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COMMONWEALTH OF MASSACHUSETTS

BEFORE THE DEPARTMENT OF PUBLIC UTILITIES

Essex County Gas Company	)	Docket No. DPU 96-70

DIRECT TESTIMONY OF

PAUL CHERNICK

ON BEHALF OF

THE ATTORNEY GENERAL

Resource Insight, Inc.

July 26, 1996

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EXHIBITS

I. Identification and Qualifications

Q: Mr. Chernick, please state your name, occupation, and business address.

A: I am Paul L. Chernick. I am president of Resource Insight, Inc., 18 Tremont Street, Suite 1000, Boston, Massachusetts.

Q: Summarize your professional education and experience.

A: I received a SB degree from the Massachusetts Institute of Technology in June 1974 from the Civil Engineering Department, and a SM degree from the Massachusetts Institute of Technology in February 1978 in Technology and Policy. I have been elected to membership in the civil engineering honorary society Chi Epsilon, and the engineering honor society Tau Beta Pi, and to associate membership in the research honorary society Sigma Xi.

I was a Utility Analyst for the Massachusetts Attorney General for more than three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, and the evaluation of power supply options. Since 1981, I have been a consultant in utility regulation and planning: first as a Research Associate at Analysis and Inference, after 1986 as President of PLC, Inc., and since August 1990 in my current position at Resource Insight. In those capacities, I have advised a variety of clients on utility matters, including, among other things, the need for, cost of, and cost-effectiveness of prospective new generation plants and transmission lines; retrospective review of generation planning decisions; ratemaking for plant under construction; ratemaking for excess and/or uneconomical plant entering service; conservation program design; cost recovery for utility efficiency programs; and the valuation of environmental externalities from energy production and use. My resume is attached as Exhibit AG-PLC-1.

Q: Have you testified previously in utility proceedings?

A: Yes. I have testified over one hundred times on utility issues before various regulatory, legislative, and judicial bodies, including numerous appearances before this Department. A detailed list of my previous testimony is contained in my resume.

Q: Have you been involved in rate design and cost allocation?

A: Yes. As listed in my resume, I have testified on electric and gas utility rate design and cost allocation many times, before this Commission and elsewhere.

II. Introduction

Q: What is the purpose of your testimony?

A: The major purpose of my testimony is to review the structure of the Market Base Allocator (MBA) for gas supply costs, and the application of the MBA by Essex County Gas Company (the Company).[1]

Q: Please summarize your conclusions.

A: The MBA, and the Company's application of that allocator, have a number of fundamental problems, including:

- The "coloring" of baseload gas supplies for different purposes, ignoring excess capacity, planning errors, the value of diversity, and the need for back-up supplies.

[1] Other utilities call the MBA the "Market-Based Allocation."

- Errors in identification of baseload supplies, including errors in modeling dispatch, and the use of perfect hindsight in selecting resources.
- Underpricing "baseload" pipeline supplies by treating average monthly consumption of gas as though it were used at 100% load factor.
- Underpricing of LNG boil-off assigned to baseload.
- Allocation of interruptible margins to "baseload" consumption that could not serve interruptible sales.
- Allocation of all non-baseload costs on design load, even though most costs are incurred for normal or actual loads.

III. Description of the MBA

Q: Please briefly describe the MBA allocator.

A: The MBA allocator has been proposed as a way to separate the assignment of costs to high load factor use from the calculation of the Proportional Responsibility (PR) allocator. The first step in the derivation of the MBA is to determine the portion of the system load curve that can be characterized as "base load." Conceptually, this base load is the minimum load on the system that can be served by a supply at a 100% load factor. In practice (at least in the case of Bay State, Fall River and Essex Gas Companies), the base load is defined as the average load in July and August. The Company refers to the remainder of the system load as "remaining" load. This terminology gives the impression that this load is a relatively minor portion of the Company's total sales. In fact, the non-base load constitutes the bulk of the load and I will refer to it as "bulk load" in my testimony.

In the MBA, costs are generally assigned to base load in the following steps:

- dispatch the Company's supplies on a daily basis to determine the total quantity needed and the cost for each supply;
- rank the gas supplies by total average cost, including both commodity and demand charges;
- assign the supplies with lowest total average cost to the base load; and
- allocate the base load costs among rate classes based on class contribution to monthly base load.

The remainder of the gas costs determined in the gas dispatch simulation are assigned to the bulk load. These costs are allocated among rate classes based on their contribution to the system bulk load (that is, total load net of base load) using the Proportional Responsibility allocator.

Q: Is the Market Base Allocation method properly named?

A: No. The MBA does not reflect the operation of the competitive *market*, since it charges uneconomic or excess resources to bulk loads, rather than shareholders. It is not truly a *base* supply allocator, since the dispatch on total cost misidentifies base resources, and several features of the MBA arbitrarily understate the costs of serving baseload. It is not even really a distinct *method*, since different utilities propose to implement the approach in vastly different ways, as shown below:

Computational Issue	Bay State	Essex	Fall River
	DPU 95-104	DPU 96-70	DPU 96-60
dispatch to storage refill	after base	before base	before base
pre-allocation dispatch	variable cost	total cost	variable cost; some resources at actual
detail on class allocations	daily	monthly	monthly
load for non-base capacity allocator	design	design	normal
LNG pricing	average of base	average of base	incremental base
load factor for base allocation	includes interruptible	100+%	includes interruptible

IV. The "Coloring" of Base Gas Supplies

A. Problems with Assigning Base Gas Supplies to Uses

Q: Why is assigning particular base gas supplies to particular uses problematic?

A: One basic problem is that real gas utilities plan for the total of their loads, not for a series of separate loads. The totality of the utility's supply mix provides diversity (by contract pricing and delivery terms, supply area, and delivery pipeline) and back-up supplies to all customers. Even when firm loads can be met with just base supplies (i.e., those nominally available 365 days per year and economic for high load-factor dispatch), a storage supply may be used to work around a pipeline maintenance outage, absorb load swings, or take advantage of price fluctuations. Especially *within* the group of base supplies, it is generally impossible to say that particular supplies serve particular loads, unless those supplies were actually acquired to match a contract sales load. Most LDC sales are not tied to specific supplies.

Q: In pricing gas for a firm load with no weather sensitivity, would a marketer simply flow through the costs of one or a couple base supplies?

A: Not generally. For the reasons discussed above, the marketer would need a variety of supplies, probably including storage, to meet fluctuations in availability, demand, and price.

Q: Does it make sense to assign lower-cost base gas to baseload customers than to weather-sensitive customers?

A: No. Much of the variation in gas costs arises from the history embedded in current gas supplies. One base purchase obligation undertaken in 1988, with a specific split of commodity and capacity costs, and a particular escalation formula, may be well below market cost in 1996. A second base contract may be above market cost. Both were undertaken to meet same type of load, and both should be allocated in the same manner.[2] The utility might wish that it were not obligated to pay for second contract at all, but neither contract is more closely associated with a particular load shape than is the other.

In addition to contracts that are simply uneconomic due to changed conditions, contracts using lagged price indices may be bargains in some years and over-priced in others. For example, a contract with prices pegged to spot prices the previous year would have been above market price in 1994-95, but well below market in 1995-96, and would probably be above market again in 1996-97. This is the same contract, undertaken to meet the same loads, regardless of its price position in a particular year.

Similarly, the utility may find itself in 1996 with some capacity obligations that are in excess of planning requirements, either for total

[2] This is particularly true where the two supplies are used similarly.

capacity or for particular types of capacity, due to uncertainty and planning errors. This excess is as likely to be due to base loads as weather-sensitive loads.

Q: Are the same resources low-cost at all times?

A: No. Due to differences in contract prices, quantities, and durations (as contracts initiated and canceled), the low-cost resource varies over years, months, and even days. In general, the resource would not be available in the low-cost periods if it were not also under contract in the periods in which it is more expensive. The MBA does not recognize the variability over years, opportunistically assigning the lowest-cost resource in each year to base load. Depending on how a utility chooses to perform the initial hypothetical dispatch and subsequent allocation steps in the MBA, low-cost resources may be assigned to baseload on a monthly or even daily basis, ignoring the need to contract for resources on a longer-term basis.

Q: How would a marketer recover costs of uneconomic or excess contracts?

A: The marketer may not be able to recover these above-market costs at all, if it depends on short-term contract sales. However, reliability-sensitive customers, especially those most concerned with price fluctuations, may sign relatively long-term contracts that reserve more capacity than they wind up needing, and agree to price formulae that may not match short-term fluctuations. There is no reason to suppose that high-load-factor customers would be more or less receptive to these long-term contracts than low-load-factor customers. Thus, if the marketer recovered these costs at all, it would likely do so equally from customers of all load shapes.

Q: Does the Company have excess capacity?

A: This is not totally clear. The Company appears to have too much baseload, given the low take shown in Exh. AEL-9, page 1.

Q: Does the Company have any uneconomic capacity?

A: Yes. In 1995, ANE was considerably more expensive than other baseload resources, even at 100% load factor (Exh. AEL-9, p. 1). Since the high cost of ANE is due to its high demand charge, it would be even more expensive at lower load factors. ANE may be justified by diversity considerations, or its pricing formula, which may produce more competitive costs in 1996. In any case, the above-market costs of ANE in 1995 should be collected (if at all) from all loads that use base resources.

B. Specific Problems in the Company's Identification of Baseload Supplies

Q: How has the Company erred in matching base supplies with base loads?

A: Even if base supplies could be meaningfully divided into portions serving baseload and intermediate loads, the Company's analysis identifying those supplies is fatally flawed in at least three respects:

- arbitrary assignment of the lowest-cost supplies to baseload
- errors in modeling dispatch
- the use of perfect hindsight in selecting resources

Q: How has the Company arbitrarily assigned the lowest-cost supplies to baseload?

A: As discussed above, this is a central part of the MBA approach. The Company assigns base resources to baseload on the basis of minimum *total* cost, rather than the *incremental* cost that actually determines the usage of the resource.

Q: How has the Company erred in modeling dispatch?

A: Gas supplies are actually dispatched based in order of increasing variable (commodity) cost, subject to constraints on availability. The Company chose instead to allocate gas supplies as if they were dispatched in order of increasing total cost. The Company claims to have started with an economic dispatch run of its Gas Supply Model (IR AG 3-2), but appears to have used a hypothetical total-cost dispatch, judging from the low load factor at which it dispatches ANE, the lowest-commodity resource. This modeling error would cause an expensive base resource, with high fixed costs and low variable costs, to be treated as a peaking resource. No allocation model that uses full-cost dispatch can be considered reliable.

Q: What is the effect of the Company's errors in modeling dispatch?

A: The Company assigns to base load only Boundary (its less expensive source on a total-cost basis) and some of its least-expensive domestic supply, Gulf A. In fact, ANE is the Company's most base resource, since it has the lowest variable cost. Boundary has the next lowest variable cost; Gulf supplies will only be used after the two Canadian supplies are fully dispatched. Since the Company computes the total cost of ANE to be about 12¢/Dekatherm (Dt) more expensive than Gulf supply, and ANE would be about 40% of the base load identified by the Company, this error understates the allocation to base load by about 5¢/Dt.[3]

Q: How has the Company used perfect hindsight in selecting resources?

A: The Company used actual loads and commodity prices and full-dispatch capacity prices, rather than dispatching resources based on the loads and

[3] As discussed below, the Company also understates the demand cost per delivered Dt.

prices anticipated when it entered into the contracts. Thus, resources acquired for base supply could be allocated to peaking service. This is the case for the ANE purchase.

C. Underpricing of supplies assigned to baseload

Q: How has the Company underpriced supplies assigned to baseload?

A: The Company understated the following allocations to base load:

- Total base pipeline capacity and commodity cost, by arbitrarily selecting the lowest-cost supplies, even if those were not the most baseload resources.
- Pipeline capacity cost, by understating the capacity cost per Dt of sendout.
- LNG boil-off costs, by ignoring the capacity value of this firm supply.

1. Base Pipeline Total Cost

Q: How did the Company understate the costs of the base pipeline supplies assigned to baseload?

A: The Company arbitrarily assigned the lowest-cost supplies to baseload. This is incorrect for several reasons:

- The lowest-total-cost resources are not necessarily the most base-type resources. Real dispatch order is determined by variable cost, not total cost.
- As discussed above, utilities obtain a mix of base pipeline supplies for diversity. Utilities do not acquire low-cost base resources for some classes and high-cost base resources for other classes.

- Differences in base-supply costs are partially the result of historical accidents (such as the decision to sign the ANE contract and its performance under particular market price trajectories).

2. *Base Pipeline Capacity*

Q: How else did the Company understate the costs of the base pipeline capacity assigned to baseload?

A: The Company computed the cost of these portion of these contracts assigned to baseload as if the contracts were dispatched at 100% load factor, even though its modeling did not dispatch *any* contracts at 100%, and the baseload does not have a 100% load factor. This convention spreads the demand costs for each supply over more Dekatherms than the supply provided in reality or in the MBA dispatch, understating the demand cost per Dt.

Q: Did the Company treat the costs of the base pipeline supplies assigned to bulk supplies in the same way as those it assigned to baseload?

A: No. While Essex manipulated the computation to minimize the assignment of costs to baseload, it charged all the remaining costs (including the under-assignment to baseload) to the bulk load. As a result, the demand charge per Dt for each base supply assigned to bulk load is higher than

- the charge per Dt for the same supply assigned to baseload
- the average demand charge per Dt of available supply
- the average demand charge per Dt of sendout dispatched by the MBA model.

Q: How serious is the understatement of demand charges to base loads?

A: I do not have daily sendout data for Essex Gas, but Fall River Gas data indicate that baseload sendout is highly variable. Essex Gas defines baseload as the July-August average load, and assumes that this average daily sendout can be used by the firm load every day and can serve the entire load for July (the lower-load of the two months). These assumptions are simply incorrect. For various load measures (1995 actual firm, design firm, and transport, which may best reflect the loads of the types of customers whose sales the Company is concerned):

- maximum July firm sendout is 18-27% higher than the July-August average
- minimum loads in July are just 11-32% of the July-August average
- minimum loads in August are 41-88% of the July-August average

These wide load swings are probably due to vacation schedules and variation in weekly operation at the high-load-factor industrial and large commercial facilities. The residential loads that operate in July and August (pilot lights, stoves, dryers and water heaters) are unlikely to exhibit these large simultaneous changes.

This variability would require additional capacity beyond the 100% load factor assumed by the Company. The load level defined as "baseload" by the Company would require about 25% additional baseload capacity, at a higher average commodity cost, to meet the upward swings, or about 0.8 MDQ of working storage injection capacity and 0.25 MDQ of withdrawal capacity per MDQ of baseload capacity (plus additional delivery capacity from storage, and higher commodity costs for storage) to balance the wide variability in "base" load.

Q: Are there any other problems in the computation of the base pipeline costs assigned to baseload?

A: Yes. Essex Gas further understates the baseload share of Boundary capacity costs by assigning to baseload capacity costs per Dt computed for 365 days of service at the winter service level, even though Essex does not appear to be entitled to take that much gas in the summer. Hence, the allocation of Boundary demand costs to baseload assumes a load factor in excess of 100%.

3. LNG boil-off

Q: How did the Company understate the costs of LNG boil-off allocated to baseload?

A: LNG storage is acquired to meet short-duration variable loads. Boil-off of LNG is a by-product of LNG storage. The boil-off is only available if storage is acquired, but it is not reasonable to allocate the full cost of LNG commodity and capacity to boil-off. Quite reasonably, the Company uses a proxy of market price for the value of the boil-off. Specifically, the Company uses the cost of the next resource not yet assigned to baseload. This is a reasonable approach as far as it goes, since without the LNG boil-off, the Company would need more year-round supply.[4]

The far more important problem with the Company's computation of LNG boil-off costs is that it used only the *commodity* value of a base resource, and failed to include the capacity needed to deliver that resource. In the absence of the boil-off, MBA would have allocated the *total* cost of additional pipeline. Alternatively, if it were not used to serve firm load, the

[4] Of course, as discussed above, any effort to stratify base supplies is inherently flawed.

boil-off could be sold in the competitive market as a total resource, delivered at city gate. The Company's allocation requires bulk load to subsidize baseload, delivering boil-off at commodity-only prices, with no delivery charge.

Adding base capacity value to the pricing of the imputed LNG boil-off would increase the cost of the boil-off assigned to baseload by 40%.

V. Other Problems in the MBA Allocation

Q: What other problems have you identified in the Company's application of the MBA allocation?

A: Other than the assignment of costs to baseload, I have identified problems in the following areas:

- allocation of interruptible margin
- the definition of normal supply conditions
- level of bulk costs
- allocation of bulk supply costs

A. Allocation of Interruptible Margins

Q: How does the Company allocate interruptible margins?

A: The Company allocates interruptible margins to all firm sales classes, in proportion to sales.

Q: Is this allocation consistent with the MBA allocation for gas supply costs?

A: No. Interruptible sales are made possible by capacity that is excess to firm requirements, including unused storage capacity in normal weather, and pipeline capacity that is not fully utilized in low-load months. The Company allocates a share of interruptible margins to "baseload" consumption, even though baseload is not allocated the resources that could serve interruptible sales. The Company does not even allocate enough capacity to the base load to serve that load, let alone make interruptible sales. The base load is assigned no excess capacity and no storage, and has no spare capacity in shoulder months, in which interruptible sales might be made.

Q: How should interruptible margins be allocated if the MBA is used to allocate gas supply costs?

A: Interruptible margins should be allocated on a measure of class contribution to allowing such sales, such as the difference between the annual supply capability of the capacity allocated to each class and the class's own load. The classes with the highest allocations of the bulk supply would thus receive the highest allocations of interruptible margins.

B. The Problem of Defining Normal Supply Conditions

Q: Why is the definition of normal supply conditions important in the MBA allocation?

A: The results of the MBA allocation are quite sensitive to the dispatch assumed for a "normal" year at the beginning of the allocation process. The normal year for cost allocation purposes should be one in which

- sales reflect normal weather in the test year,
- storage injections and withdrawals are balanced, reflecting normal weather in the test year and the preceding year, and
- supply levels and contracts exclude extraordinary and atypical events.

Q: Has the Company modeled a normal year for the MBA computation?

A: No. The Company included large withdrawals of expensive gas, offset by smaller injections of much lower-cost gas, as shown in Exh. AEL-9 and summarized below:[5]

	Volume	Cost	$/Dt
UG Storage Injections			
SS-NE	(426,037)	(732,458)	1.72
PennYork	(109,468)	(225,280)	2.06
Consol	(243,835)	(356,925)	1.46
Total	(779,340)	(1,314,663)	1.69
UG Storage Withdrawals			
SS-NE	586,308	1,365,484	2.33
PennYork	43,898	223,789	5.10
Consol	255,017	534,201	2.09
Total	885,223	2,123,474	2.40
Net Withdrawal			price difference
SS-NE	160,271	633,026	0.61
PennYork	(65,570)	(1,491)	3.04
Consol	11,182	177,276	0.63
Total	105,883	808,811	0.71

C. *Level of Bulk Supply Costs*

Q: How do the level of costs assigned to bulk supply affect the results of the MBA allocation process?

A: The MBA produces an allocator vector, a set of percentages of gas supply costs to be allocated to various classes, adding to 100%. Any understatement

[5] Exh. AEL-9 purports to show sendout volumes, but since some of the "sendout" is injected into storage, the exhibit actually appears to represent the hypothetical take of various supplies.

of the base-load costs, or overstatement of the total quantity of bulk-load costs, will result in overstated allocators for low load-factor classes (those that comprise more of the bulk load).

Q: How does the Company overstate the total amount of supply costs for the bulk load?

A: The mismatch of storage injection and withdrawals discussed above results in an apparently excess amount and cost of storage withdrawals, compared to the credit for injection.

D. Allocation of Bulk Supply Costs

Q: How does the Company allocate the bulk supply costs between customer classes?

A: The Company allocates all non-baseload capacity costs on design load.

Q: Is this appropriate?

A: No. Most gas-supply capacity costs are incurred for normal or actual loads. Utilities generally acquire total capacity sufficient to cover design criteria (e.g., design day, design winter), but select the portion of capacity that is pipeline and storage based on minimizing costs for normal loads. The remainder of the design load is met with LNG and propane. Pipeline and storage supplies have higher capacity costs (in $/year per Dt/day of capacity), but lower commodity costs, than the peaking supplies. Least-cost planning requires the utility to acquire resources with high capacity costs and low commodity costs to meet load that must be met many days of most years; peaking supplies are acquired to meet the loads that occur only a few days of a normal year, or especially only a day or two per decade. Since most of the utility's capacity costs are associated with the pipeline and storage contracts, normal years are more important in determining capacity costs than are design years. At most, design loads are relevant to the allocation of capacity costs for the peaking supplies.

Q: What is the effect of the use of design loads for allocating bulk capacity costs?

A: This practice overstates the fraction of bulk capacity costs that are due to weather-sensitive load, and overstates the allocation to heating-dominated classes.

Q: Is the Company's use of design load in the MBA consistent with past use of the PR allocator?

A: No. Utilities have use design load in applying the PR method to demand-related *distribution* costs. Total distribution capacity is driven by design conditions. Since distribution capacity is not easily divisible into base and peak supply, it may be argued that all demand-related distribution costs are driven by design loads. This is not true for gas supply.

A couple of utilities have also proposed to use the PR with design load for allocating total gas capacity costs. Even if the design PR were an appropriate approximation of the cost causation of *total* gas capacity costs, it would not be appropriate for allocating bulk supply costs, once baseload costs were removed. Since the MBA method shifts significant costs from bulk load to base load, using design loads for allocating the bulk capacity costs would be redundant.

VI. Conclusions and Recommendations

Q: Please summarize your conclusions.

A: The MBA, and the Company's application of it, are fatally flawed. The resulting allocations are heavily biased against weather-sensitive loads. Correcting the unrealistic and inconsistent modeling assumptions, arbitrary assignment and pricing of resources, under-assignment of capacity costs to base load, misallocation of interruptible margin, are beyond what is possible in this proceeding. Indeed, the current proceeding may not be sufficient to fully review the Company's hypothetical dispatch and analysis, let alone correct it.

Application of the MBA in the lightly-reviewed cost of gas adjustment (CGA) would be even more impractical and inappropriate. Changes in supply and demand conditions would require substantial revisions in the MBA allocators. Given the many arbitrary, unrealistic, variable and inconsistent decisions utilities make in implementing the MBA, allowing utilities to apply this approach in the CGA would allow the Company to allocate gas supply costs in virtually any manner it desires.

Q: What are your recommendations?

A: The Commission should reject the use of the MBA in this case, and in the CGA. The Company should not change its allocation of gas supply costs until it can construct a realistic and reasonable load-shape-based allocator.

Any adjustment to the CGA that varies between rate classes should either be a constant $/Dt or a constant percentage change across classes.

Q: Does this conclude your testimony?

A: Yes.