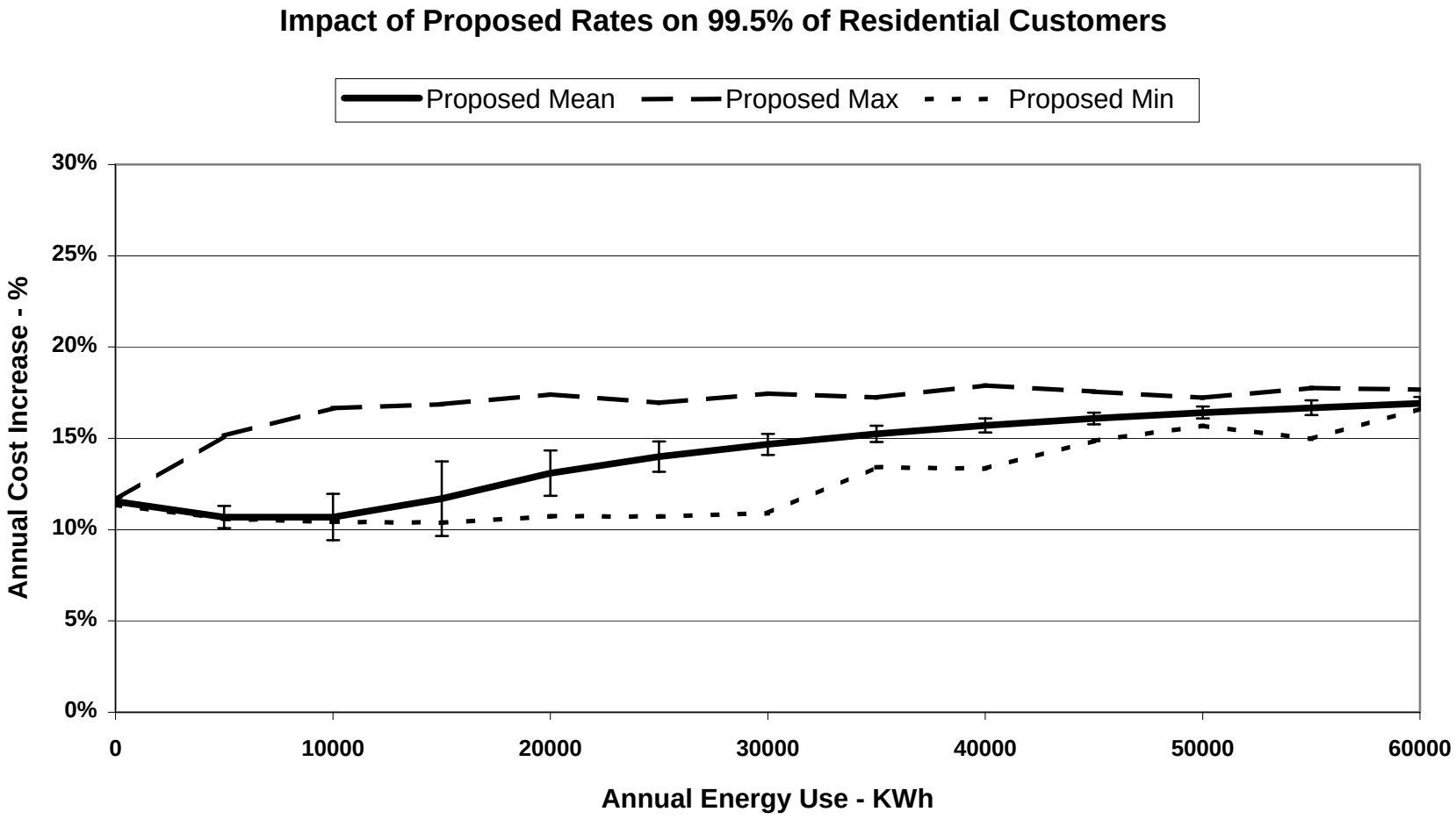
Residential Energy Sales by Class and Block Size

Energy / **Year**	**Total Residential Sales**				**1st Block Sales for 1000 KWh block size**			
	Energy Fraction - %				*Fraction of Energy in 1st Block - %*			
	Urban	*Rural*	*Seasonal*	*Total Energy GWh*	*Urban*	*Rural*	*Seasonal*	*Total*
2001	49.4%	49.6%	1.0%	4,605,484,913	53.7%	57.2%	74.3%	55.6%
2002	49.3%	49.6%	1.1%	4,402,864,095	56.4%	59.5%	74.2%	58.1%
2003	49.8%	49.2%	1.1%	4,929,196,683	51.9%	55.2%	73.6%	53.7%
2004	49.7%	49.2%	1.1%	4,921,322,346	52.8%	55.6%	70.0%	54.4%
2005	49.9%	48.9%	1.2%	4,971,525,321	53.1%	55.9%	70.7%	54.7%
2007 Estimates	***2,485***	***2,468***	***55***	***5,008***	***1,330***	***1,398***	***40***	***2,768***

Table G.3

Proof of Revenue from Residential Class for Fiscal Year 2006/2007

Item	Description	Quantity	Price	Amount (millions)
1	Urban Service Charges	1,712,335 cust-mths	$17.74 per cust-mth	$30.38
2	Rural and Seasonal Service Charges	1,930,085 cust-mths	$19.44 per cust-mth	$37.52
3	1st Block Energy Sales	2,768,000 MWh	$92.00 per MWh	$254.7
4	Run-out Energy Sales	2,240,000 MWh	$86.00 per MWh	$192.6
5	**Total Revenue from Residential Class**			**$515.2**



1 ***Figure G.1 Illustration of Impact of Proposed Rates Varying by Size of Residential Customer.***

2

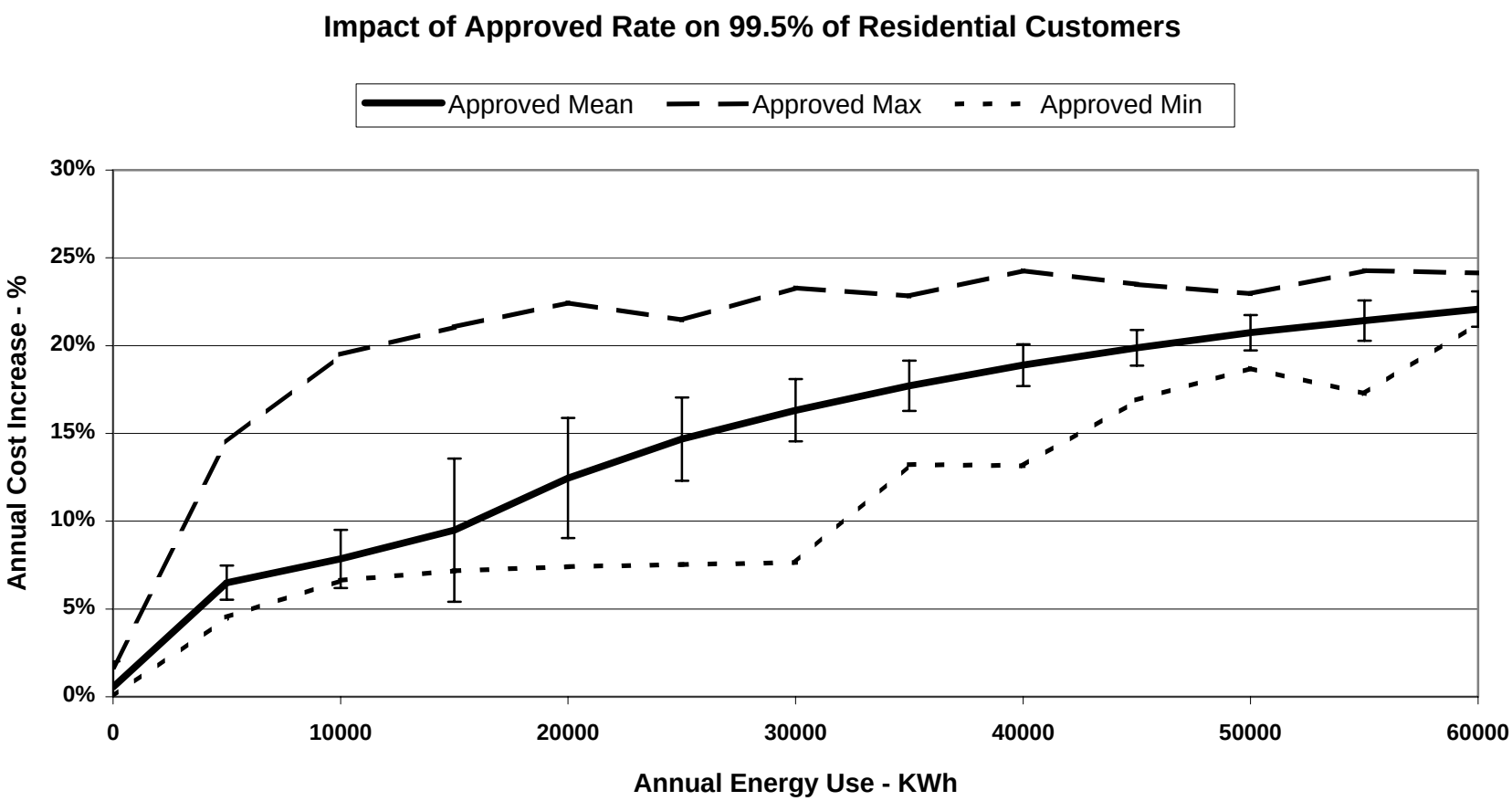


Figure G.2 Illustration of Impact of Approved Rates Varying by Size of Residential Customer.

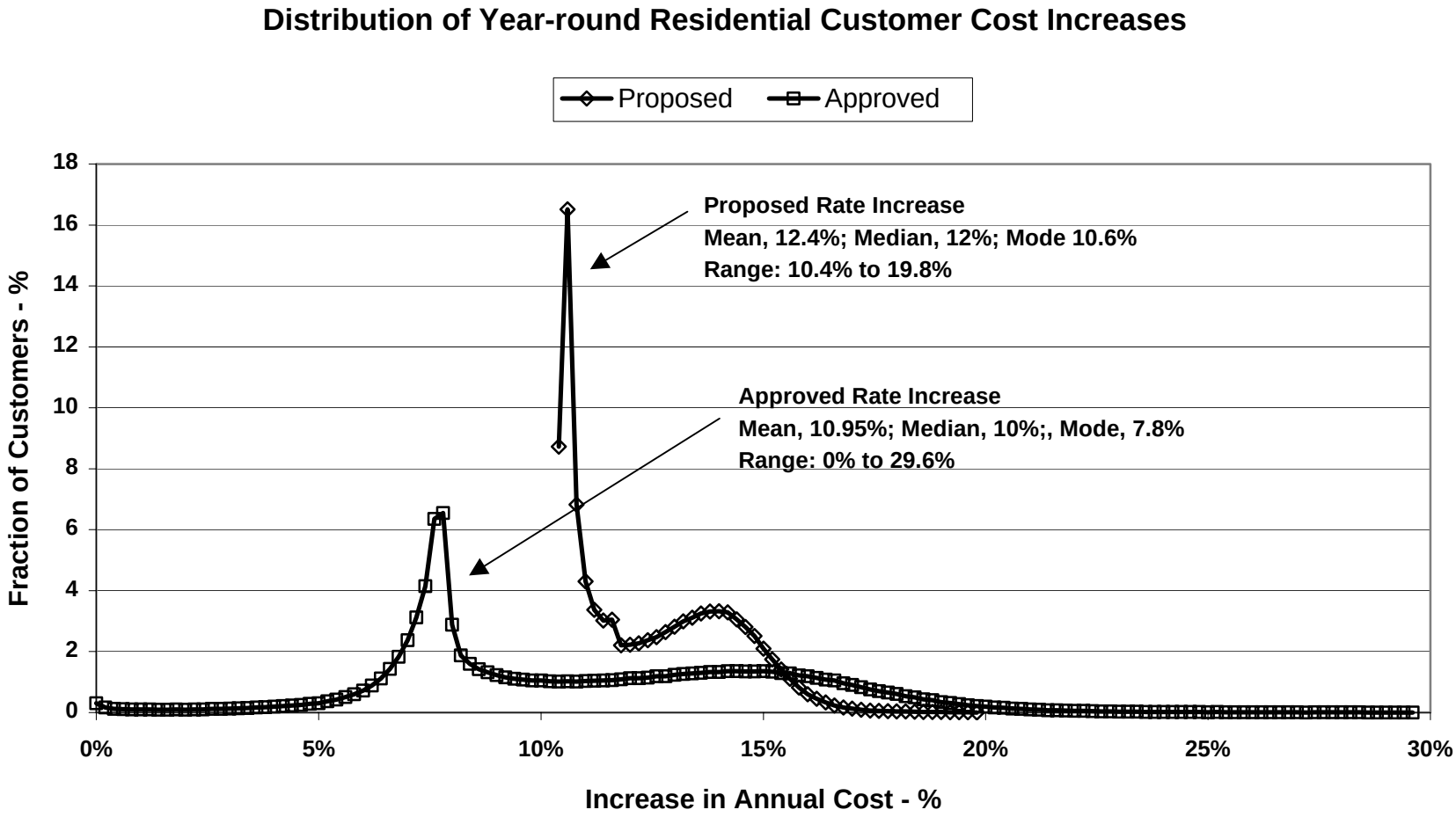


Figure G.3 Distributions of Customer Annual Cost Increases under Proposed and Approved Rates

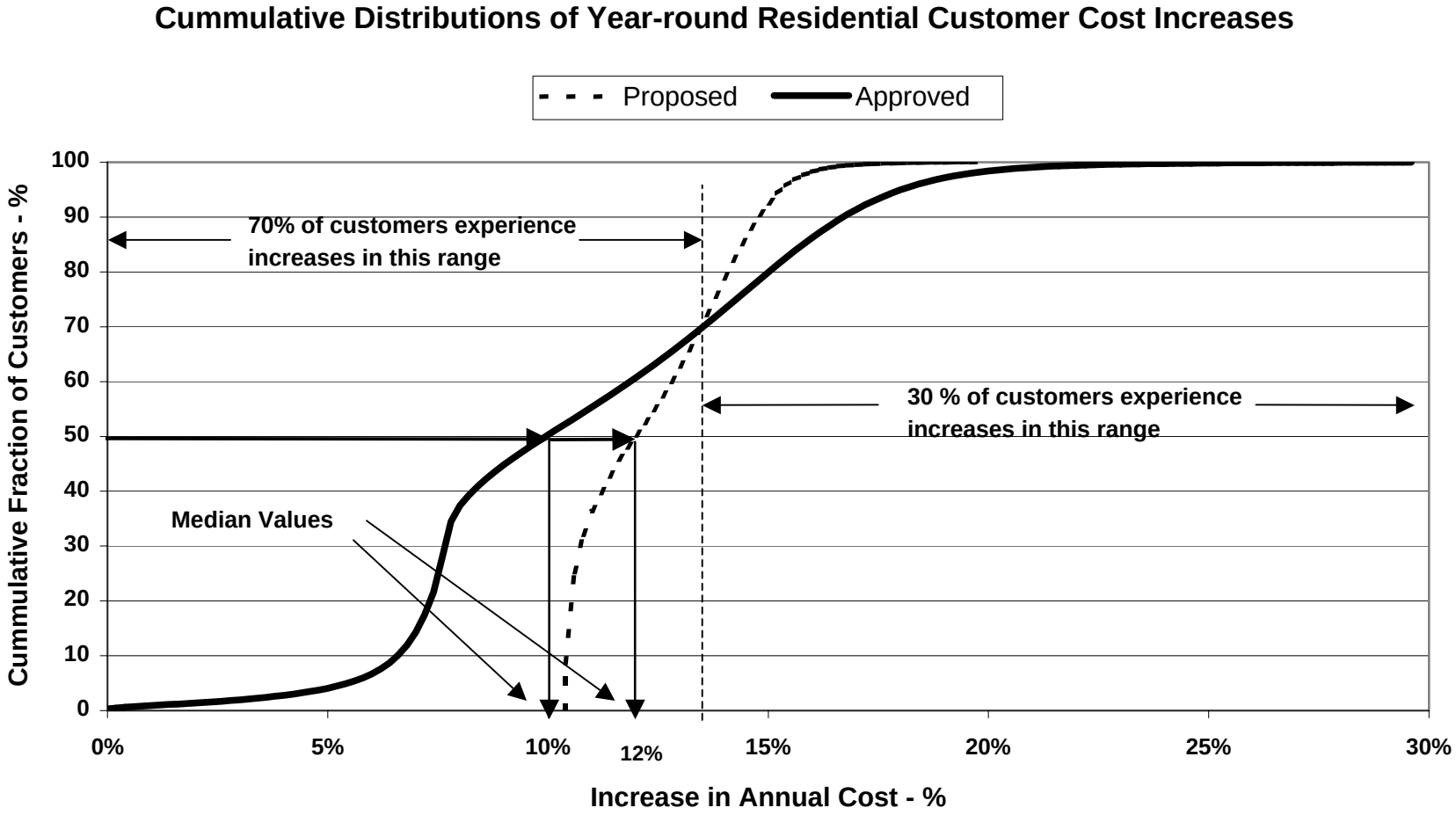
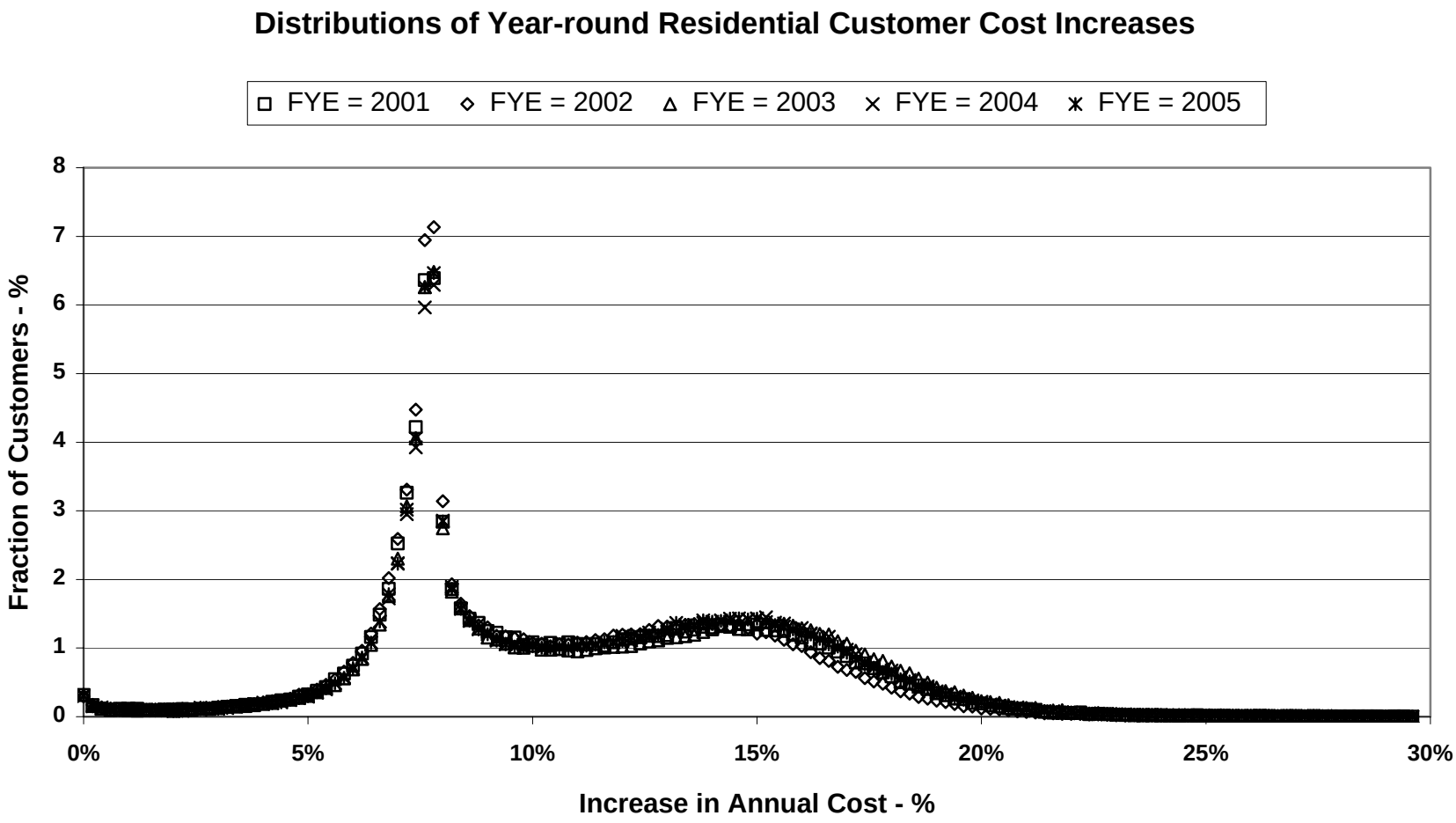


Figure G.4 Cumulative Distributions of Customer Annual Cost Increases under Proposed and Approved Rates



1 ***Figure G.5 Distributions of Annual Cost Increases for Year-Round Residential Customers by Year***