Exhibit No.: _____

Issue(s): Allocators for Services, Meters and Regulators

Witness/Type of Exhibit: Hong Hu/Direct

Sponsoring Party: Public Counsel

Case No.: GR-98-374

DIRECT TESTIMONY

OF

HONG HU

Submitted on Behalf of the Office of the Public Counsel

LACLEDE GAS COMPANY

Case No.: GR-98-374

(RATE DESIGN)

August 21, 1998

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Laclede Gas Company's tariff designed to increase rates.	))	**Case No. GR-98-374**

AFFIDAVIT OF HONG HU

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

Hong Hu, of lawful age and being first duly sworn, deposes and states:

1. My name is Hong Hu. I am a Public 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 8 along with Schedules DIR HH-1 through DIR HH-3.

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.

Hu Hong
Hong Hu

Subscribed and sworn to me this 21st day of August, 1998.

Mary S. Koestner
Mary S. Koestner, Notary Public

My Commission expires August 20, 2001.

DIRECT TESTIMONY
OF
HONG HU

LACLEDE GAS COMPANY

CASE NO. GR-98-374

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

A. Hong Hu, Public Utility Economist, Office of the Public Counsel, P. O. Box 7800, Jefferson City, Missouri 65102.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL AND EMPLOYMENT BACKGROUND.

A. I hold a Bachelor of Engineering degree in Management of Information Systems from Tsinghua University of Beijing, China and a Masters of Arts degree in Economics from Northeastern University. I have completed the comprehensive exams for a Ph.D. in Economics from the University of Missouri at Columbia.

Q. HAVE YOU TESTIFIED PREVIOUSLY BEFORE THIS COMMISSION?

A. Yes.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my direct testimony is to present the Office of the Public Counsel's (OPC) development of allocation factors for services, meters and regulators for use in the class cost of service study prepared by OPC witness Ryan Kind.

Q. WHAT IS A METER?

A. A meter is a device designed to provide accurate measurement of customer consumption of gas from the small pilot load of a domestic gas range to extremely large loads such as those encountered in industrial processing. The gas industry depends primarily on two classes of meters – positive displacement meters and orifice meters - to measure the volumes of gas delivered. Typically, at a single family dwelling where the volumes are small and at low pressure, positive displacement diaphragm meters are used. Rotary, turbine, and large size diaphragm positive displacement meters are used to measure the larger volumes delivered to many industrial and commercial customers. At the city gate station, and at other locations where large volumes of high-pressure gas must be metered, the industry uses the orifice meter, sometimes in conjunction with a diaphragm or rotary meter. The proper size of meters installed at a customer location is determined primarily on the system pressure, the customer's maximum expected load, load profile, and growth possibilities.

Q. WHAT IS A REGULATOR?

A. A regulator is a device used to control pressures in the gas distribution system. Generally, service regulators are installed ahead of the gas meter in the meter loop piping. They are used in all service lines to residential and small-volume commercial and industrial customers that connect to medium or high-pressure distribution systems. If delivery pressures are greater than 60 psig, then either a pressure-relief device or two regulators in series must be used. Regulators for industrial services range from slightly larger versions of residential service regulators to large installations similar to district regulator stations. The regulator

configuration choice is based on an individual industrial customer's load and the distribution pressure at a particular customer location.

Q. WHAT IS A SERVICE?

A. A service is a pipe that is laid from a gas main into or near the structure to be served that terminates at customer's gas meter. Different customers use different sizes of services depending on their demand for gas. Service line size is determined by considering the minimum inlet pressure, the customer's maximum expected load, and the length of the proposed service line. As in the case of meters and regulators, calculations of service sizes are only necessary for larger customers. The standard service line size of ½" will adequately serve all residential customers.

Q. PLEASE EXPLAIN WHAT COSTS ARE BEING ALLOCATED BY A METER, REGULATOR, OR A SERVICE ALLOCATOR.

A. Laclede Gas Company's (Laclede, or the Company) FERC Account 381 includes the material and installation cost of meters and its Account 383 includes the material cost and installation cost of regulators. Laclede's FERC Account 380 includes both the material and installation cost of services. In the class cost of service study, the costs recorded in Accounts 381 and 383 are allocated using the meter allocator, and the costs recorded in Account 380 are allocated using the service allocator.

Q. WHAT METHODS DID OPC EMPLOY TO DETERMINE THE ALLOCATION OF MATERIAL AND INSTALLATION COSTS OF METERS, REGULATORS, AND SERVICES?

A. I developed two sets of allocators as the results of two cost allocation approaches. On one hand, I believe that given complete cost information about meters, regulators, and services, a direct cost allocation approach should be able to allocate costs to different customer classes in a manner that best reflects a company's actual cost structure. The accuracy of a cost study, however, depends on the accuracy and the completeness of information and the preciseness of the study in capturing this information. In this case, the best cost information I could obtain comes from data provided by the Company's response to OPC Data Request No. 3014 in Case No. GR-96-193. The Company prepared a sampling of main, meter, regulator & service line data. After a careful examination of the sample, I developed some doubts about the information. I did not feel fully confident to solely rely on the sample in the development of my allocators. I believe that the allocators based on this sample should be confirmed through other reasonable methods that allocate class responsibility of these costs. For this reason, I adopted a modified version of the Company's allocation approach that functionalizes the costs of services, meters and regulators. Specifically, I used a customer/demand split technique to allocate these costs.

Q. PLEASE EXPLAIN YOUR DIRECT ASSIGNMENT ALLOCATION APPROACH.

A. In deriving the meter, regulator and service allocators, I tried to allocate costs to the actual cost causers by considering three factors: customer counts for each rate class; average costs for each type of meter, regulator and service; and the average number of meters, regulators or services used by a customer for each customer

class. The number of customers was obtained from the Staff. The average cost of services, meters and regulators, as well as number of meters used by a customer for each customer class were calculated from the data presented in the sample that the Company provided.

Q. WHAT HAVE YOU DISCOVERED IN THE SAMPLE THAT LEADS TO YOUR RESERVATION IN UTILIZING THE DIRECT ALLOCATION APPROACH?

A. After a careful examination of the sample, I found that the total service cost of a service line was derived by multiplying the service footage by a constant per foot average cost for the corresponding size and pipe type of the service line. The apparent problem I found is that the per foot average costs of 3, 4, and 6 inch plastic pipes are less than those of the smaller size plastic pipes. (See SCHEDULE DIR HH-2 for a summary of per foot cost for all types of service lines.) For example, the average cost of a 1 inch plastic pipe is $12.88 and that of a 2 inch plastic pipe is $19.71, but the average cost of a 6 inch plastic pipe is only $11.15. This discrepancy leads to strange results such as a 136 feet long 1 inch service pipe ($1764.56) costing more than a 142 feel long 6 inch service pipe ($1583.30).

Since most of the larger customers use services that are larger than 2 inches, this discrepancy produces a much lower average service cost for these customers. As shown in my direct allocation of the service cost, the resulting average service cost of a large customer is only about 7 times that of a residential service line. This does not seem to be consistent with my previous experience with other gas companies where the average service cost of a large customer could be more than 20 times that of a residential service line. Also, this is not consistent with the Company's own estimate that shows the service cost of a large customer is about

35 times of that of an average customer in its response to OPC's Data Request No. 520.

Q. PLEASE EXPLAIN THE CUSTOMER/DEMAND SPLIT APPROACH TO ALLOCATING THE COSTS OF SERVICES, METERS AND REGULATORS.

A. In this approach, the costs of services, meters and regulators were separated into two components: a customer component and a demand component. Then, allocation factors for each customer class were developed based on the percentage of total cost attributed to each class' customer and demand components.

Q. PLEASE EXPLAIN THE CUSTOMER COMPONENT.

A. Generally, a service line, a meter and a regulator would be required to serve a customer. The customer component of the costs represents the percentage of the total cost attributed to the minimum cost of connecting a customer to the gas supply system. This would include the cost of a minimum size service line, or a minimum size meter and regulator. The customer component of each customer class was then expressed as a percentage and calculated as the product of the customer count in that class and the cost of a minimum size service line, or a minimum size meter and regulator.

Q. PLEASE EXPLAIN THE DEMAND COMPONENT.

A. A minimum size service, meter and regulator can not satisfy the demand of many larger customers. Therefore, different sizes of services, meters or regulators are often chosen to meet the non-coincident peak demand of each customer and additional costs would be incurred for those customers that have higher peak

demand. This portion of the total cost that is caused by additional demand, which can not be explained by the cost of minimum size service, meter or regulator, is defined as the demand component. A noteworthy point here is that as long as a particular customer's non-coincident peak demand does not surpass a certain threshold, the amount of his demand does not influence the cost of his service, meter or regulator. In other words, it is the extra demand that falls over the threshold that should be considered in allocating the demand component of costs.

Q. PLEASE EXPLAIN HOW THE THRESHOLD IS DETERMINED.

A. The threshold is determined by an examination of the sample provided by the Company, as well as a company report on the number of meters by revenue class and rate shown in the Company's response to OPC DR No. 707. The sample provided by the Company shows that there are about 4% of residential customers and 39% of commercial and industrial customers being served by a meter size greater than the minimum. The report shows that about 3% of residential customers and 43% of commercial and industrial customers are being served by a meter of greater size than the minimum. Using estimated daily peak demand in therms per customer by billing month information that the Staff provided for, I have chosen a threshold of 50 therms. The extra demand was subsequently determined for each customer class.

Q. WHAT ARE THE RESULTS OF YOUR ALLOCATION OF SERVICE, METER AND REGULATOR COSTS?

A. The results of direct allocation are shown as SCHEDULE HH DIR-1. The results of customer/demand split allocation are shown as SCHEDULE HH DIR-3. I have made a recommendation to OPC witness Ryan Kind that in OPC's COS study, the

direct assignment meter allocator should be used and the customer/demand split allocator should be used for services cost until any further confirmation about the validity of the per foot service cost information in the Company's sample. I am intending to further investigate this issue.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.

COST ALLOCATION OF SERVICES, METERS AND REGULATORS - DIRECT

Meters and Meters Installations

	Residential	Comm&Ind GS	LV	Interruptible	Firm	Basic	LP Gas	UMGL	Total
Number of Customers	584,614	38,979	141	16	58	90	268	117	624,284
Meter/Customer Ratio	1.00	1.00	1.17	1.17	1.17	1.17	1.00	-	
Estimated Number of Meters	584,614	38,979	165	19	68	106	268	-	
Meter/Regulator Cost	$ 93.54	$ 721.27	$19,985.52	$ 19,985.52	$ 19,985.52	$ 19,985.52	$ 93.54		
Weight	1.00	7.71	213.66	213.66	213.66	213.66	1.00	-	
Weighted Meter Count	584,614	300,561	35,290	4,067	14,475	22,630	268	-	961,905
Meter Allocation Factor	60.78%	31.25%	3.67%	0.42%	1.50%	2.35%	0.03%	0.00%	100%

Services and Services Installations

	Residential	Comm&Ind GS	LV	Interruptible	Firm	Basic	LP Gas	UMGL	Total
Estimated Number of Services	584,614	38,979	141	16	58	90	268	117	624,284
Service Cost	$820.84	$1,641.98	$ 5,737.81	$ 5,737.81	$ 5,737.81	$ 5,737.81	$820.84	$410.42	
Weight	1.00	2.00	6.99	6.99	6.99	6.99	1.00	0.50	
Weighted Service Count	584,614	77,973	986	114	404	632	268	58	665,049
Service Allocation Factor	87.91%	11.72%	0.15%	0.02%	0.06%	0.10%	0.04%	0.01%	100%

Summary of Per Foot Average Cost of Services

Size (in.)	Plastic	Steel - Coated
0.50	$ 12.56	
0.75		$ 16.73
1.00	$ 12.88	
1.25	$ 15.62	
2.00	$ 19.71	$ 23.45
3.00	$ 11.79	
4.00	$ 11.79	$ 22.36
6.00	$ 11.15	$ 29.51
8.00		$ 26.20

COST ALLOCATION OF SERVICES, METERS AND REGULATORS - CUSTOMER/DEMAND SPLIT

	Mtr & Reg			
	Customer	Demand	Total	Adjusted
Residential GS	58.131%	5.026%	63.157%	63.165%
Comm & Ind GS	3.876%	9.776%	13.652%	13.654%
Large Volume Sales Service	0.014%	4.625%	4.639%	4.639%
Interruptible Sales Service	0.002%	0.675%	0.677%	0.677%
Firm	0.006%	6.950%	6.956%	6.957%
Basic	0.009%	10.872%	10.881%	10.882%
General L. P. Gas Service	0.027%	0.000%	0.027%	0.027%
Unmetered Gas Light Service	0.012%	0.000%	0.012%	0.000%
TOTAL	62.076%	37.924%	100.000%	100.000%

	Service		
	Customer	Demand	Total
Residential GS	73.586%	2.839%	76.424%
Comm & Ind GS	4.906%	5.522%	10.428%
Large Volume Sales Service	0.018%	2.612%	2.630%
Interruptible Sales Service	0.002%	0.381%	0.384%
Firm	0.007%	3.926%	3.933%
Basic	0.011%	6.141%	6.152%
General L. P. Gas Service	0.034%	0.000%	0.034%
Unmetered Gas Light Service	0.015%	0.000%	0.015%
TOTAL	78.579%	21.421%	100.000%