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BEFORE THE

PENNSYLVANIA PUBLIC UTILITY COMMISSION

PENNSYLVANIA PUBLIC UTILITY COMMISSION, ET. AL.	)	
V.	)	
PENNSYLVANIA POWER & LIGHT COMPANY	)	DOCKET NO. R-00973954
APPLICATION OF PENNSYLVANIA POWER & LIGHT COMPANY FOR APPROVAL OF ITS RESTRUCTURING PLAN UNDER SECTION 2806 OF THE PUBLIC UTILITY CODE	)	

SURREBUTTAL TESTIMONY

AND EXHIBITS

OF

RANDALL J. FALKENBERG

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J. KENNEDY AND ASSOCIATES, INC.
ATLANTA, GEORGIA

APPLICATION OF PENNSYLVANIA POWER AND LIGHT COMPANY FOR APPROVAL OF ITS RESTRUCTURING PLAN UNDER SECTION 2806 OF THE PUBLIC UTILITY CODE	))))))	DOCKET NO. R-00973954

SURREBUTTAL TESTIMONY OF RANDALL J. FALKENBERG

Q. Please state your name and business address.

A. Randall J. Falkenberg, Suite 475, 35 Glenlake Parkway, Atlanta, Georgia 30328.

Q. Are you the same Randall J. Falkenberg that presented direct testimony in this proceeding?

A. Yes.

Q. What is the purpose of this surrebuttal testimony?

A. I will present some minor revisions to my original direct testimony and address the rebuttal testimony of Mr. Falk, Dr. Jones, and Dr. Guth.

Q. Please summarize your surrebuttal testimony.

A. In this surrebuttal testimony I present the following evidence:

1. **I update my calculations increasing PP&L's stranded costs from $735 million to $799 million.**

2. **I clarify some points regarding the PP&L capacity price methodology.**

3. **I demonstrate that the PP&L market prices are not sufficient to support construction of new combined cycle or combustion turbine units in PJM. I also demonstrate that Dr. Jones' cash flow analysis purporting to prove the viability of new capacity under his market price forecast suffers from many elementary errors, omissions and other problems. Dr. Jones' capacity prices are totally inconsistent with the energy prices contained in his EGEAS run.**

4. **I demonstrate that the Kennedy and Associates' production cost model provides better estimates of market energy prices than PP&L's EGEAS model owing to its vastly superior representation of the actual generation of marginal units in PJM.**

Update to Original Direct Testimony

Q. What is the purpose of this section of your testimony?

A. I will update my original direct testimony, primarily to make a few minor revisions and corrections, and to incorporate information that became available after the filing of my direct testimony in this proceeding.

Q. Please describe the revisions and corrections that you will make at this time.

A. I have incorporated some minor revisions to my market price estimates using certain assumptions suggested in the rebuttal testimony filed by Mr. Falk in this case and by PECO witnesses in the current PECO case at Docket No. R-00973593. In addition, certain information regarding the PP&L methodology for estimation of market prices became available to me as a result of my meeting with the Company's consultants. After obtaining this information I determined that I mischaracterized PP&L's methodology. Thus, I would like to clarify the record. Finally, I am correcting two minor items in my stranded costs estimates.

Q. How substantial are the revisions you are making to your stranded cost estimates?

A. They are not substantial. In total, I have raised my stranded cost estimate for PP&L by $64 million, from $735 million to $799 million. There were several elements that resulted in this change.

First, I reduced my estimate of the future tax depreciation benefits associated with PP&L's existing generators from $116.8 million to $108.7 million.

Second, I discovered that I had not included the net book investment from PP&L's Safe Harbor facility in my computation of PP&L's total net book investment. Including Safe

Harbor increases the stranded cost by $27.5 million.

Finally, in the PECO case, Mr. John Bustard of PECO Energy suggested that I increase the amount of hydro generation and non-utility generation ("NUG") generation during peak periods. Mr. Bustard and Mr. Falk have further suggested that my modeling may overstate the frequency of power shortages, due to these and similar factors. I also determined that market energy bid prices for new combustion turbines were slightly overstated relative to the figures supplied in the EIA forecast.

As a result, I adjusted my modeling so that the NUG's and PECO's Conowingo hydro plant would generate more energy on-peak, explicitly modeled PJM tie line support for emergency generation at a price equal to about half of the highest cost generators in PJM and corrected the combustion turbine inputs. The net effect of these revisions was to decrease PP&L's market value (from $2.646 billion to $2.618 billion) by approximately $28 million, or 1%. This increased PP&L's stranded costs.

Making all of these changes, and the resultant changes to the NUG market prices and the jurisdictional allocation, results in an increase in PP&L's stranded costs of $64 million. Exhibit No.____(RJF-9) summarizes my updated calculations.

Q. Please elaborate on the reasons for the revisions to the input data in your model.

A. Mr. Falk and the PECO witnesses expressed some concerns about the fact that the modeling I performed showed around 100 loss of load hours per year. They believed that this might indicate an overstatement of market prices because, during shortages, the model prices emergency generation at the highest cost resource in the pool. In my model the highest cost resource had a price of $127/mWh (1995$).

Q. Is this a serious problem?

A. Hardly. First of all, the model is not predicting power outages. Rather, it merely indicates a brief need for additional resources such as additional tie line support or other measures. In a probabilistic model there is always some chance that multiple contingencies will result in shortages or a requirement for tie line support. I modeled less than 2000 mW of import capacity (an amount equal to the average amount of import energy). The actual peak amount of tie support is substantially higher. The model is simply indicating a need for certain additional measures such as more tie line support, short term purchases, interruptible loads, load management, voltage reductions, emergency generator ratings, departures from preset pumped storage generation schedules and departures from planned maintenance schedules. I did not explicitly include these items because I knew that they would have little impact on overall market prices. As demonstrated by my updated modeling, this did not bias market price estimates, and has little practical affect on the results.

Q. Could you place this issue in perspective?

A. Yes. For the 1999 base case, my modeling indicated that additional energy resources would be required to provide less than .1% of total energy requirements. This is negligible by any standard. Inclusion of such resources would have had no impact on my model results.

Q. How did you address these concerns?

A. First, I included interruptible loads, and the remaining amount of tie line support available from PJM's ties with other regions. I priced these resources of last resort at \$70/mWh, a price only about 50% of the highest cost generators in PJM. After performing a sensitivity analysis on the price of this last resort generation I determined that the model results were almost totally insensitive to this input. I settled on \$70/mWh because it seemed reasonable, and because runs at \$98/mWh, \$87/mWh and \$70/mWh showed no discernable change in the model results. Further, my examination of PJM peaking units revealed that there are more than twenty units with a full load cost in excess of $70/mWh, and a number of these units ran more than 100 hours in 1995.

Mr. Bustard's other suggestions (as well as those alluded to by Mr. Falk in his discussion of the same issues) also had little impact on the final results. However, I also adopted his suggestion to include more NUG and hydro generation in on-peak periods. Despite the limited impact, I believed his suggestion had merit, and chose to reflect it. Sensitivity analysis on this variable alone, likewise indicated a minimal effect.

Q. Did you make a similar adjustment for the fact that some maintenance could be rescheduled, such as suggested by Dr. Jones and Mr. Falk?

A. No. There are two reasons for not making this adjustment. First, while suppliers will have *some* flexibility in scheduling maintenance of smaller plants, it is simply wrong to assert that maintenance can be rescheduled arbitrarily as suggested by Dr. Jones, particularly in the case of larger units. Unexpected forced outages are just that - unexpected. If an outage occurs when another unit is already down for maintenance, it is not possible to put the unit on scheduled maintenance back into service automatically as Dr. Jones apparently believes. Further, despite Dr. Jones' hypothetical assumptions about generators deferring maintenance (while hoping for price spikes), competitors will never know in advance when a large unit will trip off-line. Accepting low prices, while waiting for high prices stemming from a hoped-for large plant outage, would be a rather foolish behavior in a competitive market.

Also, Dr. Jones does not appear to realize that maintenance of power plants is a complex logistical task that requires the planning, scheduling, mobilization and coordination of manpower (including specialized craft skills) well in advance of the outage itself. If a utility has planned to perform maintenance on a large plant during a given period, it will find it rather difficult to reschedule all of the activities and special workers needed for those activities just because a forced outage occurred on another plant and temporarily has increased market energy prices. Just as the case of unexpected outages, the return to service of plants on outage is also somewhat unpredictable (at least to competitors other than the plant on outage). In the case of nuclear plants (the largest and most significant resources in PJM), these plants have refueling outages scheduled far in advance. It is simply not reasonable for Dr. Jones to assume that just because of the advent of competition, utilities will be able to schedule (and then reschedule) outages at any time desired. Dr. Jones' testimony reveals a very limited understanding of utility operations and an unrealistic view of the types of efficiency gains possible in competitive markets.

Finally, in my own modeling the issue of maintenance optimization is a "red-herring."

The modeling I have performed shows little difference in the results when a single seasonal modeling is performed (thus allowing no maintenance optimization) or a two-season modeling is performed (thus avoiding the 84-day summer period as currently prescribed by PJM rules). The reasons for this lack of sensitivity do not stem from lack of capability of the model itself, but rather due to the dynamic interplay between energy and capacity prices in the model, as will be described in more detail later.

Q. Please comment on the changes in combustion turbine energy prices.

A. In my original modeling of new combustion turbines I used a base fuel price of \$4.13/mmbtu. The EIA 1995 base used a figure of \$3.90/mmbtu for distillate oil. Thus, to be consistent with the EIA forecast, I reflected this change. In my original direct testimony, the base case expansion plan did not include any combustion turbines. Thus, this adjustment would have had no direct effect on the stranded costs computed in Exhibit No.___(RJF-8). However, due to the other revision incorporated above, the modeling now suggests that a few of the combined cycle plants originally modeled should be replaced by combustion turbines. Thus, I made this correction as well.

Q. Did you also change the base gas price for new combined cycle plants based on the EIA forecast?

A. No. EIA shows a 1995 base price of $2.10/mmbtu for gas delivered to PJM. However, I used a base price of $2.04/mmbtu, based on my own calculation of the average delivered price of gas to PJM from the 1995 Forms 1. Had I used the EIA figure, I would have decreased PP&L's stranded costs by an amount that is more than all the above cited adjustments combined. I did not do so in order to minimize controversy, and because I believed the original figure was reasonable.

Q. Do these changes resolve the questions raised by Mr. Falk about power outages?

A. I believe that they demonstrate this is not a significant or relevant concern. After making these changes, the total expected unserved energy is reduced from .1% to .05% in 1999. Loss of load hours are reduced from around 100 hours per year to less than six hours. While there are still additional measures (such as emergency generator ratings, voltage reductions, departure from the model's preset pumped storage schedules and some refinements in maintenance schedules) not modeled that would serve to further reduce this figure down to the "one day in ten years" standard, given the limited impact, I chose not to pursue any further data changes. In reducing the amount of emergency energy and loss of load hours 20 fold, while also reducing the price of last resort generation by almost 50%, I only increased the market value of PP&L's resources by 1%. Any further fine tuning is simply not worth the effort.

Q. **Do you believe that these new results address Mr. Falk's other concerns regarding what he considers the 'inefficient' capacity additions, specifically, his point that more combustion turbine capacity should be added?**

A. They should. However, Mr. Falk seems to come from an erroneous premise that suppliers will or should overbuild as a matter of course. This will be discussed in more detail later. I believe that the new results do demonstrate that Mr. Falk's concerns are not important. Mr. Falk contends that by allowing 100 hours per year of emergency generation at a price of $127/mWh, the modeling should add additional combustion turbines. I have addressed this issue in three ways. First, I greatly reduced the amount of emergency generation through a more optimal scheduling of the NUG and PECO hydro resources. Second, I reducêd the cost of tie line (or last resort resources) from $127/mWh to $70/mWh. Finally, I found that owing to these changed assumptions, Mr. Falk was correct about one thing: it would be inefficient to only add combined cycle generation to the market. Some of the new capacity added should be combustion turbines. As a result, I re-optimized the expansion plan, adding CT's in the first few years. After making all of these changes, there was virtually no impact on PP&L's stranded costs.

Q. **Explain why these sorts of adjustments have little impact on market prices.**

A. Mr. Falk (as well as the various PECO witnesses) apparently has concluded that by "overstating" the amount of intermediate, peaking[1] and emergency generation, I have overstated market prices. However, apparently he did not consider the dynamic nature of my modeling. In this modeling capacity prices are based on an offset of the energy savings of new combined cycle plants compared to the capital costs of such units. If peak period generation increases, and prices are "too high" then capacity prices will be depressed. This will either do nothing more than reduce the capacity cost by an equivalent amount, or render the addition of new combined cycle units uneconomic. In that case, the supply plan is re-optimized, with more CT capacity (and an increase in market energy prices). Overall market capacity and energy prices will be largely unaffected. All that will change is the relative proportions of capacity and energy prices. My own simulations have confirmed this many times. The modeling I have performed is internally consistent and despite Mr. Jones' claims to the contrary, this is most definitely not the case for PP&L's modeling.

Q. Do you have any comments regarding Mr. Falk's suggestion that you should have added capacity in excess of the current PJM 18% reserve margin requirement?

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[1] In this case "overstated" is apparently to be measured against PP&L's EGEAS and PECO's models, not actual data as is discussed later.

A. This comment lacks merit. As an aside, I would note that in the PECO case one of the few areas of agreement among the experts was in the use of the 18% reserve margin requirement. In fact, in his rebuttal, Mr. Thomas P. Hill (of PECO) commented on this as a positive fact in that needless controversy was avoided. Further, after having substantially reduced the amount and cost of emergency generation with no real impact on PP&L's stranded costs, I don't believe this argument is valid because the premise underlying it has now largely been eliminated. Finally, I do dispute the concept that developers would build combustion turbines (or any resource) for fuel cost benefits alone once the PJM reliability requirement is met. I believe such endeavors would have very high risks, and are unlikely to occur unless pool energy prices are <u>much</u> higher than anyone now expects.

PP&L's Market Capacity Prices

Q. Please comment on the PP&L methodology for computing capacity prices based on the new information you have obtained.

A. Dr. Jones contends in his rebuttal that the intervenor studies are not logically consistent, and incorrect with respect to additions of new capacity and the attendant market energy prices. To the contrary, I will demonstrate that Dr. Jones' studies lack internal consistency.

However, in my initial review of the direct testimony of Dr. Jones, I assumed that PP&L actually applied the EGEAS model using a methodology similar to that used by me and other witnesses in these restructuring proceedings. I believed that Dr. Jones followed a fairly conventional approach of computing market capacity prices based on the marginal cost of a new combustion turbine or combined cycle generation and that the EGEAS runs provided additional inputs in the capacity cost calculation. However, subsequent review of Dr. Jones' testimony and later discovery responses created confusion on these matters. Further, Dr. Jones provided inadequate data responses to explain his methodology in any detail. In the end, I have concluded that Dr. Jones' testimony and data responses are quite misleading, and this continues to be the case even in his rebuttal.

I requested Dr. Jones' workpapers for his capacity price forecast [Exhibit No.____(STJ-8)] in a data request. The same was true of the OCA and OSBA. The key document is attached as Exhibit No.___(RJF-10).[2] This document does not just <u>summarize</u> the PP&L methodology for computing market capacity prices, it is <u>all there is</u> to the PP&L (Jones)

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[2] Despite the marking on the document that indicates it is confidential attorney client work-product, I was assured by PP&L's attorney, Ms. Helpert, that the document is not confidential.

methodology. As can be seen, the document provides only slightly more detail than Exhibit No.___(STJ-8). From my discussions with the PP&L representatives and my review of this document I have learned that Dr. Jones simply reviewed certain contracts that PP&L had been offered, examined EGEAS runs and other data, and based solely on his judgment, determined a forward (longer than two years) capacity value. He then derived assumptions about short term contract discounts (ranging from 0% to 50%, based again on his judgment) to determine the short term capacity credits he used in his analysis. In the end, Dr. Jones' approach appears to rest totally on his judgment and aside from his alleged visual examination of EGEAS runs, has little or no connection to the EGEAS model itself. This is highly significant because the new capacity added in the EGEAS modeling would lose money based on Dr. Jones' assumptions, and the market capacity and energy prices he projects.

Further, the alleged actual data relied upon by Dr. Jones for forward contracts reflects only the period prior to restructuring. This data is largely meaningless because it only reflects market prices for the next few years. PJM has excess capacity now, and will continue to have excess capacity until around 2001. Thus, these contracts do not reflect market-equilibrium values. Second, these contracts apparently reflect only wholesale transactions (or perhaps a few retail transactions where competition is now available). Presently these amount to only a portion of the total PJM energy and capacity market.

Such transactions would have to be considered thinly traded, and are simply not indicative of a long term market capacity value. **In the end, I believe Dr. Jones' computation of capacity values is totally judgmental, much like his forecast of fuel prices, and suffers from the same problems related to lack of independence discussed in my original direct testimony. The Commission simply has no way to determine whether Dr. Jones' forecast of fuel prices and capacity prices is a result-oriented effort. PP&L's claim for $4.6 billion of stranded costs rests on little more than the judgment of a single witness without substantial quantitative evidentiary support.**

Errors in Jones' Study Invalidate His Conclusions

Q. Are there other problems with Dr. Jones' forecast of capacity prices?

A. Yes. Based on my review of PP&L's EGEAS runs, and the capacity prices forecast by Dr. Jones, I have determined that a substantial error exists in the Jones study. If Dr. Jones' judgments about the market capacity prices are correct, his forecast of market energy prices is too low. The STJ-8 capacity credits will not provide sufficient revenues to justify the addition of combined cycle or combustion turbine generators in PJM anytime over the period 1999 to 2015 as modeled in EGEAS. While Dr. Jones asserts in his rebuttal testimony that this is not a problem, he has not provided a correct economic or financial analysis to demonstrate his claims. Rather, as will be discussed later, all that Dr. Jones provides is an incorrect cash flow analysis. The calculations I am presenting stem directly from Dr. Jones' market price assumptions, and his EGEAS runs and clearly demonstrate that the new combustion turbine capacity Dr. Jones assumes will be added in PJM (starting in 1999) will be uneconomic every single year of operation.

Q. **Please describe Exhibit No.___(RJF-11a).**

A. In this Exhibit I have performed an economic analysis of new combustion turbines based on Dr. Jones' estimated capacity values, and the EGEAS fuel costs and energy revenues for new units. Dr. Jones assumes that new CT capacity will be added in PJM starting in 1999. However, based on his own assumptions (the cost of new units, book and tax lives, the rate of inflation and, etc.) it would be uneconomic to build such units, as they would fail to recover their cost every year from 1999 to 2015. Clearly, no reasonable developer would add any type of new generation under these circumstances. This analysis demonstrates that Dr. Jones' forecast of market energy and market capacity prices is not consistent. This is the same sort of mistake that PECO made in its initial QRO filing, and as a result was required to substantially revise its stranded cost estimates in the QRO rebuttal phase and in its restructuring filing. PP&L's forecast of market prices is simply invalid, and should be rejected out of hand by the Commission. When confronted with the same mistake, PECO revised its QRO filing completely.

Q. Does this problem in Dr. Jones' modeling have any further implications?

A. Yes. Both Dr. Jones and Mr. Falk suggest that it is more reasonable for the Commission to rely on the PP&L EGEAS runs than on the Kennedy and Associates model that I presented. However, what is clear from my meeting with PP&L's consultants is that Dr. Jones really did not rely on EGEAS to create any linkage between capacity and energy prices. Rather, the EGEAS simulation only impacts market energy prices and had no direct connection to market capacity prices. Thus, Dr. Jones relied on only one aspect of the EGEAS model and he ignored the implications of EGEAS regarding the profitability of new capacity. The result is that Dr. Jones' judgement tells him that developers will build substantial new capacity in PJM and lose money on it every year for the next two decades. While I agree with Mr. Falk's observation that no model is perfect, at least a model allows one to avoid such huge mistakes in judgment calls. I believe that this is totally unrealistic and, much like Dr. Jones' assumptions about the infinite ability of suppliers to reschedule maintenance, reveals a limited understanding of the complexity of the issues at hand.

Q. Dr. Jones presents a cash flow analysis in Exhibit No.___(STJ-28) that purports to

address this issue. Could you clarify the difference between the economic analysis you presented above and Dr. Jones' cash flow analysis?

A. These are simply two different approaches to analyze the same question. In the economic analysis, I use the real fixed charge rate methodology. This is similar to the approach used by all of the experts in the PECO case, for example, and is more similar to conventional utility economic analysis. In STJ-28, Dr. Jones uses a cash flow analysis. I believe that when consistent assumptions are used the two methods will produce comparable results. The primary advantage of use of the real fixed charge rate method is that it also allows one to determine if a new capacity addition is economic in any give year. The analysis summarized in RJF-11a demonstrates that no new capacity additions are economic in PJM over the EGEAS study period.

STJ-28 Contains Numerous Errors

Q. Dr. Jones claims that in Exhibit No.___(STJ-28) he demonstrates that his capacity prices are high enough to support new combined cycle capacity additions. Do you agree?

A. No. Dr. Jones' analysis and statements are totally incorrect. In fact, Dr. Jones' analysis suffers from a number of elementary mistakes that invalidate his conclusion. The most obvious and serious mistakes in STJ-28 are related to Dr. Jones' confusion of the LHV and HHV heat rates for new combined cycle plants, and from his confusion related to the use of summer capacity ratings.

Q. Please explain the first point related to Dr. Jones confusion of the LHV and HHV heat rates.

A. Dr. Jones quotes the Gas Turbine World 1996 Handbook heat rates and capacity costs for new combined cycle plants in Exhibit No.____(STJ-28). The heat rates he uses are based on what is known as the Low Heating Value (LHV) of the fuel. However, the publication clearly states that for use in computing fuel costs it is necessary to use the High Heating Value (HHV) of the fuel. Exhibit No.___(RJF-12) is a copy of the page from the publication (reprinted with permission) entitled **"Keep in mind the difference between LHV and HHV in making fuel calculations."** This page clearly states that LHV fuel consumption must be increased by 1.11 for natural gas-fired units. This adjustment simply accounts for losses due to the fact that some of the fuel is wasted because it is turned into water. This means that all of the heat rates used by Dr. Jones on STJ-28 are understated by 11%. This is a substantial mistake in Dr. Jones analysis.

Q. Did any of the witnesses in the current PECO case use the same data source and make the same 11% upward adjustment to the heat rate that you reference here?

A. Yes. Dr. Hieronymus used the same source. He computed the heat rates for new combined cycle units based on the HHV heat rates, derived by increasing the LHV heat rates by 11%.

Q. What about the adjustment for summer capacity ratings?

A. This is another fundamental mistake in Dr. Jones' analysis. Dr. Jones contends that my use of the summer ratings was "selective" because summer ratings are only applicable for part of the year. That much is obvious. However, Dr. Jones apparently does not recognize the fact that it is standard industry practice to use summer ratings to report unit capacities. More significantly, it is during the summer when PJM has its peak, and when the value of capacity will be the highest. It stands to reason that most of the capacity revenues will be paid out in the summer season when capacity ratings are lower. PP&L assumed this in applying Dr. Jones' capacity prices to its own units when Mr. Schadt computed market capacity revenues. I did the same. It appears that this is another elementary fact that Dr. Jones is confused about and that Dr. Jones doesn't understand how PP&L actually applied his capacity credits in computing its stranded costs. Perhaps

Dr. Jones would like me to increase the capacities of PP&L's units in my computation of capacity revenues as well. Dr. Jones' comments are totally at odds with the manner in which PP&L itself applied his capacity prices.

Q. What is the impact of this mistake on the capacity costs assumed by Dr. Jones?

A. The summer capacity rating is about 10% less than the 59-degree rating quoted in the Gas Turbine World 1996 Handbook. Thus, Dr. Jones has understated the cost per kW of new units and overstated the capacity revenues they will produce. Also, capacity factors are normally quoted on the basis of the summer rating, thus he has overstated combined cycle generation as well.

Q. Did any of the witnesses in the current PECO case use the same source data and make the same adjustment to the capacity values you used?

A. Yes. Dr. Hieronymus used the same source. In computing the installed cost per kW of new capacity Dr. Hieronymus made the same adjustment reducing the unit capacities to the summer rating and thereby increasing the cost per kW of capacity.

Q. Are there any other mistakes in Dr. Jones' Exhibit No.___(STJ-28)?

A. There are many more mistakes. For example, Dr. Jones mistakenly assumed that the figures reported in the Gas Turbine World 1996 Handbook were in 1997 dollars. The publication itself states the figures are in 1996 dollars. Thus, Dr. Jones understated all capacity costs by an additional 2.5% (his assumed rate of inflation).

Further, Dr. Jones has a mistake in his calculation of debt interest. He assumes that debt is retired evenly over 30 years (the life of the plant). However, he actually computed the debt interest based on the 20-year tax life of the plant. Thus, he has excluded debt interest for the last ten years of the study.

In addition, Dr. Jones completely ignored the public utility realty tax, the capital stock tax and other forms of property taxes in STJ-28. Once again, PP&L includes these costs for its own units.

Finally, it does not appear that Dr. Jones included any "hard costs" for land, gas pipelines, and etc., in STJ-28. While he does include a 15% allowance for "soft costs" (such as interest during construction, overheads, etc), there is no allowance for many of the costs actually required for equipment needed to allow these units to run.

Q. Are the figures used in STJ-28 consistent with the PP&L EGEAS run used by Dr.

Jones in computing market prices?

A. No. Dr. Jones' comparison of market prices and project economics are premised upon combined cycle plants coming on line in the year 2005, not 1999, when his EGEAS study begins to add new CT capacity, or the year 2002 when EGEAS adds the first combined cycle plant. In STJ-28 new CC's avoid many of the early years when capacity prices are discounted in Dr. Jones' analysis and energy prices are low.

Second, the capital cost and heat rates for current vendor models Dr. Jones uses in STJ-28 are lower than the generic figures he claims to have used in his EGEAS runs. I believe that in computing the generic installed cost per kW ($595/kW) used in EGEAS, the PP&L engineers who prepared the study could have reflected the above referenced costs excluded by Dr. Jones as well as the summer rating. In addition, I cannot dispute that the EGEAS generic combined cycle plant heat rate (7000 btu/kWh) was intended as a HHV value by the PP&L engineers.

However, examination of the heat rates reported in the EGEAS run demonstrates additional problems in Dr. Jones' study. Even assuming his erroneous LHV heat rate of 6650 btu/kWh was reasonable for a new plant at full load (or that Dr. Jones' generic heat rate of 7000 btu/kWh is a correct HHV heat rate), this heat rate is not reasonable as applied by Dr. Jones in STJ-28 for computing average fuel costs because it ignores the impacts of cycling on combined cycle plant heat rates. The combined cycle plants simulated in EGEAS are not baseloaded implying either daily cycling is required, or the units must run at night at minimum load. In either case, the average heat rate for the unit will be higher than the average full load heat rate as assumed by Dr. Jones in STJ-28.

For example, Dr. Jones assumes that the new combined cycle unit will run with a capacity factor of 55% in 2005. The EGEAS run actually predicts an even lower capacity factor for combined cycle plants that year. Either assumption would imply some cycling of the unit and an annual average heat rate *higher* than the full load value. The EGEAS runs are purported to simulate variations in unit loadings and therefore should be able to actually simulate the impact of cycling on unit heat rates. In EGEAS, the new combined cycle units produce an annual average heat rates substantially higher than the input full load heat rate of 7000 btu/kWh Dr. Jones claims was used in the model. Assuming that EGEAS is operating correctly, then the model itself shows Dr. Jones' naive use of the full load heat rate has understated the cost of fuel used in STJ-28 by a very substantial amount. PP&L considers this output to be confidential. Thus, I cannot quote the precise figures. As noted above, EGEAS predicts even lower capacity factors for new combined cycle plants than Dr. Jones assumes in STJ-28. Owing to PP&L's claim of confidentiality, I cannot present that EGEAS result either.

In the end, Dr. Jones' exhibit does not demonstrate that the capacity prices he uses are consistent with the EGEAS inputs or outputs. Rather, Dr. Jones has proven that his capacity prices are consistent with new combined cycle units that cost less to build, have lower heat rates, and run with higher capacity factors than he claims to have used in EGEAS.

Q. Does Dr. Jones admit that his generic EGEAS assumptions are inconsistent with the capacity prices he uses?

A. In Note 3 to STJ-28 there is a statement that indicates that NPV #2 calculation shows a slight negative value using Dr. Jones' EGEAS assumptions. However, as noted above, even assuming that PP&L's engineers who prepared the EGEAS run avoided Dr. Jones' more blatant heat rate and capacity cost mistakes, Dr. Jones' analysis based on the EGEAS input overstates the benefits of new combined cycle units because the impact of cycling on average fuel costs was not considered and the capacity factors were overstated as well. In addition the debt interest and property tax mistakes, along with the incorrect completion dates remain. Once these problems are corrected, the alleged "slight negative value" becomes a very large negative value.

Q. Have you corrected STJ-28?

A. Yes. Exhibit No.___(RJF-13a) provides a correction to STJ-28. In this analysis I use fuel costs directly from the EGEAS run, the EGEAS capacity factors and I reflect the 2002 in-service date shown as the completion date for first combined cycle plant in EGEAS. I have also corrected the property tax and debt interest mistake in STJ-28. Finally, I use the generic $595/kW plant cost Dr. Jones' claims to have used in EGEAS. Correcting these blatant mistakes in the Jones study shows that new combined cycle plant would lose money the first several years of operation and not produce a positive net cash flow over its life on a present value basis. Thus, Dr. Jones' generic combined cycle EGEAS assumptions are not consistent with the market prices he has forecast.

Further, even putting aside the issue of cycling, and the in-service date issue, the comparison of current vendor combined cycle models shown in STJ-28 is still incorrect. Exhibit No.___(RJF-13b) computes the cash flow analysis based on the assumptions used in STJ-28a using the corrected HHV heat rate, the EGEAS capacity factors, the correct summer rating, and correcting the other mathematical errors. It does not correct for the cycling issue and it assumes that new units come on line in 2005. This analysis shows that once Dr. Jones' most blatant mistakes are corrected, new combined cycle capacity would produce a very large negative cash flow on a NPV basis. Thus, correcting for Dr. Jones' mistakes reverses his conclusion that new combined cycle plants would be viable under his judgmental market price forecast. Because of these mistakes , the Commission cannot rely on Dr. Jones' market price forecasts.

Q. **STJ-28 refers only to new combined cycle plants. Is it indicative of all new capacity resources added in the EGEAS model?**

A. No. In EGEAS, CT's comprise the great majority of new capacity added over the period 1999 to 2015. The EGEAS model begins to add new CT's in 1999 and, as I have previously demonstrated, these CT's are uneconomic every single year based on the generic CT assumptions that Dr. Jones claims are used in EGEAS . Further, as will be discussed briefly, even the calculation shown in RJF-11a overstated the value of new CT's because fuel costs for new CT's are grossly understated in EGEAS. I adjust for this problem in Exhibit No.___(RJF-11b).

Q. **Dr. Jones claims that new CT's will be more efficient than existing units, thus providing additional energy benefits that would defray some of the capital costs of these types of units. Do you agree?**

A. In analyzing utility industry practices for computing marginal costs for the past twenty years this is the first time I have ever seen anyone claim that fuel benefits for combustion turbines should be considered in computing marginal cost of capacity. In fact, the very definition of the marginal cost of capacity implies the capital cost of the least efficient type of resource with the lowest possible capital cost. That is why my capacity costs are premised upon relatively inefficient oil fired CT's. Such plants could be located in many more places than gas-fired units, and would avoid pipeline costs. For this reason, they have a lower capital cost than new gas-fired units. This was equivalent to Dr. Hieronymus original assumption in the PECO restructuring proceeding.

Putting aside the theoretical merits of Dr. Jones' novel argument (if any) the actual computation of energy benefits for CT's is fraught with a number of serious technical and modeling challenges. Dr. Jones' EGEAS run simply does not reflect a sufficient level of detail to use for such an analysis in the case of combustion turbines.

Q. Please explain.

A. In EGEAS it was assumed that new combustion turbines will have a full load heat rate of 10,200 btu/kWh per kWh when fired on natural gas. This is the heat rate used in EGEAS to set the market energy prices when CT's are at the margin. This approach is acceptable for computing market energy prices, but this heat rate cannot be applied for computation of average fuel costs for purposes of estimating the fuel benefits Dr. Jones discusses. The problem is that (just as in the case of the combined cycle units in STJ-28) the EGEAS study has failed to account for the fact that CT's are terribly inefficient when operated at less than full load. A CT with a full load heat rate of 10,200 would have a heat rate over 18,000 btu/kWh at 25% of full load. While CT's generally run fully loaded their short daily operational cycles inevitably lead to periods when the units run at inefficient loadings. As a result, the annual average heat rates for such units will substantially exceed the full load average heat rate. As noted above, the modeling of such considerations for combined cycle plants in EGEAS resulted in average annual heat rates substantially in excess of the input full load heat rate. For CT's the effect is even more extreme because the units cycle more frequently. The EPRI TAG data used in the PECO case estimates that the annual average heat rate for a new CT will exceed that annual average heat rate by 19%. While it appears that EGEAS did model separate heat rate blocks for combined cycle units to account for this problem, it did not do so for combustion turbines.

Q. Is there actual data that demonstrates this problem?

A. Yes. The PEPCO Dickerson units are among the most efficient gas fired CT's in PJM. Despite having a reported full load heat rate of 10,480 btu/kWh, the 1995 average heat rates for these units was 11,988 btu/kWh. A similar situation emerges with PECO's Croydon units. These are among the most efficient oil fired CT's in PJM. Despite the fact that these units have a reported full load heat rates ranging from 10,100 to 12,200 btu/kWh, the station average heat rate for 1995 was 15,875 btu/kWh. Cycling effects produce a substantial impact on CT average cycle heat rates that simply cannot be ignored it one wishes to impute energy benefits to such plants.

Q. Why are you certain that this is a problem in Dr. Jones' EGEAS run?

A. In EGEAS, all new CT's, regardless of their capacity factor, have the same reported heat rate. While this may not be a serious issue as regards market energy prices, it poses an extremely serious problem if the EGEAS figures were used to compute average fuel costs (and energy cost benefits) for purposes of adjusting capacity costs as postulated by Dr. Jones. Further, the problem may or may not be amenable to a correction in EGEAS unless the model logic can accurately simulate the partial load operations of CT's in sufficient detail. The same is true of many probabilistic models.

Q. Are there any other problems in EGEAS that would also have a bearing on this issue?

A. Dr. Jones has assumed that both CT's and new combined cycle units will have the same delivered price of natural gas. This could be true for commodity charges. However, pipeline and other delivery charges must be factored into the analysis in some fashion. Because CT's will have a lower load factor than combined cycle plants, they will have a higher average cost of delivered gas. I see no allowance for this in Dr. Jones fuel price assumptions or anywhere in his listed assumptions for new CT's as used in EGEAS. While it is arguable whether this is a short run or long-run variable cost, fixed delivery charge must be accounted for in the computation of any CT fuel savings for purposes of adjusting the capacity credit as postulated by Dr. Jones.

Also, Dr. Jones assumes that both CT's and CC's will run 100% of the time on natural gas. While gas interruptions may have limited impacts on the average cost of fuel for combined cycle plants that run at higher load factors, this is a serious problem for CT's. CT's may be interrupted at the time of the highest energy prices during the winter peak season. Dr. Jones does not account for this problem anywhere in his EGEAS run.

To account for problems related to interruptions and delivery charges GPU assumed a substantially higher average delivered cost of gas for new CT's in its modeling than it did for CC's. Even though the GPU model purports to reflect fuel savings for new CT's, it is interesting that for Portland 5, the newest gas fired CT in PJM, GPU projects the unit will have *higher* fuel costs than market energy revenues once all fuel related charges are included. In the end, I believe that Dr. Jones hypothesis on this score is totally specious.

.Q. **Could you please summarize this point?**

A. Dr. Jones has postulated the novel idea that new CT's will produce fuel cost savings sufficient to defray a substantial portion of the capital costs of these units. Putting aside the theoretical questions surrounding the validity of this concept, one thing is clear. The EGEAS results as modeled by Dr. Jones simply do not provide a full accounting for all of the fuel costs that would impact such an analysis. Dr. Jones has not actually presented such a calculation, but if he did, it would have to rest on a fundamentally different EGEAS run than he used up to this point.

Q. **I understand that STJ-28 presents Dr. Jones' correction to a cash flow analysis prepared by another witness. Does this impact your comments regarding STJ-28?**

A. No. Dr. Jones presents STJ-28 as a corrected version of the original cash flow analysis. He presents it as evidence that his market prices will support new capacity additions. Thus, Dr. Jones' has implicitly assumed responsibility for the accuracy of this analysis.

Fuel Price Forecasts

Q. **Do you have any comments regarding Dr. Jones' testimony about his fuel price**

forecasts?

A. Dr. Jones' testimony is wrong, misleading and he has totally missed the point. He agrees that fuel prices are a crucial driver to PJM market prices and stranded costs. He also acknowledges that uncertainty exists in projecting fuel prices. However, he fails to also acknowledge that it is not the validity of his forecast per-se that is at issue. Rather, it is the lack of independence between his fuel price forecast and his estimates of market prices and stranded costs. The Commission has no way of knowing whether the forecast represents a result oriented effort designed to "prove" a certain level of stranded costs.

This is a fundamentally different situation than is the case where one develops a model or methodology for estimating market prices and stranded costs. A model is a series of mathematical relationships relating inputs and outputs. The Commission can consider whether the inputs are reasonable and independent, whether the model structure is logical, and the whether the results are plausible. In the end, the Commission can make an informed decision. However, Dr. Jones' approach short-circuits that process. While Dr. Jones can obviously claim to have considered an infinite number of input factors, he can reveal no mathematical relationships that lead from his inputs to his outputs. In the end, he merely asserts that his forecast is plausible. He applied the same approach in his forecast of capacity prices with the result that there is an obvious and invalidating inconsistency in his capacity and energy price estimates.

Q. Have other market price experts in the PECO and GPU proceedings developed totally judgmental fuel price and capacity price forecasts?

A. No. PECO presented three independent market price studies supported by three experts. GPU has also presented an independent market price forecast study. Further, the OCA presented Mr. Smith and PPLICA has presented my testimony. Of the seven market price studies presented to the Commission there is only one case where the market price expert also presented his own fuel price forecast.[3] In addition, each of the other six experts computed market capacity prices based on some form of modeling approach. Whether their method was simple or complex, each expert presented a methodology or a mathematical formula that related the market price of capacity to the cost of new capacity and other factors.

Q. Provide an example of why you consider Dr. Jones' rebuttal testimony to be misleading?

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[3] Please note that nothing in this discussion is intended as an endorsement of any particular experts' application of fuel price forecasts to his determination of market prices. I am merely pointing out that other than Dr. Jones, all market price experts have utilized an independent source for fuel prices.

A. There are numerous examples. A good example can be found on page 40. Dr. Jones states that ". . . it is my opinion that PP&L's fuel price forecasts are reasonable. Intervenors' forecasts suffer from a number of problems." Similar references are found on other pages. A casual reader could easily conclude on the basis of such statements that PP&L prepared the fuel price forecast and that the *intervenors* (Mr. Smith and me) prepared our own forecasts. The truth is completely different. Dr. Jones prepared PP&L's forecast. Thus, it should be no surprise he considers the PP&L forecast reasonable. The forecasts Mr. Smith and I used were from DRI and EIA, two independent sources with no vested interest in the outcome of this proceeding.

Q. Why do you state that Dr. Jones' comments regarding fuel price forecasts are wrong?

A. Dr. Jones implies that the EIA forecast I used suffers from a "starting point problem." His graph on Exhibit No.____(STJ-12) states that "Intervenors use old forecast escalation rates to increase their estimated fuel costs." His graph shows a 1996 starting point. However, this is simply wrong. I used a <u>1995</u> starting point consistent with my use of growth rates computed starting in 1995.[4] The average PJM delivered fuel prices I used averaged $1.657/mmbtu, virtually identical to the EIA 1995 base of $1.63/mmbtu. Further, my 1995 starting point for natural gas, $2.04/mmbtu was actually *lower* than the EIA figure ($2.10). Finally, I lowered my distillate oil figure for new CT's to match the EIA figures. Dr. Jones is simply wrong.

Q. Do you believe it is necessary to respond to Dr. Jones' testimony regarding alleged problems in the DRI and EIA forecasts?

A. No. Dr. Jones places his own personal opinion and judgment above the detailed modeling and analysis of these legitimate, disinterested sources. Dr. Jones and PP&L expect ratepayers to place a $4.6 billion bet on his personal fuel price forecast. Given a total lack of mathematical analysis supporting his forecast, I believe it would be imprudent for the Commission to accept Dr. Jones forecast over that of the credible, independent and disinterested source advocated by PPLICA.

Q. Do you agree with Dr. Jones' allegation that the rate of inflation you have used is

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4 Even Dr. Jones' characterization of his own exhibits appears to be misleading. He alleges in his testimony that the EIA AEO 97 forecast is outdated and implies the new forecast is lower. In reality, the new EIA forecast is nothing but a short term (2 year) update and based on Mr. Jones' exhibit projects higher fuel prices than the AEO 97 forecast.

improbable?

A. It is only improbable in Dr. Jones' opinion. I used a 3.1% inflation rate. Dr. Jones assumed 2.5%. The inflation forecast I used was based on the EIA inflation forecast published in the AEO 1997. It is also quite close to the DRI inflation forecast. Dr. Jones apparently believes that his opinion is more sound than the collective analysis and judgment of the EIA and DRI on inflation forecasts as well as fuel.

Testimony of Dr. Guth

Q. Do you have any comments concerning Dr. Guth's testimony?

A. Dr. Guth has clarified some points in his discussion. I believe that the approach I have used is consistent with his concepts regarding the proper present value analysis. My reading of Dr. Guth's testimony leads me to conclude that in computing the value of an *asset* it is proper to compute the present value of after tax cash flows using an after tax discount rate. In computing the market value of PP&L's assets this was the approach I used. In computing a taxable damage award, Dr. Guth would compute the present worth of the pretax cash flows using the after tax discount rate. That is the method I used for estimating the stranded costs related to NUGs. As a result, I believe I am consistent with

Dr. Guth's testimony.

Q. Could the same be said of Dr. Jones' testimony?

A. Hardly. I believe that Dr. Guth's testimony effectively rebuts much of Dr. Jones' testimony. Dr. Guth testifies that investors may not always undertake attractive investments because in so doing they give up the opportunity to "*wait and see*" if something better might come along (PP&L Statement 19-R, p. 17). Contrast this with Dr. Jones' testimony that investors will make investments in the PJM capacity market even though they will lose money. In contrast to Dr. Guth's "*wait and see*" approach, Dr. Jones postulates that "This phenomenon of *racing to invest* is a common pattern in highly competitive, capital-intensive industries." (PP&L Statement 7-R, p. 81.) **It is rather interesting that Dr. Guth believes investors would "wait and see" before investing in PP&L's existing generation resources, while Dr. Jones believes investors will "race to invest" in new capacity that competes with PP&L, even if that requires losing money indefinitely.**

Kennedy and Associates' Production Cost Model

Q. What is the purpose of this section of your testimony?

A. A recurring theme in the PP&L rebuttal case was the "unsuitable" nature of the Kennedy and Associates' Production Cost model (hereinafter referred to as the "KPC"). The PP&L witnesses clearly prefer the EGEAS model. Mr. Falk generally criticizes what he considers to be the lower level of detail of the KPC as compared to EGEAS. Mr. Falk states that if the two models are equally flawed it is incumbent upon me to demonstrate that the flaw does not bias my market price estimates (PP&L Statement 20-R, p. 4). Dr. Jones testifies that I have the responsibility of proving that my modeling approach is more accurate (PP&L Statement 7-R p. 16).

Q. How do you respond to these criticisms?

A. First, I disagree with the attempt to shift the burden of proof in this proceeding. PP&L is requesting $4.6 billion in stranded cost recovery. It is incumbent on PP&L to prove its case. Returning to Dr. Guth's concept of a damage award, it is PP&L that is essentially suing ratepayers for $4.6 billion in damages for the breech of an alleged unwritten contract. PP&L must prove its claim.

Secondly, in performing projections 20 years or more into the future I fail to see how more complexity is per-se preferable. Given the volatile nature of the input assumptions, I fail to see how the "signal to noise ratio" is improved by the addition of unnecessary details. The key inputs of this type of analysis are the fuel prices, the cost of new generation resources and heat rates. Why would one assume, given the volatile nature of fuel price forecasts, that a 20-year projection of production costs would gain any accuracy by inclusion of a large number of complex and unnecessary details? In the PECO QRO case, the Commission accepted my calculation of PECO's stranded costs and market prices based on a spreadsheet calculation of long run marginal costs. In the face of uncertainty, intelligent assumptions and reasonable analysis are the best tools available to the decision maker. The less complicated, and more *transparent* these analyses are, the better and more useful they will be.

Q. **Would this also apply to Dr. Jones' judgmental determination of capacity prices and fuel escalation rates?**

A. No. Dr. Jones' judgmental approach is not transparent at all. There is literally no way that one can determine the connection between the inputs and outputs. Dr. Jones' "model" is truly a *black box* that he can assert consistently considers any and all variables. However, there is no way to determine the relative significance of any single variable, or the logical connections between any two variables, in Dr. Jones' mental modeling process.

Q. **Dr. Jones has offered to rerun the PP&L model to reflect any changes that the**

Commission may care to adopt for crucial inputs. Will you do the same?

A. Yes. I agree with Dr. Jones' assessment that the crucial variables in this analysis are fuel prices, the inflation forecast, the discount rate and the costs of new units. I will gladly provide the Commission any run it desires varying these inputs.

However, this is yet another instance where Dr. Jones is not being candid with the Commission. The reason is that the capacity prices he uses are not related in any mathematical fashion to the costs of new capacity. Thus, if the Commission were to nominate new costs for combined cycle or combustion turbine capacity, it might change the modeling of the optimal expansion plan in EGEAS (as it would in my model as well). However, lacking any analytical chain between Dr. Jones' judgmental capacity prices and the costs of new units, I fail to see how Dr. Jones would respond to a change in the cost of new capacity in his determination of capacity prices. The end result would be nothing more than another of Dr. Jones' questionable judgment calls with no way for the Commission to verify the reasonableness of his results. What Dr. Jones is really saying is that if the Commission cares to nominate a different capacity price he would *rerun* EGEAS and he might *reconsider* his capacity price estimates. However, there is no way to determine what a change in capacity prices would imply regarding his market prices.

Q. Mr. Falk testifies that there is an inherent advantage in using commercially available models. Do you agree?

A. No. Mr. Falk suggests that EGEAS is preferable to the KPC because EGEAS has been through the *crucible of competition* (PP&L Statement 20-R, p. 19). However, the mere commercial availability of models does nothing to improve the likelihood that unbiased or even correct input data will be used. The two recent PECO proceedings are replete with examples where even the Company has admitted to improper modeling using commercially available software. I would also point out to the Commission that this problem is nothing new. Several years ago I participated in a West Penn Power rate case. West Penn admitted during those proceeding that it filed studies examining the economics of Bath County using another commercially available model that contained logic errors. Those errors had an enormous impact on the final results of the West Penn study.

While the KPC may not have been through the *crucible of competition*, it has been through the process of *trial by ordeal* in numerous regulatory proceedings. The Kennedy and Associates' model was used by our firm in studies for the Georgia Public Service Commission Staff to determine whether the $8 billion Vogtle nuclear plant should be completed or canceled. In accepting our conclusion the Georgia PSC stated that it gave greater weight to our studies (based on the KPC model) than on the utility's studies that relied on the EPRI UPM model.

In the GSU/Entergy Merger, the KPC model was used to independently estimate merger production costs savings, despite the availability of PROMOD runs performed by the applicants. The Louisiana Public Service Commission ("LPSC") and FERC adopted "fuel-hold-harmless" provisions recommended by the LPSC staff based on my finding that the applicant's fuel cost savings estimates were grossly overstated. In addition, the applicant's proposals to allow shareholders to retain hundreds of millions in merger cost savings, while passing through to ratepayers a comparable amount of overstated fuel savings, was rejected by the LPSC. Once again, this was an LPSC Staff proposal supported by the model.

The model has been used frequently in regulatory proceedings, and while input assumptions are usually debated, there has never been a single instance where a utility documented a logic error in the model itself. Given the highly adversarial nature of these proceedings, and the large amounts of data and information I have been asked to produce in support of my testimony, I am sure that many individuals within the industry have examined it carefully.

In the present case I have been required to provide a complete set of inputs and outputs from the KPC model to PP&L's consultants, as well as the model itself. No expert was required to do so in the PECO case. Nor has PP&L done so in this case.

Q. **Do you believe that Mr. Falk's comments regarding the KPC present a balanced view?**

A. No. Mr. Falk has apparently made no investigation of the EGEAS model. Thus, he has little ability to contrast the two models. For example, I called Mr. Falk to inquire whether EGEAS used the method of convolution or the method of moments (often called the method of cumulants) for approximating outages. Mr. Falk stated he had no idea. This is significant because the method moments (which I believe is used in EGEAS) is a mere approximation to the more exact convolution technique used in the KPC. Thus, Mr. Falk has apparently placed the KPC under a microscope, while he has not even examined the EGEAS model used by Dr. Jones.

Q. **Comment further on Mr. Falk's characterization of the advantage of commercial models.**

A. I am not sure exactly what Mr. Falk is concerned about. Perhaps he would be more confident in a model developed by a large organization like Stone and Webster or EDS.

For example, on page 19 of his rebuttal testimony he cites EGEAS, PROMOD and ENPRO as models that have endured the "squeezing out process." In the end, it is not the organization that creates the model, but rather the individuals working for it. In this regard, I can state that I authored similar probabilistic production cost models since the late 1970's that were used by one of the nations' largest architect and engineering firms (Ebasco Services) for many studies, including projects for about 20 major utility clients. Many of these utilities used that model for many years. In the early1980's, I was employed by Energy Management Associates (prior to its becoming EDS-Utilities) and was involved in a number of projects involving enhancements to the very PROMOD model Mr. Falk cites. I also provided training services to a large number of utilities using such models. My qualifications are adequate to develop such models, and it would appear many major utilities agreed this was the case over the period from 1979 to 1983. I would further state that the two other employees of J. Kennedy and Associates, Inc. most heavily involved in the KPC coding, documentation and model development both worked at EMA and Ebasco Services on similar modeling efforts prior to their participation in the development of the KPC.

Q. Has the KPC ever been provided to anyone outside of Kennedy and Associates or used for any purpose other than litigation?

A. Yes. As noted previously PP&L was provided the complete KPC model and database. Earlier versions of the model have been provided to utilities and others. One municipal utility purchased an earlier version of the model in 1989, and in at least other one case the model was provided to a utility as part of the discovery process.[5] Further, the model was used by our firm in projection of avoided costs for two major financial institutions to evaluate the reasonableness of investments in qualifying facilities projects. As noted in my direct testimony the model was also used by an industrial firm to analyze the decision to invest in a QF project on the PJM system. In addition, the initial version of the Monte Carlo model was provided to Georgia Power Company for testing and evaluation of our analysis of the prudence of the Rocky Mountain pumped storage plant.

Q. Please describe some of the other proceedings in which you have used the earlier versions of the KPC.

A. I used the model in support of my testimony in the West Penn Milesburg, et al proceedings. In that case I believed that West Penn did not need the capacity from the Milesburg, Shannopin and Burgettstown projects. While initially disagreeing, West Penn

[5] Despite the fact that the utility and its consultants signed a confidentiality agreement, the model and data was never returned. For this reason I have become more concerned about the release of the model.

eventually attempted to escape from those contracts, and recently bought out one of them. Apparently the model led me to the correct conclusions, even though West Penn Power didn't think so originally.

I used the model in similar APS/QF proceedings in Maryland and West Virginia, in support of a combined cycle option as opposed to QF contracts. The West Virginia Commission agreed that the QF contract in question was uneconomic. The Maryland proceeding was settled with a delay in the QF in-service date. These actions saved ratepayers millions of dollars of excessive costs for uneconomic QF resources. Once again, the model supported the correct conclusions regarding the choice for capacity additions long before the utility using industry standard commercial models reached the same conclusions.

Q. **Mr. Falk was not impressed by your reference to benchmark studies. Please comment.**

A. Mr. Falk did not request to see any of the support for the benchmark studies at our meeting. I also did provide responses to PP&L's discovery requests concerning benchmark studies that might answer some of the questions Mr. Falk has raised in his rebuttal testimony. In addition, the KPC users' manual that I provided to Mr. Falk at our meeting contained results from several benchmarks including one of the EGEAS studies. [See Exhibit No.____(RJF-14), for a copy of the relevant material.] Mr. Falk certainly had the opportunity to examine this information if he desired. I also find it interesting that Mr. Falk criticizes my benchmark studies, while PP&L has never provided *any* form of verification of EGEAS relative to other models or historical data.

Q. Has the KPC been verified against similar models in other regulatory proceedings?

A. Yes. The Table below demonstrates the wide range of models the KPC has been benchmarked against and the accuracy of the results. Note that this is only a partial list, as I did not have all of the summary statistics readily available from all benchmark studies.

K&A Production Cost Model: Benchmark Studies in Regulatory Proceedings				
Year	Utility	Docket No.	Utility Co. Model	Abs. % Dif.
1984	Louisville Gas & Electric	KPSC-8924	EBASCO Model	1.64%
1984	Florida Power Corp.	FPSC-830470-EI	PROMOD III	.65%
1985	Louisville Gas & Electric	KPSC-9243	EPRI EGEAS	.5%
1986	Georgia Power Company	GPSC-3554-U	EPRI - UPM	1.24%
1987	West Penn Power Co.	Pa PUC 850220	PROMOD III	1.20%
1988	Louisville Gas & Electric	KPSC-9984	EPRI - EGEAS	1.30%

K&A Production Cost Model: Benchmark Studies in Regulatory Proceedings				
Year	Utility	Docket No.	Utility Co. Model	Abs. % Dif.
1989	West Penn Power Co.	P-870216-283	PROMOD, Actual	1.00%
1989	Georgia Power Company	GPSC-3840-U	EPRI - UPM	.93%
1989	P.S. New Mexico	NMPSC - 2087	PROMOD III	.48%
1992	Gulf St. Utilities/Entergy	LPSC-U-19904	PROMOD III	.1%

I believe that this table demonstrates that the KPC model compares quite well to any of the industry standard models, including EGEAS.

Q. Assuming that one wanted to test models used to estimate market prices, is there any way to use actual historical data for such purposes?

A. Yes. I believe that the most logical place to start would be to examine how the respective models do in predicting the actual generation of the "marginal units" on the PJM system. This would include the non-baseload units, particularly the higher cost intermediate and peaking units on the system. Simulation of marginal (higher cost intermediate and peaking units) is a challenge for any model. I have carefully examined my results to ensure that the most realistic modeling possible was performed for marginal units. In the case of the PP&L and PECO marginal generators I am satisfied that my modeling is quite good and superior to that performed by either Company using the commercial models.

Q. Why is the simulation of generation of marginal units significant to estimates of marginal costs?

A. The hydro and nuclear plants, as well as the most efficient coal plants and NUGs, run fully loaded whenever possible. All reasonable models will predict this. The generation of such units is controlled by the input availability factors alone and, for this reason, does not really provide a test of the model's predictive powers. These low-cost units do not set the marginal cost of generation in the pool. Rather, it is the less efficient units on the system that set the marginal energy costs. Accurate replication of the generation of these units therefore is a significant indicator of reasonable marginal cost estimates. Contrary to Mr. Falk's assumption, both the PP&L and PECO commercial models have failed miserably on this score

Q. Please explain.

A. Exhibit No.___(RJF- 15) summarizes the results of my modeling for 1995 for PP&L and PECO's marginal units. These include PP&L's Martins Creek 3 and 4 Units, the PP&L and PECO combustion turbines, Cromby 2, Eddystone 3 and 4, Schuylkill 1, and

Delaware 7 and 8. This run is based on my new updated assumptions.[6] The figures demonstrate an excellent correlation between the generation of these marginal units in the KPC model compared to 1995 actual. For example, PP&L's CT's produced 23 gWh in 1995 (or a .7% annual capacity factor), while the KPC projected 36 gWh (or a 1.0% annual capacity factor). This is significant because it is the generation of such peaking units that is the closest measure of the highest cost energy required in PJM.

All in all, the model is projecting operation of the least efficient units on the PP&L and PECO systems that are quite close to historical levels. Naturally, the model did not perform perfectly. However, it did do an excellent job of replicating the actual generation of most of the marginal units.

Q. How do PP&L's EGEAS simulation results compare to the 1995 actual figures?

A. Quite poorly. Neither PP&L nor PECO presented any 1995 results, however, comparison of 1995 actual results to the PP&L and PECO 1997, 1998, or 1999 projections is enlightening. Mr. Schadt presents the EGEAS simulation results for PP&L's units in his exhibits, while in the PECO case Mr. Bustard presented a PROMOD simulation in JFB-

6 For comparison purposes I have also included data from my original unadjusted 1995 modeling. The changes in NUG and Hydro generation made very little difference and did not actually improve the quality of the results.

10. This comparison demonstrates how poorly the PP&L and PECO modeling (using the commercial models) actually performed. This comparison also demonstrates that Mr. Falk's comments concerning the advantages of commercial software are totally unfounded.

For example, the PP&L EGEAS modeling predicts that PP&L's CT's will generate only 1-2 gWh from 1997 to 1999, or less than one tenth of the 1995 actual. Likewise, Mr. Bustard projected that in 1999 PECO's CT's would produce only 3.5 gWh, or only about 2% of the actual 1995 generation. In both cases these commercial models provide projections that appear totally unrealistic compared to actual history.

As noted elsewhere, PECO's other models all predicted little or no CT generation for 1999 or beyond. Given the decline in reserve margins projected between 1995 and 1999 this substantial decrease in peaking generation is not just hard to understand, it is indicative of a serious set of problems in both the PP&L and PECO models.

Even more revealing is the terrible job of modeling that both PP&L and PECO did regarding Eddystone units 3 and 4. Both Mr. Bustard's PROMOD and PMDAM projections for the operation of Eddystone 3 and 4 are completely unrealistic. For 1999, Mr. Bustard's PROMOD IV run projects only 125 gWh and PMDAM projected absolutely no generation for Eddystone 3 and 4 (despite assuming the unit would run 100% of the time on gas). The actual 1995 generation was about 1900 gWh, some 15 times greater than Mr. Bustard projects for 1999, in the best of his two models. Likewise, PECO's IPM model (a commercial product developed by ICF) drastically under-predicts the generation of Eddystone 3 and 4, projecting less than 700 gWh (36% of 1995 actual) for 1999. The KPC was also too low for Eddystone 3 and 4 in 1995 at 1063 gWh, but far closer than three of PECO's commercial models

However, the PP&L modeling of Eddystone 3 and 4 is even worse than projected by PECO's models. In the EGEAS runs the 1997 generation projected for Eddystone was virtually insignificant and only a small faction of the actual 1995 generation of these important units.

Q. Does the fact that Eddystone 3 and 4 never run in Mr. Bustard's PMDAM model (and seldom run in the PP&L EGEAS and PECO IPM and PROMOD models) raise any "red flags"?

A. Absolutely! It is important to realize that in 1995, Eddystone 3 and 4 ran with a 28.7% capacity factor. Based on the 1995 EIA heat rates and PJM fuel prices there is more than 14,000 mW of capacity with a higher full load fuel costs than Eddystone 3 and 4 in PJM.

If a simulation model shows that Eddystone 3 and 4 run only infrequently (or never!) we can only assume that the higher cost capacity in PJM runs even less in that model. For the most extreme example, the commercial EDS model is predicting that somehow PJM utilities will serve load with nearly 30% of all capacity idle for the next 30 years. There is no explanation for this anomaly. The greatly understated projections of operation for Eddystone 3 and 4 cast great doubt on the EGEAS, ICF and PROMOD projections for the same reasons. In each case, the commercial product is producing totally unrealistic estimates of the generation of these units, thus undercutting Mr. Falk's comments regarding the alleged advantages of commercial software.

Q. Did PP&L's EGEAS model fare any better for its own Martins Creek 3 and 4 units?

A. No. This is a really telling modeling result. In 1995 these units were 100% oil fired. PP&L plans to convert these units to 50% natural gas firing. This fact, and the above referenced decline in reserve margins suggests that, in the year ahead, Martins Creek 3 and 4 should substantially increase their output. However, the PP&L EGEAS modeling shows a decline in generation from these units from the 1995 actual level of 1032 gWh to 733 gWh in 1997 and only 502 gWh in 1999. In fact, the EGEAS projections show Martins Creek 3 and 4 generation dropping to 397 gWh in 2003.

Q. **How well did PP&L's EGEAS model perform in producing logical generation estimates for <u>PECO's</u> marginal units?**

A. Very poorly. For example, EGEAS projects that in 1997, Eddystone 3 and 4, Delaware 7 & 8 , Cromby 2, and Schuylkill 1 combined would produce only 373 mWh, or about 12 % of 1995 actual. EGEAS projects that by 1997 the output of PECO's CT's will drop to 21 gWh also only 12% of 1995 actual. What is even more telling is the fact that by 1999 EGEAS predicts that the generation of all of these marginal units will drop even further. In addition, the EGEAS model seriously underpredicted the output of every single plant listed above, by far more than 50%. Clearly, EGEAS is not even coming close to predicting the generation of marginal units, and therefore is seriously understating marginal energy costs.

Q. **Do you believe that there is an explanation for the further drop in generation in the existing PJM marginal units from 1997 to 1999?**

A. Part of the explanation lies in Dr. Jones' assumption that new suppliers will "race to invest" in new PJM capacity by 1999. His modeling shows substantial installation of new capacity by 1999, resulting in a drop in the generation of marginal units. However, developers will lose money on these investments as discussed earlier. In addition, the low level of generation in 1997 and 1998 in EGEAS for the marginal units is simply due to other unrelated modeling problems. In the end, I believe that this analysis demonstrates some serious questions regarding the validity of PP&L's EGEAS studies.

Q. How does your modeling compare to actual 1995 results for these marginal units?

A. Quite well. Because I used 1995 actual fuel prices and loads as the basis for my projections, this is a good test of the model. For Cromby 2, the KPC is also lower for 1995 than actual, and about the same as the PECO 1999 PROMOD result but much closer than EGEAS. For Delaware 7 and 8, the KPC predicted 1995 generation of 212 gWh, compared to actual of 249 gWh. PROMOD IV predicted only 167 gWh, or 67% of 1995 actual for 1999. Given the decline in PJM reserve margins, it would be logical to assume generation for all PECO units would increase by 1999. For Schuylkill 1, the KPC also under predicted 1995 actual (86 gWh vs. 159). However, this result was far closer than Mr. Bustard's PROMOD result (29 gWh or 18% of 1995 actual) for1999, and is much better than the EGEAS results.

Q. How well does the KPC model the PP&L and PECO's combustion turbines?

A. I believe the KPC model results are excellent, if not outstanding, while the PP&L and

PECO commercial models are uniformly abysmal. In 1995 PECO's CT's produced 174 gWh. The updated KPC run predicts 113 gWh, while the original predicted 142 gWh.. As noted elsewhere, these units are predicted to produce almost no energy in the PROMOD, MAPS, IPM, PMDAM, or EGEAS simulations. For the PP&L CT's, the KPC predicted 36 gWh for 1995, compared to virtually no generation in EGEAS. Actual 1995 generation from the PP&L CT's was 23 gWh, quite close to the KPC prediction.

I believe that the evidence clearly indicates the KPC never seriously overpredicted generation from any of the PP&L or PECO marginal units. In fact, the tendency of the model is to underpredict marginal generation. However, the KPC was almost always far closer than any of the commercial PP&L or PECO models. In the end, the understatement of marginal generation suggests a slight understatement of marginal costs and market energy prices, not a gross overstatement of marginal costs as suggested by Mr. Falk.

Q. **What conclusion do you draw from this analysis?**

A. The ability to accurately predict marginal generation is a reality check for any market price model. I believe that this reality check has at least partially validated the KPC model and its assumptions, while EGEAS and other commercially available products have melted away in this *crucible* of comparison to actual results.

Q. Does the fact that the PP&L and PECO models seriously underpredict peaking generation have any bearing on the question of alleged power outages referenced earlier?

A. Yes. In effect, the KPC is being criticized because it does such a good job in predicting the output of the highest cost combustion turbine units. The commercial models used by PP&L and PECO show almost no generation from peaking plants, thus they seldom (or never) show any need for tie-line support, curtailments of interruptible loads, and etc. The KPC predicts the operation of these extremely high cost resources quite well and also predicts a very limited need for additional resources. Thus, these criticisms really underscore the fact that the KPC is doing a much more realistic job than EGEAS or the other commercial models.

Heat Rate Issues

Q. Has Dr. Jones added anything of substance to the heat rate debate?

A. Dr. Jones has demonstrated that PP&L's use of incremental instead of average heat rates understated market energy prices, and overstated PP&L's stranded costs. He estimates this factor to amount to $37 million (Jones rebuttal page 14). He argues that this amount is inconsequential, but does not challenge the validity of the concept (indeed in his earlier response to an OCA data request he states the concept is valid). It is interesting that despite proving that PP&L's claim is overstated by $37 million, Dr. Jones proposes to make no correction to the PP&L stranded cost estimate. Apparently he considers $37 million too inconsequential to even consider. I disagree. Further, I would like to point out that in using higher fuel cost estimates based on the independent EIA forecast, the impact would be larger in my modeling. Finally, as demonstrated above, PP&L's modeling greatly understates the generation of the higher cost gas and oil units in PJM for which this heat rate adjustment is most significant. Thus, Dr. Jones' conclusion regarding the size of this adjustment is suspect.

Other Issues

Q. Do you agree with Dr. Jones' position that new generators will not incur Administrative and General ("A&G") costs?

A. No. Dr. Jones assumes that new generators will enjoy a perpetual "free-ride" as regards A&G expenses. He argues that existing utilities will build many of these new units and will not require additional support staff to manage them. I assume that his comments apply to PP&L. What is really interesting is the fact that PP&L seeks to include <u>all</u> A&G

expenses currently incurred as part of O&M in its stranded cost calculation. Based on Dr. Jones' comments, it is safe to assume that PP&L, at least, is spending enough on A&G to support not only its own generators, but new ones as well.. Thus, ratepayers are being asked to pay for part of the A&G needed for PP&L to build new generators in the competitive market. This is totally unfair. By including a modest allowance for A&G in the new generators cost, I am at least providing a minimal offset to insure that ratepayers will not be asked to subsidize PP&L's competitive ventures under the guise of stranded cost recovery.

In addition, Dr. Jones makes a fundamental mistake of assuming that any factor that does not cause an immediate increase in spending is zero for all time. If nothing else, even small CT's will require accountants to do their books and purchasing agents to buy fuel. The maintenance personnel who perform repairs will have pensions, health insurance and will require the services of a Personnel Department. Competitors' CT's will require most of the same support functions as any generator would incur. Initially such requirements may not cause an increase in A&G costs for a given supplier. However, over the long run they will and should be considered as part of long run marginal cost.

Q. Do you have any comments regarding the assumption of Dr. Jones and Mr. Falk that overbuilding will occur?

A. In effect, these witnesses are suggesting that new competitors will not always be able to recover the full cost of their investment because of possible overbuilding. As noted above, Dr. Guth has fairly well decimated this argument already with his *wait and see* concept. However, even accepting that Dr. Jones and Mr. Falk are correct, it really implies that the high likelihood of overbuilding[7] means that investment in new capacity is a much higher risk venture than currently expected. This will in turn lead to a higher cost of capital for such projects, and ultimately *higher* (not lower) market prices. There is no basis for assuming that temporary overbuilding will be a permanent feature of any competitive market.[8] This would imply that competitive markets are destined to fail as suppliers will never be able to fully recover their full cost of capital.

Q. Do you believe Mr. Falk has raised a significant issue regarding repowering?

A. No. I agree that repowering is one of the most attractive technologies available to existing utilities to take advantage of older plants. Repowering of older plants will probably be more common than greenfield combined cycle units. However, such projects have very

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[7] Even assuming contrary to any real evidence that there is not a symmetrical probability of underbuilding.

[8] I grant that it has undoubtably been the hallmark of monopoly regulation, with PP&L a textbook example.

site-specific capital costs. While the capital costs of such projects may be lower than new combined cycle plants, repowering projects will not necessarily have a lower busbar cost. Such units will be built upon older generator technologies and will have higher heat rates than a new combined cycle plant, for example. Further, the necessity of using an existing site may not always allow the lowest possible fuel supply costs. A chief benefit of this option is the ability to avoid the larger capital investment required for a new plant. Repowering of an existing generator fits perfectly into Dr. Guth's *wait and see* concept, in that it takes less time to complete and less capital, but in some cases at the expense of a higher cost per kWh of output.

In addition, Mr. Falk's comment cuts both ways. PP&L plans to retire many of its older plants in the next 20 years. Many of these units may have a substantial latent value that could be unlocked by repowering. Unless PP&L reflects the latent value of this option for its own plants, it should not speculate that other utilities will repower their units either. In effect, Mr. Falk is suggesting that other utilities could mitigate their own stranded costs by repowering. If so, then so should PP&L.

Q. Do you have any comments regarding the suggestion made by Dr. Jones that new combined cycle plants may show much better reliability than existing ones?

A. Yes. First, if Mr. Falk is correct, that repowering is the technology of choice, then the availability assumptions for new combined cycle plants are largely irrelevant. Further, if Dr. Jones is correct about the addition of new rather than repowering units and they are more reliable than existing ones, then the overall reliability of the PJM system would improve substantially in the years ahead. This would occur because less reliable older plants would be retired and replaced with these newer, and allegedly more reliable models. In addition, load growth would be met by these more reliable plants. This means that PJM would experience a decline in reserve margin requirements in the years ahead. This would imply that less new capacity would be added, and the remaining, less efficient, older plants would run more. In the end this would provide upwards pressure on market prices and some new equilibrium point (with a reserve margin lower than the current 18%) would be reached. Dr. Jones adopts the higher availabilities for purposes of computing energy prices, while ignoring the offsetting impact of the lower reserve margin requirements. This is plainly inconsistent. Dr. Jones simply is not providing the Commission with a balanced view.

Q. Some might claim just the reverse is true - that owing to your lower assumed reliability levels for new plants, PJM reserve margins should be increased in your studies. What is wrong with such reasoning?

A. The 18% PJM reserve margin is grounded in the actual historical experienced reliability levels of existing plants. Therefore, my assumption, that new plants will enjoy reliability levels comparable to existing ones, does not justify an increase in reserve margins. However, Dr. Jones assumes substantial improvements in reliability levels for new units, indicating that reserve margins should be lowered in his EGEAS modeling.

Q. As a final question, Mr. Falkenberg, do you have any comments regarding Dr. Jones' statements regarding your airline analogy?

A. Dr. Jones implies that I assume planes will never leave the gate until every seat was sold. This is both wrong and a misrepresentation of my testimony. I testified that airlines would not enter a market (or stay in a market) if prices were insufficient to at least recover the average variable cost of the flight. Dr. Jones confuses this long run marginal cost concept with a short run observation. Yes, it is true that at times airlines will fail to recover variable costs on scheduled flights. However, this is a far cry from Dr. Jones' assumption (as modeled in EGEAS) that as a matter of course suppliers will set prices sufficient to recover only the short run marginal costs even if they fall below average variable costs. If Dr. Jones comments were correct, then airlines would routinely provide free rides to anyone who supplied his own drinks, peanuts and a few gallons of kerosene.

Q. Does this conclude your testimony?

A. Yes.

BEFORE THE

PENNSYLVANIA PUBLIC UTILITY COMMISSION

PENNSYLVANIA PUBLIC UTILITY COMMISSION, ET. AL.	)	
V.	)	
PENNSYLVANIA POWER & LIGHT COMPANY	)	
	)	DOCKET NO. R-00973954
APPLICATION OF PENNSYLVANIA POWER & LIGHT COMPANY FOR APPROVAL OF ITS RESTRUCTURING PLAN UNDER SECTION 2806 OF THE PUBLIC UTILITY CODE	)	

SURREBUTTAL

EXHIBITS

OF

RANDALL J. FALKENBERG

ON BEHALF OF THE

PP&L INDUSTRIAL CUSTOMER ALLIANCE

Air Products and Chemicals, Inc.
Alumax
Appleton Papers Inc.
Armstrong World Industries
Bethlehem Steel Corporation
CertainTeed Corporation
Hercules Cement Company
Hershey Foods Corporation
Horsehead Resource Development Co., Inc.
Lafarge Corporation Whitehall Plant
Lucent Technologies
Magee Carpet Company
Praxair, Inc.
R. R. Donnelley & Sons Company
The Stroh Brewery Company
Thomson Consumer Electronics, Inc.
Victaulic Company of America
WEA Manufacturing

J. KENNEDY AND ASSOCIATES, INC.
ATLANTA, GEORGIA

Exhbit No.___(RJF-9a)
PENNSYLVANIA POWER AND LIGHT COMPANY
STRANDED COST SUMMARY

Net Present Value of Contribution Margins	$2,618,338
Production Net Plant	$3,652,804
Inventory and Working Capital	$200,958
Total Book Value	$3,853,762
Future Tax Depreciation Benefits	$108,739
Accumulated Deferred Investment Tax Credit Benefits	$78,101
Deferred Income Tax	$798,985
Total Adjusted NPV -	$249,599
NUG's Adjusted NPV	$557,080
Less Non-Jurisdictional	($7,787)
GRAND TOTAL	$798,891
Scenario: EIA FUEL PRICE Escalation	

Exhbit No.___(RJF-9b)

PENNSYLVANIA POWER AND LIGHT COMPANY

CALCULATION OF NET PRESENT VALUE OF CONTRIBUTION MARGINS

		============Capacity===========				Capacity	Capacity	Energy	PSH								Net
	Year	Large Units	CT's	PSH	Total	Charges	Revenue	Margins	Magins	Total Costs	O&M	Cap. Add	A&G	Other Tax	Decomm.	Life Ext.	Margin
	1999	7904	408	0	8312	24.95	$207,406	$488,509	$0	$583,929	$437,553	$70,932	$650	$63,113	$11,681	$0	$111,987
	2000	7904	408	0	8312	38.59	$320,785	$526,860	$0	$620,028	$448,448	$96,119	$666	$63,113	$11,681	$0	$227,618
	2001	7904	408	0	8312	53.06	$441,015	$580,522	$0	$633,137	$461,901	$95,755	$686	$63,113	$11,681	$0	$388,401
	2002	7904	408	0	8312	50.89	$422,979	$633,486	$0	$664,202	$475,758	$112,943	$707	$63,113	$11,681	$0	$392,263
	2003	7904	408	0	8312	47.47	$394,564	$693,660	$0	$776,789	$491,066	$158,357	$728	$63,113	$11,681	$51,844	$311,435
	2004	7904	408	0	8312	54.20	$450,540	$693,612	$0	$877,538	$505,798	$284,355	$750	$63,113	$11,681	$11,841	$266,614
Disc. Rate	2005	7904	408	0	8312	59.11	$491,342	$706,507	$0	$754,695	$520,972	$158,156	$772	$63,113	$11,681	$0	$443,154
7.92%	2006	7904	408	0	8312	59.24	$492,382	$738,745	$0	$769,057	$538,633	$101,597	$799	$63,113	$11,681	$53,235	$462,070
	2007	7904	408	0	8312	61.22	$508,866	$760,827	$0	$745,977	$556,893	$113,465	$826	$63,113	$11,681	$0	$523,716
Tax Rate	2008	7904	408	0	8312	64.82	$538,814	$773,625	$0	$749,924	$575,771	$98,505	$854	$63,113	$11,681	$0	$562,515
41.49%	2009	7904	408	0	8312	64.69	$537,689	$809,241	$0	$762,445	$595,290	$91,478	$883	$63,113	$11,681	$0	$584,485
	2010	7904	408	0	8312	66.30	$551,056	$810,703	$0	$778,516	$604,403	$98,766	$912	$62,753	$11,681	$0	$583,244
	2011	5950	408	0	6358	71.73	$456,061	$819,692	$0	$700,988	$546,042	$85,494	$945	$56,825	$11,681	$0	$574,765
	2012	5950	408	0	6358	74.31	$472,474	$847,427	$0	$716,909	$565,481	$81,943	$979	$56,825	$11,681	$0	$602,991
Post 2014	2013	5950	408	0	6358	76.62	$487,167	$899,306	$0	$732,336	$585,613	$77,204	$1,013	$56,825	$11,681	$0	$654,138
Inflation	2014	5950	408	0	6358	75.95	$482,863	$881,171	$0	$753,422	$606,460	$77,406	$1,050	$56,825	$11,681	$0	$610,612
3.56%	2015	4516	408	0	4924	78.65	$387,270	$805,821	$0	$670,504	$532,181	$74,100	$1,087	$51,456	$11,681	$0	$522,586
	2016	4236	408	0	4644	81.45	$378,251	$834,508	$0	$659,271	$520,189	$76,738	$1,126	$49,537	$11,681	$0	$553,488
	2017	3476	408	0	3884	84.35	$327,611	$745,346	$0	$623,632	$484,068	$79,469	$1,166	$47,249	$11,681	$0	$449,325
	2018	2731	408	0	3139	87.35	$274,197	$647,759	$0	$584,861	$444,715	$82,299	$1,207	$44,960	$11,681	$0	$337,095
	2019	2521	408	0	2929	90.46	$264,962	$634,734	$0	$592,306	$452,462	$81,952	$1,250	$44,960	$11,681	$0	$307,390
	2020	2521	0	0	2521	93.68	$236,172	$657,331	$0	$609,176	$468,570	$83,965	$0	$44,960	$11,681	$0	$284,327
	2021	2521	0	0	2521	97.02	$244,580	$680,731	$0	$628,846	$485,251	$86,954	$0	$44,960	$11,681	$0	$296,464
	2022	2327	0	0	2327	100.47	$233,795	$659,970	$0	$625,639	$481,367	$87,631	$0	$44,960	$11,681	$0	$268,126
	2023	2327	0	0	2327	104.05	$242,119	$388,964	$0	$645,895	$498,503	$90,751	$0	$44,960	$11,681	$0	($14,813)
	2024	2327	0	0	2327	107.75	$250,738	$96,354	$0	$666,873	$516,250	$93,982	$0	$44,960	$11,681	$0	($319,781)
	2025	361	0	0	361	111.59	$40,283	$99,781	$0	$26,729	$25,475	$0	$0	$1,254	$0	$0	$113,335
	2026	361	0	0	361	115.56	$41,717	$103,332	$0	$27,636	$26,382	$0	$0	$1,254	$0	$0	$117,413
	2027	361	0	0	361	119.67	$43,202	$107,012	$0	$28,575	$27,321	$0	$0	$1,254	$0	$0	$121,639
	2028	361	0	0	361	123.93	$44,740	$110,822	$0	$29,548	$28,294	$0	$0	$1,254	$0	$0	$126,015
	2029	361	0	0	361	128.35	$46,333	$114,766	$0	$30,555	$29,301	$0	$0	$1,254	$0	$0	$130,544

NPV of Net Margins After Tax $2,618,338

Exhibit No. ___ (RJF-9b)

Large Units
Capacity mW

UNIT		Safe Harbor	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins 2	Martins 1	Martins 4	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	*Total*	3000	3000	3000	2024	2024	2021	2021	3000	2010	2017	2018	2018	2014	2016	2016	2014	2014	2010	2010	2010	2015	2015	2010	2010
1999	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2000	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2001	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2002	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2003	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2004	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2005	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2006	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2007	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2008	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2009	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2010	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2011	5950	137	44	108	985	981	97	97	72	0	745	105	105	378	15	745	735	321	0	0	0	140	140	0	0
2012	5950	137	44	108	985	981	97	97	72	0	745	105	105	378	15	745	735	321	0	0	0	140	140	0	0
2013	5950	137	44	108	985	981	97	97	72	0	745	105	105	378	15	745	735	321	0	0	0	140	140	0	0
2014	5950	137	44	108	985	981	97	97	72	0	745	105	105	378	15	745	735	321	0	0	0	140	140	0	0
2015	4516	137	44	108	985	981	97	97	72	0	745	105	105	0	15	745	0	0	0	0	0	140	140	0	0
2016	4236	137	44	108	985	981	97	97	72	0	745	105	105	0	15	745	0	0	0	0	0	0	0	0	0
2017	3476	137	44	108	985	981	97	97	72	0	745	105	105	0	0	0	0	0	0	0	0	0	0	0	0
2018	2731	137	44	108	985	981	97	97	72	0	0	105	105	0	0	0	0	0	0	0	0	0	0	0	0
2019	2521	137	44	108	985	981	97	97	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	2521	137	44	108	985	981	97	97	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	2521	137	44	108	985	981	97	97	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	2327	137	44	108	985	981	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	2327	137	44	108	985	981	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	2327	137	44	108	985	981	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	361	137	44	108	0	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	361	137	44	108	0	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	361	137	44	108	0	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	361	137	44	108	0	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	361	137	44	108	0	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Large Unit Output Report

UNIT		Safe Harbor	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins 2	Martins 1	Martins 4	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	*Total*	3000	3000	3000	2024	2024	2021	2021	3000	2010	2017	2018	2018	2014	2016	2016	2014	2014	2010	2010	2010	2015	2015	2010	2010
1999	41808	564	112	681	6470	6447	705	705	532	918	5298	755	750	2517	107	5115	4974	2063	647	482	480	455	446	310	278
2000	40437	564	112	681	6470	6447	715	704	531	918	5298	756	752	2527	107	5142	5010	2081	654	486	484	499	489	356	320
2001	40550	564	112	681	6470	6447	715	704	531	920	5299	757	753	2538	109	5170	5045	2097	659	490	489	538	528	422	383
2002	40618	564	112	681	6470	6447	715	704	531	920	5302	758	755	2544	109	5186	5065	2108	663	492	492	567	557	483	442
2003	40678	564	112	681	6470	6447	715	715	530	919	5304	759	755	2548	109	5198	5082	2118	665	495	494	597	587	550	508
2004	40779	564	112	681	6470	6447	715	715	531	918	5301	759	758	2562	109	5233	5127	2119	667	496	495	560	551	513	474
2005	40858	564	112	681	6470	6447	715	715	540	918	5303	760	759	2566	110	5244	5142	2148	670	498	498	559	551	495	452
2006	40892	564	112	681	6470	6447	715	715	540	918	5305	761	759	2570	110	5255	5158	2139	673	500	500	559	549	494	459
2007	40939	564	112	681	6470	6447	716	716	540	919	5307	761	759	2573	110	5265	5171	2147	676	503	502	539	510	498	463
2008	40986	564	112	681	6470	6447	715	715	540	919	5311	762	760	2578	110	5276	5184	2155	678	505	504	497	490	483	450
2009	40993	564	112	681	6470	6447	716	716	540	920	5316	762	762	2576	110	5270	5175	2163	681	506	506	499	490	490	458
2010	39348	564	112	681	6470	6447	716	716	540	922	5322	763	762	2581	110	5282	5190	2170	0	0	0	484	477	497	0
2011	38493	564	112	681	6470	6447	716	716	540	0	5325	764	763	2588	110	5303	5218	2176	0	0	0	486	480	0	0
2012	38543	564	112	681	6470	6447	716	716	540	0	5332	764	764	2593	111	5314	5230	2189	0	0	0	483	475	0	0
2013	38563	564	112	681	6470	6447	718	716	540	0	5333	765	765	2594	111	5317	5237	2193	0	0	0	486	479	0	0
2014	33782	564	112	681	6470	6447	718	716	540	0	5333	766	764	0	111	5320	5240	0	0	0	0	499	492	0	0
2015	28542	564	112	681	6470	6447	718	716	540	0	5333	766	764	0	111	5320	0	0	0	0	0	499	0	0	0
2016	28542	564	112	681	6470	6447	718	716	540	0	5333	766	764	0	111	5320	0	0	0	0	0	0	0	0	0
2017	23111	564	112	681	6470	6447	718	716	540	0	5333	766	764	0	0	0	0	0	0	0	0	0	0	0	0
2018	17778	564	112	681	6470	6447	718	716	540	0	0	766	764	0	0	0	0	0	0	0	0	0	0	0	0
2019	16248	564	112	681	6470	6447	718	716	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	16248	564	112	681	6470	6447	718	716	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	16248	564	112	681	6470	6447	718	716	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	14814	564	112	681	6470	6447	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	8367	564	112	681	6470	0	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	1897	564	112	681	0	0	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	1897	564	112	681	0	0	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	1897	564	112	681	0	0	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	1897	564	112	681	0	0	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	1897	564	112	681	0	0	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	1897	564	112	681	0	0	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Fuel Cost $ (1000)

UNIT		Safe Harbor	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins 2	Martins 1	Martins 4	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	Total	3000	3000	3000	2024	2024	2021	2021	3000	2010	2017	2018	2018	2014	2016	2016	2014	2014	2010	2010	2010	2015	2015	2010	2010
1999	483006	5	1	7	35424	35485	8397	8394	6535	12711	75925	11037	10951	37033	1579	75301	73443	31305	10035	7455	7440	8732	8596	12757	10963
2000	454143	5	1	7	35304	35365	8611	8478	6600	12844	76760	11168	11099	37598	1605	76546	74790	31922	10238	7608	7594	9666	9530	14580	13172
2001	461179	5	1	7	35703	35765	8713	8577	6678	13010	77723	11319	11262	38203	1631	77864	76195	32558	10447	7765	7753	10556	10423	17983	16409
2002	467581	5	1	7	36105	36169	8816	8678	6757	13165	78674	11464	11412	38746	1654	79024	77401	33097	10623	7897	7886	11254	11125	21398	19698
2003	474014	5	1	7	36515	36577	8921	8920	6831	13310	79632	11600	11556	39268	1677	80146	78580	33627	10796	8028	8017	11987	11864	25388	23558
2004	481160	5	1	7	36926	36991	9027	9026	6908	13460	80539	11757	11728	39935	1706	81637	80218	34081	10944	8137	8127	11386	11262	24653	22896
2005	488037	5	1	7	37344	37408	9134	9134	7111	13621	81509	11902	11878	40473	1730	82782	81411	34919	11127	8275	8266	11501	11380	24712	22701
2006	511064	5	1	7	38723	38789	9570	9570	7451	14274	85426	12478	12457	42471	1815	86912	85538	36452	11712	8711	8702	12044	11891	25714	23958
2007	535317	5	1	7	40151	40220	10026	10026	7806	14959	89526	13079	13061	44550	1904	91207	89825	38329	12318	9163	9154	12172	11569	26991	25209
2008	560846	5	1	7	41632	41705	10503	10503	8178	15682	93860	13715	13699	46745	1998	95738	94344	40305	12957	9639	9630	11761	11632	27282	25517
2009	586779	5	1	7	43170	43243	11004	11003	8568	16443	98413	14383	14368	48941	2092	100194	98676	42375	13625	10138	10130	12354	12221	28847	27061
2010	579189	5	1	7	44761	44839	11529	11529	8976	17743	103201	15075	15055	51367	2195	105201	103668	44539	0	0	0	12564	12431	30441	0
2011	576220	5	1	7	46360	46440	11765	11765	9161	0	105387	15404	15394	52576	2247	107779	106360	45574	0	0	0	12876	12245	0	0
2012	590429	5	1	7	48014	48097	12007	12006	9348	0	107667	15739	15730	53740	2298	110189	108778	46803	0	0	0	13056	12925	0	0
2013	604375	5	1	7	49728	49815	12299	12351	9539	0	109893	16067	16059	54833	2346	112533	111128	47828	0	0	0	13409	13273	0	0
2014	513556	5	1	7	51504	51594	12550	12502	9735	0	112131	16394	16388	0	2395	114877	113473	0	0	0	0	14025	13897	0	0
2015	414299	5	1	7	53335	53409	12999	12950	10077	0	116146	16974	16966	0	2482	118948	0	0	0	0	0	14536	0	0	0
2016	479050	6	1	8	55234	55311	13462	13411	10436	0	120280	17578	17570	0	2570	123183	0	0	0	0	0	0	0	0	0
2017	314093	6	1	8	57200	57280	13940	13887	10808	0	124562	18205	18196	0	0	0	0	0	0	0	0	0	0	0	0
2018	196277	6	1	8	59236	59319	14437	14383	11192	0	0	18852	18843	0	0	0	0	0	0	0	0	0	0	0	0
2019	164229	7	1	8	61346	61431	14951	14894	11591	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	170074	7	1	8	63530	63618	15483	15424	12003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	176131	8	1	9	65792	65883	16034	15973	12431	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	149252	8	1	9	68133	68228	0	0	12873	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	83909	8	1	9	70559	0	0	0	13332	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	13824	8	1	9	0	0	0	0	13806	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	14317	8	1	10	0	0	0	0	14298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	14826	9	1	10	0	0	0	0	14806	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	15354	9	1	10	0	0	0	0	15334	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	15901	9	1	12	0	0	0	0	15879	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	16467	9	1	12	0	0	0	0	16445	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Fuel Cost $/mWh

UNIT		Safe Harbor	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins 2	Martins 1	Martins 4	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	Total	3000	3000	3000	2024	2024	2021	2021	3000	2010	2017	2018	2018	2014	2016	2016	2014	2014	2010	2010	2010	2015	2015	2010	2010
1999	11.70	0.01	0.01	0.01	5.48	5.50	11.91	11.91	12.28	13.83	14.34	14.61	14.60	14.71	14.76	14.72	14.77	15.17	15.51	15.47	15.50	19.19	19.27	39.54	39.72
2000	11.23	0.01	0.01	0.01	5.46	5.49	12.04	12.04	12.43	13.99	14.49	14.77	14.76	14.88	15.00	14.89	14.93	15.34	15.65	15.65	15.69	19.37	19.49	40.96	41.16
2001	11.37	0.01	0.01	0.01	5.52	5.55	12.19	12.18	12.58	14.14	14.67	14.95	14.96	15.05	14.96	15.06	15.10	15.53	15.85	15.85	15.85	19.62	19.74	42.61	42.84
2002	11.51	0.01	0.01	0.01	5.58	5.61	12.33	12.33	12.73	14.31	14.84	15.12	15.12	15.23	15.17	15.24	15.28	15.70	16.02	16.05	16.03	19.85	19.97	44.30	44.57
2003	11.65	0.01	0.01	0.01	5.64	5.67	12.48	12.48	12.89	14.48	15.01	15.28	15.31	15.41	15.39	15.47	15.46	15.89	16.23	16.22	16.23	20.08	20.21	46.16	46.37
2004	11.80	0.01	0.01	0.01	5.71	5.74	12.63	12.62	13.01	14.66	15.19	15.49	15.47	15.59	15.65	15.60	15.65	16.08	16.41	16.41	16.42	20.33	20.44	48.06	48.30
2005	11.94	0.01	0.01	0.01	5.77	5.80	12.77	12.77	13.17	14.84	15.37	15.66	15.65	15.77	15.73	15.79	15.83	16.27	16.61	16.62	16.60	20.57	20.65	49.92	50.22
2006	12.50	0.01	0.01	0.01	5.99	6.02	13.38	13.38	13.80	15.55	16.10	16.40	16.41	16.53	16.50	16.54	16.58	17.04	17.40	17.42	17.40	21.55	21.66	52.05	52.20
2007	13.08	0.01	0.01	0.01	6.21	6.24	14.00	14.00	14.46	16.28	16.87	17.19	17.21	17.31	17.31	17.32	17.37	17.85	18.22	18.22	18.24	22.58	22.68	54.20	54.45
2008	13.68	0.01	0.01	0.01	6.43	6.47	14.69	14.69	15.14	17.06	17.67	18.00	18.03	18.13	18.16	18.15	18.20	18.70	19.11	19.09	19.11	23.66	23.74	56.48	56.69
2009	14.31	0.01	0.01	0.01	6.67	6.71	15.37	15.37	15.87	17.87	18.51	18.88	18.86	19.00	19.02	19.01	19.07	19.59	20.01	20.04	20.02	24.76	24.94	58.87	59.09
2010	14.72	0.01	0.01	0.01	6.92	6.96	16.10	16.10	16.62	18.70	19.39	19.76	19.76	19.90	19.95	19.92	19.97	20.52	0.00	0.00	0.00	25.96	26.06	61,25	0.00
2011	14.97	0.01	0.01	0.01	7.17	7.20	16.43	16.43	16.96	0.00	19.79	20.16	20.18	20.32	20.43	20.32	20.38	20.94	0.00	0.00	0.00	26.49	26.62	0.00	0.00
2012	15.32	0.01	0.01	0.01	7.42	7.46	16.77	16.77	17.31	0.00	20.19	20.60	20.59	20.73	20.70	20.74	20.80	21.38	0.00	0.00	0.00	27.03	27.21	0.00	0.00
2013	15.67	0.01	0.01	0.01	7.69	7.73	17.13	17.11	17.66	0.00	20.61	21.00	20.99	21.15	21.14	21,16	21.22	21.81	0.00	0.00	0.00	27.58	27.71	0.00	0.00
2014	15.20	0.01	0.01	0.01	7,96	8.00	17.48	17.46	18.03	0.00	21.03	21.40	21.45	0.00	21.58	21.59	21.66	0.00	0.00	0.00	0.00	28.11	28.25	0.00	0.00
2015	14.57	0.01	0.01	0.01	8.24	8.28	18.10	18.09	18.66	0.00	21.78	22.16	22.21	0.00	22.36	22.36	0.00	0.00	0.00	0.00	0.00	29.13	0.00	0.00	0.00
2016	15.03	0.01	0.01	0.01	8.54	8.58	18.75	18.73	19.33	0.00	22.55	22.95	23.00	0.00	23.15	23.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	13.59	0.01	0.01	0.01	8.84	8.88	19.42	19.40	20.01	0.00	23.36	23.77	23.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	11.04	0.01	0.01	0.01	9.16	9.20	20.11	20.09	20.73	0.00	0.00	24.61	24.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019	10.11	0.01	0.01	0.01	9.48	9.53	20.87	20.80	21.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	10.47	0.01	0.01	0.01	9.87	9.87	21.56	21.54	22.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	10.84	0.01	0.01	0.01	10.17	10.22	22.33	22.31	23.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	10.08	0.01	0.01	0.01	10.53	10.58	0.00	0.00	23.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	10.03	0.01	0.01	0.01	10.91	0.00	0.00	0.00	24.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	7.29	0.01	0.01	0.01	0.00	0.00	0.00	0.00	25.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	7.55	0.01	0.01	0.01	0.00	0.00	0.00	0.00	26.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	7.82	0.02	0.01	0.01	0.00	0.00	0.00	0.00	27.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	8.09	0.02	0.01	0.01	0.00	0.00	0.00	0.00	28.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2028	8.38	0.02	0.01	0.02	0.00	0.00	0.00	0.00	29.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029	8.68	0.02	0.01	0.02	0.00	0.00	0.00	0.00	30.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Market Energy Prices $/mWh

UNIT		Safe Harbor	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins 2	Martins 1	Martins 4	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	*Total*	3000	3000	3000	2024	2024	2021	2021	3000	2010	2017	2018	2018	2014	2016	2016	2014	2014	2010	2010	2010	2015	2015	2010	2010
1999	23.38	22.45	22.40	22.45	22.67	22.66	22.61	22.60	22.61	22.65	22.66	22.69	22.72	22.89	22.94	22.90	23.01	23.18	23.20	23.16	23.23	29.70	29.89	52.85	55.44
2000	24.26	23.89	23.85	23.90	24.14	24.14	24.05	24.08	24.10	24.13	24.13	24.14	24.17	24.36	24.51	24.37	24.47	24.64	24.62	24.64	24.72	31.21	31.48	56.63	59.53
2001	25.69	25.31	25.26	25.32	25.58	25.58	25.48	25.51	25.53	25.53	25.57	25.58	25.63	25.78	25.59	25.78	25.89	26.07	26.06	26.07	26.10	32.83	32.86	56.97	59.50
2002	27.11	26.71	26.66	26.72	27.01	27.01	26.90	26.93	26.95	26.95	26.98	26.99	27.02	27.20	27.06	27.20	27.31	27.48	27.45	27.52	27.50	34.14	34.41	58.16	60.50
2003	28.71	28.30	28.24	28.31	28.61	28.61	28.50	28.50	28.58	28.56	28.57	28.55	28.63	28.80	28.70	28.79	28.90	29.09	29.09	29.08	29.11	35.79	36.07	59.66	61.76
2004	28.81	28.42	28.37	28.43	28.75	28.74	28.63	28.63	28.65	28.71	28.71	28.71	28.70	28.86	28.91	28.85	28.93	29.20	29.15	29.17	29.21	36.98	37.25	62.21	64.44
2005	29.24	28.86	28.80	28.87	29.20	29.19	29.08	29.08	29.07	29.16	29.15	29.13	29.13	29.29	29.13	29.28	29.35	29.50	29.55	29.59	29.57	37.62	37.83	64.73	67.30
2006	30.56	30.20	30.14	30.21	30.53	30.52	30.42	30.42	30.41	30.51	30.49	30.44	30.49	30.61	30.49	30.59	30.65	30.88	30.85	30.90	30.88	39.30	39.62	67.78	70.07
2007	31.66	31.27	31.21	31.28	31.64	31.64	31.48	31.48	31.51	31.59	31.59	31.56	31.62	31.72	31.63	31.68	31.73	31.96	31.89	31.90	31.95	41.34	42.37	71.06	73.57
2008	32.56	32.16	32.11	32.17	32.55	32.55	32.43	32.42	32.41	32.52	32.50	32.45	32.51	32.61	32.57	32.57	32.62	32.83	32.79	32.76	32.81	43.93	44.17	74.24	76.79
2009	34.06	33.66	33.60	33.67	34.04	34.04	33.87	33.87	33.91	34.00	33.98	33.97	33.95	34.12	34.05	34.09	34.15	34.28	34.23	34.29	34.27	45.87	46.31	77.54	80.21
2010	35.32	34.90	34.84	34.91	35.33	35.33	35.15	35.15	35.19	35.24	35.26	35.23	35.24	35.40	35.39	35.36	35.41	35.55	0.00	0.00	0.00	48.29	48.58	81.26	0.00
2011	36.26	35.85	35.77	35.86	36.29	36.28	36.11	36.11	36.14	0.00	36.22	36.18	36.21	36.34	36.43	36.27	36.31	36.48	0.00	0.00	0.00	49.42	50.68	0.00	0.00
2012	37.31	36.88	36.81	36.89	37.34	37.34	37.16	37.16	37.19	0.00	37.26	37.27	37.26	37.37	37.21	37.30	37.34	37.47	0.00	0.00	0.00	50.87	51.30	0.00	0.00
2013	38.99	38.58	38.50	38.59	39.03	39.02	38.93	38.85	38.88	0.00	38.96	38.92	38.91	39.06	38.91	39.00	39.02	39.13	0.00	0.00	0.00	53.12	53.47	0.00	0.00
2014	41.29	40.84	40.76	40.85	41.35	41.34	41.23	41.15	41.19	0.00	41.26	41.17	41.27	0.00	41.22	41.30	41.33	0.00	0.00	0.00	0.00	55.91	56.29	0.00	0.00
2015	42.75	42.28	42.32	42.30	42.82	42.81	42.70	42.61	42.64	0.00	42.73	42.64	42.73	0.00	42.68	42.77	0.00	0.00	0.00	0.00	0.00	57.95	0.00	0.00	0.00
2016	44.27	43.79	43.83	43.80	44.34	44.34	44.22	44.13	44.16	0.00	44.26	44.16	44.25	0.00	44.21	44.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	45.84	45.35	45.39	45.36	45.92	45.92	45.80	45.70	45.73	0.00	45.83	45.73	45.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	47.48	46.96	47.01	46.98	47.55	47.55	47.43	47.33	47.36	0.00	0.00	47.36	47.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019	49.17	48.63	48.68	48.65	49.25	49.24	49.12	49.01	49.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	50.92	50.37	50.41	50.38	51.00	51.00	50.88	50.76	50.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	52.74	52.16	52.21	52.18	52.82	52.81	52.67	52.56	52.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	54.63	54.02	54.06	54.03	54.70	54.69	0.00	0.00	54.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	56.52	55.94	55.99	55.96	56.84	0.00	0.00	0.00	56.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	58.08	57.93	57.99	57.95	0.00	0.00	0.00	0.00	58.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	60.15	59.99	60.05	60.01	0.00	0.00	0.00	0.00	60.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	62.29	62.13	62.18	62.15	0.00	0.00	0.00	0.00	62.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	64.51	64.34	64.40	64.36	0.00	0.00	0.00	0.00	64.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2028	66.80	66.83	66.70	66.65	0.00	0.00	0.00	0.00	67.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029	69.18	69.00	69.06	69.02	0.00	0.00	0.00	0.00	69.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Market Energy Revenues ($1000)

UNIT		Safe Harbor	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins 2	Martins 1	Martins 4	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	*Total*	3000	3000	3000	2024	2024	2021	2021	3000	2010	2017	2018	2018	2014	2016	2016	2014	2014	2010	2010	2010	2015	2015	2010	2010
1999	977515	12659	2509	15289	146649	146113	15938	15936	12029	20815	120026	17129	17040	57624	2455	117159	114476	47821	15011	11162	11148	13513	13329	16384	15301
2000	981003	13475	2671	16274	156215	155643	17196	16951	12797	22152	127785	18253	18176	61562	2623	125295	122611	51281	16103	11977	11963	15573	15385	20159	19049
2001	1041701	14276	2829	17242	165533	164927	18221	17960	13559	23486	135473	19366	19301	65438	2789	133305	130610	54673	17174	12778	12763	17553	17362	24040	22787
2002	1101067	15067	2986	18198	174745	174108	19236	18960	14313	24795	143057	20459	20398	69208	2949	141061	138318	57934	18202	13542	13531	19358	19168	28091	26743
2003	1167674	15960	3163	19276	185113	184436	20376	20377	15150	26247	151551	21670	21617	73389	3128	149671	146876	61554	19343	14393	14382	21365	21176	32813	31374
2004	1174772	16031	3177	19362	185993	185313	20474	20473	15214	26359	152208	21793	21757	73940	3151	150954	148316	61883	19445	14470	14459	20709	20523	31815	30546
2005	1194544	16276	3226	19658	188899	188206	20794	20793	15697	26773	154606	22141	22111	75170	3204	153521	150910	63299	19800	14734	14724	21028	20844	32043	30421
2006	1249809	17032	3376	20570	197499	196776	21750	21750	16419	28004	161729	23167	23141	78676	3354	160762	158098	66052	20761	15451	15442	21968	21749	33482	32163
2007	1296144	17636	3495	21289	204706	203958	22538	22537	17015	29031	167666	24019	23996	81620	3479	166799	164095	68609	21561	16047	16038	22280	21610	35388	34064
2008	1334471	18141	3596	21910	210594	209824	23184	23183	17502	29884	172599	24728	24707	84058	3583	171826	169097	70738	22231	16546	16538	21835	21641	35856	34556
2009	1396020	18986	3783	22931	220232	219428	24253	24253	18310	31279	180663	25888	25870	87897	3746	179642	176727	74150	23309	17351	17342	22891	22691	37996	36736
2010	1389892	19686	3902	23777	228598	227763	25168	25168	19000	32491	187669	26880	26855	91366	3893	186755	183785	77136	0	0	0	23373	23172	40388	0
2011	1395912	20217	4006	24418	234780	233922	25852	25852	19517	0	192874	27639	27625	94037	4007	192344	189450	79372	0	0	0	24016	23314	0	0
2012	1437856	20802	4123	25124	241588	240705	26604	26604	20084	0	198695	28474	28463	96901	4130	198236	195301	82022	0	0	0	24570	24368	0	0
2013	1503681	21759	4312	26260	252512	251590	27952	27814	20997	0	207759	29777	29768	101333	4319	207360	204332	85817	0	0	0	25815	25611	0	0
2014	1394727	23032	4565	27817	267508	266529	29605	29460	22241	0	220062	31539	31530	0	4575	219714	216550	0	0	0	0	27901	27697	0	0
2015	1220120	23848	4740	28805	277025	276021	30660	30511	23025	0	227905	32662	32648	0	4738	227532	0	0	0	0	0	28916	0	0	0
2016	1263558	24697	4909	29830	286888	285848	31752	31597	23845	0	236018	33825	33810	0	4907	235632	0	0	0	0	0	0	0	0	0
2017	1059439	25577	5084	30692	297101	296024	32682	32722	24694	0	244420	35029	35014	0	0	0	0	0	0	0	0	0	0	0	0
2018	844036	26487	5265	31993	307678	306563	34053	33887	25573	0	0	36276	36261	0	0	0	0	0	0	0	0	0	0	0	0
2019	798963	27430	5452	33131	318631	317477	35265	35093	26484	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	827405	28406	5646	34311	329975	328779	36520	36342	27426	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	856862	29417	5848	35533	341722	340483	37820	37636	28403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	809222	30465	6055	36797	353887	352604	0	0	29414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	472873	31549	6271	38107	366485	0	0	0	30461	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	110178	32673	6495	39464	0	0	0	0	31546	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	114098	33836	6726	40868	0	0	0	0	32668	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	118158	35040	6964	42323	0	0	0	0	33831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	122366	36287	7213	43830	0	0	0	0	35036	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	126723	37580	7470	45390	0	0	0	0	36283	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	131233	38917	7735	47006	0	0	0	0	37575	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Energy Margins ($1000)

UNIT		Safe Harbor	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins 2	Martins 1	Martins 4	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	*Total*	3000	3000	3000	2024	2024	2021	2021	3000	2010	2017	2018	2018	2014	2016	2016	2014	2014	2010	2010	2010	2015	2015	2010	2010
1999	488509	12654	2508	15282	111225	110628	7541	7542	5494	8104	44101	6097	6089	20591	876	41858	41033	16518	4978	3707	3706	4781	4733	4127	4338
2000	526860	13470	2670	16267	120911	120278	8585	8473	6197	9308	51025	7085	7077	23964	1018	48749	47821	19359	5865	4369	4369	5907	5855	5579	5877
2001	580522	14271	2828	17235	129830	129162	9508	9383	6881	10476	57750	8047	8039	27235	1158	55441	54415	22115	6727	5011	5010	6997	6939	6057	6378
2002	633488	15062	2985	18191	138840	137939	10420	10282	7556	11630	64383	8995	8986	30462	1295	62037	60917	24837	7579	5645	5645	8104	8043	6693	7045
2003	693660	15955	3162	19269	148598	147859	11457	11457	8319	12937	71919	10070	10061	34121	1451	69525	68296	27927	8547	6365	6365	9378	9312	7425	7816
2004	693612	16028	3176	19355	149067	148322	11447	11447	8306	12899	71669	10036	10029	34005	1445	69317	68098	27802	8501	6333	6332	9323	9261	7262	7650
2005	706507	16271	3225	19651	151555	150800	11660	11659	8586	13152	73097	10239	10233	34697	1474	70739	69499	28380	8673	6459	6458	9527	9464	7331	7720
2006	738745	17027	3375	20563	158776	157987	12180	12180	8968	13730	76303	10689	10684	36205	1539	73850	72560	29600	9049	6740	6740	9924	9858	7768	8205
2007	760827	17631	3494	21292	164555	163738	12512	12511	9209	14072	78140	10940	10935	37070	1575	75592	74270	30280	9243	6884	6884	10108	10041	8397	8855
2008	773625	18138	3595	21903	168962	168119	12681	12680	9324	14202	78739	11013	11008	37313	1585	76090	74753	30433	9274	6907	6908	10074	10009	8574	9044
2009	809241	18981	3762	22924	177062	176185	13249	13250	9742	14836	82250	11505	11502	38956	1654	79448	78051	31775	9684	7213	7212	10537	10470	9149	9675
2010	810703	19681	3901	23770	183837	182924	13639	13639	10024	15250	84468	11805	11800	39999	1698	81554	80117	32597	0	0	0	10809	10741	9947	0
2011	819692	20212	4005	24411	188420	187482	14087	14087	10356	0	87492	12235	12231	41461	1760	84565	83090	33798	0	0	0	11140	11069	0	0
2012	847427	20797	4122	25117	193574	192608	14597	14598	10736	0	91028	12735	12733	43161	1832	88047	86523	35219	0	0	0	11514	11443	0	0
2013	899306	21754	4311	26273	202784	201775	15653	15563	11458	0	97862	13710	13709	46461	1973	94827	93204	37989	0	0	0	12412	12338	0	0
2014	881171	23027	4564	27810	216004	214935	17055	16958	12506	0	107931	15145	15142	0	2180	104837	103077	0	0	0	0	13876	13800	0	0
2015	805821	23843	4739	28798	223690	222612	17661	17561	12948	0	111759	15688	15682	0	2256	108584	0	0	0	0	0	14380	0	0	0
2016	834508	24691	4908	29822	231654	230537	18290	18186	13409	0	115738	16247	16240	0	2337	112449	0	0	0	0	0	0	0	0	0
2017	745346	25571	5083	30884	239901	238744	18942	18835	13886	0	119858	16824	16818	0	0	0	0	0	0	0	0	0	0	0	0
2018	647759	26481	5264	31985	248442	247244	19616	19504	14381	0	0	17424	17418	0	0	0	0	0	0	0	0	0	0	0	0
2019	634734	27423	5451	33123	257285	256046	20314	20199	14893	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	657331	28399	5645	34303	266445	265161	21037	20918	15423	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	680731	29409	5847	35524	275930	274600	21766	21663	15972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	659970	30457	6054	36788	285754	284376	0	0	16541	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	388964	31541	6270	38098	295926	0	0	0	17129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	96354	32665	6494	39455	0	0	0	0	17740	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	99781	33828	6725	40858	0	0	0	0	18370	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	103332	35031	6963	42313	0	0	0	0	19025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	107012	36278	7212	43820	0	0	0	0	19702	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	110822	37571	7469	45378	0	0	0	0	20404	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	114766	38908	7734	46994	0	0	0	0	21130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Unit Capacity Factors

UNIT		Safe Harbor	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins 2	Martins 1	Martins 4	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	*Total*	3000	3000	3000	2024	2024	2021	2021	3000	2010	2017	2018	2018	2014	2016	2016	2014	2014	2010	2010	2010	2015	2015	2010	2010
1999	60.38	47.00	29.06	71.98	74.98	75.02	82.97	82.97	84.35	81.96	81.15	82.08	81.54	76.01	81.43	78.38	77.25	73.37	78.57	78.60	78.28	37.10	38.37	4.51	3.90
2000	58.40	47.00	29.06	71.98	74.98	75.02	84.15	82.85	84.19	81.87	81.15	82.19	81.76	76.31	81.43	78.79	77.81	74.01	79.42	79.28	78.93	40.69	39.87	5.18	4.53
2001	58.57	47.00	29.06	71.98	74.98	75.02	84.15	82.85	84.19	82.05	81.20	82.30	81.87	76.65	82.95	79.22	78.36	74.57	80.03	79.91	79.75	43.87	43.05	6.14	5.42
2002	58.66	47.00	29.06	71.98	74.98	75.02	84.15	82.85	84.19	82.05	81.24	82.41	82.08	76.83	82.95	79.46	78.67	74.97	80.52	80.23	80.23	46.23	45.42	7.02	6.25
2003	58.75	47.00	29.06	71.98	74.98	75.02	84.15	84.15	84.03	81.96	81.27	82.52	82.08	76.95	82.95	79.65	78.93	75.25	80.76	80.72	80.56	48.68	47.86	8.00	7.19
2004	58.90	47.00	29.06	71.98	74.98	75.02	84.15	84.15	84.19	81.87	81.23	82.52	82.41	77.37	82.95	80.18	79.63	75.36	81.00	80.89	80.72	45.68	44.93	7.46	6.71
2005	59.01	47.00	29.06	71.98	74.98	75.02	84.15	84.15	85.62	81.87	81.26	82.63	82.52	77.49	83.71	80.35	79.86	76.32	81.37	81.21	81.21	45.58	44.93	7.20	6.39
2006	59.06	47.00	29.06	71.98	74.98	75.02	84.15	84.15	85.62	81.87	81.29	82.74	82.52	77.61	83.71	80.52	80.11	76.07	81.73	81.54	81.54	45.58	44.77	7.18	6.49
2007	59.13	47.00	29.06	71.98	74.98	75.02	84.26	84.26	85.62	81.96	81.32	82.74	82.52	77.70	83.71	80.67	80.31	76.35	82.09	82.03	81.87	43.95	41.59	7.24	6.55
2008	59.19	47.00	29.06	71.98	74.98	75.02	84.15	84.15	85.62	81.96	81.38	82.84	82.63	77.86	83.71	80.84	80.51	76.64	82.34	82.35	82.19	40.53	39.95	7.02	6.37
2009	59.21	47.00	29.06	71.98	74.98	75.02	84.26	84.26	85.62	82.05	81.46	82.84	82.84	77.79	83.71	80.75	80.37	76.92	82.70	82.52	82.52	40.69	39.95	7.13	6.48
2010	56.83	47.00	29.06	71.98	74.98	75.02	84.26	84.26	85.62	82.23	81.55	82.95	82.84	77.95	83.71	80.94	80.61	77.17	0.00	0.00	0.00	39.47	38.89	7.23	0.00
2011	73.85	47.00	29.06	71.98	74.98	75.02	84.26	84.26	85.62	0.00	81.59	83.06	82.95	78.16	83.71	81.26	81.04	77.38	0.00	0.00	0.00	39.63	37.51	0.00	0.00
2012	73.95	47.00	29.06	71.98	74.98	75.02	84.26	84.26	85.62	0.00	81.70	83.06	83.06	78.31	84.47	81.43	81.23	77.85	0.00	0.00	0.00	39.38	38.73	0.00	0.00
2013	73.99	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	81.72	83.17	83.17	78.34	84.47	81.47	81.34	77.99	0.00	0.00	0.00	39.63	39.06	0.00	0.00
2014	64.81	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	81.72	83.28	83.06	0.00	84.47	81.52	81.38	0.00	0.00	0.00	0.00	40.69	40.12	0.00	0.00
2015	72.15	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	81.72	83.28	83.06	0.00	84.47	81.52	0.00	0.00	0.00	0.00	0.00	40.69	0.00	0.00	0.00
2016	76.92	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	81.72	83.28	83.06	0.00	84.47	81.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	75.90	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	81.72	83.28	83.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	74.31	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	0.00	83.28	83.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019	73.57	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	73.57	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	73.57	47.00	29.06	71.98	74.98	75.02	84.50	84.26	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	72.67	47.00	29.06	71.98	74.98	75.02	0.00	0.00	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	41.05	47.00	29.06	71.98	74.98	0.00	0.00	0.00	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	9.31	47.00	29.06	71.98	0.00	0.00	0.00	0.00	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	59.99	47.00	29.06	71.98	0.00	0.00	0.00	0.00	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	59.99	47.00	29.06	71.98	0.00	0.00	0.00	0.00	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	59.99	47.00	29.06	71.98	0.00	0.00	0.00	0.00	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2028	59.99	47.00	29.06	71.98	0.00	0.00	0.00	0.00	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029	59.99	47.00	29.06	71.98	0.00	0.00	0.00	0.00	85.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

S.T. Jones

Pennsylvania Power & Light Company
Response to Interrogatories
of the PP&L Industrial Customer Alliance, Set VII
Dated June 5, 1997
Docket No. R-00973954
(Supplemental Response - July 25, 1997)

Q.1. Refer to PP&L's answer to OCA-III-74. Please provide workpapers showing the following information:

a. Derivation of the 8.91% cost of capital
b. Workpapers showing the connection between the annual capacity cost figures shown on STJ-8 and the figures shown on the response to OCA-III-74.
c. To the extent that the capacity figures reported on STJ-8 rely on fixed charge rate or annual carrying cost rate of any kind (whether levelized real, levelized nominal, or otherwise), please provide all workpapers supporting the figures uses.

A.1.c. The following definitions and explanation is provided relative to Dr. Jones' Exhibit STJ-8.

1. Capital Costs: Cost of constructing capacity additions.

2. Cost of Capital: Expected return that is forgone by investing in capacity additions (opportunity cost of capital).

3. Variable Cost of Capital: The incremental cost of maintaining capacity in an operational status. This represents a price "floor" for sellers of existing capacity.

4. PP&L is a net seller of capacity. The Company is and has been approached by utilities who want to acquire short-term and long-term capacity, plus forward capacity (i.e., 24 months out). Because of this, PP&L has information on buyers' willingness to pay for capacity over a variety of time horizons. PP&L provided Dr. Jones with this information. Dr. Jones analyzed this information and determined that when excess capacity existed in PJM, the price for capacity tended to be very low, near incremental cost. This is the type of market behavior has been exhibited elsewhere, such as in the market for natural gas following FERC Order No. 636.

AUG - 6 1997

Competition in commodity markets tends to cause prices to rise rapidly when it is clear that demand will continue to grow, absorbing existing capacity. Since investors lack perfect foresight, competitive markets can "overshoot" a long-term equilibrium price (the period leading up to 2002 in Dr. Jones' Exhibit STJ 8) and produce some "overbuild", resulting in a brief period of subsequent price softness as shown by Dr. Jones in 2003-05 of his Exhibit STJ 8.

Attachment 1 is a copy of the "spread sheet" showing the year-to-year calculation of capacity prices ($/kW), as they appear in Exhibit STJ-8. The spread sheet contains both short and forward capacity data used by Dr. Jones. The prices shown in the early years (e.g., 1996, 1997) are compiled from actual negotiations between PP&L as a seller of capacity and potential buyers as reported by PP&L staff to Dr. Jones. In this way, Dr. Jones' capacity price outlook is grounded in actual "bid-ask" market information.

Capacity Price Forecast

(3/13/97)

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Forward Capacity Value	$/kW/yr.	**17**	**19**	**22**	25	29	38	50	49	48	49	47	50	52	53
Short term Cap Value	$/kW/yr.	**9**	**13**	**17**	22	29	38	50	49	48	44	45	50	51	53
Discount: Short Term vs. Forward		50%	35%	25%	10%	0%	0%	0%	0%	0%	10%	5%	0%	0%	0%
Cost of CT Capacity	$/kW	338	345	352	359	366	373	381	388	396	404	412	420	429	437

Notes:

a. The cost of CT capacity is escalated at 2%/yr.

b. Data for forward capacity values and short term capacity values shown in bold are compiled from PP&L capacity sales agreements.

c. Short term capacity values beyond 2009 are escalated by inflation.

d. Capacity cost from vendors (Westinghouse, General Electric, ABB, Seimans, etc.)

Attorney Work Product,
Privileged and Confidential

Attachment 1

Exhibit No.___(RJF-10)
Page 3 of 3

Responsible Party:
Scott T. Jones

Exhibit No.__(RJF-11a)
Corrected STJ Capacity
Per EGEAS Run

Year	Fixed Capacity Cost	Total Operating Cost Less Energy Revenue	Jones Capacity Credit	Jones Capacity Shortfall	Corrected Capacity Price
1996	41.73				
1997	42.56				
1998	43.41				
1999	44.28	6.40	22.00	28.68	50.68
2000	45.17	5.86	29.00	22.03	51.03
2001	46.07	5.21	38.00	13.28	51.28
2002	46.99	6.93	50.00	3.93	53.93
2003	47.93	7.23	49.00	6.17	55.17
2004	48.89	6.87	48.00	7.76	55.76
2005	49.87	7.92	44.00	13.79	57.79
2006	50.87	8.50	45.00	14.36	59.36
2007	51.88	9.19	50.00	11.07	61.07
2008	52.92	8.76	53.00	8.68	61.68
2009	53.98	10.30	53.00	11.29	64.29
2010	55.33	10.73	54.00	12.06	66.06

Exhibit No.__(RJF-11b)
Corrected STJ Capacity
Per AdjustedEGEAS Run

Year	Fixed Capacity Cost	Total Operating Cost Less Energy Revenue	Jones Capacity Credit	Jones Capacity Shortfall	Corrected Capacity Price
1996	41.73				
1997	42.56				
1998	43.41				
1999	44.28	9.65	22.00	31.93	53.93
2000	45.17	9.96	29.00	26.13	55.13
2001	46.07	9.97	38.00	18.05	56.05
2002	46.99	10.61	50.00	7.60	57.60
2003	47.93	11.04	49.00	9.97	58.97
2004	48.89	10.39	48.00	11.28	59.28
2005	49.87	11.38	44.00	17.25	61.25
2006	50.87	11.36	45.00	17.23	62.23
2007	51.88	12.67	50.00	14.56	64.56
2008	52.92	11.62	53.00	11.55	64.55
2009	53.98	13.31	53.00	14.29	67.29
2010	55.33	13.40	54.00	14.73	68.73

Keep in mind the difference between LHV and HHV in making fuel calculations

Introduction: It is general practice in the industry to calculate gas turbine performance on the basis of the lower heating value (LHV) of the fuel to be burned whereas fuel supply requirement and purchase contracts are figured on the basis of higher heating value (HHV).

The difference between them is BTU content you pay for but do not see as power output. Technically it is difficult to explain. Basically, however, what it amounts to is that fuel-bound hydrogen forms water as a by-product of combustion which is not recoverable in the exhaust.

HHV is measured on the basis of the chemical energy in the fuel which accounts for the total heat given up when the fuel is burned (including formation of water vapor) while LHV measures the useable energy.

In practical terms, some 6% by weight of liquid fuels is "wasted" versus 11% for natural gas fuel. Or, put another way, you must increase LHV fuel consumption by a factor of 1.06 for liquid fuels and by 1.11 for gas.

Cycle studies for gas turbine projects are done on an LHV basis and fuel requirement on an HHV basis. This means you must figure on supplying gas turbines more fuel than called for in the specifications and performance calculations.

Bulk Weight of Liquid Fuels. This table lists the weights of various liquid fuels. For gaseous fuel 3500 cubic feet of still gas is equivalent to one 42-gallon barrel of liquid fuel.

Type Fuel	Gravity at 60°F (Average)	Gallons per Pound	Pounds per Gallon	Pounds 42-Gal Barrel	Barrels per Short Ton (2000 Lbs)	Barrels per Metric Ton (2205 Lbs)
Crude Oil (U.S. imports)	25.6	0.13333	7.500 lb	315 lb	6.349 bbl	6.998 bbl
Crude Oil (U.S. domestic)	36.0	0.14217	7.034 lb	295 lb	6.770 bbl	7.463 bbl
Distillate Oil	31.3	0.13817	7.237 lb	304 lb	6.580 bbl	7.253 bbl
Residual Oil	18.0	0.12687	7.882 lb	331 lb	6.041 bbl	6.660 bbl
Liquefied Petroleum Gas	—	0.22104	4.524 lb	190 lb	10.526 bbl	11.603 bbl

Cross Index to BTU Content of Fuels (HHV). This table lists HHV values. For approximate performance calculations, figure on an LHV of 18,400 BTU/lb for distillate or crude oil.

Fuel Type and Bulk	42-Gallon Barrel of Crude Oil	1000-Cu Ft of Natural Gas	42-Gallon Barrel of Distillate	42-Gallon Barrel of Residual	42-Gallon Barrel of LPG
Btu Content x 10^6	5,800 Btu	1.035 Btu	5.825 Btu	6.287 Btu	4.011 Btu
Crude Oil (42-gallon barrel)	1.000	5.604	0.996	0.923	1.446
Dry Natural Gas (1000 cubic feet)	0.178	1.000	0.178	0.165	0.258
Distillate Oil (42-gallon barrel)	1.004	5.628	1.000	0.927	1.452
Residual Oil (42-gallon barrel)	1.084	6.074	1.079	1.000	1.567
Liquefied Petroleum Gas (42-gallon barrel)	0.692	3.875	0.689	0.638	1.000

Exhibit No.___(RJF- 13a)
Correction of STJ-28
Based on EGEAS CC Capacity

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Operating Margin		15658	17575	17675	15171	16167	21711	22784	24860	26003	25444	26667	30959	29373	30522
Depreciation Index Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Depr. Rate		7.50%	6.94%	6.42%	5.94%	5.49%	5.08%	4.70%	4.35%	4.29%	4.29%	4.29%	4.29%	4.29%	4.29%
Cumulative Tax Deprciation		7.50%	14.44%	20.85%	26.79%	32.28%	37.36%	42.06%	46.40%	50.69%	54.98%	59.27%	63.55%	67.84%	72.13%
Tax Basis EOY		249055	230376	213097	197115	182331	168657	156007	144307	132763	121219	109675	98131	86587	75043
Tax Depreciation		-20194	-18679	-17278	-15982	-14784	-13675	-12649	-11701	-11544	-11544	-11544	-11544	-11544	-11544
Interest		-8314	-8037	-7760	-7483	-7206	-6929	-6652	-6374	-6097	-5820	-5543	-5266	-4989	-4711
Income Tax		5333	3794	3056	3442	2416	-460	-1445	-2816	-3470	-3353	-3976	-5872	-5329	-5921
Net Income		-7517	-5348	-4307	-4852	-3406	648	2038	3969	4891	4727	5604	8277	7511	8346
Construction Expenditures	-269248														
EOY Book Value	269248	249055	230376	213097	197115	182331	168657	156007	144307	132763	121219	109675	98131	86587	75043
EOY Debt	103930	100465	97001	93537	90073	86608	83144	79680	76215	72751	69287	65822	62358	58894	55429
Net Income		-7517	-5348	-4307	-4852	-3406	648	2038	3969	4891	4727	5604	8277	7511	8346
Depreciation		-20194	-18679	-17278	-15982	-14784	-13675	-12649	-11701	-11544	-11544	-11544	-11544	-11544	-11544
Working Cap.		2288	3322	3276	3314	3362	4019	4148	4488	4643	4888	5097	5608	5508	5726
Debt Cash Flow	103930	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464
Work Cap. Cash Flow		-2288	-1034	46	-38	-48	-657	-129	-340	-156	-244	-209	-511	100	-218
Net Cash Flow	-165318	6924	8833	9553	7628	7865	10201	11094	11865	12815	12562	13475	15846	15691	16207
NPV 1$	0.89	0.79	0.70	0.62	0.55	0.49	0.44	0.39	0.35	0.31	0.27	0.24	0.22	0.19	0.17
12.50%	-146950	-141479	-135275	-129311	-125078	-121199	-116726	-112402	-108291	-104345	-100906	-97628	-94201	-91184	-88414
NET PV Lifetime	-66631														
Internal Rate of Return	6.91%														

Exhibit No. ___ (RJF-13a)
Page 1 of 2

Exhibit No.___(RJF-13a)
Correction of STJ-28
Based on EGEAS CC Capacity

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
31352	32203	33076	33970	34886	35826	36789	37776	38788	39825	40888	41977	43094	44238	45412	46614
15	16	17	18	19	20	21									
4.29%	4.29%	4.29%	4.29%	4.29%	4.29%	2.15%									
76.42%	80.70%	84.99%	89.28%	93.57%	97.85%	100.00%									
63499	51955	40411	28867	17323	5779	0									
-11544	-11544	-11544	-11544	-11544	-11544	-5779									
-4434	-4157	-3880	-3603	-3326	-3049	-2771	-2494	-2217	-1940	-1663	-1386	-1109	-831	-554	-277
-6380	-6848	-7325	-7812	-8307	-8812	-11719	-14642	-15177	-15722	-16278	-16845	-17424	-18014	-18616	-19230
8994	9654	10326	11011	11710	12421	16520	20640	21394	22162	22946	23746	24561	25393	26242	27107
63499	51955	40411	28867	17323	5779	0									
51965	48501	45036	41572	38108	34643	31179	27715	24250	20786	17322	13857	10393	6929	3464	0
8994	9654	10326	11011	11710	12421	16520	20640	21394	22162	22946	23746	24561	25393	26242	27107
-11544	-11544	-11544	-11544	-11544	-11544	-5779	0	0	0	0	0	0	0	0	0
5869	6015	6166	6320	6478	6640	6806	6976	7150	7329	7512	7700	7893	8090	8292	8500
-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464	-3464
-143	-147	-150	-154	-158	-162	-166	-170	-174	-179	-183	-188	-193	-197	-202	-207
16930	17587	18255	18937	19631	20339	18668	17005	17755	18519	19299	20094	20904	21731	22575	23436
0.15	0.14	0.12	0.11	0.09	0.08	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.03
-85843	-83468	-81277	-79257	-77395	-75680	-74282	-73149	-72098	-71123	-70221	-69385	-68613	-67899	-67239	-66631

Exhibit No.___(RJF- 13b)
Correction of STJ-28
Based on Current CC Models

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating Margin		18961	20068	26612	27898	30428	31784	31397	32904	37962	36155	37585	38601	39642	40710	41804
Depreciation Index Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Depr. Rate		7.50%	6.94%	6.42%	5.94%	5.49%	5.08%	4.70%	4.35%	4.29%	4.29%	4.29%	4.29%	4.29%	4.29%	4.29%
Cumulative Tax Deprciation		7.50%	14.44%	20.85%	26.79%	32.28%	37.36%	42.06%	46.40%	50.69%	54.98%	59.27%	63.55%	67.84%	72.13%	76.42%
Tax Basis EOY		282170	261008	241432	223325	206575	191082	176751	163495	150416	137337	124258	111179	98100	85021	71942
Tax Depreciation		-22879	-21163	-19576	-18107	-16749	-15493	-14331	-13256	-13079	-13079	-13079	-13079	-13079	-13079	-13079
Interest		-9420	-9106	-8792	-8478	-8164	-7850	-7536	-7222	-6908	-6594	-6280	-5966	-5652	-5338	-5024
Income Tax		5535	4233	728	-545	-2289	-3503	-3955	-5157	-7460	-6840	-7564	-8116	-8678	-9251	-9836
Net Income		-7802	-5968	-1027	768	3226	4938	5575	7269	10515	9642	10662	11440	12233	13041	13865
Construction Expenditures	-305049															
EOY Book Value	305049	282170	261008	241432	223325	206575	191082	176751	163495	150416	137337	124258	111179	98100	85021	71942
EOY Debt	117749	113824	109899	105974	102049	98124	94199	90274	86349	82424	78499	74574	70649	66724	62799	58874
Net Income		-7802	-5968	-1027	768	3226	4938	5575	7269	10515	9642	10662	11440	12233	13041	13865
Depreciation		-22879	-21163	-19576	-18107	-16749	-15493	-14331	-13256	-13079	-13079	-13079	-13079	-13079	-13079	-13079
Working Cap.		3724	3779	4517	4662	5044	5219	5494	5729	6303	6191	6436	6597	6761	6930	7104
Debt Cash Flow	117749	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925
Work Cap. Cash Flow		-3724	-54	-738	-145	-382	-175	-275	-235	-574	112	-245	-161	-165	-169	-173
Net Cash Flow	-187300	7427	11216	13885	14805	15668	16331	15706	16365	19095	18909	19571	20433	21222	22026	22846
NPV 1$	0.89	0.79	0.70	0.62	0.55	0.49	0.44	0.39	0.35	0.31	0.27	0.24	0.22	0.19	0.17	0.15
12.50%	-166489	-160621	-152744	-144075	-135859	-128130	-120970	-114848	-109179	-103299	-98123	-93361	-88941	-84861	-81097	-77627
NET PV Lifetime	-58014															
Internal Rate of Return	8.80%															

Exhibit No.___(RJF- 13b)
Correction of STJ-28
Based on Current CC Models

2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
42925	44074	45252	46460	47698	48966	50267	51600	52966	54367	55802	57273	58781	60327	61912
16	17	18	19	20	21									
4.29%	4.29%	4.29%	4.29%	4.29%	2.15%									
80.70%	84.99%	89.28%	93.57%	97.85%	100.00%									
58863	45784	32705	19626	6547	0									
-13079	-13079	-13079	-13079	-13079	-6547									
-4710	-4396	-4082	-3768	-3454	-3140	-2826	-2512	-2198	-1884	-1570	-1256	-942	-628	-314
-10431	-11039	-11658	-12289	-12933	-16301	-19688	-20371	-21069	-21780	-22506	-23247	-24003	-24775	-25563
14705	15561	16434	17324	18231	22978	27753	28716	29699	30702	31726	32770	33836	34924	36035
58863	45784	32705	19626	6547	0									
54950	51025	47100	43175	39250	35325	31400	27475	23550	19625	15700	11775	7850	3925	0
14705	15561	16434	17324	18231	22978	27753	28716	29699	30702	31726	32770	33836	34924	36035
-13079	-13079	-13079	-13079	-13079	-6547	0	0	0	0	0	0	0	0	0
7281	7463	7650	7841	8037	8238	8444	8655	8872	9093	9321	9554	9793	10037	10288
-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925	-3925
-178	-182	-187	-191	-196	-201	-206	-211	-216	-222	-227	-233	-239	-245	-251
23681	24533	25401	26286	27189	25400	23622	24580	25558	26556	27573	28612	29672	30754	31859
0.14	0.12	0.11	0.09	0.08	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.03
-74430	-71485	-68775	-66283	-63991	-62088	-60514	-59059	-57714	-56472	-55325	-54268	-53293	-52395	-51568

Exhibit No. ___ (RJF-13b)
Page 2 of 2

Benchmark of EGEAS To
Kennedy and Associates' Models
Cancellation of Trimble County Vs. Completion of Baseload Forecast
Present Worth Revenue Requirements: 1984-2023

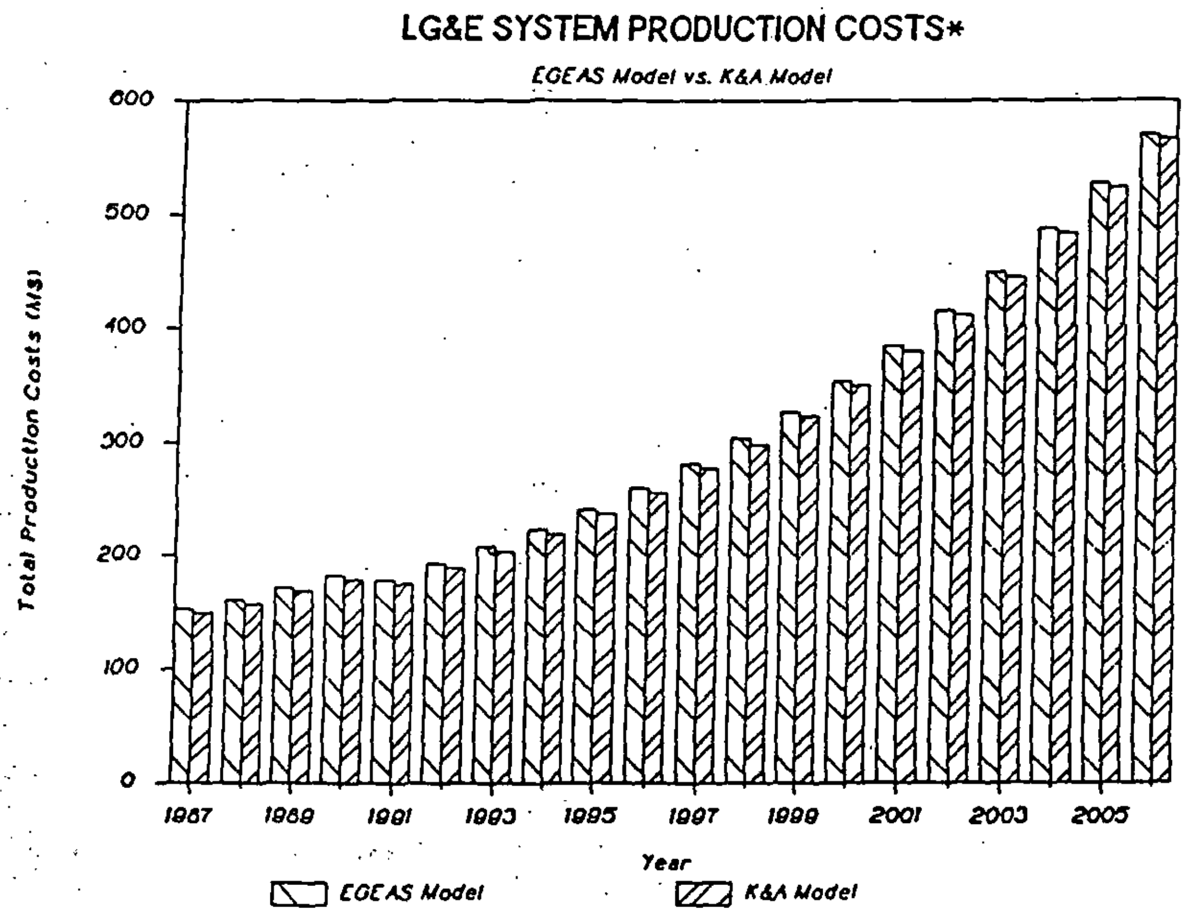
(Millions of Dollars)

	Kennedy & Assoc. Models	S&W EGEAS	Difference (%)
1988 Trimble County Revenue Requirements			
Fuel and Variable O&M	2308	2310	(0.1)
Fixed Charges	863	829	4.1
Total	3172	3139	0.5
All Gas Turbines *			
Fuel and Variable O&M	2701	2683	0.7
Fixed Charges	397	383	3.7
Total	3097	3066	1.0
Difference	73	73	0.0

* Assumes turbines run on oil.
May not add precisely due to round off.

Q. What is the source of the data used in the K&A model in this case, and have you verified the results of the model by comparison of the LG&E EGEAS program?

A. <u>All of the data used in modeling the LG&E system came directly from the Company's EGEAS input data files</u>. This data includes unit capacities, heat rates, fuel costs, forced outage rates, variable O&M costs, energy forecasts, and capacity expansion alternatives. We modeled the base, low and high load growth cases, and the underlying expansion plans proposed by Mr. Lyon. In all instances conservative modeling assumptions were employed whenever judgmental decisions in data conver-



*Production costs include fuel, O&M and purchased power expenses.
Figure 1

Case 1: New Model

Cromby	2 Eddysto	3 Eddysto	4 Delawar	7 Delawar	8 Schuylk	1	PECO CT's	Martin Cr.	PPL CT's
327.	562.	501.	129.	83.	86.	113.	769.	36.	

Case 2 Exactly as Modeled In Original Direct Testimony Market Price Studies

Summer

Cromby	2 Eddysto	3 Eddysto	4 Delawar	7 Delawar	8 Schuylk	1	PECO CT's	Martins Cr.	PPL CT's
176.	303.	290.	76.	53.	57.	83.	387.	27.	

Spring, Fall, Winter

Cromby	2 Eddysto	3 Eddysto	4 Delawar	7 Delawar	8 Schuylk	1	PECO CT'S	Martins Cr.	PPL CT's
189.	310.	290.	72.	44.	45.	59.	277.	20.	

Total 1995 As Modeled

Cromby	2 Eddysto	3 Eddysto	4 Delawar	7 Delawar	8 Schuylk	1	PECO CT'S	Martins Cr.	PPL CT's
365.	613.	580.	148.	97.	102.	142.	664.	47.	

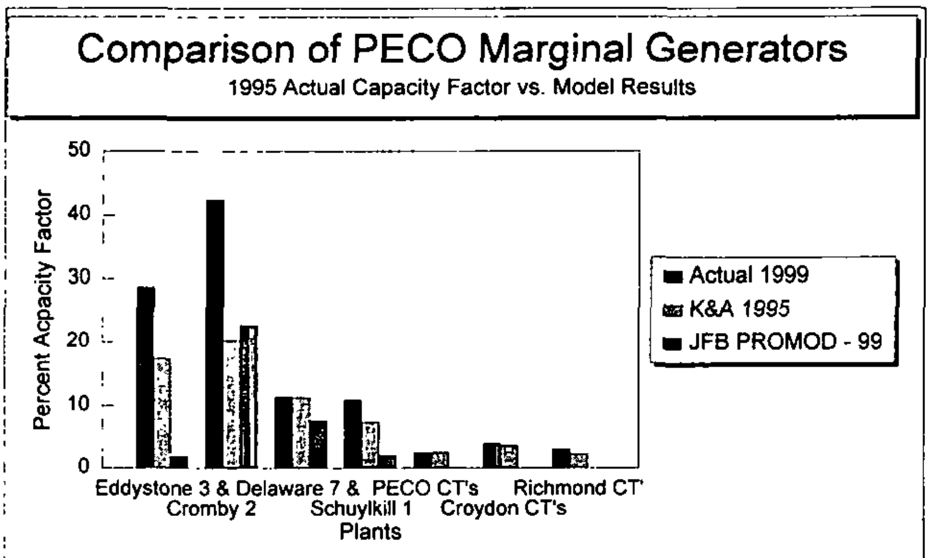
Comparison to Actual 1995

	Actual	CF	Case 1	CF	Case 2	CF	mW
Eddystone 3 & 4	1908.	28.7	1063.	16.0	1193.	17.9	760.
Cromby 2	746.	42.4	327.	18.6	365.	20.7	201.
Delaware 7 & 8	249.	11.4	212.	9.7	245.	11.2	250.
Schuylkill 1	159.	10.9	86.	5.9	102.	7.0	166.
PECO CT's	174.	2.4	113.	1.5	142.	1.9	835.
Martins Cr. 3 & 4	1033.	7.4	769	5.5	664.	4.8	1592.
PP&L CT's	23.	0.7	36.	1.0	47.	1.4	393.

Exhibit No.___(RJF-15)
PECO Marginal Generator Capacity Factors

	Actual 1995	K&A Model	JFB Promod	EGEAS
Eddystone 3 & 4	28.7	17.4	1.9	-
Cromby 2	42.4	20.3	22.7	-
Delaware 7 & 8	11.4	11.3	7.7	-
Schuylkill 1	10.9	7.4	1.98	-
PECO CT's	2.4	2.5	0.0	2.1*
Croydon CT's	3.9	3.6	N	-
Richmond CT's	3	2.3	N	-
Martins Creek	7.4	5.5	N	5.3
PPL CT's	0.7	1.0	N	0.1

* - EGEAS Result is Average for all PECO Marginal Units. Actual 1995 Average Capacity Factor for these units was 16.7%, some 8 times greater than EGEAS predicts.



DOCKETED

AUG 28 1997

PPLICA STATEMENT NO. 2-S
(UPDATE -- 8/22/97)

S2
8-26-97
HRG

BEFORE THE

PENNSYLVANIA PUBLIC UTILITY COMMISSION

APPLICATION OF PENNSYLVANIA POWER AND LIGHT COMPANY FOR APPROVAL OF ITS RESTRUCTURING PLAN UNDER SECTION 2806 OF THE PUBLIC UTILITY CODE	)	DOCKET NO. R-00973954

DOCUMENT FOLDER

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SURREBUTTAL TESTIMONY

AND EXHIBITS

OF

RANDALL J. FALKENBERG

ERRATA

ON BEHALF OF THE

PP&L INDUSTRIAL CUSTOMER ALLIANCE

J. KENNEDY AND ASSOCIATES, INC.
ATLANTA, GEORGIA

AUGUST 1997

APPLICATION OF PENNSYLVANIA	)	
POWER AND LIGHT COMPANY	)	
FOR APPROVAL OF ITS	)	
RESTRUCTURING PLAN UNDER	)	**DOCKET NO. R-00973954**
SECTION 2806 OF THE PUBLIC	)	
UTILITY CODE	)	

Errata To Surrebuttal Testimony of Randall J. Falkenberg

Exhibit No.___(RJF-9) contained some inconsistent calculations and has been revised. The net effect of these changes are minor. The changes generally fall into these categories:

a. Inconsistent unit retirement dates between the calculation of energy margins (which went to the last year each unit runs) and capacities and fixed O&M (which went to the last year the station generated energy).

b. A slight overstatement of generation from hydro units.

c. An exclusion of the energy margins for Martins Creek Units 1 and 2 from the NPV calculation.

d. Incorrect retirement date for Holtwood 17.

The net effect of these revisions is to reduce PP&L's stranded costs from $799 million to $798 million. Attached is Exhibit No.___(RJF-9-Revised) which presents the corrected analysis.

In addition, the following changes should be made in the testimony (PPLICA Statement No. 2-S):

Page 2, line 4 changes from $799 to $798.

Page 3, line 13 changes from $64 to $63.

Page 3, line 13 changes from $799 to $798.

Page 4, line 15 should have the sentence "Finally, I revised certain other factors that reduced PP&L's stranded costs by $1 million." added to the end.

Page 4, line 18 changes from $64 to $63.

Exhbit No.___(RJF-9a- Revised)
PENNSYLVANIA POWER AND LIGHT COMPANY
STRANDED COST SUMMARY

Net Present Value of Contribution Margins	$2,618,759
Production Net Plant	$3,652,804
Inventory and Working Capital	$200,958
Total Book Value	$3,853,762
Future Tax Depreciation Benefits	$108,739
Accumulated Deferred Investment Tax Credit Benefits	$78,101
Deferred Income Tax	$798,985
Total Adjusted NPV -	$249,178
NUG's Adjusted NPV	$556,304
Less Non-Jurisdictional	($7,774)
GRAND TOTAL	$797,707
Scenario: EIA FUEL PRICE Escalation	

Exhbit No.___(RJF-9b-Revised)
PENNSYLVANIA POWER AND LIGHT COMPANY
CALCULATION OF NET PRESENT VALUE OF CONTRIBUTION MARGINS

		============Capacity===========				Capacity	Capacity	Energy	PSH								Net	Cumulative
	Year	Large Units	CT's	PSH	Total	Charges	Revenue	Margins	Magins	Total Costs	O&M	Cap. Add	A&G	Other Tax	Decomm.	Life Ext.	Margin	NPV After Tax
	1999	7904	408	0	8312	24.95	$207,406	$478,158	$0	$583,929	$437,553	$70,932	$650	$63,113	$11,681	$0	$101,636	$57,282
	2000	7904	408	0	8312	38.59	$320,785	$537,139	$0	$620,028	$448,448	$96,119	$666	$63,113	$11,681	$0	$237,897	$181,521
	2001	7904	408	0	8312	52.12	$433,202	$593,463	$0	$633,137	$461,901	$95,755	$686	$63,113	$11,681	$0	$393,529	$371,955
	2002	7904	408	0	8312	49.61	$412,340	$648,936	$0	$664,202	$475,758	$112,943	$707	$63,113	$11,681	$0	$397,074	$550,004
	2003	7904	408	0	8312	46.09	$383,093	$711,929	$0	$776,789	$491,066	$158,357	$728	$63,113	$11,681	$51,844	$318,233	$682,227
	2004	7904	408	0	8312	52.94	$440,067	$710,770	$0	$877,538	$505,798	$284,355	$750	$63,113	$11,681	$11,841	$273,299	$787,448
Disc. Rate	2005	7904	408	0	8312	58.13	$483,197	$722,037	$0	$754,695	$520,972	$158,156	$772	$63,113	$11,681	$0	$450,539	$948,176
7.92%	2006	7904	408	0	8312	58.02	$482,242	$756,308	$0	$769,057	$538,633	$101,597	$799	$63,113	$11,681	$53,235	$469,492	$1,103,375
	2007	7904	408	0	8312	59.96	$498,393	$778,538	$0	$745,977	$556,893	$113,465	$826	$63,113	$11,681	$0	$530,954	$1,266,009
Tax Rate	2008	7904	408	0	8312	63.56	$528,341	$790,996	$0	$749,924	$575,771	$98,505	$854	$63,113	$11,681	$0	$569,413	$1,427,624
41.49%	2009	7904	408	0	8312	63.39	$526,883	$827,204	$0	$762,445	$595,290	$91,478	$883	$63,113	$11,681	$0	$591,642	$1,583,225
	2010	6791	408	0	7199	65.00	$467,910	$818,370	$0	$757,401	$585,105	$98,766	$912	$60,936	$11,681	$0	$528,879	$1,712,112
	2011	5878	408	0	6286	70.43	$442,725	$827,249	$0	$700,988	$546,042	$85,494	$945	$56,825	$11,681	$0	$568,986	$1,840,596
	2012	5878	408	0	6286	74.31	$467,123	$854,974	$0	$716,909	$565,481	$81,943	$979	$56,825	$11,681	$0	$605,188	$1,967,226
Post 2014	2013	5878	408	0	6286	76.62	$481,651	$907,590	$0	$732,336	$585,613	$77,204	$1,013	$56,825	$11,681	$0	$656,905	$2,094,591
Inflation	2014	5179	408	0	5587	74.57	$416,599	$890,052	$0	$705,680	$561,335	$77,406	$1,050	$54,208	$11,681	$0	$600,971	$2,202,559
3.56%	2015	4304	408	0	4712	77.22	$363,862	$799,273	$0	$654,608	$517,244	$74,100	$1,087	$50,497	$11,681	$0	$508,527	$2,287,214
	2016	4164	408	0	4572	79.97	$365,620	$812,628	$0	$659,271	$520,189	$76,738	$1,126	$49,537	$11,681	$0	$518,977	$2,367,269
	2017	3404	408	0	3812	82.82	$315,695	$721,408	$0	$623,632	$484,068	$79,469	$1,166	$47,249	$11,681	$0	$413,471	$2,426,369
	2018	2659	408	0	3067	85.76	$263,040	$621,666	$0	$584,861	$444,715	$82,299	$1,207	$44,960	$11,681	$0	$299,844	$2,466,081
	2019	2449	408	0	2857	88.82	$253,752	$607,320	$0	$592,306	$452,462	$81,952	$1,250	$44,960	$11,681	$0	$268,766	$2,499,066
	2020	2449	0	0	2449	91.98	$225,258	$628,940	$0	$609,176	$468,570	$83,965	$0	$44,960	$11,681	$0	$245,022	$2,526,929
	2021	2449	0	0	2449	95.25	$233,277	$651,330	$0	$628,846	$485,251	$86,954	$0	$44,960	$11,681	$0	$255,761	$2,553,880
	2022	2255	0	0	2255	98.65	$222,445	$629,135	$0	$625,639	$481,367	$87,631	$0	$44,960	$11,681	$0	$225,941	$2,575,941
	2023	1274	0	0	1274	102.16	$130,148	$355,208	$0	$335,451	$261,128	$45,376	$0	$23,107	$5,841	$0	$149,904	$2,589,503
	2024	289	0	0	289	105.79	$30,574	$59,501	$0	$25,853	$24,599	$0	$0	$1,254	$0	$0	$64,222	$2,594,887
	2025	289	0	0	289	109.56	$31,663	$61,617	$0	$26,729	$25,475	$0	$0	$1,254	$0	$0	$66,551	$2,600,057
	2026	289	0	0	289	113.46	$32,790	$63,811	$0	$27,636	$26,382	$0	$0	$1,254	$0	$0	$68,965	$2,605,021
	2027	289	0	0	289	117.50	$33,957	$66,085	$0	$28,575	$27,321	$0	$0	$1,254	$0	$0	$71,467	$2,609,788
	2028	289	0	0	289	121.68	$35,166	$68,436	$0	$29,548	$28,294	$0	$0	$1,254	$0	$0	$74,055	$2,614,365
	2029	289	0	0	289	126.01	$36,418	$70,872	$0	$30,555	$29,301	$0	$0	$1,254	$0	$0	$76,735	$2,618,759

NPV of Net Margins After Tax **$2,618,759**

bit No. ___ (RJF-9b - Revised)

Exhibit No.___(RJF-9c Revised)
PENNSYLVANIA POWER AND LIGHT COMPANY

Exhibit No.____(RJF-9c-R)
Page 1 of 4

Large Units
Capacity mW

UNIT		Safe Ho 1	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins	Martins	Martins	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire		3000	3000	3000	2023	2022	2021	2021	2009	2010	2017	2018	2018	2013	2018	2016	2014	2013	2009	2009	2009	2015	2014	2010	2009
1999	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2000	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2001	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2002	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2003	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2004	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2005	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2006	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2007	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2008	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	725	321	94	70	70	140	140	785	807
2009	7904	137	44	108	985	981	97	97	72	128	745	105	105	378	15	745	735	321	94	70	70	140	140	785	807
2010	6791	137	44	108	985	981	97	97	0	128	745	105	105	378	15	745	735	321	0	0	0	140	140	785	0
2011	5878	137	44	108	985	981	97	97	0	0	745	105	105	378	15	745	735	321	0	0	0	140	140	0	[illegible]
2012	5878	137	44	108	985	981	97	97	0	0	745	105	105	378	15	745	735	321	0	0	0	140	140	0	[illegible]
2013	5878	137	44	108	985	981	97	97	0	0	745	105	105	378	15	745	735	321	0	0	0	140	140	0	0
2014	5179	137	44	108	985	981	97	97	0	0	745	105	105	0	15	745	735	0	0	0	0	140	140	0	0
2015	4304	137	44	108	985	981	97	97	0	0	745	105	105	0	15	745	0	0	0	0	0	140	0	0	0
2016	4164	137	44	108	985	981	97	97	0	0	745	105	105	0	15	745	0	0	0	0	0	0	0	0	0
2017	3404	137	44	108	985	981	97	97	0	0	745	105	105	0	0	0	0	0	0	0	0	0	0	0	0
2018	2659	137	44	108	985	981	97	97	0	0	0	105	105	0	0	0	0	0	0	0	0	0	0	0	0
2019	2449	137	44	108	985	981	97	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	2449	137	44	108	985	981	97	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	2449	137	44	108	985	981	97	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	2255	137	44	108	985	981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	1274	137	44	108	985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	289	137	44	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	289	137	44	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	289	137	44	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	289	137	44	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	289	137	44	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	289	137	44	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Large Unit Output Report

UNIT		Safe Ho 1	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins	Martins	Martins	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire		3000	3000	3000	2023	2022	2021	2021	2009	2010	2017	2018	2018	2013	2016	2016	2014	2013	2009	2009	2009	2015	2014	2010	2009
1999	40925	351	80	592	6470	6447	705	704	531	919	5235	755	750	2520	107	5120	4983	2067	648	482	482	463	454	318	284
2000	41128	351	80	592	6470	6447	715	704	531	918	5294	756	752	2530	107	5147	5017	2085	655	487	488	507	497	364	328
2001	41305	351	80	592	6470	6447	715	703	530	919	5296	757	753	2538	109	5172	5048	2100	660	491	490	547	537	431	392
2002	41425	351	80	592	6470	6447	715	703	530	919	5298	758	755	2544	109	5187	5068	2110	663	492	492	576	566	493	452
2003	41546	351	80	592	6470	6447	715	715	530	918	5299	758	755	2548	109	5199	5084	2118	666	495	495	606	596	562	520
2004	41583	351	80	592	6470	6447	715	715	531	918	5300	759	758	2563	110	5236	5131	2123	667	496	496	567	558	524	485
2005	41706	351	80	592	6470	6447	715	715	540	920	5313	761	760	2572	110	5258	5157	2154	672	500	500	564	555	504	[illegible]
2006	41698	351	80	592	6470	6447	715	715	540	919	5307	761	759	2571	110	5260	5163	2142	673	501	501	566	555	504	[illegible]
2007	41676	351	80	592	6470	6447	715	715	540	919	5307	761	760	2574	110	5268	5174	2149	676	504	503	545	516	507	[illegible]
2008	41665	351	80	592	6470	6447	715	715	540	919	5312	762	760	2579	110	5278	5186	2158	679	505	505	504	496	432	459
2009	41677	351	80	592	6470	6447	716	716	540	920	5317	763	762	2578	110	5274	5180	2165	682	507	506	505	496	500	467
2010	39462	351	80	592	6470	6447	716	716	0	922	5323	763	763	2583	110	5286	5195	2173	0	0	0	490	482	505	0
2011	38590	351	80	592	6470	6447	716	716	0	0	5327	764	763	2590	110	5306	5222	2178	0	0	0	492	466	0	0
2012	38653	351	80	592	6470	6447	716	716	0	0	5333	765	765	2594	111	5317	5234	2192	0	0	0	489	481	0	0
2013	38676	351	80	592	6470	6447	718	716	0	0	5335	765	765	2596	111	5321	5240	2194	0	0	0	491	484	0	0
2014	33918	351	80	592	6470	6447	718	716	0	0	5335	766	765	0	111	5323	5244	0	0	0	0	504	498	0	0
2015	28178	351	80	592	6470	6447	718	716	0	0	5335	766	765	0	111	5323	0	0	0	0	0	504	0	0	0
2016	27674	351	80	592	6470	6447	718	716	0	0	5335	766	765	0	111	5323	0	0	0	0	0	0	0	0	0
2017	22240	351	80	592	6470	6447	718	716	0	0	5335	766	765	0	0	0	0	0	0	0	0	0	0	0	0
2018	16905	351	80	592	6470	6447	718	716	0	0	0	766	765	0	0	0	0	0	0	0	0	0	0	0	0
2019	15374	351	80	592	6470	6447	718	716	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	15374	351	80	592	6470	6447	718	716	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	15374	351	80	592	6470	6447	718	716	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	13940	351	80	592	6470	6447	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	7493	351	80	592	6470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	1023	351	80	592	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	1023	351	80	592	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	1023	351	80	592	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	1023	351	80	592	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	1023	351	80	592	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	1023	351	80	592	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Exhibit No. ___ (RJF-9c - Revised) Page 1 of 4

Annual Total

Exhibit No.____(RJF-9c-R)
Page 2 of 4

Fuel Cost $ (1000)

UNIT		Safe Ha 1	Wallenp 1	Holtwoo 1	Susqueh 2	Susquah 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Kayston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins	Martins	Martins	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire		3000	3000	3000	2023	2022	2021	2021	2009	2010	2017	2018	2018	2013	2016	2016	2014	2013	2009	2009	2009	2015	2014	2010	2009
1999	466390	4	1	6	35424	35485	8390	8389	6531	12705	75900	11033	10956	37063	1581	75385	73555	31361	10053	7470	7456	8890	8752	12538	11224
2000	473956	4	1	6	35304	35365	8611	8473	6597	12840	76742	11168	11103	37627	1695	76627	74897	31975	10256	7622	7609	9830	9693	14909	13480
2001	482597	4	1	6	35703	35765	8713	8569	6671	12999	77671	11314	11260	38212	1632	77902	76257	32594	10459	7775	7763	10730	10597	18381	16784
2002	490341	4	1	6	36105	36169	8816	8670	6750	13153	76614	11457	11409	38749	1555	79047	77450	33126	10633	7905	7893	11428	11301	21863	20138
2003	498162	4	1	6	36515	36577	8921	8920	6823	13297	79559	11593	11551	39265	1677	80157	78614	33650	10804	8034	8023	12156	12035	25939	24084
2004	504294	4	1	6	36926	36991	9026	9026	6905	13458	80524	11756	11729	39950	1707	81682	80286	34126	10960	8150	8139	11533	11409	25159	23382
2005	512108	4	1	6	37344	37408	9134	9134	7111	13648	81670	11928	11905	40572	1734	83002	81649	35027	11166	8304	8294	11594	11473	25185	23159
2006	535592	4	1	6	38723	38789	9570	9570	7451	14278	85446	12482	12463	42498	1816	86983	85628	36505	11730	8725	8716	12180	12028	26223	24450
2007	559566	4	1	6	40151	40220	10025	10024	7805	14959	89531	13081	13064	44568	1905	91258	89894	38373	12333	9175	9166	12313	11710	27509	25711
2008	584785	4	1	6	41632	41705	10503	10503	8178	15684	93875	13718	13703	46767	1999	95796	94417	40351	12972	9651	9643	11903	11774	27812	26025
2009	611955	4	1	6	43170	43243	11004	11003	8568	16445	98433	14386	14373	48970	2093	100267	98768	42421	13641	10150	10142	12500	12367	29389	27588
2010	595819	4	1	6	44761	44839	11529	11529	0	17247	103234	15081	15062	51401	2197	105283	103767	44588	0	0	0	12712	12578	30991	0
2011	592705	4	1	6	46360	46440	11765	11765	0	0	105409	15409	15399	52601	2249	107838	106433	45618	0	0	0	13021	12387	0	0
2012	607624	4	1	6	48014	48097	12007	12007	0	0	107707	15746	15738	53769	2299	110257	108859	46843	0	0	0	13200	13070	0	0
2013	622039	4	1	6	49728	49815	12299	12251	0	0	109934	16072	16065	54899	2347	112595	111200	47863	0	0	0	13545	13415	0	0
2014	532241	4	1	6	51504	51594	12550	12502	0	0	112179	16402	16396	0	2396	114946	113552	0	0	0	0	14168	14041	0	[illegible]
2015	419032	4	1	6	53335	53409	12999	12950	0	0	116189	16983	16977	0	2482	119015	0	0	0	0	0	14682	0	0	[illegible]
2016	418745	4	1	6	55234	55311	13462	13411	0	0	120325	17587	17582	0	2570	123252	0	0	0	0	0	0	0	0	0
2017	303349	4	1	7	57200	57280	13940	13887	0	0	124609	18213	18208	0	0	0	0	0	0	0	0	0	0	0	0
2018	185103	4	1	7	59236	59319	14437	14383	0	0	0	18861	18855	0	0	0	0	0	0	0	0	0	0	0	0
2019	152634	4	1	7	61346	61431	14951	14894	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	158068	4	1	8	63530	63618	15483	15424	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	163695	4	1	8	65792	65883	16034	15973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	136375	5	1	8	68133	68228	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	70573	5	1	8	70559	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	14	5	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	15	5	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	15	5	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	15	5	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	15	5	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	17	6	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Fuel Cost $/mWh

UNIT		Safe Ha 1	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins	Martins	Martins	Martins 3
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire		3000	3000	3000	2023	2022	2021	2021	2009	2010	2017	2018	2018	2013	2016	2016	2014	2013	2009	2009	2009	2015	2014	2010	2009
1999	11.40	0.01	0.01	0.01	5.48	5.50	11.90	11.92	12.30	13.82	14.33	14.61	14.61	14.71	14.78	14.72	14.76	15.17	15.51	15.50	15.47	19.20	19.28	39.43	39.52
2000	11.52	0.01	0.01	0.01	5.46	5.49	12.04	12.04	12.42	13.99	14.50	14.77	14.76	14.87	15.01	14.89	14.93	15.34	15.66	15.65	15.66	19.39	19.50	40.96	41.10
2001	11.68	0.01	0.01	0.01	5.52	5.55	12.19	12.19	12.59	14.14	14.67	14.95	14.95	15.08	14.97	15.06	15.11	15.52	15.85	15.84	15.84	19.62	19.73	42.85	42.82
2002	11.84	0.01	0.01	0.01	5.58	5.61	12.33	12.33	12.74	14.31	14.84	15.11	15.11	15.23	15.18	15.24	15.28	15.70	16.04	16.07	16.04	19.84	19.97	44.35	44.55
2003	11.99	0.01	0.01	0.01	5.64	5.67	12.48	12.48	12.87	14.48	15.01	15.29	15.30	15.41	15.39	15.42	15.46	15.89	16.22	16.23	16.21	20.06	20.19	46.15	46.32
2004	12.13	0.01	0.01	0.01	5.71	5.74	12.62	12.62	13.00	14.66	15.19	15.49	15.47	15.59	15.52	15.60	15.65	16.07	16.43	16.43	16.41	20.34	20.45	48.01	48.21
2005	12.28	0.01	0.01	0.01	5.77	5.80	12.77	12.77	13.17	14.83	15.37	15.67	15.66	15.77	15.70	15.79	15.83	16.26	16.62	16.61	16.59	20.56	20.67	49.97	50.13
2006	12.84	0.01	0.01	0.01	5.99	6.02	13.35	13.38	13.60	15.54	16.10	16.40	16.42	16.53	16.51	16.54	16.58	17.04	17.43	17.42	17.40	21.52	21.67	52.03	52.36
2007	13.43	0.01	0.01	0.01	6.21	6.24	14.02	14.02	14.45	16.28	16.87	17.19	17.19	17.31	17.32	17.32	17.37	17.88	18.24	18.20	18.22	22.59	22.69	54.26	54.47
2008	14.04	0.01	0.01	0.01	6.43	6.47	14.69	14.69	15.14	17.07	17.67	18.00	18.03	18.13	18.17	18.15	18.20	18.70	19.10	19.11	19.10	23.62	23.74	56.53	[illegible]
2009	14.68	0.01	0.01	0.01	6.67	6.71	15.37	15.37	15.87	17.88	18.51	18.85	18.86	19.00	19.03	19.01	19.07	19.59	20.00	20.02	20.04	24.75	24.93	58.78	[illegible]
2010	15.10	0.01	0.01	0.01	6.92	6.96	16.10	16.10	0.00	18.71	19.35	19.77	19.74	19.90	19.97	19.92	19.97	20.52	0.00	0.00	0.00	25.94	26.10	61.37	[illegible]
2011	15.36	0.01	0.01	0.01	7.17	7.20	16.43	16.43	0.00	0.00	19.79	20.17	20.18	20.31	20.45	20.32	20.38	20.94	0.00	0.00	0.00	26.47	26.58	0.00	0.00
2012	15.72	0.01	0.01	0.01	7.42	7.45	16.77	16.77	0.00	0.00	20.20	20.58	20.57	20.73	20.71	20.74	20.80	21.37	0.00	0.00	0.00	26.99	27.17	0.00	0.00
2013	16.08	0.01	0.01	0.01	7.69	7.73	17.13	17.11	0.00	0.00	20.61	21.01	21.00	21.15	21.14	21.16	21.22	21.82	0.00	0.00	0.00	27.59	27.72	0.00	0.00
2014	15.69	0.01	0.01	0.01	7.96	8.00	17.48	17.46	0.00	0.00	21.03	21.41	21.43	0.00	21.59	21.69	21.65	0.00	0.00	0.00	0.00	28.11	28.31	0.00	0.00
2015	14.87	0.01	0.01	0.01	8.24	8.28	18.10	18.09	0.00	0.00	21.78	22.17	22.19	0.00	22.36	22.38	0.00	0.00	0.00	0.00	0.00	29.13	0.00	0.00	0.00
2016	15.13	0.01	0.01	0.01	8.54	8.58	18.75	18.73	0.00	0.00	22.55	22.96	22.98	0.00	23.15	23.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	13.64	0.01	0.01	0.01	8.84	8.88	19.42	19.40	0.00	0.00	23.36	23.78	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	10.95	0.01	0.01	0.01	9.16	9.20	20.11	20.09	0.00	0.00	0.00	24.62	24.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019	9.93	0.01	0.01	0.01	9.48	9.53	20.82	20.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	10.28	0.01	0.01	0.01	9.82	9.87	21.56	21.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	10.65	0.01	0.01	0.01	10.17	10.22	22.33	22.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	9.78	0.01	0.01	0.01	10.53	10.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	9.42	0.01	0.01	0.01	10.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2028	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029	0.02	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Exhibit No.____(RJF-9c-R)
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Market Energy Prices $/mWh

UNIT		Safe Ha 1	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34
Retire		3000	3000	3000	2023	2022	2021	2021	2009	2010	2017	2018
1999	23.08	22.54	22.64	22.59	22.80	22.80	22.73	22.76	22.78	22.77	22.79	22.82
2000	24.58	24.01	24.10	24.06	24.30	24.30	24.21	24.22	24.24	24.28	24.29	24.30
2001	26.05	25.45	25.55	25.50	25.76	25.76	25.67	25.71	25.74	25.72	25.74	25.75
2002	27.50	26.87	26.98	26.93	27.21	27.21	27.10	27.15	27.18	27.16	27.18	27.17
2003	29.13	28.47	28.59	28.53	28.83	28.83	28.72	28.72	28.78	28.79	28.79	28.79
2004	29.22	28.57	28.69	28.63	28.94	28.94	28.83	28.82	28.84	28.90	28.90	28.90
2005	29.59	28.94	29.05	29.00	29.33	29.33	29.21	29.21	29.20	29.28	29.28	29.28
2006	30.98	30.33	30.45	30.39	30.71	30.71	30.60	30.60	30.59	30.66	30.86	30.63
2007	32.11	31.40	31.53	31.47	31.83	31.83	31.70	31.70	31.69	31.78	31.78	31.75
2008	33.02	32.30	32.43	32.36	32.74	32.73	32.61	32.61	32.60	32.71	32.68	32.64
2009	34.53	33.79	33.93	33.87	34.23	34.23	34.06	34.06	34.10	34.20	34.18	34.13
2010	35.84	35.03	35.18	35.11	35.52	35.52	35.34	35.34	0.00	35.44	35.46	35.43
2011	36.80	35.98	36.13	36.05	36.48	36.48	36.30	36.30	0.00	0.00	36.41	36.38
2012	37.84	37.01	37.15	37.09	37.53	37.53	37.34	37.34	0.00	0.00	37.46	37.43
2013	39.55	38.71	38.85	38.79	39.22	39.22	39.12	39.04	0.00	0.00	39.15	39.13
2014	41.93	40.97	41.13	41.06	41.55	41.55	41.44	41.35	0.00	0.00	41.47	41.40
2015	43.24	42.42	42.41	42.49	43.03	43.03	42.92	42.83	0.00	0.00	42.95	42.87
2016	44.50	43.93	43.94	44.01	44.56	44.56	44.44	44.35	0.00	0.00	44.48	44.40
2017	46.08	45.49	45.50	45.58	46.15	46.15	46.03	45.93	0.00	0.00	46.06	45.98
2018	47.72	47.11	47.11	47.20	47.79	47.79	47.66	47.56	0.00	0.00	0.00	47.61
2019	49.43	48.79	48.79	48.88	49.49	49.49	49.36	49.26	0.00	0.00	0.00	0.00
2020	51.19	50.53	50.53	50.62	51.26	51.25	51.12	51.01	0.00	0.00	0.00	0.00
2021	53.01	52.32	52.33	52.42	53.08	53.08	52.94	52.83	0.00	0.00	0.00	0.00
2022	54.91	54.19	54.20	54.29	54.97	54.97	0.00	0.00	0.00	0.00	0.00	0.00
2023	56.82	56.12	56.11	56.22	56.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	58.18	58.12	58.11	58.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	60.25	60.19	60.18	60.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	62.39	62.32	62.33	62.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	64.61	64.55	64.55	64.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2028	66.91	66.84	66.84	66.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029	69.30	69.22	69.23	69.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

UNIT	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins	Martins	Martins	Martins 3
Own %	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	2018	2013	2016	2016	2014	2013	2009	2009	2009	2015	2014	2010	2009
1999	22.86	23.01	23.09	23.03	23.13	23.30	23.33	23.33	23.30	29.75	29.93	52.75	55.21
2000	24.33	24.50	24.69	24.52	24.62	24.78	24.77	24.78	24.80	31.29	31.54	56.68	59.48
2001	25.80	25.96	25.77	25.96	26.07	26.23	26.22	26.22	26.25	32.68	32.93	57.08	59.50
2002	27.21	27.40	27.26	27.40	27.50	27.67	27.67	27.74	27.72	34.20	34.47	58.28	60.53
2003	28.84	29.01	28.91	29.00	29.11	29.29	29.27	29.31	29.28	35.84	36.13	59.70	61.72
2004	28.89	29.04	28.84	29.03	29.11	29.36	29.37	29.39	29.37	37.08	37.34	62.21	64.37
2005	29.28	29.42	29.32	29.39	29.46	29.59	29.68	29.68	29.66	37.68	37.98	64.87	67.25
2006	30.68	30.80	30.68	30.76	30.83	31.05	31.06	31.06	31.04	39.35	39.73	67.81	70.35
2007	31.76	31.90	31.82	31.86	31.92	32.14	32.11	32.05	32.10	41.45	42.47	71.20	73.67
2008	32.71	32.79	32.76	32.76	32.80	32.99	32.98	32.98	32.96	43.94	44.26	74.38	76.86
2009	34.15	34.30	34.26	34.27	34.33	34.47	34.40	34.44	34.49	45.96	46.39	77.49	80.26
2010	35.40	35.58	35.61	35.54	35.59	35.72	0.00	0.00	0.00	48.35	48.74	81.49	0.00
2011	36.41	36.51	36.64	36.46	36.49	36.66	0.00	0.00	0.00	49.46	50.71	0.00	0.00
2012	37.41	37.56	37.41	37.49	37.53	37.63	0.00	0.00	0.00	50.90	51.33	0.00	0.00
2013	39.12	39.25	39.13	39.18	39.21	39.33	0.00	0.00	0.00	53.24	53.59	0.00	[illegible]
2014	41.44	0.00	41.45	41.50	41.53	0.00	0.00	0.00	0.00	56.04	56.53	0.00	[illegible]
2015	42.92	0.00	42.90	42.98	0.00	0.00	0.00	0.00	0.00	58.07	0.00	0.00	[illegible]
2016	44.45	0.00	44.42	44.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	46.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	47.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2028	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Market Energy Revenues ($1000)

UNIT		Safe Ha 1	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34
Retire		3000	3000	3000	2023	2022	2021	2021	2009	2010	2017	2018
1999	944548	7912	1811	13373	147533	146993	16024	16021	12094	20929	120696	17229
2000	1011095	8426	1928	14241	157220	156646	17308	17053	12873	22286	128574	18370
2001	1076060	8933	2044	15097	166699	166089	18351	18072	13644	23634	136339	19493
2002	1139277	9430	2158	15940	176034	175392	19379	19083	14407	24957	144005	20598
2003	1210111	9992	2287	16889	186531	185848	20534	20533	15252	26425	152580	21821
2004	1215064	10027	2295	16948	187233	186549	20610	20609	15312	26529	153190	21936
2005	1234145	10157	2324	17167	189756	189062	20888	20887	15768	26941	155583	22283
2006	1291900	10645	2436	17992	198686	197960	21881	21880	16518	28178	162732	23313
2007	1338104	11022	2522	18630	205933	205179	22668	22668	17113	29203	168665	24163
2008	1375781	11336	2594	19160	211811	211036	23317	23317	17602	30060	173616	24874
2009	1439159	11862	2714	20049	221468	220658	24390	24390	18413	31460	181709	26039
2010	1414189	12297	2814	20784	229832	228991	25305	25304	0	32675	188737	27034
2011	1419954	12628	2890	21342	236027	235164	25989	25989	0	0	193943	27792
2012	1462598	12990	2972	21955	242821	241933	26739	26739	0	0	199777	28631
2013	1529629	13586	3108	22964	253780	252852	28091	27953	0	0	208867	29937
2014	1422293	14381	3290	24307	268851	267867	29754	29608	0	0	221251	31710
2015	1216305	14889	3393	25157	278408	277399	30813	30663	0	0	229116	32839
2016	1231373	15419	3515	26053	288320	287274	31910	31754	0	0	237275	34009
2017	1024757	15968	3640	26981	298584	297501	33046	32885	0	0	245722	35219
2018	806769	16537	3769	27941	309213	308093	34222	34056	0	0	0	38473
2019	759954	17125	3903	28936	320221	319060	35441	35268	0	0	0	0
2020	787008	17735	4042	29966	331621	330419	36702	36523	0	0	0	0
2021	815025	18366	4186	31032	343427	342182	38009	37823	0	0	0	0
2022	765510	19021	4336	32137	355653	354363	0	0	0	0	0	0
2023	425761	19697	4489	33281	368314	0	0	0	0	0	0	0
2024	59515	20399	4649	34467	0	0	0	0	0	0	0	0
2025	61632	21125	4814	35693	0	0	0	0	0	0	0	0
2026	63826	21876	4986	36964	0	0	0	0	0	0	0	0
2027	66100	22656	5164	38280	0	0	0	0	0	0	0	0
2028	68451	23462	5347	39642	0	0	0	0	0	0	0	0
2029	70889	24297	5538	41054	0	0	0	0	0	0	0	0

UNIT	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins	Martins	Martins	Martins 3
Own %	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	2018	2013	2016	2016	2014	2013	2009	2009	2009	2015	2014	2010	2009
1999	17144	57993	2471	117937	115271	48162	15119	11244	11229	13774	13589	16776	15679
2000	18297	61985	2642	126182	123514	51666	16225	12068	12055	15863	15673	20632	19511
2001	19431	65894	2809	134263	131580	55088	17304	12874	12862	17876	17684	24592	23323
2002	20541	69703	2971	142098	139365	58380	18343	13648	13636	19700	19509	28723	27361
2003	21771	73523	3151	150788	148002	62032	19495	14507	14496	21721	21533	33550	32096
2004	21902	74442	3172	152003	149371	62340	19590	14578	14568	21023	20837	32599	31221
2005	22254	75666	3225	154556	151951	63742	19942	14840	14831	21254	21068	32694	31069
2006	23288	79185	3375	161820	159161	66512	20908	15560	15551	22270	22051	34177	32852
2007	24141	82123	3500	167849	165149	69064	21706	16155	16146	22589	21916	36100	34773
2008	24856	84570	3604	172892	170164	71198	22377	16655	16647	22144	21951	36584	[illegible]
2009	26022	88427	3769	180746	177835	74620	23456	17461	17453	23208	23008	35744	[illegible]
2010	27012	91905	3917	187875	184910	77613	0	0	0	23693	23491	41153	[illegible]
2011	27780	94569	4030	193446	190552	79847	0	0	0	24335	23631	0	0
2012	28620	97439	4152	199347	196411	82492	0	0	0	24891	24689	0	0
2013	29928	101853	4343	208495	205465	86296	0	0	0	26143	25938	0	0
2014	31703	0	4601	220926	217758	0	0	0	0	28244	28040	0	0
2015	32831	0	4762	228768	0	0	0	0	0	29265	0	0	0
2016	34001	0	4931	236912	0	0	0	0	0	0	0	0	0
2017	35211	0	0	0	0	0	0	0	0	0	0	0	0
2018	36465	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	0	0	0	0	0	0	0	0	0	0	0	0	0

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Energy Margins ($1000)

UNIT		Safe Ha 1	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34
Retire		3000	3000	3000	2023	2022	2021	2021	2009	2010	2017	2018
1999	478158	7908	1810	13367	112109	111508	7634	7632	5563	6224	44796	6196
2000	537139	8422	1927	14235	121916	121281	8697	8580	6276	9446	51832	7202
2001	593463	8929	2043	15091	130996	130324	9638	9503	6973	10635	58668	8179
2002	648936	9426	2157	15934	139929	139223	10563	10413	7657	11804	65391	9141
2003	711929	9988	2286	16883	150016	149271	11613	11613	8429	13128	73021	10228
2004	710770	10023	2294	16942	150307	149558	11584	11583	8407	13071	72666	10180
2005	722037	10153	2323	17161	152412	151654	11754	11753	8657	13293	73913	10355
2006	756308	10641	2435	17986	159963	159171	12311	12310	9067	13900	77286	10831
2007	778538	11018	2521	18624	165782	164959	12643	12644	9308	14244	79134	11082
2008	790996	11332	2593	19154	170179	169331	12814	12814	9424	14376	79741	11156
2009	827204	11858	2713	20043	178298	177415	13386	13387	9845	15015	83276	11653
2010	818370	12293	2813	20778	185071	184152	13776	13775	0	15428	85503	11953
2011	827249	12624	2889	21338	189667	188724	14224	14224	0	0	88534	12383
2012	854974	12986	2971	21949	194807	193836	14732	14732	0	0	92070	12885
2013	907590	13582	3107	22958	204052	203037	15792	15702	0	0	98933	13865
2014	890052	14377	3289	24301	217347	216273	17204	17106	0	0	109072	15308
2015	799273	14885	3392	25151	225073	223990	17814	17713	0	0	112929	15856
2016	812628	15415	3514	26047	233086	231963	18448	18343	0	0	116950	16422
2017	721408	15964	3639	26974	241384	240221	19106	18998	0	0	121113	17006
2018	621666	16533	3768	27934	249977	248774	19785	19673	0	0	0	17612
2019	607320	17121	3902	28929	258875	257629	20490	20374	0	0	0	0
2020	628940	17731	4041	29958	268091	266801	21219	21099	0	0	0	0
2021	651330	18362	4185	31024	277635	276299	21975	21850	0	0	0	0
2022	629135	19016	4335	32129	287520	286135	0	0	0	0	0	0
2023	355208	19692	4488	33273	297755	0	0	0	0	0	0	0
2024	59501	20394	4648	34459	0	0	0	0	0	0	0	0
2025	61617	21120	4813	35684	0	0	0	0	0	0	0	0
2026	63811	21871	4985	36955	0	0	0	0	0	0	0	0
2027	66085	22651	5163	38271	0	0	0	0	0	0	0	0
2028	68436	23457	5346	39633	0	0	0	0	0	0	0	0
2029	70872	24291	5537	41044	0	0	0	0	0	0	0	0

UNIT	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins	Martins	Martins	Martins 3
Own %	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	2018	2013	2016	2016	2014	2013	2009	2009	2009	2016	2014	2010	2009
1999	6188	20930	890	42552	41716	16801	5066	3774	3773	4884	4837	4238	4455
2000	7194	24358	1036	49555	48617	19691	5969	4446	4446	6033	5980	5723	6031
2001	8171	27682	1177	56361	55323	22494	6845	5099	5099	7146	7087	6211	6539
2002	9132	30954	1316	63051	61915	25254	7710	5743	5743	8272	8208	6860	7223
2003	10220	34658	1474	70631	69388	28382	8691	6473	6473	9565	9498	7611	8012
2004	10173	34492	1465	70321	69085	28214	8630	6428	6429	9490	9428	7440	7839
2005	10349	35094	1491	71554	70302	28715	8776	6536	6537	9660	9595	7509	7910
2006	10825	35687	1559	74837	73533	30007	9176	6835	6835	10090	10023	7954	8402
2007	11077	37555	1595	76591	75255	30691	9373	6980	6980	10276	10206	8591	9062
2008	11153	37803	1605	77096	75747	30847	9405	7004	7004	10241	10177	8772	9255
2009	11649	39457	1676	80479	79067	32199	9817	7311	7311	10708	10641	9355	9893
2010	11950	40504	1720	82592	81143	33025	0	0	0	10981	10913	10182	0
2011	12381	41963	1781	85608	84119	34229	0	0	0	11314	11244	0	0
2012	12882	43670	1853	89090	87552	35649	0	0	0	11691	11619	0	0
2013	13863	46984	1996	95900	94265	38433	0	0	0	12598	12523	0	[illegible]
2014	15307	0	2205	105982	104206	0	0	0	0	14076	13999	0	[illegible]
2015	15854	0	2280	109753	0	0	0	0	0	14583	0	0	[illegible]
2016	16419	0	2361	113660	0	0	0	0	0	0	0	0	0
2017	17003	0	0	0	0	0	0	0	0	0	0	0	0
2018	17610	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	0	0	0	0	0	0	0	0	0	0	0	0	0

Unit Capacity Factors

UNIT		Safe Ha 1	Wallenp 1	Holtwoo 1	Susqueh 2	Susqueh 1	Conemau 2	Conemau 1	Holtwoo 17	Sunbury 4	Montour 2	Keyston 2
Own %		33.33	100	100	90	90	11.39	11.39	100	100	100	12.34
Retire		3000	3000	3000	2023	2022	2021	2021	2009	2010	2017	2018
1999	59.1	29.2	20.8	62.6	75.0	75.0	83.0	82.9	84.2	82.0	81.1	82.1
2000	59.4	29.2	20.8	62.6	75.0	75.0	84.1	82.9	84.2	81.9	81.1	82.2
2001	59.7	29.2	20.8	62.6	75.0	75.0	84.1	82.7	84.0	82.0	81.1	82.3
2002	59.8	29.2	20.8	62.6	75.0	75.0	84.1	82.7	84.0	82.0	81.2	82.4
2003	60.0	29.2	20.8	62.6	75.0	75.0	84.1	84.1	84.0	81.9	81.2	82.4
2004	60.1	29.2	20.8	62.6	75.0	75.0	84.1	84.1	84.2	81.9	81.2	82.5
2005	60.2	29.2	20.8	62.6	75.0	75.0	84.1	84.1	85.6	82.0	81.4	82.7
2006	60.2	29.2	20.8	62.6	75.0	75.0	84.1	84.1	85.6	82.0	81.3	82.7
2007	60.2	29.2	20.8	62.6	75.0	75.0	84.1	84.1	85.6	82.0	81.3	82.7
2008	60.2	29.2	20.8	62.6	75.0	75.0	84.1	84.1	85.6	82.0	81.4	82.8
2009	60.2	29.2	20.8	62.6	75.0	75.0	84.3	84.3	85.6	82.0	81.5	83.0
2010	66.3	29.2	20.8	62.6	75.0	75.0	84.3	84.3	0.0	82.2	81.6	83.0
2011	74.9	29.2	20.8	62.6	75.0	75.0	84.3	84.3	0.0	0.0	81.6	83.1
2012	75.1	29.2	20.8	62.6	75.0	75.0	84.3	84.3	0.0	0.0	81.7	83.2
2013	75.1	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	81.7	83.2
2014	74.8	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	81.7	83.3
2015	74.7	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	81.7	83.3
2016	75.9	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	81.7	83.3
2017	74.6	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	81.7	83.3
2018	72.6	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	0.0	83.3
2019	71.7	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	0.0	0.0
2020	71.7	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	0.0	0.0
2021	71.7	29.2	20.8	62.6	75.0	75.0	84.5	84.3	0.0	0.0	0.0	0.0
2022	70.6	29.2	20.8	62.6	75.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0
2023	67.1	29.2	20.8	62.6	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2024	40.4	29.2	20.8	62.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2025	40.4	29.2	20.8	62.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2026	40.4	29.2	20.8	62.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2027	40.4	29.2	20.8	62.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2028	40.4	29.2	20.8	62.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2029	40.4	29.2	20.8	62.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UNIT	Keyston 1	Brunner 2	Montour 11	Montour 1	Brunner 3	Brunner 1	Sunbury 3	Sunbury 2	Sunbury 1	Martins	Martins	Martins	Martins 3
Own %	12.34	100	100	100	100	100	100	100	100	100	100	100	100
Retire	2018	2013	2016	2016	2014	2013	2009	2009	2009	2016	2014	2010	2009
1999	81.5	76.1	81.4	78.5	77.4	73.5	78.7	78.6	78.6	37.8	37.0	4.6	4.0
2000	81.8	76.4	81.4	78.9	77.9	74.1	79.5	79.4	79.3	41.3	40.5	5.3	4.6
2001	81.9	76.6	83.0	79.2	78.4	74.7	80.2	80.1	79.9	44.6	43.8	6.3	5.5
2002	82.1	76.8	83.0	79.5	78.7	75.0	80.5	80.2	80.2	47.0	46.2	7.2	6.4
2003	82.1	76.9	83.0	79.7	79.0	75.3	80.9	80.7	80.7	49.4	48.6	8.2	7.4
2004	82.4	77.4	83.7	80.2	79.7	75.5	81.0	80.9	80.9	46.2	45.5	7.6	6.9
2005	82.6	77.7	83.7	80.6	80.1	76.6	81.6	81.5	81.5	46.0	45.3	7.3	6.5
2006	82.5	77.6	83.7	80.6	80.2	76.2	81.7	81.7	81.7	46.2	45.3	7.3	6.6
2007	82.6	77.7	83.7	80.7	80.4	76.4	82.1	82.2	82.0	44.4	42.1	7.4	6.7
2008	82.6	77.9	83.7	80.9	80.6	76.7	82.5	82.4	82.4	41.1	40.4	7.2	[illegible]
2009	82.8	77.9	83.7	80.8	80.5	77.0	82.8	82.7	82.5	41.2	40.4	7.3	[illegible]
2010	83.0	78.0	83.7	81.0	80.7	77.3	0.0	0.0	0.0	40.0	39.3	7.3	[illegible]
2011	83.0	78.2	83.7	81.3	81.1	77.5	0.0	0.0	0.0	40.1	38.0	0.0	0.0
2012	83.2	78.3	84.5	81.5	81.3	78.0	0.0	0.0	0.0	39.9	39.2	0.0	0.0
2013	83.2	78.4	84.5	81.5	81.4	78.0	0.0	0.0	0.0	40.0	39.5	0.0	0.0
2014	83.2	0.0	84.5	81.6	81.4	0.0	0.0	0.0	0.0	41.1	40.4	0.0	0.0
2015	83.2	0.0	84.5	81.6	0.0	0.0	0.0	0.0	0.0	41.1	0.0	0.0	0.0
2016	83.2	0.0	84.5	81.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2017	83.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2018	83.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2019	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2020	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2021	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2022	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2023	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2024	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2026	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2027	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2028	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2029	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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