

TAB 10

Cost of Service Study and Testimony



**STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION**

Docket No. DW 23-088

Pennichuck Water Works Inc.
Pennichuck East Utility, Inc.
Pittsfield Aqueduct Company, Inc.

Consolidated Permanent Rate Proceeding

DIRECT TESTIMONY

OF

GREGG H. THERRIEN

November 21, 2023

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1 **I. INTRODUCTION**

2 **Q. Please state your name, address, and position.**

3 A. My name is Gregg H. Therrien. I am a Vice President with Concentric Energy Advisors,
4 Inc. (“Concentric”), 293 Boston Post Road West, Suite 500, Marlborough,
5 Massachusetts. My professional qualifications and experience are provided in
6 Attachment GHT-1 to this testimony.

7 **Q. Have you testified previously before the New Hampshire Public Utilities
8 Commission (“NHPUC” or the “Commission”)?**

9 A. Yes, I have. I have previously testified in Docket No. DW 19-084, Pennichuck Water
10 Works, Inc. (“PWW”) Request for Change in Rates. I have also filed direct testimony in
11 Docket Nos. DE 19-064, Liberty Utilities (Granite State Electric) distribution service rate
12 case and DE 23-039, Granite State Electric - Petition for Permanent and Temporary
13 Rates. Further, I testified on behalf of Liberty Utilities on the subject of revenue
14 decoupling compliance in Docket No. DG 22-041 (Energy North Natural Gas) and
15 Docket No. DE-22-052 (Granite State Electric). I previously provided written and oral
16 testimony in Docket No. DG 17-048, Liberty Utilities (EnergyNorth Natural Gas)
17 distribution service rate case.

18 **Q. Have you previously provided consulting service and rate support for water
19 utilities?**

20 A. Yes. I have provided rate reviews, power purchasing strategies, and regulatory
21 consulting services for the Connecticut Water Company, as well as direct testimony on

1 allocated cost of service and rate design in their most recent Connecticut rate cases.¹

2 Additionally, our firm supported the efforts of San Jose Water and the Connecticut Water
3 Company in regulatory proceedings in Connecticut and Maine on a proposed merger.

4 **Q. What is your responsibility in this proceeding?**

5 A. In this proceeding, I am responsible for conducting an Allocated Cost of Service Study
6 (“ACOS”) reflecting the consolidated operations of Pennichuck Water Works, Inc.,
7 Pennichuck East Utility (“PEU”) and Pittsfield Aqueduct Company (“PAC”)
8 (Collectively, “Pennichuck” or “the Companies”).

9 **Q. Please describe Concentric.**

10 A. Concentric is an economic advisory and management consulting firm, headquartered in
11 Marlborough, Massachusetts, which provides consulting services related to energy
12 industry transactions, energy market analysis, litigation, and regulatory support. Our
13 regulatory economic and market analysis services include utility ratemaking, including
14 allocated and marginal cost of service studies, rate design, revenue requirements, and
15 other services in support of general rate cases. Our regulatory services also include
16 energy market assessments, market entry and exit analysis, corporate and business unit
17 strategy development, demand forecasting, resource planning, and energy contract
18 negotiations. Our financial advisory activities include both buy and sell side merger,
19 acquisition and divestiture assignments, due diligence and valuation assignments, project
20 and corporate finance services, and transaction support services. In addition, we provide

¹ Docket No. 23-08-32 - Application of Connecticut Water Company to Amend its Rate Schedules and Docket No. 20-12-30 - Application of the Connecticut Water Company to Amend its Rate Schedule.

1 litigation support services on a wide range of financial and economic issues on behalf of
2 clients throughout North America.

3 **Q. What is the purpose of your testimony in this proceeding?**

4 A. The purpose of my testimony is to explain the ACOS study prepared on behalf of
5 Pennichuck. ACOS studies are an important first step in establishing just and reasonable
6 rates. Allocating the Companies' proposed cost of service to the individual rate classes
7 provides valuable cost-based insight in establishing rates for classes of customers.

8 **Q. Were Attachments ACOS-1 through ACOS-6, Attachments ALLOC-1 through**
9 **ALLOC-6 and REV-1 through REV-5 (collectively, the "ACOS Exhibits") prepared**
10 **by you or under your direct supervision?**

11 A. Yes.

12 **II. ACOS PRINCIPLES FOR WATER UTILITIES**

13 **Q. Please describe the guiding principles that govern water ACOS studies.**

14 A. The purpose of the ACOS is to allocate the overall revenue requirements to the rate
15 classes in a manner that reflects cost causation and avoids unjust or undue discrimination
16 between rate classes. This is accomplished through analyzing the fixed and variable costs
17 associated with service provided to each customer class and assigning each customer or
18 rate class its proportionate share of the utility's total cost of service, i.e., the utility's total
19 revenue requirement. Many of the overarching concepts used in developing an ACOS
20 are common across all utility industries.

1 The results of the ACOS can be utilized to help determine the individual class revenue
2 responsibility and inform rate design. Rate design is the product of ACOS consultation,
3 customer rate gradualism considerations, efficiency, simplicity, continuity of rates,
4 fairness between rate classes and corporate earnings stability.² The Company's proposed
5 rate design is described in detail in the pre-filed testimony of Mr. Ware.

6 **Q. Please provide an overview of the ACOS cost allocation methodology used in your**
7 **study.**

8 A. Consistent with past cost of service studies used by PWW, I have used the base-extra
9 capacity method to allocate various components of the revenue requirement.³ This
10 methodology is used to allocate the cost of providing water service to the rate classes
11 based on each classes' use of the commodity (the actual water), various facilities (e.g.,
12 pumps, mains, etc.), and services (the physical service lines, meters and appurtenances).
13 The American Water Works Association ("AWWA") recognizes the base-extra capacity
14 method as a "fair and equitable" means of distributing the total revenue requirements in
15 proportion to each class's contribution to the cost of the system.⁴ I further describe the
16 functionalization and class allocation methodologies used in this study in Section III
17 below.

² *Principles of Public Utility Rates*, Public Utility reports, Inc. by James C. Bonbright, Albert L. Danielsen and David R. Kamerschen. Second edition March 1988, pp. 383-384.

³ See, Docket No. DW 10-091, *Pennichuck Water Works, Inc.*, Testimony of John R. Palko, April 2010. See also, Docket No. DW 17-071, Testimony of Donald L. Ware, Attachment DLW-1, *Cost of Service Study*, April 2017 by Raftelis Financial Consultants, Inc. and Docket No. DW 19-084, *Pennichuck Water Works, Inc. – Rate Proceeding*, Testimony of Gregg H. Therrien, June 2019.

⁴ AWWA Cost Manual, *Principles of Water Rates, Fees and Charges*, M1 Sixth Edition.

1 **III. ACOS STUDY METHODOLOGY**

2 **A. Introduction**

3 **Q. Please describe the ACOS performed in this case.**

4 A. Concentric has developed a proprietary model for conducting allocated cost of service
5 studies, which we used for the ACOS in this rate case. The same model has been used in
6 PWW's prior rate case ACOS. The ACOS is an iterative model that calculates both
7 functional and class cost allocations simultaneously. This is an iterative process because
8 internal allocators are a function of how line item costs are allocated using the external
9 allocators⁵. The model has also been customized to track and calculate the Municipal and
10 Private Fire Service results by community.

11 **Q. Has the ACOS been developed on a consolidated basis for PWW, PEU, and PAC?**

12 A. Yes. The Companies have previously noted the intent to file a merged general rate case
13 with consolidated tariff rates. Pennichuck is seeking to increase revenues on a combined
14 basis, by approximately 10.35% above the Test Year revenues generated by sales and
15 rates authorized in their last respective rate cases.⁶ Accordingly, the ACOS filed in this
16 proceeding reflects the consolidation of the Companies. Concentric used the
17 consolidated plant and expenses by account and function as well as consolidated
18 allocation factors such as customers, peak demand, and revenues.

⁵ "External allocators" are direct inputs into the model and are typically statistical items such as number of bills, gallons of water usage, cost of meters, etc. "Internal allocators" are mathematically calculated based on the first iteration cost allocations that result from multiple internal allocator cost allocations. Cost allocators are described in more detail in Section II. C. below.

⁶ Allowed revenues were last established for PWW in Docket No. DW 22-032; PEU in Docket No. DW 20-156; and PAC in Docket No. DW 20-153.

1 **Q. Please comment on the Companies' proposal to consolidate customer rates and the**
2 **impact on the ACOS.**

3 Utilities generally design their rates so that all similarly situated customers are charged
4 the same rates. The Companies operate today under common management, and
5 combining the rates brings the ratemaking in line with that common operating structure.
6 Consolidating rates ensures that customers are provided fair and consistent rate treatment
7 based on their relative share of the Companies' costs and helps avoid customer confusion.
8 It is good utility practice to periodically review the customer classes and cost causation.
9 Maintaining multiple sets of rates in perpetuity can unnecessarily complicate the
10 formulation of rates and the regulatory review of those rates by the Commission and
11 other parties when the costs associated with each customer classes all fall within a zone
12 of just and reasonableness.

13 **Q. Please comment on the impact of this rate consolidation on customers.**

14 **Q.** In some instances, a transition period is necessary to minimize adverse impacts of a rate
15 consolidation. We have reviewed the customer impact of consolidating Pennichuck's
16 affiliate customer rates and agree with the Companies' position that, for general water
17 service, the rate effects and underlying cost differences are not of a magnitude that
18 typically would warrant maintaining separate rates or the use of transitional rates. As
19 discussed later in this case, based on multiple discussions with the Companies' operating
20 personnel, I believe it is appropriate to only differentiate fire service rates by community

1 given the differences in service requirements, while all general service customers would
2 pay a consolidated rate schedule.

3 **Q. Please describe the Company's pro forma revenue requirements.**

4 The ACOS relies on a pro forma revenue requirement, with account-level detail, to
5 allocate specific costs to the rate classes. As previously stated, the ACOS builds off of
6 the consolidated test year and pro forma rate year revenue requirement developed by
7 Pennichuck. The 2022 Annual Reports of the Companies filed with the Commission
8 served as a guide to the detailed accounts used to accumulate the combined costs in the
9 test year. The pro forma revenue requirements build off of the test year actual costs,
10 adjusted for known and measurable changes.

11 **Q. What are the major components of the Company's revenue requirements?**

12 A. Pennichuck's revenue requirements are comprised of repayment to the City of Nashua
13 ("City") of City bonds (herein referred to as the "City Bond Fixed Revenue
14 Requirement", or "CBFRR"), as well as more traditional costs such as Operations and
15 Maintenance ("O&M") expenses, taxes, and interest. Pennichuck's rate base is
16 supported by the combination of the City bond proceeds and Company-issued debt. Rate
17 base depreciation and return are not part of the revenue requirement *per se*; rather,
18 revenue requirements related to net plant are based on recovery of the CBFRR and debt
19 service. This is described in detail in Mr. Ware's testimony. Fixed Contract Revenues
20 from Special Contract Customers are treated as a deduction to revenue requirements for
21 purposes of the ACOS.

1 **Q. Does the unique build-up of PWW's revenue requirement affect the ACOS**
2 **methodology?**

3 A. No. Concentric used the Company's records which are maintained in accordance with
4 the NHPUC chart of accounts for both operating expenses and asset accounts to derive
5 cost allocation factors, which are then applied to the CBFRR, the Debt Service Revenue
6 Requirement ("DSRR 1.0"), and the 10% Debt Service Reserve Revenue Requirement
7 ("0.1 DSRRR").

8 **B. Special Contract Customers**

9 **Q. Please explain how special contract customers are treated in the ACOS and why**
10 **these proceeds are treated as a deduction to the revenue requirement.**

11 A. Special contracts, by their nature, are the result of arms-length negotiations. The purpose
12 of a special contract is to provide service to a large facility or water system that is: 1) not
13 willing to pay a standard General Metered rate given its ability to utilize alternative
14 supply at a cheaper price; and 2) provides incremental revenues in excess of the marginal
15 cost to serve that special contract customer. These incremental revenues provide a
16 benefit to the General Metered customers through an offset to the revenue requirements
17 necessary to operate, maintain, and invest in, the utility water system.

18 Special contract customers' rates include a fixed fee component based on a negotiated
19 contract price and cannot be changed until contract expiration. Given that the special
20 contracts have set fixed prices for the remaining term of the contract, it is logical to
21 exclude special contracts as a stand-alone class in the ACOS. Another distinguishing
22 factor is that special contract customers have traditionally paid for these specific

1 investments through a Contribution in Aid of Construction (“CIAC”) whereas other
2 customer classes have not. Such investments include dedicated pipes that do not rely on
3 the existing core system for service. Special Contract customers also have their own
4 storage facilities which limit the peaking factor of their demands resulting in steady
5 demands.

6 Special contract revenues are applied as an offset to the General Metered class rates in
7 recognition that the General Metered class pays for the overall system deliverability.

8 Assignment of the revenue requirements to the core customer groups – General Metered,
9 Public Fire and Private Fire – results in costs being allocated to the customers that cause
10 those costs to be incurred. Certainly, special contract customers do receive the benefit of
11 being a customer of the utility and receive services such as metering, billing, maintenance
12 on pipes and appurtenances and the like; however, the revenues received from these
13 customers more than offset their marginal costs. Therefore, crediting special contract
14 revenue back to the General Metered class is both efficient and accurate for purposes of
15 the ACOS.

16 **C. Cost Allocators**

17 **Q. Please summarize the major cost allocators deployed in the ACOS.**

18 A. There are two types of cost allocators used in developing this ACOS: functional
19 allocators and class allocators. Functional allocators are used to assign various costs to
20 specific functional categories and the class allocators are then utilized to allocate these
21 functionalized costs to the three rate classes. Functional allocators allocate costs to the

1 following cost functions: 1) Base; 2) Extra; 3) Customer; and 4) Fire. Class allocators
2 allocate costs among the General Metered, Municipal Fire and Private Fire rate classes.

3 **1. Functional Allocators**

4 **Q. How are costs allocated to the functions?**

5 A. The Companies accumulate costs according to the Commission-approved Uniform
6 System of Accounts for Water Utilities.⁷ The combined costs are for each of these
7 individual accounts is assigned a functional allocator from the following list:

- 8 1) Base Cost;
- 9 2) Base / Excess Capacity Maximum Day;
- 10 3) Base / Excess Capacity Maximum Hour;
- 11 4) Customer Service and Billing;
- 12 5) Meters;
- 13 6) Services, and
- 14 7) Fire Hydrants.

15 **Q. Please describe the methodology to calculate the Base and Extra Capacity**
16 **Functional Allocators.**

17 A. The Base and Extra Capacity allocators (including Extra Maximum Day and Extra
18 Maximum Hour) are calculated using the Company's actual metered annual usage,
19 converted to Millions of Gallons per Day ("MGD").⁸ Maximum Daily usage was
20 provided by the Company, which was derived from metered data for the General Metered
21 customer class and was estimated for the remaining classes. Excess Maximum Day is
22 equal to the Maximum Day less the Average Day. The split between Base and Maximum
23 day Extra Capacity is calculated by comparing the ratio of average day usage to
24 Maximum Daily usage and the ratio of Excess Maximum Day to Maximum Daily usage.

⁷ Uniform System of Accounts for Water Utilities, Published by the N.H. Public Utilities Commission, June 2015.

⁸ 1 CCF = 748 gallons.

1 Excess Maximum Hour is similarly calculated, whereby the percentage of Maximum Day
2 is established based on Company data for the General Metered class and estimated for the
3 remaining water service customers. The split between Base and Maximum Hour Extra
4 Capacity is calculated by comparing the ratio of average day usage to Maximum Hourly
5 usage and the ratio of Excess Maximum Hour to Maximum Hourly usage.

6 Fire service MGD, Maximum Day and Maximum Hour factors are based on factors
7 provided by the Company. The result is a Base-Excess Max Day split of 48%/52%, and a
8 Base-Excess Max Hour split of 25%/75%. For plant costs allocated using a combination
9 of Base, Daily Excess Capacity, and Hourly Excess Capacity, a composite allocation of
10 25%/27%/48% is used. Support for these calculations is included in **Attachments**
11 **ALLOC-1, ALLOC-4 and ALLOC-6**. ALLOC-1 provides details regarding the Base
12 and Extra Capacity functional allocators while ALLOC-4 provides details regarding
13 factors used to allocate cost functionalized to base, extra day, and extra hour to the rate
14 classes. ALLOC-6 provides details regarding the Fire Protection demand factors.

15 **Q. Please explain the Customer Service and Billing functional allocation factor.**

16 A. This allocation factor is used to directly assign costs in certain accounts to the Customer
17 Service and billing function. Examples include account no. 902 (Meter Reading
18 Expense), account no. 903 (Customer Records and Collection Expense) and account no.
19 904 (Uncollectible Accounts Expense).

20 **Q. How are the Meter and Services functional allocators calculated?**

21 A. Similar to the Customer Service and Billing functional allocator, the Meters and Services
22 functional allocators are used to directly assign costs in certain accounts to these

1 functions. Examples of meter directly assigned costs include account no. 663 Meter
2 Expenses and account no. 676, Maintenance of Meters. Service-related directly assigned
3 costs include account no. 664, Customer Installations Expense and account no. 675,
4 Maintenance of Services.

5 **Q. How is the Fire Hydrants functional allocator derived?**

6 A. The Fire Hydrants functional allocator is a binary allocator that directly assigns costs to
7 the Fire Hydrant function, such as account no. 677 Maintenance of hydrants.

8 **2. Customer Class Allocators**

9 **Q. How are costs allocated to the individual rate classes?**

10 A. Class allocators allocate costs to the specific classes. The class allocators are:

- 11 1) Base Cost (MGD);
- 12 2) Extra Capacity – Maximum Day (MGD)
- 13 3) Extra Capacity – Maximum Hour (MGD)
- 14 4) Number of Customers;
- 15 5) Number of Bills;
- 16 6) Revenues;
- 17 7) Meters;
- 18 8) Weighted Cost of Services,
- 19 9) Inch-Feet (Municipal Fire), and
- 20 10) Fire Hydrants.

21 **Q. Please explain the Number of Customers, Number of Bills and Revenues class**
22 **allocators.**

23 These allocators are equal to the test year actual figures for these categories. Each of
24 these class allocators will assign costs (maintained at the uniform system of accounts
25 level) to the individual rate classes. Examples include account no. 904, Uncollectible
26 Accounts (allocated based on number of customers), account no. 903, Customer Records

1 and Collection Expense (Number of bills), and account no. 461, Water Sales (Revenues).

2 These test year figures are detailed in **Attachment ALLOC-2** (customers and bills)

3 **Attachment ALLOC-4** (usage) and **Attachment ALLOC-5** (revenues).

4 **Q. Please explain the Base Cost, Extra Capacity - Max Day, and Extra Capacity - Max**
5 **Hour class allocators.**

6 A. The Base Cost, Extra Capacity - Max Day, and Extra Capacity - Max Hour class
7 allocators are used to allocate costs functionalized as Base Cost, Maximum Day Extra
8 Capacity, and Maximum Hour Extra Capacity, respectively. The calculations detailing
9 the development of these allocators are provided in **Attachment ALLOC-4**.

10 **Q. How is the weighted cost of services Class allocator calculated?**

11 A. The weighted cost of services allocator is used to allocate costs (including plant and
12 O&M) functionalized as services to the rate classes. This allocator utilizes unit costs for
13 each service size deployed by the Company. These unit costs are then divided by the unit
14 cost for a ¾-inch service line to derive a cost weighting factor. The ¾-inch service is the
15 most common and least expensive service and was the best choice to use as the base unit
16 to factor against. Stated differently, the ¾-inch service lines have a weighting factor of
17 1.00 while other services have weighting factors that progressively increase from the 1-
18 inch service line (1.19 weighting factor) up to the 16-inch service line (weighting factor
19 of 6.04). These weighting factors are then multiplied times the number of services to
20 create weighted service costs, which form the basis for the allocations to the rate classes.
21 These calculations are detailed in **Attachment ALLOC-3**.

1 **Q. How are meters assigned in the ACOS?**

2 A. Meter costs are directly assigned to the General Metered class only, as the Municipal and
3 Private fire classes are not metered.

4 **Q. How does the ACOS utilize the fire hydrant Class allocator?**

5 A. The fire hydrant allocator directly assigns all fire hydrant costs to the Municipal Fire rate
6 class. All Private Fire customers own their own hydrants and are therefore excluded
7 from this cost assignment.

8 **Q. What functional and class allocators were chosen for each cost element?**

9 A. **Attachment ACOS-5** provides the allocators chosen for each element. The Function
10 column represents the functional allocator, while the subsequent columns show the class
11 allocations by the functionalized category.

12 **3. Internal Allocators**

13 **Q. What is the purpose of internal allocators?**

14 A. There are various indirect cost items related to overheads such as intangible plant and
15 general plant, as well as administrative and general expenses that cannot be directly
16 assigned to a particular function. These items were allocated to functions based on the
17 relative amount of certain costs that have been directly assigned to each function. The
18 internally developed functional allocators (“internal allocators”) used to assign overhead
19 costs have been selected to reflect the type of direct costs that each overhead account
20 generally supports. An example of such an allocator is the “NET_PLANT” allocator,
21 which is derived based on the sum of all of the individual allocations to each gross plant

1 and depreciation reserve account number. This allocator is used to allocate the CBFRR,
2 DSRR 1.0, 0.1 DSRRR, Amortization expense and income taxes.

3 **IV. ACOS RESULTS**

4 **A. Summary Class Allocation Results**

5 **Q. What are the class allocated results for each rate class?**

6 A. **Attachment ACOS-1** is the Class summary report from the ACOS. This report shows
7 how rate base related costs were allocated among the classes (lines 1-4); revenues at
8 current rates (lines 5-10), and the proposed revenue requirement components (lines 11-21
9 and line 24). The difference between the allocated revenue requirement and current rates
10 results in a (deficiency) or surplus for each customer class (line 22). This is an important
11 calculation when considering changes to revenue allocation among the rate classes.
12 Those with deficiencies above the system average may require a higher relative
13 percentage increase than those classes with below average deficiency or a surplus. This
14 is summarized as follows:

15 **Table 1: Allocated Pro Forma Revenue Requirements**

Rate Class	Revenues at Present Rates	Pro Forma Revenue Requirements	(Deficiency) / Surplus	(Deficiency) / Surplus %
<i>Reference</i>	<i>ACOS-1 Line 8</i>	<i>ACOS-1 Line 21</i>	<i>ACOS-1 Line 22</i>	
General Metered Service	\$42,083,941	\$46,732,010	(\$4,648,069)	-11.04%
Municipal Fire Protection	\$5,454,877	\$6,095,622	(\$640,745)	-11.75%
Private Fire Protection	\$2,694,250	\$2,405,889	\$288,361	10.70%
System Total	\$50,233,067	\$55,233,521	(\$5,000,454)	-9.95%

16

1 **Q. Please discuss these results.**

2 Table 1 indicates an overall revenue increase of \$5.0 million (9.95%) is required. Of that
3 increase, the ACOS indicates this increase should be recovered primarily from the
4 General Metered class. Although the Public Fire class indicates revenues are currently
5 below ACOS levels, this is consistent with results from past ACOS studies. Private Fire
6 revenue requirements indicate that revenues are currently above ACOS levels, the
7 amount of revenue to be redistributed to the other classes is relatively small. The
8 Commission has previously ordered a gradual reallocation of revenue to the Municipal
9 and Private Fire Protection classes, where these classes received an increase of 3 percent
10 per year over six years, where the General Metered Service customers received an
11 equivalent overall revenue decrease.⁹

12 Updating the ACOS provided the Pennichuck with an opportunity to re-look at costs and
13 revenues to determine if the prior efforts to bring Fire Service rates closer to cost parity
14 were on track. The updated results of the ACOS reflect that the prior reallocation has
15 brought the Fire Protection classes closer to ACOS levels. These results are driven by the
16 individual allocators chosen within the ACOS based on cost-causation.

17 **Q. Did Concentric prepare a functional revenue requirement summary by rate class?**

18 A. Yes, **Attachment ACOS-2** is a functional summary of the major components of the
19 revenue requirement: CBFRR, O&M, Amortization, DSRR 1.0, 0.1 DSRRR and taxes
20 (income and other). This functional cost exhibit displays the cost responsibility for the

⁹ See, Order Nos. 26,383 in Docket Nos. 19-084 and 20-055 and Order No. 26,425 in Docket No. 22-032.

1 classes for base costs, extra capacity costs (by max day and max hour), customer service
2 and billing, meters, service lines and fire hydrants.

3 **Attachment ACOS-3** is a more detailed summary of the functional revenue requirement.

4 The following table, based on the Functional Revenue Requirement information
5 contained in Attachment ACOS-3, summarizes this information:

7 **Table 2: Class Allocations**

Allocator	System Total	General Metered Service	Municipal Fire Protection	Private Fire Protection
Base Cost	\$ 20,076,928	\$ 19,889,450	\$ 139,341	\$ 48,136
Extra Capacity - Max Day	\$ 11,803,397	\$ 10,312,783	\$ 1,045,713	\$ 444,901
Extra Capacity - Max Hour	\$ 12,227,285	\$ 7,200,712	\$ 3,540,766	\$ 1,485,806
Customer Service & Billing	\$ 4,027,675	\$ 3,891,977	\$ 1,425	\$ 134,273
Meters	\$ 1,960,297	\$ 1,960,297	\$ -	\$ -
Service Lines	\$ 4,378,494	\$ 4,048,157	\$ -	\$ 330,337
Fire Hydrants	\$ 1,444,427	\$ -	\$ 1,444,427	\$ -
Total Revenue Requirement	\$ 55,918,502	\$ 47,303,377	\$ 6,171,673	\$ 2,443,452
Base Cost	36%	42%	2%	2%
Extra Capacity - Max Day	21%	22%	17%	18%
Extra Capacity - Max Hour	22%	15%	57%	61%
Customer Service & Billing	7%	8%	0%	5%
Meters	4%	4%	0%	0%
Service Lines	8%	9%	0%	14%
Fire Hydrants	3%	0%	23%	0%
Total Revenue Requirement	100%	100%	100%	100%

8
9 As Table 2 indicates, those classes with higher percentages of cost allocation to Base and
10 Extra Capacity incur the most costs. For example, the Company's Plant, Structures and
11 Equipment accounts, the Water Treatment Plant accounts, and Transmission and
12 Distribution Mains account are all allocated based on base and max day. The Pumping
13 equipment accounts, Distribution Reservoir and Standpipes Account and the

1 Transmission and Distribution Mains account all have substantial plant allocated based
2 on max hour. It is logical that the Municipal and Private Fire Protection classes would
3 incur a higher percentage of Extra Capacity costs given the nature of the service that
4 these classes provide. That logic is illustrated by the fact that Municipal Fire Protection
5 is allocated 17% and Private Fire Protection is allocated 18% of the Extra Capacity-Max
6 Day and 57% and 61% of the Extra Capacity-Max Hour, respectively.

7 **Q. How can this functional information be utilized in rate design?**

8 These functions help determine *how* costs should be collected, either through the fixed or
9 variable charge. Attachment ACOS-3 also includes a unit cost summary. Lines 46
10 through 51 show the functional costs on a unit basis. Base costs, which represent
11 primarily the variable commodity cost of water service, are divided by annual CCF usage
12 for each class to derive a volumetric unit cost. The remaining functionalized costs are
13 divided by the number of annual bills for each class, deriving a monthly fixed unit cost.
14 Lines 46 through 54 represent three different summations of these fixed costs for
15 purposes of assisting in the fixed monthly charge rate design. These three summations
16 are:

- 17 1) Direct Customer Costs – the sum of meters and service line unit costs;
- 18 2) Direct plus Customer Service and Billing – adds the results from summary 1)
19 and customer service and billing costs, and
- 20 3) Total Customer and Extra Capacity Costs – Adds the extra capacity unit costs
21 to summary 2) to derive total monthly customer-related fixed costs.

22 These unit costs are summarized as follows:
23
24

1 **Table 3: Unit Costs**

Revenue Requirement	General Metered Service	Municipal Fire Protection	Private Fire Protection
Base Cost (\$ / CCF)	\$3.87	\$3.87	\$3.87
Extra Capacity Cost (\$ / Bill)	\$38.82	\$25,480.44	\$113.87
Customer Service & Billing (\$ / Bill)	\$8.63	\$7.92	\$7.92
Meters (\$ / Bill)	\$4.34	\$0.00	\$0.00
Service Lines (\$ / Bill)	\$8.97	\$0.00	\$19.48
Fire Hydrants (\$ / Bill)	\$0.00	\$8,024.60	\$0.00
Direct Customer Costs	\$13.32	\$0.00	\$19.48
Direct plus Customer Service & Billing Customer Costs	\$21.94	\$7.92	\$27.40
Total Customer Costs + Extra Capacity Costs	\$60.76	\$25,488.36	\$141.27

2
3 **Q. Municipal Public Fire Revenue Requirements by Community**

4 A. Municipal Fire Revenue Requirements are based on factors developed using public fire
5 flow requirements in each of the communities that receive fire protection services from
6 Pennichuck’s core system. Because fire flow requirements differ significantly by
7 community, Concentric grouped the fire service communities into four subgroups based
8 on their relative flow requirements and whether they are provided from the Core Nashua
9 system.¹⁰ The four subgroups are as follows:

- 10 1) Group 1 - Communities with fire flow requirements in excess of 3,500
- 11 gallons per minute (“GPM”) and depend upon the storage located in Nashua
- 12 (the core system)
- 13 2) Group 2 -Communities with fire flow requirements in of between 2,000-
- 14 2,500 GPM outside of the core system
- 15 3) Group 3 – Pittsfield with fire flow requirement of 3,500 gallons per minute
- 16 (“GPM”) outside of the core system.

¹⁰ Companies that do not receive public fire protection services from Pennichuck were excluded from the allocation of municipal fire protection revenue requirements.

1 4) Group 4 – Small residential Communities outside of the core system with fire
2 flow requirements of no more than 500 GPM.

3
4 The Allocation of hydrant costs are based on the number of hydrants within each
5 individual community relative to the total. The allocation of all other costs is based on
6 the number of inch-feet within each community group relative to the total. The details of
7 the allocation of Municipal Fire Revenue Requirements by community group and the
8 communities within each group are shown in **Attachments REV-3** (calculation of unit
9 rates) and **REV-4** (revenue requirement community allocation detail). **Attachment**
10 **REV-5** compares current revenue allocations of municipal fire, by community, to
11 proposed revenue requirements.

12 **B. Fixed Versus Variable Cost Summary**

13 **Q. Has an analysis of total system costs, split by fixed and variable costs, been**
14 **performed?**

15 A. Yes. Using the functionalized cost information from **Attachment ACOS-5** certain
16 known variable costs were selected to derive the fixed/variable cost split:

17 **Table 4: Fixed and Variable System Costs**

	ACOS \$	Percent	Source:
Total Revenue Requirement	\$ 55,918,502		ACOS-1 Line 19
<u>Variable Costs:</u>			
Purchased water	\$ 1,976,900.8		ACOS-5: Account no. 602
Energy Portion of Fuel or Power Purchased for Pumping	\$ 2,280,046.3		Account no. 623
Chemicals	\$ 1,707,351.4		Account no. 641
Sludge Disposal	\$ 532,015.2		Account no. 652
Total Variable Costs	\$6,496,314	11.6%	
Total Fixed Costs	\$49,422,188	88.4%	

1 As Table 4 indicates, the vast majority (88.4%) of PWW's revenue requirement is fixed.

2 An alternative calculation using the functionalized Base O&M expenses shown on
3 Attachment ACOS-2 (line 6 column C) shows a variable cost of \$12,162,530. Dividing
4 this figure by the total system revenue requirement of \$55,918,498 yields a variable
5 percentage of 21.75% and a fixed percentage of 78.25%. Fixed costs represent between
6 78.25% to 88.4% of the Companies' total revenue requirement needs. This relationship
7 between fixed and variable costs is considered in the Company's rate design proposal, as
8 discussed in Mr. Ware's testimony.

9 **V. USE OF THE ACOS IN RATE DESIGN**

10 **Q. Have you prepared an exhibit to assist in the Company's proposed rate design?**

11 A. Yes, I have. **Attachment REV-2** utilizes the final revenue requirement class allocations
12 from **Attachment REV-1**. In **Attachment REV-2**, I first propose a base fixed charge of
13 \$29.02 per month for the General Class 5/8" meter class customers, which is the value
14 necessary to collect the \$15.713 million General Service meter revenue requirement in
15 conjunction with the larger meter size fixed charges, which are established through the
16 respective current ratios to the 5/8" meter baseline. This is shown on lines 31 through 43
17 of the revenue proof calculation in **Attachment REV-2**. The remaining General Service
18 class revenue requirement is then collected through a unit rate (rate per ccf) designed to
19 recover the remaining General Service revenue shortfall. Special contract customer
20 volumetric revenues are increased at the same proportional increase as the General
21 Service class. Final pro forma revenues are designed to equal the proposed revenue
22 requirement. This is accomplished through a final iterative balancing step using the

1 General Service per ccf unit rate. The testimony and exhibits of Mr. Ware provide
2 typical customer bill impacts in support of this proposed rate design.

3 **VI. CONCLUSION**

4 **Q. Please summarize your testimony.**

5 A. Concentric has performed an ACOS study on behalf of Pennichuck that comports with
6 industry standards, the AWWA guidance, and past cost of service studies filed with the
7 Commission. The Company's pro forma revenue requirements were functionalized then
8 allocated to the rate classes using the base-extra capacity methodology. The ACOS
9 supports a rate increase to the General Class and Municipal Fire Protection classes, and a
10 modest reduction to the Private Fire class. Additionally, the ACOS shows that the
11 Company's fixed costs are between 78.25% to 88.4%, representing the vast majority of
12 system costs.

13 **Q. Does this complete your testimony?**

14 A. Yes, it does.