

**PUBLIC HOUSING UTILITY ALLOWANCES  
FOR THE METRO DADE HOUSING AGENCY**

**By:**

**Roger D. Colton  
Fisher, Sheehan & Colton  
Public Finance and General Economics (FSC)  
34 Warwick Road, Belmont, MA 02178  
617-484-0597 (phone) \*\*\* 617-484-0594 (FAX)  
rcolton101@aol.com (e-mail)**

**November 1997**

---

Fisher, Sheehan & Colton, Public Finance and General Economics (FSC) has reviewed the calculation of public housing utility allowances for the Metro Dade Housing Agency (MDHA). After an introduction, these comments on the methodology employed will be divided into three major areas: (1) a review of the natural gas component; (2) a review of the electric component; and (3) a review of the water component.

## 1 INTRODUCTION

This document presents a review of certain aspects of the calculation of MDHA utility allowances for public housing. The review is limited to tenants in the Venetian Gardens development.

### 1.1 *Limits of Analysis*

Our review of the proposed utility allowances is hampered by the lack of documentation for the methodology that was used to make the calculations of utility allowances. This lack of documentation manifests itself in at least three ways:

- o The source data for much of the consumption data is not revealed in any type of documentation. Thus, for example, the source data for the assumptions regarding lighting usage (both in terms of number of light fixtures and of hours of use per day) is nowhere provided. The documentation of the assumptions of how many persons per bedroom live in each size of housing is never provided.
- o The assumptions underlying the consumption data are not revealed in any of the documentation. Thus, for example, the assumption as to age, size and efficiency of refrigerator units is never provided as documentation for the refrigeration energy consumption levels contained in the calculations. The source of the energy efficiency rating for hot water heaters was not identified either.
- o No documentation of local custom and usage is provided for any of the calculations. HUD requires that utility allowances reflect local custom and usage. A determination of the appliance usage (both in terms of what appliances are assumed and the extent of their usage), for example, should be traceable to some determination of local custom and usage.

In each instance above, this listing of failures is illustrative and not comprehensive.

## 2 NATURAL GAS CONSUMPTION

Natural gas consumption for a utility allowance at Venetian Gardens consists of three components: (1) space heating; (2) domestic hot water (DHW) heating; and (3) cooking. Only DHW and cooking are considered below.

**2.1 Hot Water Consumption**

The annual hot water consumption provided for the Venetian Gardens public housing residents varies by unit size (measured by number of bedrooms). The consumption proposed by MDHA for Venetian Gardens is:

Venetian Gardens DHW Utility Allowance	
2 bedroom	164 therms
3 bedroom	204 therms
4 bedroom	244 therms

An appropriate calculation of the annual hot water consumption relies upon the following formula:

$$\text{Hot water load} = \frac{\text{temp rise} \times 8.33 \text{ lb/gal} \times \text{gal/year/unit}}{\text{system efficiency}}$$

The "temp rise" represents the difference between the water inlet temperature and the temperature of the water in the hot water tank. The "gallons/year/unit" represents the usage per tenant times the number of tenants. The "system efficiency" is the energy efficiency of the hot water heater. The "Btu per fuel unit" and "pounds per gallon" are standard units of measure. Using the data and assumptions set forth by the MDHA, the following equation would occur for natural gas hot water heating for a 2 bedroom unit in Venetian Gardens:

$$\frac{57 \times 8.33 \times 9.3/\text{gal/person/day} \times 365 \text{ days}}{0.70}$$

Solving for the equation using the MDHA's input<sup>11</sup> would result in annual natural gas consumption of 4,835 kBtu a year for "consumption

---

<sup>11</sup> This calculation yields an energy load in Btu's. There are 100,000 Btu's in a therm. A therm is the measurement of natural gas sold at retail.

energy required.<sup>121</sup> In fact, this was the MDHA's result. As is shown below, however, this result is wrong. In making its calculations, the MDHA relies upon assumptions that result in lower than reasonable utility allowances.

### 2.1.1 Water Temperature

In the equation above, the "temperature rise" (also called "Delta T") involves calculating the difference between the water inlet temperature and the temperature at which the hot water is assumed to be delivered. The MDHA assumes a hot water temperature of 125° and a water inlet temperature of 68° Fahrenheit. The "temperature rise" is thus calculated to be 57° F by the MDHA (125 - 68 = 57).

A hot water temperature of 125° is an unreasonably low assumption. A reasonable assumption is a hot water temperature of 135°. Given a hot water temperature of 135°, the Delta-T is 67° rather than 57° (135 - 68 = 67).

The unreasonableness of the MDHA's assumption of a 125° hot water temperature is evident from at least two observations. First, the federal government has prescribed a "uniform methodology for measuring the energy consumption of water heaters."<sup>131</sup> In defining the "storage tank temperature" to be used in this methodology, those federal regulations state that "the average temperature of the water within the storage tank shall be set to 135 +/- 5 degrees F."<sup>141</sup> Moreover, in prescribing the "test procedures," the regulations provide that one of the very first steps is to determine whether "the mean tank temperature is within the range of 135 degrees F +/-5 degrees F."<sup>151</sup>

Second, in establishing its uniform methodology, the U.S. Department of Energy (DOE) explained its choice of water temperatures.<sup>161</sup>

---

<sup>121</sup> Given the documentation provided, it is not possible to replicate or reconstruct the MDHA's calculation of "total energy lost." No opinion is expressed on its adequacy.

<sup>131</sup> 10 *C.F.R.* Pt. 430, Subpt. B, App. E (1996).

<sup>141</sup> Appendix E, §2.4.

<sup>151</sup> *Id.*, at §5.1.2.

<sup>161</sup> U.S. Department of Energy, *Energy Conservation Program for Consumer Products: Final Rule Regarding Energy Conservation Standards for Three Types of Consumer Products*, Docket No. CE-RM-88-101, 56 *Fed. Reg.* 22250 (May 14, 1991).

According to DOE, a 120° hot water temperature is inadequate to perform certain basic household chores. DOE found, for example, that 120° was inadequate to perform clothes washing.<sup>171</sup> Moreover, 120° water in a dishwasher, without a booster heater, provides insufficiently hot water to adequately clean dishes.<sup>181</sup> DOE decided that 135° (+/- 5°) was needed.

Accepting the DOE's finding that water temperature can be expected to vary +/- 5°, it becomes evident that the hot water temperature used by the MDHA (125°) can be *expected* to fall to a level that does not provide for safe and sanitary clothes and dish washing. The water temperature adopted by the Department of Energy (135°) should be used as the water temperature appropriate for an energy conservative household.

### 2.1.2 Water Use by Occupant

In the Venetian Gardens complex, the MDHA assumes hot water consumption of less than 10 gallons per occupant per day. Hot water consumption involves all types of hot water use, including showers, cooking, clothes washing, and the like. The 10 gallon per person per day figure is unreasonable.

As is shown below, the per person hot water consumption generally reported in the literature is 25 gallons per day for a unit that uses low-flow faucets and aerators. Units that are *not* equipped with these water-saving devices will have hot water requirements that are even higher. FSC assumes the presence of water savings devices and uses the 25 gallons per person per day.

A 25 gallon per person per day consumption is overwhelmingly supported by existing research. The U.S. DOE's Lawrence Berkeley Laboratory found an estimated daily personal use of 31 gallons of hot water per person per day.<sup>191</sup> This finding, Berkeley Lab said, was "slightly higher than any of the average values reported in the literature."<sup>101</sup> More recently, a paper presented at the American Council for an

---

<sup>171</sup> *Id.*, at 22264.

<sup>181</sup> *Id.*, at 22266.

<sup>191</sup> E. Vine *et al.*, *Domestic Hot Water Consumption in Four Low-Income Apartment Buildings*, at 12, Lawrence Berkeley Laboratory: 1986.

<sup>101</sup> *Id.*, at 7 (literature reports 27 - 29 gallons per person per day).

Energy Efficient Economy biannual "Summer Studies" program found that average residential hot water consumption was 30 gallons per person per day.<sup>\11\</sup>

It is not, however, simply that use of a 25 gallon figure is *more* reasonable. Rather, the finding here is that the MDHA's assumption of less than 10 gallons of hot water use per day is clearly *unreasonable*. Consider, for example, that the average flow rate for existing showerheads is 3.4 gallons per minute.<sup>\12\</sup> Using this average, the MDHA utility allowance would allow household members living in public housing to take a shower of something more than three minutes long each day, but to use no other hot water (for cooking, clothes washing, handwashing, or anything else).<sup>\13\</sup> Using the low flow hot water shower flow rate estimated by Lawrence Berkeley Laboratory of 2.5 gallons per minute<sup>\14\</sup> would allow each person to take a four minute shower each day, with no other hot water use. Again, however, any other use of hot water during the day (*e.g.*, washing hands, cooking, washing dishes) would reduce the time that a person could spend in the shower to below this four minute limit under the MDHA assumption.

Obviously, daily hot water usage includes more than simply showering. According to the Gas Appliance Manufacturers Association (GAMA), average gallons of hot water per usage include:<sup>\15\</sup>

---

<sup>\11\</sup> F.Goldner and D.Price, "Domestic Hot Water Loads, System Sizing and Selection for Multifamily Buildings," at 2-105, ACEEE 1994 Summer Study on Energy Efficiency in Buildings (1994).

<sup>\12\</sup> J.Koomey *et al.*, "The Effect of Efficiency Standards on Water Use and Water Heating Energy Use in the U.S.: A Detailed End-Use Treatment," at 7-103, 7-104, ACEEE 1994 Summer Study on Energy Efficiency in Buildings (1994).

<sup>\13\</sup> The shower would not simply be three minutes long since a shower flow includes more than simply hot water.

<sup>\14\</sup> E. Vine *et al.*, *Domestic Hot Water Consumption in Four Low-Income Apartment Buildings*, at 12, Lawrence Berkeley Laboratory: 1986.

<sup>\15\</sup> Gas Appliance Manufacturers Association, *Consumers' Directory of Certified Efficiency Ratings for Residential Heating and Water Heating Equipment* (October 1996).

Use	Gallons of Hot Water Per Use
Shower	20
Shaving	2
Hands and Face Washing	4
Hand Dishwashing	4 /a/
Food Preparation	5
NOTES:	
/a/ This does not set forth average daily use. Thus, for example, while an average of four gallons of hot water is used for each hand dishwashing, hand dishwashing generally occurs three times a day.	

In addition to this research, American Society for Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) has recently addressed research and standard-setting attention to hot water consumption issues.<sup>16)</sup> ASHRAE research found that specific demographic characteristics correlated to different levels of hot water consumption: high, medium and low. ASHRAE's categorization follows:

Demographic Characteristics Correlation to DHW Consumption (ASHRAE 1996)	
No occupants work	High

<sup>16)</sup> The American Society for Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) is a national standard-setting body.

Demographic Characteristics Correlation to DHW Consumption  
(ASHRAE 1996)

Public assistance and low income (mix)	Medium
Family and single-parent households (mix)	
High percentage of children	
Low income	
Families	
Public assistance	
Singles	
Single-parent households	Low
Couples	
Higher population density	
Middle income	
Seniors	
One person works, one stays homes	
All occupants work	

Demographic Characteristics Correlation to DHW Consumption (ASHRAE 1996)
NOTES:  Demographics listed in order from highest consumption to lowest consumption.

According to the ASHRAE research, a low-income housing project will generally fall somewhere between the "low income" and "no occupants work" categories of high-volume water consumption. ASHRAE then set national standards for sizing hot water equipment for multi-family buildings. According to ASHRAE, the average daily per person usage to be assumed for purposes of sizing a hot water heater would be as follows:

National DHW Sizing Guidelines (Low-Medium-High) (ASHRAE 1996)	
	Average Per Person Per Day
Low	14 gallons
Medium	30 gallons
High	54 gallons
NOTES:  These data are for centrally fired units. Consumption for individually metered are likely to be somewhat lower.	

In sum, the 10 gallon per person per day hot water consumption implicit within the MDHA utility allowance study should be replaced with a 25 gallon consumption input figure.<sup>17\</sup>

---

<sup>17\</sup> Hot water consumption per person is not linear. There are, in other words, certain "fixed" usage amounts. Therefore, it would not be

### 2.1.3 System Efficiency

In calculating the amount of energy needed to heat hot water, it is necessary to take into account the fact that natural gas hot water heaters are not 100 percent efficient. If a hot water heater burns 100 Btu's of gas, in other words, it does not produce 100 Btu's of energy. It is, therefore, necessary to determine an appropriate efficiency rating for the hot water heaters used in the MDHA public housing units.<sup>\18\</sup>

The MDHA's efficiency assumption of 70% for hot water heaters is too high and should be replaced with a reasonable figure. A hot water energy efficiency level of 70 percent is associated only with top of the line *new* hot water systems today. In contrast, the efficiency of gas water heaters is *typically* in the range of 50 to 60 percent. The U.S. Department of Energy, Lawrence Berkeley Laboratory reported the average efficiency of natural gas hot water heaters by the year in which the water heater was purchased.<sup>\19\</sup>

(. . .continued)

accurate to assume that a six person household uses 150 gallons of hot water ( $6 \times 25 = 150$ ). The non-linear relationship is not discussed here. In the recommendations below, the per person per day hot water consumption has been qualitatively adjusted downward to take into account this non-linear relationship.

<sup>\18\</sup> If a system is less efficient, it needs more fuel to deliver the same amount of energy. More fuel purchased, of course, means a higher bill.

<sup>\19\</sup> Roland Hwang *et al.*, Lawrence Berkeley Laboratory, *Residential Appliance Data, Assumptions and Methodology for End-Use Forecasting with EPRI-REEPS 2.1*, at 59 (May 1994).

Gas-fired Storage Water Heater Stock Data		
Year of Purchase	Average Efficiency	Share of 1990 Stock
pre-1973	47.4%	14.7%
1973, 1974	47.6%	5.1%
1975, 1976	47.9%	6.0%
1977, 1978	48.1%	7.1%
1979, 1980	48.5%	7.5%
1981, 1982	48.9%	8.5%
1983, 1984	49.3%	10.6%
1985, 1986	50.8%	12.5%
1987, 1988	52.7%	13.9%
1989, 1990	54.5%	14.1%

In addition to this work by Lawrence Berkeley Laboratory, the U.S. Department of Energy publishes annual figures on energy efficiencies.<sup>120\</sup> DOE's *Annual Energy Outlook 1995*, for example, reported the following for natural gas water heaters:

Energy Efficiency Factors: Natural Gas Water Heaters: 1993		
Stock Average	New Purchases	Best Available Technology
52%	54%	72%

<sup>120\</sup> DOE publishes this data in its *Annual Energy Outlook: 199x* (Energy Information Administration).

SOURCE: Department of Energy, Energy Information Administration, *Energy Outlook 1995*, at Table 5.

To assume an *average* water heater efficiency of 70% as was done by MDHA cannot be justified. For purposes of these allowances, an assumed system efficiency of 55% is used.

#### 2.1.4 Results of the changes

Making the recommended corrections to the utility allowance above results in increased natural gas consumption to be included in the MDHA utility allowances. A comparison of the MDHA hot water consumption to the corrected hot water consumption is presented below:

MDHA DHW Consumption vs. Corrected DHW Consumption (therms) (Venetian Gardens)		
Number of bedrooms	MDHA	Corrected
2	164	313
3	204	415
4	244	482

#### 2.2 *Cooking Consumption*

The absence of an administrative record to support the cooking component makes it impossible to review the cooking usage. Cooking consumption is a product of many factors, including the number of persons in the unit, the number of meals eaten in the unit, *which* meals (*e.g.*, lunch, dinner) are eaten in the unit, and the type, size, age and efficiency of the range and ovens used. While requested from MDHA in a public records request, none of this information was made available.

In the absence of an administrative record upon which to base a review of the MDHA cooking allowance, I have included HUD's "suggested

monthly energy consumption requirements for cooking.<sup>21\</sup> According to the HUD *Utility Allowance Guidebook*, these cooking allowances are "generally considered reasonable" for Housing Authorities:

Annual Cooking Consumption Allowances (therms) Venetian Gardens			
	2 Bedrooms	3 Bedrooms	4 Bedrooms
Natural Gas Consumption (therms)	78	89	97

### 2.3 *Natural Gas Consumption for Utility Allowances*

Keeping the MDHA space heating natural gas consumption constant, the appropriate natural gas consumption for Venetian Garden residents is as follows:

---

<sup>21\</sup> Scott Hebert and Sandra Nolden (draft: 1995). *Utility Allowance Guidebook, For Optional Use by Public Housing Agencies and Indian Housing Authorities*, Apt Associates: Cambridge, MA.

MDHA Natural Gas Consumption (therms) Venetian Gardens				
Number of bedrooms	Space Heat	DHW	Cooking	Total
2	60	313	78	451
3	67	415	89	571
4	73	482	97	652

Using these consumption amounts, the dollar utility allowances that should have been in place for natural gas consumption since January 1990 are presented in Attachment A.

### **3 ELECTRIC CONSUMPTION**

Calculating electricity consumption for purposes of utility allowances involves identifying the appliances in use, determining the extent of their use, assigning an energy consumption to their use, and accumulating those various end uses into a total utility allowance. Electric consumption might, for example, involve lighting, refrigeration, television/radios, microwaves, and other typical appliances.

#### **3.1 Overview**

The MDHA identified the following annual usage for public housing units at Venetian Gardens:

Electric Consumption (kWh) for Utility Allowances Venetian Gardens					
Bedrooms	Refrigerator	Misc.	Lights	Fans/Heat	Total
2	1,314	335	543	28	2,220
3	1,445	467	842	39	2,793
4	1,557	607	1,041	49	3,254

In turn, the "miscellaneous" electric component was composed of three factors: (1) television; (2) radio; and (3) a washing machine.<sup>122\</sup> MDHA calculated the miscellaneous component as follows:

Electric Consumption (kWh) for Utility Allowances Venetian Gardens				
Bedrooms	Total Miscellaneous Consumption	Components of Miscellaneous Consumption		
		TV	Radio	Wshg Machine
2	335	228	69	38
3	467	319	84	64
4	607	411	107	89

### 3.1.1 Lack of Documentation

<sup>122\</sup> In this sense, the "public notice" to tenants informing them that their utility allowance includes usage for "miscellaneous appliances" is simply wrong. No miscellaneous appliance usage is included in the MDHA electric utility allowance.

Unfortunately, the MDHA provided no back-up documentation for these assertions. It is, for example, impossible to ascertain the source of the assumed annual refrigerator consumption.<sup>\23\</sup> How the annual television consumption was set is impossible to divine.

### **3.2 *Miscellaneous appliance consumption***

The inability to obtain documentation for the MDHA estimates places the MDHA estimates in question, particularly when compared with other authoritative estimates of electric consumption. Substantially greater values are included in the U.S. Department of Energy, Energy Information Administration (EIA) estimates of "end use consumption of electricity" for various appliances.<sup>\24\</sup> In addition, MDHA excludes much consumption that a public housing resident can reasonably be expected to incur.

#### **3.2.1 Failure to consider**

MDHA projects *zero* "miscellaneous" electric consumption outside of television/radio and limited washing machine usage. Miscellaneous appliances include things such as clocks, toasters, microwave ovens, blenders, coffee makers, irons, vacuum cleaners, and other small appliances.

This failure to include other miscellaneous appliances is unreasonable. Consider, for example, that the U.S. Department of Housing and Urban Development's (HUD) *Utility Allowance Guidebook* includes a table with the following estimated energy consumption figures by appliance:

---

<sup>\23\</sup> Pending a review of some administrative record for refrigerators, no opinion is expressed as to the adequacy of the refrigeration component.

<sup>\24\</sup> U.S. Department of Energy, Energy Information Administration (1993). *Household Energy Consumption and Expenditures, 1990*, at 10, U.S. Government Printing Office: Washington D.C.

Annual Kilowatt Hour (kWh) Usage By Small Appliance	
Hand iron	50
Blender	33
Coffee maker	80
Dishwasher	170
Mixer	3
Microwave	200
Toaster	50
Garbage disposal	10
Hair dryer	50
Stereo	70
VCR	40
Clock	17
Sewing machine	12
Vacuum cleaner	40
Total	825

As can be seen from this listing of "miscellaneous" appliances, by excluding miscellaneous appliance usage *in its entirety*, the MDHA "miscellaneous" component excludes substantial electric consumption from its utility allowance estimates.

### 3.2.2 Unreasonably low estimate

Aside from the complete exclusion of miscellaneous appliance usage discussed above, the appliance consumption figures that MDHA *does* include in its utility allowances appear to be unreasonably low. Consider for example, that MDHA estimates that the electric consumption for a washing machine will range from 38 - 89 kWh per year for two to four bedroom units. Thus, for example, MDHA projects that a four bedroom (7 person) family will use 89 kWh for its washing machine. In contrast, the figure that HUD includes in its "average" consumption (which would be for a family much smaller than 7 persons) is 145 kWh per year. The U.S. Department of Energy (DOE) estimates the average household (again, which is much smaller than seven persons) has a washing machine consumption of 99 kWh. As can be seen, the HUD and DOE estimates range from 2x to 3x higher than what MDHA estimated. HUD provides an estimate of the "monthly electric consumption requirements of a typical clothes washer," which have been incorporated below.

In addition to the washing machine consumption, the television consumption appears to be unreasonably low as well. MDHA estimates television consumption to range from 228 kWh to 411 kWh for three to seven person families. According to the HUD *Guidebook* cited above, average consumption for a color television will range up to 300 kWh per year. According to the DOE estimates cited above, average television consumption reaches 360 kWh per year. As can be seen, the MDHA's television estimate is roughly 50% below what other standard estimates would lead one to expect.

### 3.2.3 Results of the changes

I have not performed an analysis that would allow me to project electric consumption based on the number of bedrooms in a unit (or, by extension, by the number of persons in a family). Without an administrative record showing appliance saturation and usage estimates, such an analysis is not possible. Accordingly, I have assigned the "average" consumption levels discussed above to the two bedroom units at Venetian Gardens.<sup>125\</sup> I have then maintained the overall relationship between unit sizes in my final figures. Given this procedure, the final estimates are as follows:

---

<sup>125\</sup> This assignment has an empirical basis. MDHA estimates three persons per two bedroom unit. This family size most closely parallels the median family size in Florida.

Miscellaneous Appliance Usage (kWh) Venetian Gardens						
# of BRms	Furn. Fans	TV	Radio	Wshg Mchne	Misc.	Total
2 bedrooms	28	300	69	120	825	1,342
3 bedrooms	39	420 /a/	84	180 /a/	1,031 /b/	1,754
4 bedrooms	49	541 /a/	107	240 /a/	1,289 /b/	2,226
<b>NOTES:</b>						
/a/ 3 and 4 bedroom units are in same relation to 2 bedroom units as in MDHA allowances.						
/b/ In the absence of any administrative record upon which to base an estimate, the calculated average amount for a two bedroom unit has been increased by 25% to fall within the mid-range per unit increase recommended in HUD's <i>Utility Allowance Guidebook</i> .						

### 3.3 Lighting

It is not possible to determine whether MDHA has reasonably determined the electric consumption that it allows for inside lighting. As noted above, the MDHA lighting consumption estimates are as follows:

MDHA Lighting Consumption (kWh) Venetian Gardens	
Number of Bedrooms	Consumption
2 bedrooms	543
3 bedrooms	842

4 bedrooms	1,041
------------	-------

In the absence of seeing the underlying documentation, a review of the MDHA conclusion cannot be made. The data forming the basis for the Venetian Garden lighting estimates was solicited from MDHA via a public records request. Amongst the data sought was:

1. All studies, surveys or other written assessments of: (a) the number of persons per unit within MDHA public housing who stay home; (b) the number of person-hours per day at home, and the specific hours of the day in which these persons stay home.
2. A single copy of any and all blank survey forms used to determine the number, size and hours of use of lighting fixtures in MDHA public housing.
3. The source for all lighting hours of use data used in calculating the lighting consumption. Provide such source for each room type (*e.g.*, bedroom, kitchen, living room, etc.).
4. The source of all data on the size of lighting fixtures assumed for purposes of calculating lighting consumption. Provide such source for each room type (*e.g.*, bedroom, kitchen, living room, etc.).
5. A list of all information sources used to determine local custom and usage in metropolitan Dade County respecting:
  - a. Size of light fixtures (by room type if available); and
  - b. Hours of daily lighting use (by room type if available).
6. All data collected regarding local custom and usage in metropolitan Dade County respecting:
  - a. Size of light fixtures (by room type if available); and
  - b. Hours of daily lighting use (by room type if available).

MDHA indicated that *none* of this requested information was available. In the absence of an administrative record upon which to base a review of the MDHA lighting allowance, I have included HUD's "monthly electric consumption requirements for lighting, typical ranges." According to the HUD *Utility Allowance Guidebook*, "energy consumption requirements for lighting in public housing typically fall into the ranges" presented here.

Annual Lighting Consumption Allowances (kWh) Venetian Gardens					
2 Bedrooms		3 Bedrooms		4 Bedrooms	
Low	High	Low	High	Low	High
1,080	1,620	1,260	2,220	1,440	2,820

Picking the low-point of this range of typical lighting consumption yields the following recommended lighting consumption for MDHA:<sup>126\</sup>

Annual Lighting Consumption Allowances (kWh) Venetian Gardens		
2 Bedrooms	3 Bedrooms	4 Bedrooms
1,080	1,260	1,440

### 3.4 *Cooling Allowances*

In calculating its electric utility allowance, the MDHA did not include any cooling component, air conditioning or otherwise. This observation is readily conceded by the consultant who developed the MDHA utility allowances. Lance Skelton (President, Management Trends and Solutions, Inc.) has stated:

The department of Housing and Urban Development does not subsidize cooling allowances and it is, therefore, not provided by Housing Agencies across the nation, including the State of Florida. Hence there are no calculations for cooling allowances.<sup>127\</sup>

<sup>126\</sup> By selecting the low point of the reasonable range, I do not endorse the conclusion that MDHA residents should be lower than typical. It is merely to introduce a note of conservatism into the recommendation in the absence of an administrative record.

<sup>127\</sup> Correspondence to Barbara Goolsby, Legal Services of Greater Miami (November 11, 1997).

The conclusion reached by Mr. Skelton is an erroneous statement of the law and the exclusion of a cooling component to the MDHA utility allowance in its entirety is unreasonable. The issue presented is not one of whether these allowances should pay for air conditioning. The issue is one of cooling more generally. The proposed utility allowances make *no* provision for cooling, air conditioning or otherwise.

### **3.4.1 The Context of Providing Cooling**

The implications of whether MDHA provides a utility allowance for cooling are tremendous. On the one hand, if cooling consumption is to be excluded, low-income shelter costs can substantially exceed the 30-percent maximum dictated by federal law as appropriate.<sup>128\</sup> On the other hand, if cooling is discouraged, low-income households may well be faced with significant threats to health and safety.<sup>129\</sup>

#### **3.4.1.1 The Current Context**

The utility allowance is intended to pay for energy consumption associated with: (a) appliances that are PHA-provided, and (b) appliances that are not PHA-provided, but that are necessary nonetheless. Tenants in public housing using more energy than that provided in the utility allowance must pay for that additional consumption out of their own pockets. The utility allowances established by the MDHA are to be sufficient to cover the consumption necessary to provide a safe, sanitary and healthful living environment.<sup>130\</sup> The issue raised below is whether electric consumption associated with cooling in Miami falls within this language.

Rightly or wrongly, the U.S. Department of Housing and Urban Development (HUD) has made clear its current position on including *air*

---

<sup>128\</sup> 42 *U.S.C.* §1437(a) (1996).

<sup>129\</sup> See generally, Roger Colton and Michael Sheehan (1994). *The Other Part of the Year: Low-Income Households and Their Need for Cooling: A State-by-State Look at Low-Income Summer Electric Bills*, Fisher, Sheehan & Colton, Public Finance and General Economics: Belmont, MA. ("Heat is a substantial contributor to death tolls in even average summers. While those persons most prone to heat-induced deaths are the elderly and the infirm, death can be found in all age groups and socio-economic strata. Given that observation, cooling can be viewed as more than a comfort-related luxury. Cooling can, and indeed most often is, a necessity of life.").

<sup>130\</sup> 24 *C.F.R.* §965.505(a) (1996).

*conditioning* in utility allowances in public housing. HUD regulations and Congressional actions, however, do not allow cooling consumption to be ignored in its entirety.

### 3.4.1.2 Current HUD Regulations with Respect to Air Conditioning

The issue of whether the MDHA should include *air conditioning* consumption in utility allowances for public housing appears to be settled by HUD regulations. According to HUD:

If a PHA installs air conditioning, it shall provide, to the maximum extent economically feasible, systems that give residents the option of choosing to use air conditioning in their units. The design of systems that offer each resident the option to choose air conditioning shall include retail meters or checkmeters, and residents shall pay for the energy used in its operation. For systems that offer residents the option to choose air conditioning, the PHA shall not include air conditioning in the utility allowance.<sup>131\</sup>

HUD explained the rationale for its current regulation, adopted in final form in February 1996, when it stated:

There is considerable debate as to the extent to which air conditioning should be considered an essential component. As noted earlier, the cost of utilities is in excess of \$1 billion annually, Appropriations for the last two years have been, and for the foreseeable future will be, insufficient to fund PHAs at 100 percent of their eligibility under the [performance funding system]. Including air conditioning in utility allowances beyond what is already specifically authorized<sup>132\</sup> would seriously and adversely impact the level of funding for other critical services such as maintenance. This will affect all PHAs around the nation, since it will reduce the overall amount of operating subsidy which is fixed. The Department's approach to this difficult issue is to allow the capital costs to be an eligible expense while requiring the resident to pay the costs of the energy associated with its use.<sup>133\</sup>

---

<sup>131\</sup> 24 *C.F.R.* § 965.505(e) (1996).

<sup>132\</sup> Specific authorization is given to include air conditioning if: (a) the air conditioning is provided by the PHA; (b) there is no means for the resident to choose to use or not to use it; and (c) there is no means to individually or check-meter resident consumption.

<sup>133\</sup> 61 *Fed. Reg.* 7966, 7968, Final Rules, HUD Docket No. FR-3928-F-02 (Feb. 29, 1996).

Subsequently, HUD again noted that its decision on air conditioning was based on "the financial impact of including air conditioning in utility allowances."<sup>34\</sup>

### 3.4.1.3 Distinguishing "Cooling" Generally from "Air Conditioning" in Particular

HUD's decision with respect to air conditioning in particular does not give authority to the MDHA to completely forego providing Miami public housing tenants with a utility allowance to pay for their cooling expenses not associated with air conditioning. The fact that cooling needs are to be met through public housing utility allowances is evident from several lines of analysis:

#### 3.4.1.3.1 Utility Allowance Regulations

HUD's own regulations provide evidence for the conclusion that cooling needs are to be included in the allowances provided to public housing tenants. HUD articulates nine mandatory factors that the MDHA "shall take into account" as "relevant factors" in establishing utility allowances.<sup>35\</sup> One of these factors includes the climatic location of the housing projects.<sup>36\</sup> While the MDHA may argue that this factor refers to heating needs rather than cooling needs, HUD's own regulations belie that conclusion. The eighth factor identified by HUD includes "temperature levels intended to be maintained in the unit during the day and at night, and in . . . warm weather. . ."<sup>37\</sup> Moreover, HUD comments dating back to the original 1984 regulations refer not simply to "air conditioning" but rather to "heating *and cooling* systems and their efficiencies."<sup>38\</sup> One can conclude, therefore, that when HUD now excludes the narrower class of equipment (air conditioning) when it previously had favorably discussed the broader class of cooling equipment generally, it knew what it was doing and intended the distinction.

---

<sup>34\</sup> *Id.*, at 7969.

<sup>35\</sup> 24 *C.F.R.* §965.505(d) (1996).

<sup>36\</sup> 24 *C.F.R.* §965.505(d)(2) (1996).

<sup>37\</sup> 24 *C.F.R.* §965.505(d)(8) (1996). (emphasis added).

<sup>38\</sup> *See e.g.*, 49 *Fed.Reg.* 31399, 31405 (August 7, 1984).

This conclusion is only bolstered by continuing reference in the HUD regulations to the mandatory consideration of climatic location, as well as the temperature levels to be maintained in the unit during "warm weather."

In addition to the specific HUD consideration of cooling requirements outside the context of air conditioning, HUD has constrained the discretion of the MDHA to determine which energy end uses are "luxuries" rather than necessities. In adopting its Final Rule in August 1984 regarding establishing utility allowances, the Department discussed local determinations of "luxury" versus "necessary" energy end uses.<sup>39\</sup> (While HUD has since amended its Final Rule in part, in adopting those amendments, the Department *explicitly* said that "the `factors' cited, which have been in effect for more than a decade, are reasonable and necessary to be `considered' regardless of the methodology used in order to meet the objective [of the utility allowance regulation].")<sup>40\</sup> According to HUD's rationale for its 1984 Final Rule:

While actual consumption does not distinguish between necessities and luxuries, the energy conservative household standard does because the PHA must estimate the amount of energy needed to provide lighting, heating, hot water, refrigerator, cooking, etc. The division between necessities and luxuries is left to the particular PHA and *HUD expects that this division will reflect local usage and custom patterns.*<sup>41\</sup>

Despite the HUD policy decision regarding air conditioning in particular, therefore, the MDHA must make a determination of to what extent the use of cooling equipment not consisting of air conditioning is a necessity in Miami. This determination "will reflect local usage and custom patterns" with respect to cooling. Moreover, even aside from the substantive duty imposed by the "will reflect" language,<sup>42\</sup> an MDHA utility

---

<sup>39\</sup> 49 *Fed. Reg.* 31399.

<sup>40\</sup> 61 *Fed. Reg.* 7969.

<sup>41\</sup> 49 *Fed. Reg.* 31404. (emphasis added).

<sup>42\</sup> Note that unlike many times when HUD merely requires a local PHA to "consider" a factor, HUD instead states that the division between luxuries and necessities "*will reflect*" local usage and custom. The use of the word "will" stands in contrast to "should" or "may" or "ought." The term "reflect" is certainly more restrictive than the requirement merely to "consider" local usage and custom.

With no administrative record to attest to whether the factors set forth in the Rule were indeed considered, it is impossible to conclude that the allowances were not arbitrary and capricious. The Final Rule specifically directs PHAs to document its

allowance decision the fails even to consider "local usage and custom patterns" respecting cooling use is unreasonable.<sup>43\</sup>

### **3.4.1.3.2 Congressional Consideration of "Cooling" and Utility Allowances**

Aside from HUD's regulations regarding the inclusion (or non-inclusion) of air conditioning consumption in public housing utility allowances, a second important consideration is whether *Congress* has evidenced an intent for cooling consumption to be included in such allowances. In several instances, Congress has evidenced just such an intent.

**Congressional Amendments to the Performance Funding System (PFS)**: In 1990, in the Cranston-Gonzalez affordable housing act,<sup>44\</sup> Congress recognized the legitimacy of including cooling equipment within the energy costs of public housing. Section 508 of the Cranston-Gonzalez Act provided that:

In determining the Performance Funding System utility subsidy for public housing agencies pursuant to Section 9 of the United States Housing Act of 1937, the Secretary of Housing and Urban Development shall include a *cooling degree day* adjustment factor. The method by which a cooling degree day adjustment factor is included shall be identical to the method by which the heating degree day adjustment factor is included.

(. . .continued)

reviews. Moreover, under the arbitrary and capricious standard of review of an agency's action the agency must examine the relevant data and articulate a satisfactory explanation for its action including a "rational connection between the facts found and the choice made." [citations omitted] In reviewing that explanation, we must "consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment." *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 416, 91 S.Ct. 814, 823, 28 L.Ed.2d 136 (1971).

*Dorsey v. Housing Authority of Baltimore City*, 984 F.2d 622, 630 (4th Circ. 1993).

<sup>43\</sup> *Dorsey v. Housing Authority of Baltimore City*, *supra*; see also, *Scenic Hudson Preservation Conference v. Federal Power Commission*, 354 F.2d 608 (2d Circ. 1965).

<sup>44\</sup> Public Law 101-625 (1990).

(emphasis added). To understand the significance of this, one must understand how the Performance Funding System works, particularly as it relates to Heating Degree Days. According to HUD:

At the beginning of the year, the PFS uses a Housing Agency's (HA) average consumption for a specified three year period as the best estimate of consumption in the coming year. At the end of the year, there is a 50/50 sharing with the Department of the cost [or] savings of any consumption over or below this estimate. This builds in an incentive to decrease consumption because HAs get to keep half of the savings, and protects HAs from the full impact of increases in consumption.

Before the sharing is calculated, however:

the estimated full consumption of any meter measuring a utility that is used for heat is adjusted to reflect the difference in heating degree days between the three years used in the estimate and the actual heating degree days in the year which has just ended.

According to HUD's proposed rule to implement Section 508:

A literal interpretation of statutory language on cooling degree days poses a potential problem in that the cooling degree day adjustment will be applied to the electric consumption in almost all cases. This means that if a summer is ten percent cooler than the years in the rolling base, the total estimated annual electric consumption for the meter will be reduced by ten percent.

While HUD ultimately implemented PFS regulations in a way *not* to consider cooling,<sup>45\</sup> there is no question but that Congress, in enacting the PFS amendment in the Cranston-Gonzalez Act, acknowledged the need for cooling in public housing at least in the Sun Belt states. In its order adopting a final rule in response to the legislation, HUD stated that:

Section 508 of the Cranston-Gonzalez National Affordable Housing Act of 1990 (104 Stat. 4187) directs the Department to incorporate into the PFS a methodology to adjust utility consumption to account for Cooling Degree Days that is the same as the methodology used to account for Heating Degree Days. The impetus for this legislation was that housing agencies in the

---

<sup>45\</sup> Since HUD did not want to include cooling degree day adjustments, it eliminated the heating degree day adjustments as well. As a result, heating and cooling degree days are treated the same (*i.e.*, not at all), in literal compliance with the statute.

sunbelt who had to pay higher utility bills for air conditioning during hot summers (*e.g.*, in projects that were "master-metered" in which the cost of running air conditioning could not be assigned to the tenant) wanted an adjustment in their PFS payments to account for the increased utility consumption.<sup>\46\</sup>

Again, it is not the intent here to indicate that the MDHA must include an air conditioning component in its utility allowance. It *is* the intent, however, to demonstrate that an exclusion of *any* cooling allowance for public housing in Miami was certainly not contemplated as being appropriate by Congress.

**Federal Fuel Assistance: LIHEAP:**<sup>\47\</sup> The final Congressional action regarding how much federal fuel assistance to provide to households receiving public housing utility allowances provides guidance on Congressional intent as to whether or not cooling consumption should be included in such allowances. The fuel assistance statute --LIHEAP-- consistently refers to "heating *and* cooling" components to home energy use.<sup>\48\</sup> Moreover, it specifically defines "home energy" to include both heating *and* cooling.<sup>\49\</sup>

More specifically, however, Congress amended the LIHEAP statute to provide a "clarification" on HUD utility allowances. With regard to public housing in particular, the statute provides that:

tenants. . .who are responsible for paying some or all heating or cooling costs shall not have their eligibility automatically denied. A State may consider the amount of the heating *or* cooling component of utility allowances received by tenants. . .when setting benefit levels under the Low-Income Home Energy Assistance Program.<sup>\50\</sup>

---

<sup>\46\</sup> 59 *Fed. Reg.* 51852-02 (October 13, 1994).

<sup>\47\</sup> LIHEAP is the Low-Income Home Energy Assistance Program.

<sup>\48\</sup> See *e.g.*, 42 *U.S.C.* §8624(b)(15) (1996); §8624(f)(2)(A) (1996).

<sup>\49\</sup> 42 *U.S.C.* § 8622(3) (1996).

<sup>\50\</sup> See, 42 *U.S.C.* §8624 (1994), Pub. L. 102-550, Title IX, §927 (Oct. 28, 1992), 106 Stat. 3885, *as amended*, Pub. L. 103-185, §1 (Dec. 14, 1993), 107 Stat. 2244.

The statute continues to state:

The size of any reduction in Low-Income Home Energy Assistance Program benefits must be reasonably related to the amount of the heating *or cooling* components of utility allowances received and must ensure that the highest level of assistance will be furnished to those households with the lowest incomes and the highest energy costs in relation to income, taking into account family size. . .<sup>51\</sup>

Clearly, Congress intended utility allowances to have, where appropriate, a "cooling" component. If no cooling allowance was permitted by Congress in the first place, the LIHEAP language just cited would be entirely superfluous, a result not to be reached. Of course, this does not mean that the "cooling component" must be "air conditioning" in particular. It could involve a ceiling fan or some other fan; it could involve a heat pump. It could involve an evaporative cooler. Whatever the form that cooling takes, however, the explicit Congressional reference to a "cooling component of utility allowances" clearly indicates that cooling is not to be excluded in its entirety from utility allowances as the MDHA has done.

### 3.4.2 Space Cooling Usage and Custom in Miami

MDHA does not have absolute discretion to determine which energy uses are "luxuries" and which uses are "necessities" in Dade County. According to HUD's preamble in its 1984 Final Rules regarding the establishment of utility allowances, "the division between necessities and luxuries is left to the particular PHA and *HUD expects that this division will reflect local usage and custom patterns.*"<sup>52\</sup> This "expectation" establishes both a procedural and a substantive obligation. On the one hand, if MDHA has failed even to *consider* "local usage and custom" patterns" with respect to cooling in Miami, its utility allowance decision will be procedurally "arbitrary and capricious." On the other hand, utility allowances that were established without consideration of "local usage and custom" respecting cooling in Miami would "reflect" such usage and custom merely by sheer happenstance. Whether a utility allowance "reflects local usage and custom" sets an objective measure of the reasonableness of the allowance.<sup>53\</sup>

---

<sup>51\</sup> *Id.*, at subsection (d).

<sup>52\</sup> 49 *Fed. Reg.* 31404. (emphasis added).

<sup>53\</sup> In overturning the utility allowances of the Housing Authority of Baltimore City, the Fourth Circuit said:

Reliance upon cooling equipment is not only ubiquitous, but is almost universal, even amongst low-income consumers in the Miami/Fort Lauderdale metropolitan area. According to the U.S. Department of Housing and Urban Development's (HUD) *American Housing Survey*, there were 168,500 "occupied units" in the Miami/Fort Lauderdale metropolitan area in 1990 that were occupied by households living at or below 100% of the federal Poverty Level. Of those, 109,900 were tenants living at or below 100% of the federal Poverty Level. HUD reports that reliance upon different types of air conditioning was virtually universal:

USE OF AIR CONDITIONING IN THE MIAMI/FT. LAUDERDALE METROPOLITAN AREA (HOUSEHOLDS AT OR BELOW 100% OF FEDERAL POVERTY LEVEL)				
	Total /a/		Renters /b/	
	Number	Percent	Number	Percent
Total Occupied Units	168,500		109,900	
Central Air Conditioning	74,900		42,400	
1 room unit	40,800		35,400	
2 room units	16,300		10,300	
3 room units	10,200		3,700	
Total with some type of a/c	142,200	84%	91,800	84%

(. . . continued)

Commentary to the Final Rule shows that, while HUD provided only minimal guidelines to the PHAs in distinguishing between consumption generated by necessary and luxury appliances, it "expect[ed] that this division w[ould] reflect local usage and custom patterns." 49 Fed.Reg. 31404. In fact, all of the Rule's recommended sources of data for determining reasonable allowances consisted of actual consumption data, implying that reasonableness must bear some relation to use.

*Dorsey v. Housing Authority of Baltimore City*, 984 F.2d 622, 629 - 630 (4th Circ. 1993).

**SOURCE:**

/a/ *American Housing Survey*, at Table 2-4 (p.12), U.S. GPO: Washington D.C. (1990).

/b/ *American Housing Survey*, at Table 4-4 (p.12), U.S. GPO: Washington D.C. (1990).

As this table clearly demonstrates, there is a need for cooling even within the low-income population. The data shows that more than eight of ten low-income consumers use not merely cooling equipment, but use air conditioning in particular. Moreover, the data shows that the use of cooling equipment is not limited to homeowners. Low-income tenants rely on cooling in Miami as much as the total low-income population does.

Limiting the data in this table to air conditioning is reflective only of the fact that air conditioning is the cooling equipment for which data is reported. Other types of cooling equipment are available, ranging from evaporative coolers to ceiling fans, to room fans. Indeed, HUD defines "air conditioning" for purposes of its *American Housing Survey* to mean: "the cooling of air by a refrigeration unit; excluded are evaporative coolers, fans, or blowers that are not connected to a refrigeration unit."<sup>54\</sup> If one engages in the assumption that air conditioning does not represent 100 percent of the cooling equipment in Miami, the fact that nearly 85 out of every 100 low-income consumers use air conditioning would seem to necessarily imply a nearly universal penetration rate of cooling equipment more generally.

Given this data, a utility allowance that provides for *no* cooling consumption whatsoever cannot be said to "reflect local usage and custom patterns."

### **3.4.3 Summary and Conclusions**

A decision not to include air conditioning consumption in MDHA utility allowances cannot be equated to a decision not to include any consumption for cooling more generally. A variety of HUD statements and regulations, as well as compelling evidence of Congressional intent, indicate that cooling consumption should be part of a utility allowance. This is particularly true if the climatic conditions in Miami reveal the need for cooling. It is particularly true, as well, if inclusion of cooling consumption is needed to reflect local usage and custom.

### **3.4.4 Amount of Cooling Allowance to be Included**

---

<sup>54\</sup> *American Housing Survey*, at Appendix A, p. A-13.

In the absence of air conditioning, it is assumed that tenants in the Venetian Gardens complex will use cooling fans for their cooling purposes. Standard data is not readily available for the calculation of consumption for cooling fans. The Council of Large Public Housing Authorities (CLPHA), however, has reported that a calculation for inside cooling fans involving a "basic allowance" of 36.6 kWh/month plus an additional 36.6 kWh/month for each additional person on the lease has been deemed reasonable.<sup>155</sup> Using this data for the months in Miami when Cooling Degree Days exceed 400 (May - November), and assuming two persons per bedroom, yields a cooling consumption as follows:

Annual Electric Consumption (kWh) for Cooling Venetian Gardens			
	2 Bedrooms (4 persons)	3 Bedrooms (6 persons)	4 Bedrooms (8 persons)
Venetian Gardens	1,098	1,537	1,976

### 3.5 *Electricity Consumption for Utility Allowances*

The total electric consumption to be included in MDHA utility allowances should be as follows:

---

<sup>155</sup> Council of Large Public Housing Authorities, *Methods Used by Selected PHAs to Calculate Utility Allowances*, at 3 - 4, CLPHA Research Report 91-1, CLPHA: Washington D.C.

Electric Consumption (kWh) for Utility Allowances Venetian Gardens						
Bedrooms	Refrigerator	Misc.	Lights	Cooling	Fans/Heat	Total
2	1,314	1,342	1,080	1,098	28	4,834
3	1,445	1,754	1,260	1,537	39	5,996
4	1,557	2,226	1,440	1,976	49	7,199

Using these consumption amounts, the dollar utility allowances that should have been in place for electricity consumption since January 1990 are presented in Attachment A.

#### 4 WATER CONSUMPTION

Home water consumption<sup>156\</sup> differs somewhat from home energy consumption in that it is difficult to "build-up" total consumption by end use. Several things are known about water use, however. First, consumption is universally measured on a per capita basis. Consumption is estimated on the basis of per capita gallons per day (gpd). Second, use is highly sensitive to factors such as the amount of time individuals spend at home.

MDHA has estimated the following water consumption for public housing residents at Venetian Gardens:

MDHA Estimate of Water Consumption Venetian Gardens		
Bedroom Size	CCF	GPD /a/
2	7.7	5,760

<sup>156\</sup> "Water" consumption includes sewer bills as well.

3	11.8	8,826
4	15.7	11,744
/a/ Gallons are calculated using a conversion factor of 748 gallons per ccf.		

Unfortunately, the administrative record that supports these usage amounts does not exist. In response to a public records request for all data and documents supporting the assumed consumption, Dade County's Department of Housing and Urban Development responded: "we could not locate any written documents to satisfy your request on how DCHUD calculates the utility."<sup>157\</sup>

#### **4.1 Household Water Consumption**

Despite the inability to reconstruct the MDHA calculation because of the lack of any record, it is possible to make some estimates of a reasonable water consumption for Venetian Gardens. Estimates of in-home water usage range from 60 to 100 gallons per person per day. Consider the following:

Per Capita In Home Water Usage Estimates	
Source of Estimate	Estimated Water Usage (GPD)
U.S. Dept. of Housing and Urban Development	60 gpd
U.S. Geological Survey	80 - 100 gpd
American Water Works Association	65 gpd
Iowa State University	65 gpd
gpd = gallons per day	

<sup>157\</sup> Correspondence, Cynthia Moore to Barbara Goolsby (January 12, 1996).

Given these estimate ranges, I have estimated the in-home water consumption by multiplying 65 gpd times the estimated number of persons in each unit.

#### **4.2 *Water Consumption for Utility Allowances***

The total water consumption to be included in MDHA utility allowances should be as follows:<sup>1581</sup>

---

<sup>1581</sup> I have used a linear relationship between the number of gallons per day of consumption and the number of persons in the unit. A constant usage of 65 gpd is estimated. When MDHA requested water consumption figures from Dade County Water and Sewer for its Section 8 utility allowance calculation, the response indicated that a linear relationship existed. (Correspondence, David O'Neal to Sheri Marsella (March 3, 1995)). That representation has been accepted for my calculation of public housing allowances as well.

In Home Water Consumption Venetian Gardens		
Bedroom Size	CCF	GPD /a/
2	10.6	7,908
3	15.9	11,863
4	21.2	15,817
/a/ Gallons converted at rate of 1 ccf = 748 gallons.		

Using these consumption amounts, the dollar utility allowances that should have been in place for water and sewer charges since January 1990 are presented in Attachment A.

#### **4.3 *Conservative Estimates***

Several conservative aspects of my calculations should be noted. First, I have provided no allowance to cover possible water leaks. Despite the fact that consumption due to leaks may well be beyond the ability of tenants to control, I have made no estimate of water lost to leaks. In addition, while the water consumption for persons who spend more time at home is higher than for the average person, I have made no adjustment for this factor in my calculations either.

### **5 UTILITY ALLOWANCES SHORTFALL**

I have attached the following:

- o Attachment B presents the year-by-year determination of the monthly shortfall between the actual electric utility allowance provided by the MDHA and the utility allowance that would have reflected a reasonable consumption of electricity.
- o Attachment C presents the year-by-year determination of the monthly shortfall between the actual natural gas utility allowance

provided by the MDHA and the utility allowance that would have reflected a reasonable consumption of natural gas.

- o Attachment D presents the year-by-year determination of the monthly shortfall between the actual water utility allowance provided by the MDHA and the utility allowance that would have reflected a reasonable consumption of water.

## **6 RENT REFUNDS DUE VENETIAN GARDEN TENANTS**

As a result of the unreasonably low utility allowances, tenants at the Venetian Garden complex are due a rent refund. The amount of the annual refund by size of the unit is set forth in Attachment F.

### **6.1 Present Value of Rent Refunds**

The rent refunds presented in Attachment E are presented by type of utility in 1997 dollars. I have converted the rent refunds into present value through application of the Consumer Price Index for Urban Consumers (CPI-U). Conceptually, the purpose of the calculation today is to place the tenants of Venetian Gardens in the same position they would have been in had the underpayment of utility allowances not occurred.

The method I used seeks merely to restore the tenants to the status quo *ex ante* had the utility underpayments not occurred. An example illustrates: I wrongly take (or, conversely, fail to provide you with) \$100 in 1960 (with the \$100 being in 1960 dollars). In 1988, I am directed to give you the \$100 back in dollars adjusted for inflation. Adjusted for inflation, by giving you \$389, I have restored your \$100 in 1988 dollars, nothing more and nothing less. I clearly cannot legitimately take \$100 from you, wait for 10 years, give you \$100 back, and argue that I have restored to you that which I had taken. It is this shortcoming which the present value analysis seeks to overcome.

### **6.2 Summary**

In sum, the formula used to present dollars in present value dollars takes into account the fact that, due to inflation, a dollar in the illustration above had greater purchasing power in 1960 than it did in 1988. Stated another way, the numbers presented through the conversion of dollars to constant 1988 dollars are functionally the same. In terms of purchasing power, \$100 in 1960 is functionally the equivalent of \$389 in 1988.

Attachments E and F perform this same function for the rate refunds due for the years 1990 through 1997.

**ATTACHMENT A: CORRECTED MONTHLY UTILITY ALLOWANCES FOR MDHA BY YEAR**

Corrected Monthly Utility Allowances Venetian Gardens 1990 - 1997									
As of January	Electric			Natural Gas			Water		
	2 BR	3 BR	4 BR	2 BR	3 BR	4 BR	2 BR	3 BR	4 BR
1990	\$37	\$44	\$51	\$27	\$33	\$36	\$19	\$26	\$34
1991	\$36	\$43	\$51	\$28	\$34	\$37	\$20	\$28	\$37
1992	\$38	\$46	\$54	\$34	\$41	\$45	\$24	\$33	\$43
1993	\$37	\$44	\$52	\$33	\$40	\$44	\$26	\$36	\$47
1994	\$37	\$45	\$52	\$36	\$43	\$48	\$29	\$40	\$53
1995	\$36	\$43	\$50	\$36	\$43	\$48	\$35	\$48	\$64
1996	\$35	\$42	\$49	\$39	\$48	\$53	\$39	\$56	\$75
1997	\$37	\$44	\$52	\$41	\$50	\$56	\$42	\$61	\$83
1998	\$38	\$46	\$53	\$45	\$55	\$62	\$44	\$66	\$89

**ATTACHMENT B: EXISTING VERSUS CORRECTED ELECTRIC UTILITY ALLOWANCES**

Monthly Shortfall Arising from Existing MDHA Electric Utility Allowances									
Bedroom Size	1990			1991			1992		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall
2	\$19	\$37	\$18	\$20	\$36	\$16	\$19	\$38	\$19
3	\$21	\$44	\$23	\$22	\$43	\$21	\$21	\$46	\$25
4	\$22	\$51	\$29	\$23	\$51	\$28	\$22	\$54	\$32
Monthly Shortfall Arising from Existing MDHA Electric Utility Allowances									
Bedroom Size	1993			1994			1995		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall
2	\$19	\$37	\$18	\$18	\$37	\$19	\$18	\$36	\$18
3	\$21	\$44	\$23	\$21	\$45	\$24	\$20	\$43	\$23
4	\$23	\$52	\$29	\$22	\$52	\$30	\$21	\$50	\$29
Monthly Shortfall Arising from Existing MDHA Electric Utility Allowances									
Bedroom Size	1996			1997			1998		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Proposed	Corrected	Shortfall
2	\$19	\$35	\$16	\$21	\$37	\$16	\$21	\$38	\$17

**ATTACHMENT B: EXISTING VERSUS CORRECTED ELECTRIC UTILITY ALLOWANCES**

3	\$21	\$42	\$21	\$25	\$44	\$19	\$25	\$46	\$21
4	\$22	\$49	\$27	\$28	\$52	\$24	\$28	\$53	\$25

**ATTACHMENT C: EXISTING VERSUS CORRECTED NATURAL GAS UTILITY ALLOWANCES**

Monthly Shortfall Arising from Existing MDHA Natural Gas Utility Allowances									
Bedroom Size	1990			1991			1992		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall
2	\$21	\$27	\$6	\$25	\$28	\$3	\$25	\$34	\$9
3	\$26	\$33	\$7	\$31	\$34	\$3	\$30	\$41	\$11
4	\$33	\$36	\$3	\$39	\$37	(\$2)	\$39	\$45	\$6
Monthly Shortfall Arising from Existing MDHA Natural Gas Utility Allowances									
Bedroom Size	1993			1994			1995		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall
2	\$27	\$33	\$6	\$27	\$36	\$9	\$29	\$36	\$7
3	\$33	\$40	\$7	\$33	\$43	\$10	\$36	\$43	\$7
4	\$42	\$44	\$2	\$42	\$48	\$6	\$46	\$48	\$2
Monthly Shortfall Arising from Existing MDHA Natural Gas Utility Allowances									
Bedroom Size	1996			1997			1998		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Proposed	Corrected	Shortfall
2	\$30	\$39	\$9	\$30	\$41	\$11	\$30	\$45	\$15

**ATTACHMENT C: EXISTING VERSUS CORRECTED NATURAL GAS UTILITY ALLOWANCES**

3	\$38	\$48	\$10	\$34	\$50	\$16	\$34	\$55	\$21
4	\$49	\$53	\$4	\$38	\$56	\$8	\$38	\$62	\$34

**ATTACHMENT D: EXISTING VERSUS CORRECTED WATER UTILITY ALLOWANCES**

Monthly Shortfall Arising from Existing MDHA Water Utility Allowances									
Bedroom Size	1990			1991			1992		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall
2	\$15	\$19	\$4	\$19	\$20	\$1	\$20	\$24	\$4
3	\$22	\$26	\$4	\$26	\$28	\$2	\$28	\$33	\$5
4	\$28	\$34	\$6	\$33	\$37	\$4	\$36	\$43	\$7
Monthly Shortfall Arising from Existing MDHA Water Utility Allowances									
Bedroom Size	1993			1994			1995		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall
2	\$22	\$26	\$4	\$27	\$29	\$2	\$30	\$35	\$5
3	\$32	\$36	\$4	\$38	\$40	\$2	\$43	\$48	\$5
4	\$41	\$47	\$6	\$49	\$53	\$4	\$56	\$64	\$8
Monthly Shortfall Arising from Existing MDHA Water Utility Allowances									
Bedroom Size	1996			1997			1998		
	Existing	Corrected	Shortfall	Existing	Corrected	Shortfall	Proposed	Corrected	Shortfall
2	\$31	\$39	\$8	\$24	\$42	\$18	\$24	\$44	\$20

**ATTACHMENT D: EXISTING VERSUS CORRECTED WATER UTILITY ALLOWANCES**

3	\$46	\$56	\$10	\$38	\$61	\$23	\$38	\$66	\$28
4	\$61	\$75	\$14	\$52	\$83	\$31	\$52	\$89	\$37

**ATTACHMENT E: MONTHLY RENT REFUNDS DUE VENETIAN GARDEN TENANTS**

Monthly Rent Refund Due to Electric Utility Allowance Shortfall									
Unit Size	1990			1991			1992		
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund
2	\$18	1.25	\$23	\$16	1.19	\$19	\$19	1.16	\$22
3	\$23	1.25	\$29	\$21	1.19	\$25	\$25	1.16	\$29
4	\$29	1.25	\$36	\$28	1.19	\$33	\$32	1.16	\$37
Monthly Rent Refund Due to Electric Utility Allowance Shortfall									
Unit Size	1993			1994			1995		
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund
2	\$18	1.12	\$20	\$19	1.09	\$21	\$18	1.06	\$19
3	\$23	1.12	\$26	\$24	1.09	\$26	\$23	1.06	\$24
4	\$29	1.12	\$32	\$30	1.09	\$33	\$29	1.06	\$31
Monthly Rent Refund Due to Electric Utility Allowance Shortfall									
Unit Size	1996			1997					
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund			
2	\$16	1.03	\$16	\$16	1.01	\$16			
3	\$21	1.03	\$22	\$19	1.01	\$19			

**ATTACHMENT E: MONTHLY RENT REFUNDS DUE VENETIAN GARDEN TENANTS**

4	\$27	1.03	\$28	\$24	1.01	\$24	
---	------	------	------	------	------	------	--

**ATTACHMENT E: RATE REFUNDS DUE VENETIAN GARDEN TENANTS**

Monthly Rent Refund Due to Natural Gas Utility Allowance Shortfall									
Unit Size	1990			1991			1992		
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund
2	\$6	1.25	\$8	\$3	1.19	\$4	\$9	1.16	\$10
3	\$7	1.25	\$9	\$3	1.19	\$4	\$11	1.16	\$13
4	\$3	1.25	\$4	\$0	1.19	\$0	\$6	1.16	\$7
Monthly Rent Refund Due to Natural Gas Utility Allowance Shortfall									
Unit Size	1993			1994			1995		
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund
2	\$6	1.12	\$7	\$9	1.09	\$10	\$7	1.06	\$7
3	\$7	1.12	\$8	\$10	1.09	\$11	\$7	1.06	\$7
4	\$2	1.12	\$2	\$6	1.09	\$7	\$2	1.06	\$2
Monthly Rent Refund Due to Natural Gas Utility Allowance Shortfall									
Unit Size	1996			1997					
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund			
2	\$9	1.03	\$9	\$11	1.01	\$11			
3	\$10	1.03	\$10	\$16	1.01	\$16			

**ATTACHMENT E: RATE REFUNDS DUE VENETIAN GARDEN TENANTS**

4	\$4	1.03	\$4	\$8	1.01	\$8	
---	-----	------	-----	-----	------	-----	--

**ATTACHMENT E: RATE REFUNDS DUE VENETIAN GARDEN TENANTS**

Monthly Rent Refund Due to Water Utility Allowance Shortfall									
Unit Size	1990			1991			1992		
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund
2	\$4	1.25	\$5	\$1	1.19	\$1	\$4	1.16	\$5
3	\$4	1.25	\$5	\$2	1.19	\$2	\$5	1.16	\$6
4	\$6	1.25	\$8	\$4	1.19	\$5	\$7	1.16	\$8
Monthly Rent Refund Due to Water Utility Allowance Shortfall									
Unit Size	1993			1994			1995		
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund
2	\$4	1.12	\$4	\$2	1.09	\$2	\$5	1.06	\$5
3	\$4	1.12	\$4	\$2	1.09	\$2	\$5	1.06	\$5
4	\$6	1.12	\$7	\$4	1.09	\$4	\$8	1.06	\$8
Monthly Rent Refund Due to Water Utility Allowance Shortfall									
Unit Size	1996			1997					
	Overcharge	PV Value	Rent Refund	Overcharge	PV Value	Rent Refund			
2	\$8	1.03	\$8	\$18	1.01	\$18			
3	\$10	1.03	\$10	\$23	1.01	\$23			

**ATTACHMENT E: RATE REFUNDS DUE VENETIAN GARDEN TENANTS**

4	\$14	1.03	\$14	\$31	1.01	\$31	
---	------	------	------	------	------	------	--

**ATTACHMENT F: TOTAL RATE REFUNDS DUE VENETIAN GARDEN TENANTS**

Total Rent Refund Due to Utility Allowance Shortfall									
	1990			1991			1992		
	2 BRs	3 BRs	4 BRs	2 BRs	3 BRs	4 BRs	2 BRs	3 BRs	4 BRs
Total	\$432	\$516	\$576	\$288	\$372	\$456	\$444	\$576	\$624

Total Rent Refund Due to Utility Allowance Shortfall									
	1993			1994			1995		
	2 BRs	3 BRs	4 BRs	2 BRs	3 BRs	4 BRs	2 BRs	3 BRs	4 BRs
Total	\$372	\$456	\$492	\$376	\$468	\$528	\$372	\$432	\$492

Total Rent Refund Due to Utility Allowance Shortfall									
	1996			1997					
	2 BRs	3 BRs	4 BRs	2 BRs	3 BRs	4 BRs			
Total	\$396	\$504	\$552	\$540	\$696	\$756			