EXHIBIT

**Exhibit No.:** 208
**Issue(s):** Rate Design/ Low-Income Weatherization and Energy Efficiency Proposals/ Mains Cost Economies of Scale Factor
**Witness/Type of Exhibit:** Meisenheimer/Direct
**Sponsoring Party:** Public Counsel
**Case No.:** GR-2004-0209



# DIRECT TESTIMONY

# OF

# BARBARA A. MEISENHEIMER

Submitted on Behalf of the Office of the Public Counsel

**MISSOURI GAS ENERGY**

**CASE NO. GR-2004-0209**

(Rate Design)

April 22, 2004

# BEFORE THE PUBLIC SERVICE COMMISSION
# OF THE STATE OF MISSOURI

| | | |
|---|---|---|
| In the matter of Missouri Gas Energy's tariffs to implement a general rate increase for natural gas service. | ) ) ) | Case No. GR-2004-0209 |

## AFFIDAVIT OF BARBARA A. MEISENHEIMER

**STATE OF MISSOURI** )
) ss
**COUNTY OF COLE** )

Barbara A. Meisenheimer, of lawful age and being first duly sworn, deposes and states:

1. My name is Barbara A. Meisenheimer. I am Chief Utility Economist for the Office of the Public Counsel.

2. Attached hereto and made a part hereof for all purposes is my direct testimony consisting of pages 1 through 16 and Schedules BAM DIR-1 through BAM DIR-4.

3. I hereby swear and affirm that my statements contained in the attached testimony are true and correct to the best of my knowledge and belief.

**Barbara A. Meisenheimer**

Subscribed and sworn to me this 22nd day of April 2004.

KATHLEEN HARRISON
Notary Public - State of Missouri
County of Cole
My Commission Expires Jan. 31, 2006

Kathleen Harrison
Notary Public

My Commission expires January 31, 2006.

## TABLE OF CONTENTS

# DIRECT TESTIMONY
# OF
# BARBARA A. MEISENHEIMER

## MISSOURI GAS ENERGY

## (RATE DESIGN)

## CASE NO. GR-2004-0209

## *Introduction*

**Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.**

A. Barbara A. Meisenheimer, Chief Utility Economist, Office of the Public Counsel (OPC or Public Counsel), P. O. Box 2230, Jefferson City, Missouri 65102. I am also employed as an adjunct Economics Instructor for William Woods University.

**Q. HAVE YOU TESTIFIED PREVIOUSLY IN THIS CASE?**

A. Yes, I filed direct testimony regarding revenue requirement issues on April 15, 2004.

**Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

A. In this testimony I will present Public Counsel's recommendations regarding rate design, renewal and expansion of the experimental low-income program initiated in Joplin as a result of Missouri Gas Energy's (MGE's) last rate case and a new efficiency initiative for MGE customers in Kansas City MO. I will also discuss the economic basis for Public Counsel's method of developing allocation factors for

transmission and distribution mains that is used in the class cost of service study prepared by Public Counsel witness James Busch.

## ***RATE DESIGN***

**Q. WHAT IS THE RELATIVE IMPORTANCE OF CCOS STUDY RESULTS IN RATE DESIGN?**

A. A CCOS study provides the Commission with a general guide to the just and reasonable rate for the provision of service based on costs. In addition, other factors are also relevant considerations when setting rates including the value of a service, affordability, rate impact, and rate continuity, etc. A determination as to the particular manner in which the results of a cost of service study and all the other factors that are balanced in setting rates can only be determined on a case-by-case basis.

**Q. HOW DO YOU RECOMMEND THAT THE COMMISSION ACCOMMODATE FACTORS SUCH AS AFFORDABILITY, RATE IMPACT, AND RATE CONTINUITY IN DETERMINING RATE DESIGN?**

A. Generally, I recommend that the Commission adopt a rate design that balances movement toward cost of service with rate impact and affordability considerations. To reach this balance, I believe that in cases where the existing revenue structure departures greatly from the class cost of service, the Commission should impose, at a maximum, class revenue shifts equal to one half of the "revenue neutral shifts" indicated by Public Counsel's class cost of service study. Revenue neutral shifts are shifts that hold overall company revenue at the existing level but allow for the share attributed to each class to be adjusted to reflect the cost responsibility of the class. In addition to moving half way to

the revenue neutral shifts, I recommend that if the Commission determines that an overall increase in revenue requirement is necessary, then no customer class should receive a net decrease as the combined result of: (1) the revenue neutral shift that is applied to that class, and (2) the share of the total revenue increase that is applied to that class. Likewise, if the Commission determines that an overall decrease in revenue requirement is necessary, then no customer class should receive a net increase as the combined result of: (1) the revenue neutral shift that is applied to that class, and (2) the share of the total revenue decrease that is applied to that class.

**Q. WHAT CONCLUSIONS CAN BE REACHED FROM PUBLIC COUNSEL'S COST OF SERVICE STUDY?**

A. Based on the results of Mr.Busch's class cost of service study, the residential class and large general service class are contributing a disproportionate share of the Company's current revenues. The study indicates that at current revenues, the residential class contributes almost $4.8M more than the residential cost of service. Large General Service contributes almost $393,000 more than its cost of service. On the other hand, the Small General Service and Large Volume classes under-recover cost by about $861,000 and $4.35M respectively. In addition the study indicates that the Company should receive an overall increase of about $2.752M above current revenues.

**Q. WHAT RATE DESIGN ARE YOU PROPOSING FOR THIS CASE?**

A. While it would be acceptable on a purely cost basis to provide full relief to the Residential and Large General Service classes, it would necessitate a substantial increase to the Small General Service and Large Volume classes. To reach a balance between

movement toward cost of service with rate impact and affordability considerations, I believe that the Commission should adopt the following class revenue adjustments;

Table 1. Recommended Revenue Adjustments At $2.752M Increase

| Total Change | Residential | Small General Service | Large General Service | Large Volume |
|---|---|---|---|---|
| $2,751,874[1] | $0 | $774,689 | $0 | $2,491,341 |
| 1.9% | 0% | 2.59% | 0% | 21.88% |

These adjustments do not achieve full movement to each class's cost responsibility but the adjustments represent meaningful movement in the right direction. These values appear on lines 21 and 26 of Schedule BAM DIR-1.

**Q. PLEASE DESCRIBE HOW YOU ARRIVED AT THIS RECOMMENDATION.**

A. Schedule BAM DIR 1 also shows how I arrived at my rate design recommendation. Line 1 and 2 on the schedule show the full amount necessary to bring each class to its class responsibility at the current revenue level. As an initial step, I have reduced these amounts by half as illustrated on line 10 of the schedule. Then, as shown on line 15, I considered each class's share of the additional overall increase. In this case I made an

[1] The difference between the amount shown in the Total column and the sum of the Small General Service and Large Volume values is attributable to the revenue requirement adjustments totaling $514,156 that I proposed in my direct testimony filed April 15, 2004 which would be recovered from the Residential class and therefore reduce the offset provided to the Small General Service and Large Volume classes.

additional adjustment that ensures that no class receives a decrease when another class would receive an increase. For example, the combined affect of half the revenue neutral shift and an overall increase in Company revenues could result in the Residential class receiving a decrease of approximately $3M (-$4.8M from line 10 plus $1.8M from line 15) while Small General Services would receive a combined increase of approximately $1.44M (approx. $.861M from line 10 + approx. $.583M from line 15). From a public policy perspective providing some relief to the Small General Service class by offsetting a portion with some of the Residential class decrease helps to mitigate rate shock while also ensuring that the Small General Service class moves closer to cost of service reducing the proportion of costs that must be covered by the Residential class. In a nutshell, this approach moves classes toward class cost of service and assures that at a minimum, no class which is currently over recovering, is made worse off than they currently are.

**Q. PLEASE DESCRIBE THE ADDITIONAL INFORMATION PROVIDED IN SCHEDULE BAM DIR-1.**

A. Schedule BAM DIR 1 also shows how the results of my rate design approach would change at different levels of an overall revenue requirement increase. For example on lines 16, 22 and 27, I illustrate the results of my proposed rate design assuming the Commission orders a revenue requirement that is 10% less than that proposed by Public Counsel in this case. Lines 17, 23 and 28 illustrate the results of my rate design assuming the Commission orders a revenue requirement that is 10% more than that proposed by Public Counsel.

**Q. IF THE COMMISSION DETERMINES IT TO BE REASONABLE IN THIS CASE, CAN YOUR RATE DESIGN METHODOLOGY BE APPLIED TO DIFFERENT REVENUE REQUIREMENTS?**

A. Yes, it can. This method could be utilized to calculate class revenue requirements for any practical level of overall revenue requirement. I will likely provide comparisons of the class revenues that result from applying this methodology to other parties' revenue requirements in my rebuttal testimony. I would also be able to supply similar calculations to the Commission for any other revenue requirement it decides to consider.

**Q. DO YOU PROPOSE ANY CHANGE IN THE RESIDENTIAL CUSTOMER CHARGE, CONNECTION CHARGES RECONNECTIONS OR OTHER MISCELLANEOUS FEES?**

A. No. The Residential class already recovers more than its cost of service. There is no need to change the status quo with respect to Residential rates.

**Q. PLEASE REVIEW YOUR PROPOSED CHANGES TO THE EXPERIMENTAL LOW-INCOME BILL DISCOUNT PROGRAM CURRENTLY PROVIDED TO CUSTOMERS IN THE JOPLIN AREA.**

In August 2003, there were 484 participants in the Joplin experimental rate discount program. Although this represents just less than one half of the number of participants originally targeted, Roger Colton, who evaluated the program, determined that it had resulted in the payment characteristics of low-income customers becoming more like the characteristics of the overall residential class. As I described in my April 15, 2004, direct testimony, I believe there is room to refine the current plan by creating additional tiers and expanding the coverage area to evaluate if success differs by average winter temperatures or other factors. I suggest that the program continue to receive funding sufficient to provide rate discounts for 500 residential customers in the Joplin area. In

addition, I would recommend that a similar program be implemented in MGE's St. Joseph service area with a participation target of 500 residential customers. I would recommend a bill discount apply November through March according to the following discount tiers;

| *Group* | *Estimated Households*[2] | *Joplin Discount* | *St. Joseph Discount* |
|---|---|---|---|
| 0%-25% | 125 | $80 | $105 |
| 26% - 50% | 125 | $65 | $90 |
| 51% - 75% | 125 | $50 | $75 |
| 76% - 100% | 125 | $25 | $50 |

To qualify for the bill discount the customer would be required to make arrangements to pay down arrearages at a rate of $5 to $30 per month. Optimally, if administrative responsibilities can be provided by local community action agencies, the customer's

[2] The estimated households in each group were developed from Roger Colton's Report information indicating that the average cost were $384. A $30 charge was incurred for administrative cost. The remainder $354/12=$29.50. This implies that discounts were provided in about equal proportion of $40 and $20.

arrearage payment level could be determined by the agency based on the customer's financial situation.

**Q. WHAT INFORMATION SHOULD BE GATHERED TO EVALUATE THE PROGRAM AND WHAT EVALUATION MEASURES SHOULD BE USED?**

A. I would recommend obtaining the same types of data that was used in Roger Colton's Report on the MGE program.

## ***Low-Income Weatherization And Energy Efficiency Proposals***

**Q. PLEASE SUMMARIZE YOUR PREVIOUS TESTIMONY ON LOW-INCOME WEATHERIZATION PROGRAMS AND EFFICIENCY PROGRAMS.**

A. Weatherization is effective in helping to make natural gas bills more affordable for low-income customers. Public Counsel supports retaining both the $250,000 weatherization program in the Kansas City metropolitan area and the $90,000 weatherization program covering the remainder of MGE's service area. In addition we support increasing low-income weatherization funding by 15% system wide which will increase revenue requirement by $51,000.

In the revenue requirement portion of this case, I suggested that there is a growing need to investigate methods for developing programs targeted at assisting moderate and middle-income households in making energy bills more affordable while not burdening the general body of ratepayers with unnecessary rate increases. Developing financially "self-sufficient" programs, that help to offset the obstacles these households face in reducing their energy use while not burdening the general body of ratepayers, appears to produce win-win outcomes, especially in natural gas, since there may not be substantial system wide benefits produced through subsidizing efficiency measures. I recommended that the Commission seek input based on experiences in other jurisdictions to explore initiatives such as "Pay As You Save" and low interest rate loan programs to assist moderate and middle-income households at relatively low program costs. I proposed that the Commission allow MGE to collect $126,156 annually for two years to be earmarked for implementing a pilot PAYS program available to households with income up to $60,000 per year in MGE's Kansas City service area as well as other efficiency incentives such as low interest loan program available to customers with income up to $100,000 per year. Please see the additional discussion on low-income weatherization and efficiency contained in my April 15, 2004 direct testimony.

## ***Mains Cost Economies Of Scale Factor***

**Q. WHAT ARE THE CHARACTERISTICS OF MAINS COST?**

A. Mains are "shared" in the sense that they are facilities generally available and used to provide service to multiple customers and customer classes. Therefore, from an economic perspective, they should bee treated as a shared cost recovered from all customers and classes that benefit from the facilities availability. Local distribution

companies (LDCs) are generally believed to be natural monopolies. For natural monopolies, operation of fewer producers tends to result in the most cost effective market structure for providing service. One such cost reducing characteristic typical to natural monopolies such as LDCs is called "economies of scope". The term "economies of scope" refers to the ability to achieve cost savings by utilizing the same equipment, facilities and/or expertise to provide multiple products at lower cost than if the products were produced on a stand-alone basis. In this case, the Company's investment in transmission and distribution mains provides the Company with the means to deliver natural gas to the locations of all customer classes in response to its customers' year-round demands for natural gas or have it available as a back-up fuel sources.

Another such cost reducing characteristic typical to natural monopolies such as LDCs is the presence of "economies of scale." The term "economies of scale" describes the phenomenon where larger scale production can achieve cost savings. In this case, the average cost of producing good or services declines as the output level increases. According to various flow formulas, with other factors held constant, a 4" pipe has a flow capacity of about 6 times of that of a 2" pipe while, the per foot cost to install the 4" pipe may be less than 2 times the cost to install the 2" pipe. This means that the cost of the incremental capacity needed to serve during higher demand periods (peak periods) is less expensive than the average cost of capacity. Taking advantage of economies of scale benefits the utility by increasing use of facilities and in turn increasing revenues. It benefits those who do not use the system as much in peak periods because any revenue generated above incremental cost helps offset costs that would otherwise have to be recovered during normal use periods. It can also benefit the peak period user if some of the cost savings are reflected as per unit rate reductions. The cost study OPC has

prepared and submitted includes an adjustment to allocating mains cost to reflect the economies of scale inherent in providing service during peak periods.

Since all customers benefit from the existence of the system, all customers should contribute to the recovery of the cost of the system. Economic theory suggests that if each customer or class of customers is responsible for at least the incremental cost that this customer brings to the system, and that if no customer or class of customers is responsible for more than the stand alone cost that would be needed to serve this customer individually, then there is no cross-subsidy and the allocation of cost can be acceptable. However, both the incremental cost and the stand-alone cost of each customer class are hard to measure or determine. To accurately pinpoint the cost responsibility of each specific customer class is inherently impossible.

**Q. HOW SHOULD ECONOMIES OF SCOPE RELATED TO THE COST OF MAINS BE REFLECTED IN THE ALLOCATION OF MAINS?**

A. When economies of scope are present, the total cost of the transmission and distribution system for delivering gas to the residential, commercial and industrial classes would be less than the sum of the stand-alone costs of the separate distribution systems for delivering gas to each of the customer classes. Generally, when allocating the shared cost of joint production, the general principle is that no cross subsidization should be present. The term cross subsidization, in this context, describes a situation where the revenue earned on part of the total output of the industry is more than the stand-alone production cost of that part. This general principle attempts to ensure that no group of customers should pay more than they would have paid if they were to provide their own products and services using the best available production technique. Similarly, for utilities that are "one-way" in nature, the revenue requirement for any customer class should be at least as

large as the incremental cost to provide services to this class because otherwise somebody else will be forced to pay for more than its stand-alone cost.

The implication of this characteristic is that a just and reasonable cost allocation to a customer class ranges from the incremental cost to the stand-alone cost of providing services to that class. A judgement call is required to determine which point along this range is the most appropriate cost allocation. In fact, different viewpoints about whether the stand alone cost, the incremental cost, or a cost that is somewhere in the middle should be allocated to a product or a customer is one of the main reasons why different parties have different cost of service study results and different rate designs to recover the costs. However, absent other policy considerations, a just and reasonable solution should ask each customer class to pay for more than their respective incremental cost. The total cost will not be covered if each class only pays for its incremental cost.

**Q. HOW SHOULD ECONOMIES OF SCALE RELATED TO THE COST OF MAINS BE REFLECTED IN THE ALLOCATION OF MAINS?**

A: When economies of scale are present, there is not a one-to-one relationship between the incremental cost burden that the system peak load imposes upon the transmission and distribution system and that imposed by the average load. Therefore, we should not allocate cost corresponding to demand as if there is a direct one to one relationship between costs and the level of demand. Instead, we need to develop an allocation of mains costs that reflects an appropriate non-linear relationship. For example, if the peak demand is twice the average demand, simply allocating half of the total cost of mains to customers who use natural gas at the peak period and half to customers who use at the base period does not reasonably apportion the per unit savings associated with production levels that achieve economies of scale. A better method would be to estimate the cost

that are incurred to satisfy the increment of peak demand over average demand and allocate that portion of cost to those customers who use natural gas in the peak period. In this manner they receive an offsetting cost benefit associated with driving the system to higher use where economies of scale are achieved.

**Q. PLEASE DISCUSS THE ORIGIN AND OF OPC'S NON-LINEAR ECONOMIES OF SCALE FACTOR USED IN THE ALLOCATION OF MAINS?**

A. Barry Hall, an engineer that worked for our office during the 1990s, initially developed the basis for OPC's non-linear allocator. Using MGE data, and mathematical and engineering relationships, he identified a nonlinear relationship between capacities and cost which he attributed to economies of scale.

**Q. HAVE YOU UPDATED OPC'S NON-LINEAR ECONOMIES OF SCALE FACTOR FOR USE IN THIS CASE?**

A. Yes, I have. For this case, I have performed a study to update OPC's economies of scale factor using information provided by MGE. The result of my study is an economies of scale factor of .3972, which Mr. Busch used in OPC's cost of service study. Appendix 1 contains a description of the methods used to estimate this factor. Plots of the data points and trend lines related to Appendix 1 are provided in Schedule BAM DIR-3 and BAM DIR-4.

## ***Appendix 1***

Q. Please describe the mathematical and engineering relationships relied upon to develop the economies of scale factor.

A. Based on page 6 of the direct testimony of Barry Hall in Case No. GR-97-393, the flow capacity (Q) of a pipe is related to the diameter according to the equation;

(1) $Q= 28.05[(p_i^2-p_o^2)d^{5.33}/sL]^{.5}$

where L is the pipe length, $p_i$ and $p_o$ are the inlet and outlet pressures respectively and s is the gravity of the gas. Assuming the inlet and outlet pressures, and the length and gravity of the gas are constants the flow capacity in (1) can be expressed as;

(2) $Q=\alpha\, d^{2.665}$

where $\alpha$ is a constant.

Based on review of data plots of the general relationship between capacity and cost, I relied on an equation of the following form to fit a curve to express cost as a function of capacity;

(3) $C(Q_o) = \beta^* Q_o^r$;

$\beta$ is a constant.

From (2) we know $Q_o=\alpha\, d^{2.665}$. Since $\alpha$ is a constant, it is the exponent r that causes differences in the relative costs at different diameters and in turn causes different capacity levels. Therefore, the exponent r embodies the "economies of scale" effect that causes

cost to increase at a decreasing rate. In order to determine r it is acceptable to use the simplifying assumption d2.665 =Q.[3] This yields the equation;

(4) $C(Q) = bQ^r$

where $Q= d^{2.665}$.

In order to estimate r, since equation (4) is non-linear, I applied the natural log (Ln), which allows for estimation of r based on a linear regression;

(5) $\text{Ln } C(Q) = \text{Ln}\{bQ^r\}$ or $\text{Ln } C(Q) = \text{Ln } b + r \text{ Ln } Q$.

This is a linear equation of the form;

(6) $y = a + mx$

where a is a constant and m=r.

I performed two regressions utilizing data provided with the Company's direct testimony to obtain estimates of r. One regression was based on all mains sizes. The other was performed using a subset of the more common mains sizes. The regressions resulted in r = .4056 and r = .3888 respectively. I then averaged the two r values to obtain r=. 3972 which is the factor Mr. Busch uses in OPC's class cost of service study.

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[3] $C(d) = a\alpha^r * (d^{2.665})^r = b_1 * (d^{2.665})^r$. A constant b exists such that C(d) =C(Q) when $Q= d^{2.665}$.

**Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

A. Yes.

**Rate Design Analysis**

| | TOTAL | Residential | Small General Service | Large General Service | Large Volume |
|---|---|---|---|---|---|
| 1 Revenue Neutral Shifts (RNS) to Equalize Class | | | | | |
| 2 Rates of Return (ROR) | $0 | ($9,629,017) | $1,722,075 | ($786,070) | $8,693,013 |
| 3 | | | | | |
| 4 Percentage Revenue Change to Equalize Class ROR | 0.00% | -9.82% | 5.96% | -28.09% | 80.93% |
| 5 | | | | | |
| 6 Current Class Revenue Percentages | 100.00% | 69.58% | 20.60% | 1.97% | 7.84% |
| 7 | | | | | |
| 8 COS Indicated Class Revenue Percentages | 100.00% | 62.95% | 21.79% | 1.43% | 13.83% |
| 9 | | | | | |
| 10 **OPC's Recommended Revenue Neutral Shifts** | $ - | $ (4,814,508) | $ 861,037 | $ (393,035) | $ 4,346,506 |
| 11 | | | | | |
| 12 OPC's Recommended Revenue Percentages | 0.00% | 66.26% | 21.20% | 1.70% | 10.84% |
| 13 | | | | | |
| 14 **Spread of Proposed Revenue Requirement Increases** | | | | | |
| 15 OPC Proposed Revenue Requirement Increase | 2,751,874 | 1,823,450 | 583,271 | 46,875 | 298,278 |
| 16 10% Less Than OPC Proposal | 2,476,687 | 1,641,105 | 524,944 | 42,188 | 268,450 |
| 17 10% More Than OPC Proposal | 3,027,062 | 2,005,795 | 641,598 | 51,563 | 328,105 |
| 18 | | | | | |
| 19 **Combined Impact of Revenue Increase** | | | | | |
| 20 **and OPC's RNS Adjusted For No Decreases** | | | | | |
| 21 OPC Proposed Revenue Requirement Increase | 2,751,874 | - | 774,689 | - | 2,491,341 |
| 22 10% Less Than OPC Proposal | 2,476,687 | - | 690,768 | - | 2,300,075 |
| 23 10% More Than OPC Proposal | 3,027,062 | - | 861,413 | - | 2,679,805 |
| 24 | | | | | |
| 25 **Percentage Change in Class Rate Revenue** | | | | | |
| 26 OPC Proposed Revenue Requirement Increase | 1.90% | 0.00% | 2.59% | 0.00% | 21.88% |
| 27 10% Less Than OPC Proposal | 1.71% | 0.00% | 2.31% | 0.00% | 20.20% |
| 28 10% More Than OPC Proposal | 2.09% | 0.00% | 2.88% | 0.00% | 23.53% |

Direct Testimony
Barb Meisenheimer
GR-2004-0209

Poverty Level by Household Size(2004)

| Poverty Level Range | Household Size 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 25% | $2,328 | $3,123 | $3,918 | $4,713 | $5,508 | $6,303 |
| 50% | $4,655 | $6,245 | $7,835 | $9,425 | $11,015 | $12,605 |
| 75% | $6,983 | $9,368 | $11,753 | $14,138 | $16,523 | $18,908 |
| 100% | $9,310 | $12,490 | $15,670 | $18,850 | $22,030 | $25,210 |
| 125% | $11,638 | $15,613 | $19,588 | $23,563 | $27,538 | $31,513 |
| 150% | $13,965 | $18,735 | $23,505 | $28,275 | $33,045 | $37,815 |
| 200% | $23,275 | $31,225 | $39,175 | $47,125 | $55,075 | $63,025 |

SOURCE:100% Federal Poverty Level: 69 Federal Register 7335-7338 (February 13, 2004).

Natural Gas Burden at 4% Based On Poverty Level by Household Size (2004)

| Poverty Level Range | Household Size 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 25% | $93 | $125 | $157 | $189 | $220 | $252 |
| 50% | $186 | $250 | $313 | $377 | $441 | $504 |
| 75% | $279 | $375 | $470 | $566 | $661 | $756 |
| 100% | $372 | $500 | $627 | $754 | $881 | $1,008 |
| 125% | $466 | $625 | $784 | $943 | $1,102 | $1,261 |
| 150% | $559 | $749 | $940 | $1,131 | $1,322 | $1,513 |
| 200% | $931 | $1,249 | $1,567 | $1,885 | $2,203 | $2,521 |

| | | | % Of Total |
|---|---|---|---|
| Winter Use (1) | | 499 | 76% |
| PGA Rate | | 0.75056 | |
| Commodity Rate | | 0.11423 | |
| Customer Charge | $ | 10.05 | |
| Estimated Winter Season Bills | $ | 482.13 | |
| Average Bill | $ | 96.43 | |

(1) Estimated

5 Month Natural Gas Burden at 4% Based On Poverty Level by Household Size

| Poverty Level Range | Household Size 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 25% | $71 | $95 | $119 | $143 | $167 | $191 |
| 50% | $141 | $189 | $237 | $286 | $334 | $382 |
| 75% | $212 | $284 | $356 | $428 | $501 | $573 |
| 100% | $282 | $378 | $475 | $571 | $667 | $764 |
| 125% | $353 | $473 | $593 | $714 | $834 | $955 |
| 150% | $423 | $568 | $712 | $857 | $1,001 | $1,146 |
| 200% | $705 | $946 | $1,187 | $1,428 | $1,669 | $1,910 |

Estimated Average Bill Based On Household Size (2003)

| Poverty Level Range | Household Size 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 25% | $409.81 | $433.91 | $482.13 | $482.13 | $530.34 | $554.45 |
| 50% | $409.81 | $433.91 | $482.13 | $482.13 | $530.34 | $554.45 |
| 75% | $409.81 | $433.91 | $482.13 | $482.13 | $530.34 | $554.45 |
| 100% | $409.81 | $433.91 | $482.13 | $482.13 | $530.34 | $554.45 |
| 125% | $409.81 | $433.91 | $482.13 | $482.13 | $530.34 | $554.45 |
| 150% | $409.81 | $433.91 | $482.13 | $482.13 | $530.34 | $554.45 |
| 200% | $409.81 | $433.91 | $482.13 | $482.13 | $530.34 | $554.45 |

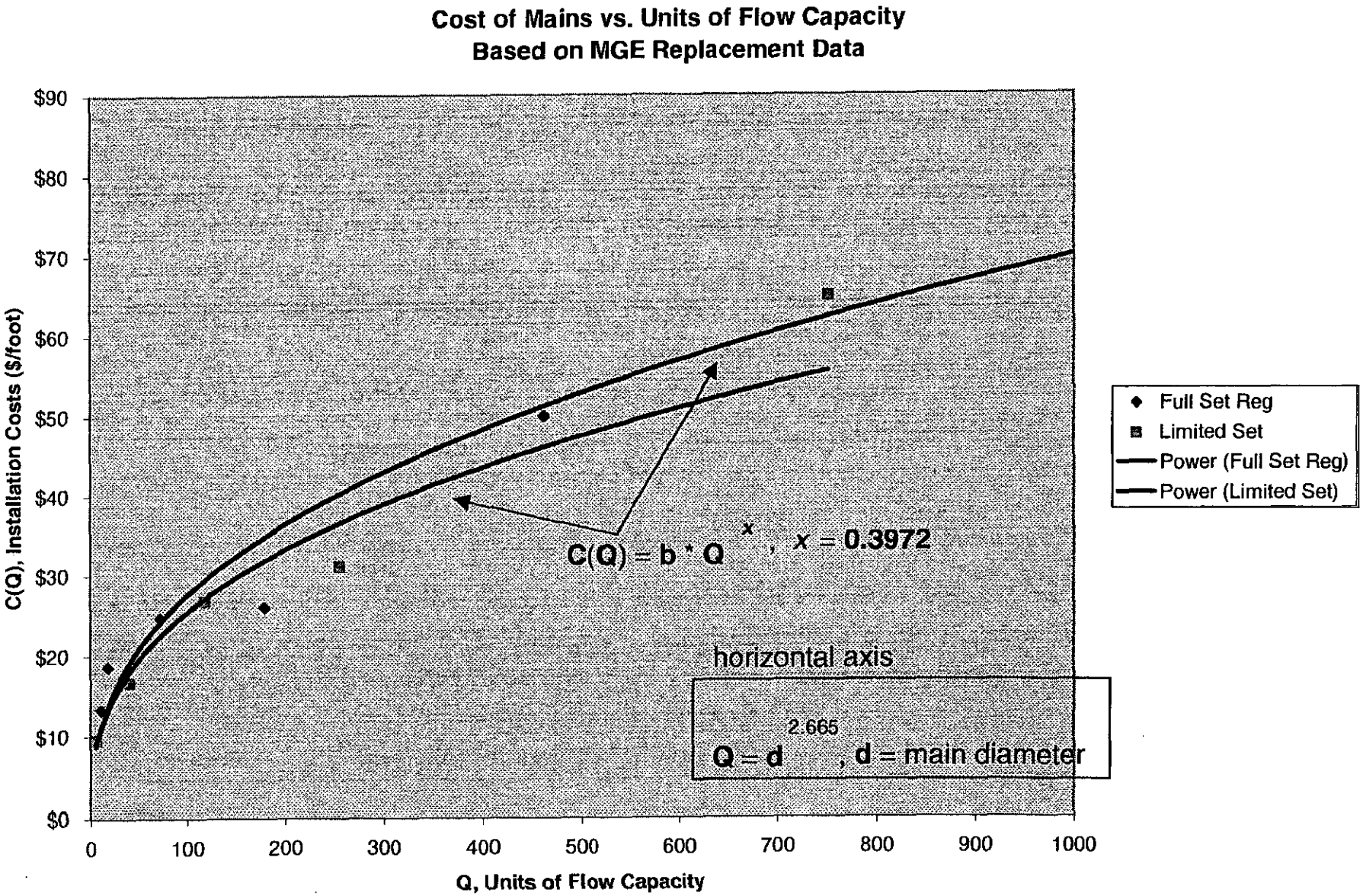
Ability To Reach Natural Gas Burden Without Support

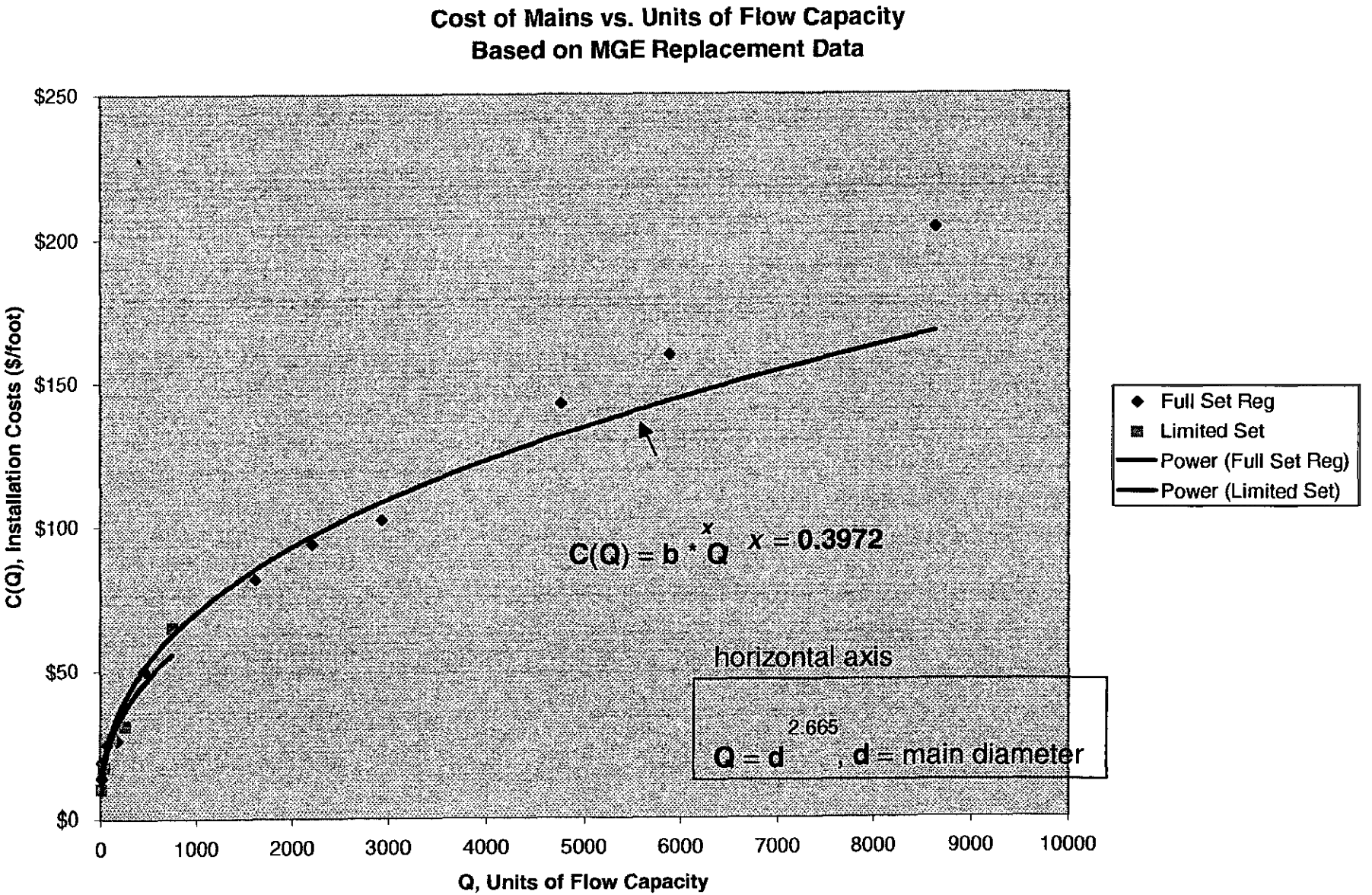
| Poverty Level Range | Household Size 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 25% | ($339.29) | ($339.31) | ($363.44) | ($339.35) | ($363.48) | ($363.49) |
| 50% | ($268.77) | ($244.71) | ($244.75) | ($196.57) | ($196.61) | ($172.54) |
| 75% | ($198.25) | ($150.10) | ($126.05) | ($53.80) | ($29.75) | $18.41 |
| 100% | ($127.74) | ($55.50) | ($7.36) | $88.98 | $137.12 | $209.36 |
| 125% | ($57.22) | $39.11 | $111.33 | $231.76 | $303.98 | $400.31 |
| 150% | $13.30 | $133.71 | $230.02 | $374.54 | $470.84 | $591.26 |
| 200% | $295.37 | $512.13 | $704.78 | $945.64 | $1,138.30 | $1,355.06 |

4% Burden + any $s Support Less Estimated Bill

| Poverty Level Range | Household Size 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 25% | $60.71 | $60.69 | $36.56 | $60.65 | $36.52 | $36.51 |
| 50% | $31.23 | $55.29 | $55.25 | $103.43 | $103.39 | $127.46 |
| 75% | $26.75 | $74.90 | $98.95 | $171.20 | $195.25 | $243.41 |
| 100% | ($27.74) | $44.50 | $92.64 | $188.98 | $237.12 | $309.36 |
| 125% | ($57.22) | $39.11 | $111.33 | $231.76 | $303.98 | $400.31 |
| 150% | $13.30 | $133.71 | $230.02 | $374.54 | $470.84 | $591.26 |
| 200% | $295.37 | $512.13 | $704.78 | $945.64 | $1,138.30 | $1,355.06 |

where $80 discount per month for 0% - 25% Poverty
$65 discount per month for26% - 50% Poverty
$50 discount per month for 51% - 75% Poverty
$25 discount per month for 76% -100% Poverty


Cost of Mains vs. Units of Flow Capacity
Based on MGE Replacement Data
C(Q), Installation Costs ($/foot)
$90
$80
$70
$60
$50
$40
$30
$20
$10
$0
0
100
200
300
400
500
600
700
800
900
1000
Q, Units of Flow Capacity
Full Set Reg
Limited Set
Power (Full Set Reg)
Power (Limited Set)
C(Q) = b * Q^x, x = 0.3972
horizontal axis
Q = d^2.665, d = main diameter


Cost of Mains vs. Units of Flow Capacity
Based on MGE Replacement Data
$250
$200
$150
$100
$50
$0
C(Q), Installation Costs ($/foot)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Q, Units of Flow Capacity
C(Q) = b * Q^x  x = 0.3972
horizontal axis
Q = d^2.665 , d = main diameter
Full Set Reg
Limited Set
Power (Full Set Reg)
Power (Limited Set)