BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

PENNSYLVANIA PUBLIC UTILITY COMMISSION v.
PESCO ENERGY COMPANY – ELECTRIC DIVISION

DOCKET NO. R-2018-3000164

DIRECT TESTIMONY

WITNESS: JIANG DING

SUBJECT: CLASS COST-OF-SERVICE STUDY

DATED: MARCH 29, 2018
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I. INTRODUCTION AND PURPOSE OF TESTIMONY

1. Q. Please state your full name and business address.

A. My name is Jiang Ding. My business address is PECO Energy Company, 2301 Market Street, Philadelphia, Pennsylvania 19103.

2. Q. By whom are you employed and in what capacity?

A. I am employed by PECO Energy Company ("PECO" or the "Company") as Principal Regulatory & Rates Specialist.

3. Q. Please describe your educational background.

A. I received a Bachelor’s Degree in Law from China University of Political Science and Law, and I received a Master of Science Degree in Finance from Texas A&M University.

4. Q. Please describe your work experience with the energy industry.

A. Upon graduation from Texas A&M University, I worked as an Accountant for Enron and as a Financial Analyst for Halliburton Energy Services. I was hired by Exelon Power as an Operational Area Analyst in 2002. I then worked for Exelon Generation and Exelon Corporation as a Senior Project Evaluation Analyst. I was appointed Principal Regulatory & Rates Specialist in PECO’s Regulatory Strategy and Revenue Policy Division in 2013. My main responsibilities include revenue requirement modeling
and analyses for regulatory initiatives, cost of service studies and base rate case filings. For example, in the Company’s last base rate proceeding, I developed the COS study with PECO witness, Alan B. Cohn, and assisted with preparing all exhibits accompanying his cost-of-service testimony.

5. Q. **Have you prepared any exhibits to accompany your testimony?**

A. Yes. PECO Exhibits JD-1 to JD-10 were prepared and are described in detail in my testimony.

6. Q. **Please describe the purpose of your testimony?**

A. I will explain the cost of service principles underlying the unbundled, fully allocated class cost-of-service study (“COS study”) that I performed, the methods and procedures employed to perform such study and the results produced by the COS study.

7. Q. **How is your testimony organized?**

A. My testimony is divided into four parts. First, I provide some background information, identify the exhibits that I am sponsoring, and summarize the results of the COS Study. Second, I introduce and discuss the COS study methodology. Third, I explain the development of the revenue requirement for each rate class. Fourth, I present the results of the COS study in detail and discuss the contents of the exhibits. Finally, I describe the analysis undertaken by the Company in accordance with the settlement of its 2015 base rate proceeding.
II. BACKGROUND INFORMATION AND SUMMARY OF COST-OF-SERVICE STUDY RESULTS

8. Q. What is the total revenue requirement you used to prepare PECO’s COS study?

A. I used the total distribution revenue requirement for the fully projected future test year (“FPFTY”) developed in PECO Exhibit BSY-1, which is sponsored by PECO witness Benjamin S. Yin and discussed in Mr. Yin’s direct testimony (PECO St. No. 3). The total distribution revenue requirement for the FPFTY is $1,406 million (PECO Exhibit JD-1, line 64) excluding costs recovered under PECO’s Generation Supply Adjustment (“GSA”)\(^1\) and Transmission Service Charge (“TSC”)\(^2\) and $2,241 million (PECO Exhibit JD-1, line 114) including costs recovered under the GSA and TSC. The total distribution revenues and distribution revenues by customer class for the FPFTY under existing rates that are used in the COS study were also obtained from PECO Exhibit BSY-1.

9. Q. Please identify the exhibits that accompany your direct testimony.

A. The exhibits identified below accompany my testimony and are discussed in greater detail in Section IV of my testimony.

\(^1\) The GSA is the reconcilable rate adjustment that recovers, on a bypassable basis, the costs PECO incurs to provide default service to customers that do not obtain generation from an electric generation supplier.

\(^2\) The TSC is the reconcilable rate adjustment that recovers charges for network transmission service incurred by PECO on a bypassable basis from PECO’s default service customers. PJM Interconnection LLC (“PJM”) furnishes network transmission service to PECO pursuant to the PJM Open Access Transmission Tariff.
10. Q. Please summarize the results of the COS study as they pertain to changes in rates proposed in PECO’s filing.

A. The results of the COS study and my conclusions based on those results are as follows:

1. The current tariff rates produce the net income by rate class shown on line 16 of PECO Exhibit JD-1, which yields the rates of return on rate base shown on line 25 of that exhibit.

The table below summarizes these results.

<table>
<thead>
<tr>
<th>Rate Class</th>
<th>ROR</th>
<th>Ratio to Average ROR</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>5.65%</td>
<td>0.98</td>
</tr>
<tr>
<td>RH</td>
<td>4.50%</td>
<td>0.78</td>
</tr>
<tr>
<td>GS</td>
<td>6.63%</td>
<td>1.15</td>
</tr>
<tr>
<td>PD</td>
<td>6.46%</td>
<td>1.12</td>
</tr>
<tr>
<td>HT</td>
<td>6.03%</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Please note that the line numbering is continuous across pages 1-3 of PECO Exhibit JD-1. I will refer to the line numbers in PECO Exhibit JD-1 without page references.
2. PECO’s total distribution revenue requirement for the FPFTY has been allocated or assigned among the rate classes based on the results of the COS study. The results of the COS study are summarized on pages 1-3 of PECO Exhibit JD-1, which show the total distribution revenue requirement separately for Distribution, Transmission, and Purchased Power costs.

3. The increases or (decreases) in revenue by rate class needed to produce rates of return by class equal to the Company’s proposed overall rate of return are shown on line 120 of page 3 of PECO Exhibit JD-1. The increases or (decreases) in revenue shown on line 120 are shown separately for Distribution base rates (line 70) and the working capital revenue requirement recovered in the TSC (line 95) and in the GSA (line 83) on page 2 of PECO Exhibit JD-1. While the summary on pages 1-3 of PECO Exhibit JD-1 shows the rate increases or decreases necessary to move each class to the system average rate of return, the Company is not proposing rates that will take all classes to their indicated cost of service at this time, as explained by the direct testimony of Mark Kehl in PECO Statement No. 7.
III. PECO’S CLASS COST-OF-SERVICE STUDY

11. Q. Briefly describe the purpose of a class COS study.

A. The purpose of a COS study is to determine the cost to serve, expressed as revenue requirement, for each rate class served by a utility. The revenue requirement for a rate class is that portion of a utility’s total cost of service attributed to that rate class in accordance with principles of cost causation. In a COS study, all of the utility’s costs of providing service must be analyzed and assigned or allocated among the rate classes. The COS study is used, along with other factors, as discussed in more detail by Mr. Kehl, to design rates that fully recover the utility’s costs.

12. Q. What are the guiding principles for performing a class COS study?

A. The central element in performing a COS study is the determination of allocation factors based on causal relationships between, on the one hand, customer demands, load profiles and usage characteristics, and, on the other hand, the costs incurred by the Company to meet customers’ service requirements imposed by those demands, load profiles and usage characteristics. The primary goals in selecting allocation factors are:

1. The appropriate recognition of cost causality;

2. The stability of study methods and their consistent application over time, so that trends in the direction of class revenues relative to cost-of-service can be discerned properly from case to case; and
3. Completeness, such that the COS study captures all of the costs that each class imposes on the distribution system.

13. Q. **What rate classes are included in the PECO COS study?**

A. The rate classes included in the PECO COS study are Residential (rate R), Residential Heating (rate RH), General Service (rate GS), Primary Distribution (rate PD), High Tension (rate HT), Electric Propulsion (rate EP) and Lighting. In the COS study, all of the lighting rate schedules in PECO’s current tariff are combined into a single Lighting class, because their cost and usage characteristics are very similar. The separate classes consist of Private Outdoor Lighting (POL), Street Lighting-Suburban (SL-S), Street Lighting-Customer-Owned (SL-E), Traffic Lighting Constant Load Service (TLCL), Alley Lighting (AL) and Smart Lighting Control (SL-C).

For customers participating in PECO’s Customer Assistance Program (“CAP”), the current CAP Residential (CAP-R) rate class is combined with the Residential class, because their usage characteristics are the same and CAP-R rates are designed with reference to Residential rates. For the same reasons, the current CAP Residential Heating (CAP-RH) rate class is combined with the Residential Heating class.

14. Q. **Please summarize the approach you used in preparing PECO’s COS study.**

A. As I previously explained, the most critical task in performing any COS study is establishing relationships between customer demands, load
profiles and usage characteristics, and the costs incurred to meet those
customer requirements. This requires an understanding of the design of
the utility’s distribution system and how that design relates to the
characteristics of the customers it is designed to serve.

PECO, like most electric utilities, designs its electric distribution system to
meet three primary objectives:

1. Connect all customers to the grid;
2. Deliver sufficient electricity to meet the aggregate peak
demand for electricity of all firm delivery customers whenever
those peaks occur, and
3. Assure that electricity is delivered to customers safely and
   reliably throughout the year.

The allocation methods used in a COS study must take into account the
objectives that the distribution system is designed to achieve so that the
allocation of plant investment and operating expenses properly aligns with
cost-causation factors such as the need to connect all customers to the
distribution system and to meet class peak demands whenever they occur.
Other factors, such as incentives to influence customer behavior (e.g.,
conservation or demand reduction) or to temper the impact on customers
of rate changes, are more appropriately considered in the revenue
allocation and rate design phase.

The PECO COS study I prepared was performed using the proprietary
Electric Cost of Service Model (“Model”) developed by Management
Applications Consulting, Inc., which employs a Microsoft Excel platform. The Model facilitates the preparation of the COS study, accelerates computations and develops appropriate documentation. The Model uses a three-step process to allocate or assign costs to rate classes, in accordance with general cost of service principles. These three steps consist of: (1) functionalizing rate base and costs to determine the particular rate schedules that should share responsibility for each of those assets and costs; (2) classifying functionalized costs into demand-related, energy-related and customer-related cost categories to facilitate allocating such costs to rate schedules in accordance with identifiable characteristics; and (3) allocating the functionalized, classified costs among rate classes. The Model provides functionalized, classified cost information by rate class, develops unbundled revenue requirements by functional classification and in total for each rate class, and calculates unit costs.

15. Q. Please describe the functions included in the COS study.

A. The COS study includes the following functions:

**Energy**: The Energy function includes purchased power and related costs incurred by the Company, which are recovered under its GSA, which applies to default service.

**Transmission**: The Transmission function includes costs associated with the Company’s bulk transmission system, which is designed to move power from generation sources to the primary distribution system and
operates at voltages of 69 kV and above. These costs are generally recovered in the TSC and the Non-Bypassable Transmission Rider (“NBT”). The working capital included in this function only applies to the bypassable portion of the TSC cost.

Primary Distribution High Tension (“Primary HT”): This function includes costs associated with moving power from the transmission system to the Primary Distribution system, including substations that transform power from 69 kV to 34 kV or 13 kV and from 34 kV to 13 kV, conductors operating primarily at voltages between 13 kV and 34 kV, and related assets. This includes some facilities operating at voltages of 69 kV and above that are distribution facilities.

Primary Distribution (“Primary”): This function includes costs associated with moving power from the Primary HT system to the primary distribution system, including transformers that reduce voltage from 13 kV to 4 kV or 2.4 kV, conductors operating at voltages between 2.4 kV and 4 kV, and related assets.

Secondary Distribution Customer and Demand (“Secondary Distribution”): This function includes costs associated with moving

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4 The NBT is the reconcilable rate adjustment that recovers PJM charges for Regional Transmission Expansion Plan (“RTEP”), Expansion Cost Recovery, and certain Generation Deactivation / Reliability Must Run charges on a non-bypassable basis from all of PECO’s distribution customers.
power from the Primary system to customers’ premises, including costs related to conductors operating at secondary voltage.

**Distribution Transformers:** This function includes the secondary transformers that reduce the voltage from primary power levels to levels at which secondary voltage customers receive service.

**Meters:** This function includes the cost to meter customers’ usage and demand.

**Services:** This function includes the investment in, and operating and maintenance expenses related to, the service lines from the Company’s distribution conductors to customer locations.

**Customer Accounts:** This function includes the cost of customer billing and records, call center, collection of customer accounts and uncollectible accounts.

**Customer Service:** This function includes costs incurred to provide energy efficiency, education, educational advertising, and conservation-related service.

**Customer Other:** This function includes costs not included elsewhere, such as street lighting and customer deposits.
16. Q. Please describe the classification step of a COS study.

A. In the classification step, the previously functionalized assets and costs are separated into customer, energy or demand classifications according to the system design or operating characteristics that cause those costs to be incurred.

Customer-related costs are the expenditures made to attach a customer to the distribution system, to meter usage and to maintain the customer's account. Customer costs are a function of the number of customers served and continue to be incurred whether or not a customer uses any electricity. This classification includes capital costs associated with poles, wires, services and meters and operating expenses incurred for customer service, field service, billing and accounting and related activities.

Energy-related costs are those that vary with the quantity of electricity sold to, or transported for, customers. These costs include purchased power costs and related costs.

Demand-related or capacity-related costs are those expenditures associated with plant that is designed, installed and operated to meet peak usage. Distribution assets are designed to meet the peak loads of the customers they serve at a localized level. Such localized loads exhibit far less diversity than the aggregation of such localized loads that occurs at the bulk transmission and generation levels. Accordingly, the costs of demand-related distribution assets are allocated among the rate classes
based upon their respective class non-coincident peak ("NCP") demands (i.e., the peak electricity demand of each rate class, not necessarily coincident with each other or with the system peak).

17. Q. Do all expenses fit neatly into one of these three classifications?
   
   A. Many costs do fit neatly into one of the three classifications, but some costs must be assigned between two classifications based upon special studies or based upon how related costs have been classified. Special studies, such as a minimum size study, are sometimes used to classify poles, conductors and transformers between customer-related and demand-related investment. A special study was not performed in this case because investment related to such plant operating at secondary voltage was considered to be customer-related and investment in plant operating at primary voltage was considered to be demand-related and, therefore, such plant was classified as customer and demand, respectively.

18. Q. Please describe the class allocation step of a COS study.

   A. In the class allocation step, costs that have been functionalized and classified are allocated among the rate classes based on appropriate causal relationships. The allocation phase takes into account the design of the utility system and how it is operated; cost data derived from the utility’s accounting records; and usage and load data both for the system overall and for specific customer classes. Based on analyses of the relationship between costs and the factors driving the need to incur such costs, each
component of the revenue requirement is either directly assigned to a rate
class or an allocator is selected to apportion that component among rate
classes.

19. Q. Please explain the term “direct assignment.”

A. The term “direct assignment” means identifying specific plant investments
or specific expenses incurred exclusively to serve a specific customer or
group of customers. Direct assignments reflect a direct causal connection
between costs to serve and the customers being served. Therefore, if data
are available to make a direct assignment, it is generally the preferred
approach.

20. Q. Can significant portions of a utility’s assets and expenses generally be
directly assigned in a COS study?

A. No, most costs must be allocated. Utility service is generally provided to
customers by facilities that are used, and expenses that are incurred, in
common by all, or many, classes of customers. In addition, even in
instances where it might be possible to associate specific physical facilities
with particular customers, the detailed cost information needed to make a
direct assignment may not be reasonably available.

21. Q. Please explain how allocation factors are determined.

A. External and internal allocation factors are typically used to perform a
COS study and, consequently, were employed in the Model. External
allocators distribute costs in proportion to customers’ use of plant and
services represented by functionalized and classified costs. Examples of external allocators are kWh deliveries (for energy-related costs), number of customers (for customer-related costs) and class NCP demands (distribution demand-related costs). PECO Exhibit JD-7 shows the development of the main external allocators. Internal allocators are based on some combination of external allocators, directly assigned costs and other internal allocators. For example, property insurance costs are allocated in proportion to the plant investment allocated or assigned to each rate class, while plant investment itself is allocated on the basis of one or more external allocation factors (e.g., NCP demand for demand-related plant costs and customer counts for customer-related plant costs).

22. **Q.** What is the source of the total rate base amount being allocated or assigned to customer classes in the PECO COS study?

A. The total rate base amount employed in the PECO COS study is $4,846 million (PECO Exhibit JD-1, line 103) and is derived from PECO Exhibit BSY-1, page 1.

23. **Q.** What are the major components of PECO’s rate base?

A. For purposes of discussing how I functionalized, classified and allocated rate base in the PECO COS study, I will refer to the following components of rate base:

- Intangible plant
- Distribution plant
24. **Q.** How did you functionalize, classify and allocate each component of the rate base among the rate classes?

**A.** The principal allocators for each component of the rate base are discussed below:

**Intangible plant** represents the costs of franchises and consents and other intangible assets. It was functionalized, classified and allocated in proportion to distribution plant (i.e., excluding plant serving the Energy and Transmission functions) with the exception of a portion of the total that is associated with Advanced Meter Infrastructure (“AMI”). Intangible AMI system costs, which consist of the software necessary to operate the AMI system and to interface with other systems such as billing, were classified as customer-related and allocated based on number of meters.

**Distribution plant** allocators were developed for specific subcategories of distribution plant, as follows:

- Land and land rights, stations, and structures and improvements were functionalized to Primary HT, classified as demand, and allocated among the rate classes based on their respective class NCP demands at the Primary HT level.
- Poles, towers and fixtures, overhead conductors and devices, underground conduit, and underground conductors and devices were functionalized between Primary HT/Primary, on one hand, and Secondary Distribution, on the other, based upon a detailed study of the respective costs, as shown in PECO Exhibit JD-7 at page 3. The Primary HT/Primary portion was split between Primary HT and Primary based on a study of the respective wire miles of conductors in each function (see PECO Exhibit JD-7, p. 5). Costs identified as Primary HT and Primary were classified as demand-related and allocated among the rate classes based on their respective NCP demands at the Primary HT and Primary voltage levels, respectively (see PECO Exhibit JD-7, p. 14).

Costs identified as Secondary Distribution were classified as customer-related and allocated based on the number of customer locations served.

- Line transformers were functionalized to Secondary Distribution and allocated among the rate classes based on NCP demands at secondary voltage (see PECO Exhibit JD-7, p. 4).

- Services connect individual customers to the system and, therefore, were functionalized to their own category, classified as customer-related and allocated based on the estimated total replacement cost of all services in each rate class (see PECO Exhibit JD-7, p. 6). The total replacement cost of services for a
rate class was estimated by multiplying the estimated replacement cost of a single service for a member of the class by the number of customer locations in the class.

- Meters were functionalized to their own category, classified as customer-related and directly assigned based on the cost of new AMI meters installed pursuant to PECO’s Smart Meter Universal Deployment Plan, which was approved by the Pennsylvania Public Utility Commission (“Commission”). The unrecovered cost of Automated Meter Reading (“AMR”) meters replaced by AMI meters are also functionalized to this category and allocated in the same proportion as the Company’s investment in AMI meters. Street lighting and signal systems were functionalized to Customer Other, classified as customer-related and directly assigned to Lighting.

**General plant** includes primarily structures and improvements relating to administrative activities, tools, and communications equipment, as well as other miscellaneous assets. These assets were functionalized, classified and allocated among rate classes based on the direct labor component of operating expenses, which reflects the nature of the assets and common cost-of-service practices for this type of property.

**Depreciation reserve** was provided by PECO by each asset account. Each component of the depreciation reserve was functionalized, classified and allocated among rate classes in the same ratio as the related assets.
**Other rate base items** include primarily materials and supplies, accumulated deferred income taxes, customer deposits, common plant, customer advances for construction, working capital and pension and other post-retirement benefit (“OPEB”) assets, which are discussed below.

- Materials and supplies were functionalized, classified and allocated among rate classes in proportion to plant in service.
- Accumulated deferred income taxes were functionalized, classified and allocated among rate classes in proportion to plant in service.
- Customer deposits were directly assigned to rate classes based on information provided by Mr. Yin (see PECO Exhibit JD-7, page 8).
- Common plant consists of assets similar to those customarily found in General Plant and, therefore, was functionalized, classified and allocated among rate classes based on the direct labor component of operating expenses.
- Customer advances were functionalized to Distribution and Secondary Distribution, classified as demand and customer-related and allocated among the rate classes in the same proportion as Distribution and Secondary Distribution assets.
- Working capital represents PECO’s need for cash to keep the business running until revenues are collected to pay the costs of providing service. Working capital was directly assigned to
Energy and Transmission based on the results of the lead-lag study prepared by Mr. Yin and described in PECO Statement No. 3. Energy-related working capital requirements were calculated for each rate class in the same manner that Mr. Yin calculated the total working capital. Transmission-related working capital requirements were calculated for each rate class in the same manner that Mr. Yin calculated the total working capital. The cost by class of service was directly assigned in proportion to costs that are allocated on the basis of PJM’s methodology. PJM allocates such costs in proportion to contributions to the single coincident peak experienced in the prior year. The balance of working capital was functionalized, classified and calculated for each rate class using the same methodology employed by Mr. Yin.

- The pension asset and OPEB Accumulated Deferred Tax Asset, which are discussed by Mr. Yin in PECO Statement No. 3, are directly related to employees and, therefore, were functionalized, classified and allocated among rate classes based on the direct labor component of operating expenses.

**Q. What are the major categories of PECO’s expenses?**

**A.** The major expense categories in PECO’s cost-of-service are:

- Distribution operating and maintenance expenses;
• Customer accounting and customer service expenses;
• Administrative and general expenses;
• Depreciation expense;
• Taxes other than income taxes; and
• Income taxes.

26. Q. In determining how to treat these expenses in the COS study, was there any other important grouping of expenses that had to be considered?

A. Yes, there was. Labor costs affect each of the first three categories identified above. Consequently, certain cost categories are allocated on the basis of direct labor costs. For example, Account 920 – Administrative and General Salaries is allocated among rate classes based on the composite allocation of direct labor costs included in all operating expense accounts. Likewise, employee benefits are allocated using a labor allocator. In order to develop such allocators, the direct labor costs included in each expense account were obtained from data assembled by Mr. Yin.

27. Q. What do PECO’s distribution operating and maintenance expenses include and how were these expenses functionalized, classified and allocated among rate classes?

A. PECO’s distribution system consists principally of substations; poles, towers and fixtures; overhead and underground conductors and related
equipment; meters; line transformers; outdoor lighting plant; and other
miscellaneous assets. Operating and maintenance expenses were analyzed
to determine the assets they were incurred to operate or maintain and,
therefore, were functionalized, classified and allocated among rate classes
in the same manner as the assets to which they relate. The COS study also
includes costs of purchased power and transmission costs paid to PJM that
are recovered through GSA, TSC and NBT charges. Purchased power
costs were functionalized as Energy, classified as energy-related and
allocated on the basis of default service sales. Transmission-related costs
were functionalized as Transmission and assigned among rate classes
based on their contributions to the single PJM coincident peak, which is
the same basis on which PJM determines its charges to PECO for
transmission service and thus used by PECO for budgeting purposes.

In addition to the expenses of operating and maintaining PECO’s
distribution system, distribution expenses include the following:

- **Customer-installation expenses**: These expenses relate to field
  investigations, high-bill complaints, and potential and actual
  energy theft, and were allocated based on number of customers.

- **Miscellaneous distribution expenses and rents**: These
  expenses relate to information technology (“IT”) and other
  expenses associated with all distribution assets. Accordingly,
  they were functionalized, classified and allocated among rate
classes in proportion to total distribution plant.
What do PECO's customer accounting and customer service expenses include and how were those expenses functionalized, classified and allocated among the rate classes?

A. Customer accounting and customer service expenses primarily include meter-reading expenses, customer records and collection expenses, uncollectible accounts expense, miscellaneous customer accounts expense and customer-assistance expense. These costs were functionalized to Customer Accounts, classified as customer-related and allocated as follows:

- **Meter reading expenses**, have been supplanted by the new AMI system expenses except for some minor expenses.

- **Customer records and collection expenses** relate to billing, call center operations, payment processing, arrearage recoveries, support for administering PECO’s CAP program, and termination and restoration of service. The account was analyzed in detail, discrete functions were identified, and expenses related to each function were allocated among rate classes using an appropriate allocation factor (see PECO Exhibit JD-7, p. 9). For example, expenses incurred for billing activities were allocated based on number of bills, and call center costs were allocated based on the number of customers. A single customer allocation could not be used because some costs are specific to residential customers while others are specific to
commercial and industrial customers. Therefore, a weighted
allocator, based upon the analysis discussed above, was used for
this account.

- **Uncollectible accounts expense**, or bad debt expense, was
allocated among rate classes based on the Company’s experience
over an historic three-year period (2015-2017) (see PECO
Exhibit JD-7, p. 11).

- **Miscellaneous customer accounts expense** includes IT support
for the other customer account functions.

- **Customer assistance expense** comprises expenses incurred for
the Low Income Usage Reduction Program, marketing and
conservation. Costs specific to the residential class were
allocated to Rates R and RH based on number of customers.
General marketing and conservation costs were allocated based
on sales (see PECO Exhibit JD-7, p 10).

29. **Q. How were administrative and general expenses functionalized,
classified and allocated among rate classes?**

A. Administrative and general expenses include administrative and general
salaries, office supplies and expenses, outside services, property insurance
costs, injuries and damages, employee benefits, regulatory commission
expenses, general advertising expenses, miscellaneous general expenses,
maintenance of general plant, and rents.
Except for items discussed below, administrative and general expenses are related to labor costs and, therefore, were functionalized, classified and allocated among rate classes in the same ratio as direct labor expenses.

Property insurance costs were functionalized, classified and allocated among rate classes in the same ratio as plant in service.

Regulatory commission expenses, general advertising, and miscellaneous general expense were functionalized, classified, and allocated among rate classes in proportion to revenue.

30. How were depreciation expense and depreciation reserve functionalized, classified and allocated among the rate classes?

A. Depreciation expense was derived from PECO Exhibit SAB-3, which is sponsored by Mr. Bailey and PECO Exhibit No. BSY-1, which show depreciation expense by plant account. The depreciation reserve was obtained from the same sources. Both the depreciation expense and the depreciation reserve were functionalized, classified and allocated among rate classes in the same ratio as the plant account to which they relate.

31. How were taxes other than gross receipts tax and income taxes functionalized, classified, and allocated among the rate classes?

A. Taxes, other than gross receipts tax and income taxes, include Public Utility Realty Tax (“PURTA”), payroll-related taxes, local use taxes and real estate taxes. Payroll-related taxes were functionalized, classified and
allocated among rate classes in proportion to direct labor expenses;

PURTA taxes were allocated based on the allocation of land; and real
estate taxes were allocated based on total plant;

32. Q. **How was gross receipts tax functionalized, classified, and allocated among the rate classes?**

A. Gross receipts tax is based on transmission and distribution revenue,
purchased power revenue and forfeited discounts (i.e., late payment
charges). Accordingly, gross receipts tax was calculated separately by
function and was classified and allocated among rate classes on the basis
of taxable revenue.

33. Q. **How was income tax expense functionalized, classified and allocated among rate classes?**

A. Income tax expense, calculated on the basis of revenue at present rates,
was functionalized, classified and calculated for each rate class using the
same methodology employed by Mr. Yin in PECO Exhibit BSY-1,
Schedule D-18.

34. Q. **How was revenue at present rates computed for each rate class?**

A. Distribution revenue at present rates is shown in the proof of revenues set
forth in PECO Exhibit MK-6. The total was assigned to the rate classes
based on the proof of revenues. Distribution revenue at present rates for
each rate class is shown on line 4 of PECO Exhibit JD-1.
Supply charge revenue, which consists of revenue collected under the GSA tariffs for energy, administrative costs, and cash working capital, was assigned to rate classes based on projected default service prices and MWh of generation. For each rate class, and in total, supply charge revenue equals the sum of the supply cost (including administrative costs), gross receipts tax, and the revenue requirement for cash working capital.

Transmission charge revenue under the TSC was functionalized to Transmission and allocated among the rate classes in proportion to costs that are allocated on the basis of PJM’s methodology. PJM allocates such costs in proportion to contributions to the single coincident peak experienced in the prior year. Revenue equals the sum of the cost plus the revenue requirement for associated cash working capital.

Forfeited discount revenue was functionalized, classified and allocated in the same ratio as the uncollectible accounts expense.

Rent for electric property represents pole rental revenue and was functionalized, classified and allocated in the same ratio as the plant costs for poles, towers and fixtures.

Decommissioning payments in the FPFTY represent PECO’s transfer to Exelon Generation Company of amounts that PECO collects from customers for nuclear decommissioning expense. Both PECO’s recovery of these costs and the transfer of such funds to Exelon Generation Company were approved in the Commission’s Order approving the
Settlement of PECO’s restructuring proceeding.\(^5\) This amount was allocated among the rate classes in the same ratio as the revenue was collected, which is in proportion to each class’ billed kWh.

Other electric revenue was allocated among the rate classes based on distribution plant.

**IV. DEVELOPMENT OF RATE CLASS REVENUE REQUIREMENT**

35. **Q.** How did you develop the revenue requirements for each class?

**A.** The revenue requirements for each rate class were calculated using the same method employed by Company witness Mr. Yin to compute the overall revenue requirement for the FPFTY. Thus, the revenue requirements for each rate class are the sum of that class’ allocated operating expenses, depreciation expense, general taxes, return on rate base and income tax expense. Return on rate base for each rate class was computed by multiplying the rate class’ rate base by the proposed system average rate of return. Income taxes included in the revenue requirement for each rate class were computed directly by grossing up the required non-debt

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\(^5\) Application of PECO Energy Co. for Approval of its Restructuring Plan Under Section 2806 of the Public Utility Code and Joint Petition for Partial Settlement; Petition of Enron Energy Services Power, Inc. for Approval of an Electric Competition and Choice Plan and for Authority Pursuant to Section 2807(E)(C) of the Public Utility Code to Serve as the Provider of Last Resort in the Service Territory of PECO Energy Co., Docket Nos. R-00973953 and P-00971265, 1997 Pa. PUC LEXIS 51 at *120 (Dec. 23, 1997). On June 9, 2009, the Commission initiated an investigation at Docket No. I-2009-2101331 to determine whether or not it would be appropriate for PECO to continue the collection of nuclear decommissioning costs from retail customers after the expiration of PECO’s rate caps on December 31, 2010 and reaffirmed its earlier holding in PECO’s restructuring proceeding. *Investigation into PECO Energy Company’s Electric Service Tariff PA P.U.C. No. 4*, 2010 Pa. PUC LEXIS 299 (Order entered July 22, 2010).
return on rate base for the class at the applicable statutory income tax rates.  
PECO Exhibit JD-1, line 64, shows the total revenue requirements by rate class reflecting the fully allocated distribution cost of service at the proposed system average rate of return. PECO Exhibit JD-1, line 69, shows the portion of the total revenue requirements PECO proposes to collect in distribution rates.

36. Q. **How did you determine the increase or decrease in revenue needed for each class to produce the system average rate of return?**

A. The increase or decrease needed for each rate class was calculated by comparing the revenue requirements for each rate class to the forecasted revenue at present rates for that class for the FPFTY. This is the same method used by Mr. Yin in PECO Exhibit BSY-1, Schedule A-1, with respect to the overall revenue requirement and revenue deficiency. The increases or (decreases) in rate class revenue needed to produce a rate of return equal to the Company’s proposed overall rate of return are shown in PECO Exhibit JD-1 at line 120, which total $142.5 million. The increases or (decreases) in class distribution revenue are shown on line 70, which total $147.0 million. The (decrease) in Transmission revenue under the TSC are shown on line 95, which total, on a net basis, ($1.9) million, and the (decrease) in Purchased Power revenue under the GSA of ($2.5) million is shown on line 83. In addition, forfeited discounts are expected to increase by $0.6 million as a result of the increase in distribution rates.
V. RESULTS OF THE PECO COST-OF-SERVICE STUDY

37. Please describe what is shown on PECO Exhibit JD-1.

A. PECO Exhibit JD-1, which sets forth the substance of the COS study, compares the revenue at current rates by rate class to the revenue requirement allocated on a cost-of-service basis to each rate class. Net income at present rates, shown on line 16, is computed by subtracting operating expenses, depreciation and amortization, taxes other than income taxes, and income taxes (lines 10 to 14) from revenue at present rates (line 7). The return on rate base at present rates for each rate class is shown on line 25, and the relative rates of return are shown on line 26.

Line 114 shows each rate class’ revenue requirement (including revenue from distribution charges, transmission charges, purchased power, forfeited discounts and other revenue) at the proposed overall rate of return. Line 107 shows operating expenses, line 108 shows depreciation and amortization expense, line 110 shows gross receipts tax, and line 111 shows income tax expense. Line 104 shows operating income assuming each rate class pays its full cost-of-service. Line 120 shows the increase (decrease) in revenue needed for each rate class to produce revenues equal to its revenue requirement at full cost of service and produce the system average rate of return. Line 70 shows the increase (decrease) in distribution revenue for each rate class to produce revenue from distribution charges equal to its distribution revenue requirement at full cost of service. Line 95 shows the increase (decrease) in transmission
revenue for each rate class to produce revenue from transmission charges
equal to its transmission revenue requirement at full cost of service.

38. Q. What information is shown on PECO Exhibit JD-2.

A. PECO Exhibit JD-2, as noted above, is the rate class cost of service and
shows the allocation of each element of measures of value also known as
rate base (RB schedules), operating expenses (E schedules), depreciation
expense (D schedules) and taxes (TO and TI schedules) among the rate
classes. This information is contained on the first 15 pages of the exhibit.

Also included in this exhibit are the external and internal allocators used
for the rate class allocations, which are shown on pages 15-31 of the
exhibit.

39. Q. Please describe the information contained in PECO Exhibit JD-3.

A. PECO Exhibit JD-3 contains the COS study by functional category and
classification. The summary appears on pages 1-6 and the account by
account allocation to functional category and classification is provided on
pages 7 to 33. Pages 33 to 66 of this exhibit provide the external and
internal allocators used for the exhibit.

40. Q. Please describe what is shown in PECO Exhibit JD-4.

A. PECO Exhibit JD-4 presents unitized revenue requirement for each rate
class. The unitized revenue requirements are the functionalized and
classified revenue requirements allocated to each class of service divided
by the appropriate units. For example demand-related cost is divided by kW of demand, energy-related cost is divided by kWh, and customer-related cost is divided by number of customers. The unit cost is provided by classification and functional area.

41. **Q.** Which costs were considered in developing the proposed customer charges?

**A.** The proposed customer charges are based on the specific customer-classified costs in the PECO COS study that are approved for recovery in customer charges. Customer related costs include all costs incurred to attach a customer to the distribution system, to meter usage and to maintain the customer's account. They include: (1) capital costs associated with portions of the distribution system, services and meters, and general plant supporting the functions identified above; and (2) operating and maintenance expenses related to those assets described in (1), associated administrative and general expense, metering and billing expense and customer service and account expenses. Total customer costs by rate class for the FPFTY are shown on PECO Exhibit JD-4, in the unit cost analysis.

The costs typically considered in Pennsylvania in developing residential customer charges exclude allocated portions of the distribution system. PECO Exhibit JD-5 excludes the component shown on PECO Exhibit JD-4 associated with the distribution system. The residential customer charge
includes the costs of the service and meter, meter reading-related expense, billing expense, and customer accounting expense together with appropriate pensions and benefits and payroll taxes that are part of the applicable labor expenses. Also included are other supporting administrative and general costs and associated general and common plant and working capital.

42. Q. Please briefly describe the Night Service Rider (“NSR”)?

A. The NSR applies to distribution service provided to eligible commercial and industrial customers for demand registered in off-peak hours that exceeds their demand during on-peak hours (i.e., 8:00 a.m. to 8:00 p.m. daily (Friday is 4 p.m.) except Saturdays and Sundays). For example, if a customer has an off-peak maximum demand of 200 kW and an on-peak maximum demand of 190 kW, the 10 kW excess of the maximum off-peak demand over the on-peak demand would be billed at the NSR rate, not the standard tariff rate.

43. Q. What costs were included in developing the NSR rate?

A. In developing the NSR rate, I included the cost of overhead and underground conductors, transformers, and the maintenance expenses associated with those conductors and transformers and an allocable portion of administrative and general expenses and the cost of common and general plant. These costs are properly included in the NSR rate because off-peak usage affects the size of conductors and transformers.
Those facilities serve load at the localized level and, therefore, do not benefit from load diversity as does other plant, such as substations.

I excluded from the NSR rate the cost of substations, poles and underground conduit because of the location of substations on the system. The size of substations is affected by on-peak demand. The cost of poles and conduit were also excluded because off-peak demand in excess of on-peak demand is unlikely to affect the size of those facilities (PECO Exhibit JD-6).

Mr. Kehl uses these costs to determine the appropriate charge for the NSR as discussed in PECO Statement No. 7.

44. Q. Please describe the information shown on PECO Exhibit JD-7.

A. PECO Exhibit JD-7 shows the development of the external allocators, which are described below and are used in the COS study. Except where noted, all data are for the FPFTY.

Index (page 1) – Table of External Allocators

Summary of External Allocator Values (page 2) - Class Allocation

Summary of External Allocator Values (page 3) - Functionalization

Conductors-Functional Splits (page 4) - Allocates the cost of Overhead Conductors and Underground Conductors between Primary HT/Primary and Secondary based on a study that the Company prepared to separate
costs by voltage levels. The functional split for poles follows the overhead conductor split, and the functional split for underground conduit follows underground conductor split.

**Conductors-Primary Splits (page 5)** - Allocates the cost of Overhead Conductors operating at primary voltage between Primary HT and Primary based on the wire miles of those conductors. The same approach was used for Underground Conductors. The functional split for poles follows the overhead conductor split, and the functional split for underground conduit follows underground conductor split.

**Service Costs (page 6)** - Computes investment in services for each rate class at average replacement cost for the period 2014-2017. PECO does not account for services separately and, therefore, has used estimated replacement cost to allocate the account to the classes of service. In addition, the services allocation factor reflects the fact that there are some instances where multiple meters are served by a single service.

**Meter Costs (page 7)** - Meter costs are maintained separately for the residential and C&I class for meters installed as part of the new AMI system. Therefore, meter costs were directly assigned between residential and C&I customers. AMI meter costs were allocated between the commercial and industrial classes based on the number of meters. The cost of replacing legacy MV-90 meters was allocated between the commercial and industrial classes based on the number of MV-90 meters.
The unrecovered costs of legacy AMR meters were allocated among the
residential, commercial and industrial classes in the same proportion as
AMI meter costs.

Customer Deposits (page 8) - Allocates FPFTY customer deposits based
on the average customer deposit balances for each class as of the end of
2017.

Acct 903 Allocator (page 9) - Allocates costs associated with each
activity recorded in Account 903 – Customer Records and Collection
using an appropriate external allocator. Each activity, the cost of the
activity, and the allocator assigned to each is shown in a separate row.
Row 7 summarizes the costs by rate class. The weighted allocators are
shown on row 8. The separate allocations are necessary because some
costs are only applicable to specific rate classes.

Acct 908 Allocator (page 10) - Allocates the costs of each activity
recorded in Account 908 – Customer Assistance using an appropriate
external allocator. Rows 1-4 list each activity, the cost of the activity and
the allocator assigned to it. Row 5 summarizes the costs by rate class.
The allocators are on row 6.

Write-Offs (page 11) - Computes the Write-Off allocators using net
**Over 60-Day (page 12)** - Computes the Over 60-Day allocators. The column “Over 60-Day Allocator” shows the percentage of PECO’s total electric accounts receivable outstanding for more than two months for each rate class at each month-end from July 2016 to June 2017.

**Purchase of Receivables (page 13)** - Computes the allocator used in the COS study to allocate the POR portion of cash working capital.

**Demand Allocators (page 14)** - Computes the demand allocators used in the COS study.

**MWh Sales at Voltage Levels (page 15)** - Computes MWh at the different voltage levels based on projected 2019 sales at the meter and appropriate loss factors for each rate class. The class loss factors are the same as those set forth in the Company’s Electric Generation Supplier Tariff.

**Customer and Location-Based Allocators (page 2)** – The customer-based and location-based allocators are shown on page 2 at lines 8-12. The location-based allocator (Location Secondary) shown on line 12 was modified for Street Lighting to reflect 25% of each of the total locations for the Lighting class. This adjustment was made to more accurately reflect cost causation. Street lights are generally located where there are existing Company facilities serving other load. In some cases, street lights were installed after the grid was in place and, therefore, did not contribute to the need for poles, conductors, or conduit to be installed. However, that
is not always the case and, in some instances, the system was built out for
the lights, for example, as on some bridges and some roads. Counting
each location as a separate customer would allocate too much cost to street
lighting. On the other hand, not counting any lighting locations as
customers would understate the costs allocated to street lighting. Even
where the system was in place before street lights were installed, it is
appropriate to allocate some cost to the Lighting class because the service
is benefiting from the poles, conductors, and conduit. I have, therefore,
applied a 25% factor to the number of locations to allocate a reasonable
level of cost to the Lighting class.

11. **Q.** Please explain how the purchased power and transmission sections of
the COS study are used?

12. **A.** In the cost of service summary there is a section for purchased power and
a section for transmission. These sections are used to derive the
unbundled cash working capital requirement that is recovered in the GSA
and the TSC. The revenue requirement associated with cash working
capital is used to develop a rate for the GSA and TSC. The total revenue
requirement used to develop the rate is the operating income consisting of
return, income taxes, and the associated gross receipts tax. I am providing
PECO Exhibit JD-8 to show the calculation of the unbundled cash
working capital rate for the GSA. PECO Exhibit JD-9 provides the
calculation of the unbundled cash working capital rate for the TSC. The
rate developed in PECO Exhibit JD-8 of $0.00019 per kWh will replace
the rate of $0.00034 per kWh currently in the GSA. The rate developed in
PECO Exhibit JD-9 of $221 per MW-year will replace the current rate of
$363 per MW-year in the TSC.

46. Q. Please summarize your conclusions with respect to cost of service.

A. The Company’s COS study was prepared using an appropriate and well-
accepted cost of service method. The results of the Company’s COS study
provide a reasonable allocation of PECO’s cost of service among its rate
classes and are an appropriate guide for use in designing PECO’s
proposed rates.

VI. ANALYSIS OF HIGH VOLTAGE CUSTOMERS IN
ACCORDANCE WITH THE SETTLEMENT OF
PECO’S 2015 RATE CASE

47. Q. Since its last base rate proceeding in 2015, has the Company
performed further investigation of the distribution system costs for
customers served at 69 kV and higher?

A. Yes. PECO first reviewed its billing records and identified 17 customers
receiving service at voltage levels of 69 kV and higher. The Company
then analyzed the configuration of those customers to more clearly define
the portion of substation facilities performing a distribution function for
those customers. Based on this review, PECO determined that high
voltage customers are served primarily by the higher voltage side of a
substation. However, a portion of the substation equipment (e.g., the
breaker to which a radial line connects) serves a distribution function. In
addition, under the FERC seven factor test, high voltage lines that serve specific customers and are radial in nature are classified as distribution plant. In fact, between 2009 and 2013, the Company transferred over $16 million of plant operating at voltages of 69 kV and higher from its transmission plant accounts to distribution Accounts 364 to 367 in order to conform with the FERC seven factor test. That $16 million is not the only investment in distribution facilities operating at 69 kV and higher voltages that is serving PECO’s higher voltage customers.

48. Q. Is PECO proposing any changes to the allocation of distribution costs to customers served at 69 kV and higher?

A. Yes. The Company currently provides a high voltage discount to account for the way higher voltage customers use substation transformation. However, based on its efforts to more clearly define the portion of the distribution system used by high voltage customers, PECO is proposing to increase the High Voltage Distribution Discount under Rate HT to $1.29 per kW from the current rate of $0.48 per kW to reflect removal of customers served at 69 kV or higher from the allocation of distribution substation equipment costs. Mr. Kehl discusses the changes to the High Voltage Distribution Discount provided under Rate HT to customers that

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receive service at 69 kV and higher voltages in more detail in PECO Statement No. 7.

49. Q. Should PECO customers served at or within one span of a PECO-owned substation or with intermittent renewable generation be treated similarly to customers served at 69 kV or higher in the COS study?

A. No. Customers at or within one span of a PECO-owned substation are served at voltages of 33 kV or lower and, thus, are still distribution customers taking service from a distribution substation. This group of customers should not be afforded special treatment, using the arbitrary criterion of proximity to a Company-owned substation. That approach is antithetical to the concept of a “class” cost-of-service study, which allocates costs based on reasonable, discernible class usage characteristics and not based on measures such as the length of a conductor that serves one particular customer.

Similarly, customers with intermittent generation are no different than any other customer served at the same voltage and require the same level of investment in distribution facilities, including poles, wires, transformers, and substation equipment. In fact, these customers are typically served by the same distribution facilities before and after they add generation.
VII. CONCLUSION

50. Q. Does this complete your direct testimony at this time?

A. Yes, it does.