A Review of Delmarva Power & Light's Investment Activities

September 10, 2013

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Executive Summary

Delmarva Power & Light (DPL) is a private, for-profit utility whose main responsibility is the transmission and distribution of electric power within its service area. As such, the company must control and maintain a vast network of high and low voltage power lines, substations, transformers, utility poles, etc. in order to meet its responsibility. That network requires investments in order to maintain quality. Since DPL's customers receive value from its network and service, they should ultimately pay for that service.

With that said, customers do not have a choice over how much DPL invests in the grid and cannot avoid using DPL's network unless they physically move out of DPL's service territory. In addition, the costs of distributing electricity to DPL customers, particularly residential customers, have increased sharply in the last five years. The intention of this report is to inform the public about important issues behind these rate increases. The major findings and themes of this report are summarized below.

- In principle, every dollar DPL wisely invests in the grid should be repaid by rate payers. In addition to the initial investment, rate payers also pay DPL to service its debt, pay taxes, and earn profits.
- Under certain assumptions, rate payers repay DPL for grid investments as if they took out a 15 to 30 year loan with an interest rate between 9% and 10% and only made minimum payments.
- Between 1991 and 2008, DPL slowly increased their annual investment in distribution and transmission by an average of $2.2 million per year in Delaware and Maryland. However in 2009, DPL began dramatically increasing these investments. For example, DPL spent nearly twice as much in grid investments in 2012 ($246 million) as it had in 2008 ($124 million).
- The cost of smart meters was the main reason for additional grid investments in Delaware between 2009 and 2011, raising DPL's investments by an average of $24 million each year.
- After the smart meters had been installed, DPL turned their investment spending to reliability. In 2012, DPL spent $64 million on reliability investments in Delaware, or 114% more than it spent on reliability in 2010 ($30 million).

- The reliability of DPL's electric service is very good relative to the minimum standards set by the Public Service Commission and relative to other private electric utility companies. Additional expenditures in reliability will likely continue to improve DPL's service.
- Currently, DPL does not estimate the public's financial benefit when it makes grid investments, particularly those that improve reliability. Given the public's rather high cost of borrowing, it is imperative that DPL proves that these investments are truly in the public's interest.
- Early estimates show that the benefits of improved reliability may be greatest for businesses, but almost negligible for households. The estimates show that DPL's residential customers stand to lose nearly $26.9 million every year if DPL's latest rate increase request is approved.
- Making large, sustained, and discretionary investments in the grid poses other problems besides harming ratepayers. For example, fixing the cost of delivering electricity at higher levels will make the public less able to absorb shocks in supply costs, which are known to be quite volatile.
- If a single "investment" in reliability yields only temporary gains, then rate payers in the future will have to pay for benefits that are enjoyed today. Not only is such spending unfair to future rate payers, but no generation in the future has an incentive to stop the process. Such financial scenarios commonly create an ever-increasing burden for the appeal of immediate benefits.
- The strategy of investing beyond the minimum necessary to maintain standards of reliability should force the Public Service Commission to be increasingly involved with DPL's day-to-day operations. This extra burden will raise administrative costs, which will likely be borne by the rate payers.

Introduction

With fresh and unpleasant memories of the 60% overnight increase in electric rates in 2006, the public has been crying foul over Delmarva Power & Light's (DPL's) recent successes in raising electric rates.[1] In 2009, DPL projected that the $145 million it would earn in delivery side revenues was far too low to allow it to earn a reasonable profit. The Delaware Public Service Commission (PSC) reviewed DPL's request and allowed DPL to raise an additional $17 million in delivery side revenues. Two years later DPL estimated it would receive $165 million in their delivery revenue and again claimed that this amount was unfairly low. After review, the PSC allowed DPL to raise revenues by another $22 million. In 2013, DPL projected that it would likely receive $182 million in delivery revenue for that year, and asked the PSC to approve $42 million more. That request is currently being considered.

Given the nearly annual requests to raise rates, the public's distrust and anger behind DPL's continued proposals should be expected. After all, delivery side revenues have increased 26% since 2009, and if DPL's latest request is approved in whole, then that increase would be 54%. In addition, DPL residential consumers are not seeing much reduction in their electric bills despite the technological revolution in natural gas that has driven down the cost of generating electricity. The recent recession and slow recovery have decreased the demand for electricity and heightened concerns about affordability. Thus, the public is admittedly confused and upset at the persistent rate increases.

This document attempts to explain the role that investments have in DPL's rate requests. Dozens of issues are addressed in each request to raise rates, and this document cannot address every one. It will instead address only the role of investing in the grid. Hopefully, it will help the public better understand investment related issues being considered at the PSC.

[1] Counter to public opinion, deregulation does not mean that DPL may set electric rates as it sees fit. Customers who purchase their supply of electricity from DPL are considered *Standard Offer Service* (SOS) customers. The SOS rates are still regulated by the PSC, and DPL must obtain the PSC's permission before changing these rates. The rates charged for delivery are also approved by the PSC.

How Delmarva Power & Light Customers Pay for Investments in the Grid

Delmarva Power & Light's service territory captures the large majority of Delaware's population. As such, the majority of Delaware's households and businesses will have to be connected to DPL's distribution network if they want to buy electricity (or sell electricity in the case of net metering).[2] Figure 1 shows that in 2011, DPL delivered 65% of residential sales, 83% of commercial sales, and 70% of industrial sales to Delaware customers. Overall, DPL delivered 72% (8.4 million MWHs) of electricity to Delaware rate payers in 2011.

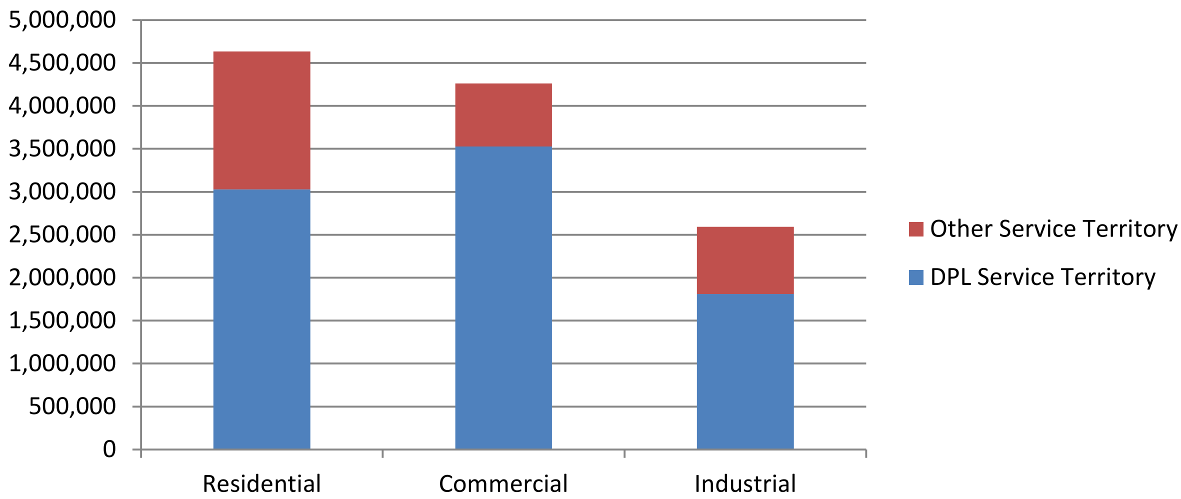
The charge that DPL levies for the distribution and transmission of electricity is referred to as delivery costs in this paper. While many view the assets that make up DPL's electric grid (e.g. power lines, transformers, substations, utility poles, etc.) as fixed, the cost of delivering electricity can vary pretty drastically over time.

The cost of delivering electricity depends on many factors, such as weather, security regulations, and price inflation. However, the quality with which electricity is delivered is another important factor that can greatly influence delivery costs. For example, the power lines which run underground are much more expensive to use than power lines running above ground. However, underground power lines wear out less quickly and are less susceptible to damage from storms. As another example, consider that transformers degrade and become increasingly susceptible of failure as they age. When transformers fail, power cannot be delivered to customers and the damage to other grid components can be severe. Which type of transformer is best and whether failed transformers should be repaired or replaced are decisions that affect both the quality and the cost of delivering electricity.

Since 2009, DPL has made repeated requests to raise revenues to compensate it for increased costs of delivering electricity. The arguments made by DPL during these requests have been convincing enough that the PSC has always agreed to raise revenues, but by less than the requested amount.

[2] Because of deregulation, DPL customers may enter a contract with any company to ensure that their electricity usage is *generated*. However, in order to send that power from the producer to the customer, it must be delivered on DPL's grid. So while it is true that customers living in DPL's service territory can "buy" electricity from other companies, they still must pay DPL to send that electricity to their business or residence.

Figure 1 Total Electricity Sales (MWH) in Delaware by Customer Type and Service Territory, 2011



- Energy Information Administration Form 861.

That process whereby DPL requests to raise rates on customers, called a rate case, is a formal legal proceeding with its own set of rules and regulations. Many important details are debated during these rate cases by DPL, the PSC staff, the Division of the Public Advocate, and other parties granted intervening status. Public comment is sought, and expert witnesses are called in to present testimony and rebuttals. A Hearing Examiner is appointed to oversee and facilitate this process, while also trying to resolve outstanding issues.

Ultimately, the Hearing Examiner will make a report to the PSC commissioners that summarizes the positions of the parties, all relevant facts and evidence, and his or her opinion on the case. By this time, the parties may have already reached a negotiated solution. A hearing is held whereby the PSC commissioners review the case materials, choose to accept or reject the Hearing Examiner's report, and make a final decision on any outstanding issues. The commissioners' orders are then enacted into law.

The following formula is a simplistic representation that describes the various components of a rate case:

$$Expected\ Revnue = Expected\ Costs + Rate\ Base \times Allowable\ Margin$$

- *Expected Revenue* depends on both the rate structure approved by the PSC, the expected number of customers, the amount of power demanded, and the amount of electricity used. Some customers are charged based on when they use electricity. Revenue is collected for delivering electricity to all customers in DPL's territory and for supplying electricity to the SOS customers.
- *Expected Costs* includes the expected costs of supply, distribution, transmission, maintenance, administration, taxes, and capital recovery. Supply costs are heavily influenced by forecasts of consumption and peak demands. The bulk of the remaining costs are classified as delivery costs.
- *Rate Base* reflects the balance of financial capital invested by DPL in assets that are being used and useful in providing service to DPL customers. The value of DPL's property, plant, and equipment used to deliver electricity net of depreciation, called "net plant", is the lion's share of the rate base and a relatively uncontested component.[3] Other items are more commonly debated as to whether they should be included in the rate base, most notably *Construction Work in Progress (CWIP)*.[4]
- *Allowable Margin* refers to the percentage which DPL, as a regulated monopoly, is allowed to charge customers on the Rate Base. The Allowable Margin is supposed to reflect DPL's cost of capital, which is simply a weighted average of the interest paid on debt (i.e. bondholder costs) and the company's return on equity (i.e. shareholder profits). While the cost of bond debt is computed rather routinely, calculating the return on equity is more subjective, and hence, frequently debated.

The PSC generally allows an increase in rates when DPL can successfully argue that the revenue it expects to collect is less than its forecasted costs and allowable return. Every component in the equation above is analyzed in minute detail and often debated within the PSC rate cases; such as why costs are projected to increase, what components enter the rate base, what rate constitutes DPL's allowable margin, and how rates should be changed to allow DPL to raise revenues.

[3] Net plant in service is defined as total plant in service less any accumulated depreciation. Total plant in service is the accumulated value of investments made in the distribution and transmission of electricity, as well as general assets, common assets, intangible assets, and assets of the service company.

[4] Construction Work in Progress is the financial value of investments that have not been classified as 'in service'. This includes incomplete projects as well as completed projects that regulatory authorities have not yet had the chance to verify whether they are being used or being useful in providing service to grid customers.

DPL's recurring complaint is that revenues consistently fail to give them a reasonable return on their grid investments. Because the process of reimbursing DPL for investments typically necessitates much larger revenues than the original amount, it is useful to understand the process that translates investments into additional ratepayer expenses. The rest of this section describes how this process works.

Table 1 on the next page is a heuristic example of investing in reliability. It is intended to show the most influential processes underlying rate increases – accumulated depreciation, DPL's fair return, and income taxes. For sake of clarity, we assume that the investment does not impact operating expenses, maintenance expenses, or other taxes. The example also omits two issues that are relevant in real-life calculations, the accumulated deferred income tax and the interest deduction. (The appendix discusses both issues in greater detail.) While the example is admittedly not quite correct, it does illustrate the primary mechanisms that raise the costs on ratepayers for delivering electricity.

Table 1 describes a $100 investment in reliability in time period '0'. The investment is expected to improve reliability and will last 15 years. That investment is initially classified as Construction Work In Progress - CWIP (B). Once the PSC confirms that the investment has created a used and useful asset, it is classified as 'in service', and total plant increases by $100. Total plant will remain $100 higher for the duration of the asset's lifetime (C).

Once the asset is classified as in service, depreciation also begins to accumulate at $6.67 per year (D), a figure that was calculated as $100 / 15 years. This 'straight line' method of depreciation means that every period has the same depreciation expense (F) and that the cost of the asset is fully depreciated at the end of the asset's expected lifetime. Consumers pay the depreciation expense over time to eventually reimburse DPL the face value of its investment ($100). The value of the investment that has not yet been depreciated, called net plant (E), is defined as total plant minus accumulated depreciation (C-D).

Table 1 Example of the Revenues Needed to Pay for $100 Investment with a 15 Year Straight Line Depreciation

A	B	C	D	E	F	G	H	I
Time Period	CWIP	Total Plant	Accumulated Depreciation	Net Plant	Depreciation Expense	Fair Return (@7.5%)	Tax Revenue	Necessary Revenues
0	$100	$0	$0	$0	$0	$0	$0	$0
1	$0	$100	$6.67	$93.33	$6.67	$7.00	$4.90	$18.57
2	$0	$100	$13.33	$86.67	$6.67	$6.50	$4.55	$17.72
3	$0	$100	$20.00	$80.00	$6.67	$6.00	$4.20	$16.87
4	$0	$100	$26.67	$73.33	$6.67	$5.50	$3.85	$16.02
5	$0	$100	$33.33	$66.67	$6.67	$5.00	$3.50	$15.17
6	$0	$100	$40.00	$60.00	$6.67	$4.50	$3.15	$14.32
7	$0	$100	$46.67	$53.33	$6.67	$4.00	$2.80	$13.47
8	$0	$100	$53.33	$46.67	$6.67	$3.50	$2.45	$12.62
9	$0	$100	$60.00	$40.00	$6.67	$3.00	$2.10	$11.77
10	$0	$100	$66.67	$33.33	$6.67	$2.50	$1.75	$10.92
11	$0	$100	$73.33	$26.67	$6.67	$2.00	$1.40	$10.07
12	$0	$100	$80.00	$20.00	$6.67	$1.50	$1.05	$9.22
13	$0	$100	$86.67	$13.33	$6.67	$1.00	$0.70	$8.37
14	$0	$100	$93.33	$6.67	$6.67	$0.50	$0.35	$7.52
15	$0	$100	$100.00	$0.00	$6.67	$0.00	$0.00	$6.67
				Total	$100.00	$52.50	$36.75	$189.25

As a privately owned utility, DPL is allowed to earn a fair return on its investments. More specifically, the fair return equals DPL's allowable margin multiplied by the rate base. Table 1 estimates the fair return (G) as DPL's weighted cost of capital, approximately 7.5% in recent filings, multiplied by *net plant* (0.075 × E). As stated before, net plant is the primary component of the rate base. In this example, DPL's fair return on their $100 investment sums to $52.50 over 15 years. The bulk of those profits will accrue in the years immediately following that investment.

Since DPL's allowable margin is intended to repay DPL for its cost of borrowing capital, DPL's fair return is calculated on net earnings *after* income taxes are paid. However, DPL's tax rate of approximately 41% is applied to their net earnings *before* any local, state, and federal taxes are considered. Therefore, DPL must collect $0.70 in taxes for every $1 of fair return it is allowed to keep [41% = $0.70 / ($1 + $0.70)]. Applying this rate to the example above implies that an extra $36.75 must be collected for DPL to make $52.50 in after-tax profits.

All in all, the revenue collected by rate payers must cover the depreciation expense, DPL's fair return, and tax revenues (F+G+H). In this heuristic example, these costs sum to $189.25 in additional revenue (I) over 15 years to repay DPL for the initial $100 investment.

Keep in mind that Table 1 omits a few key adjustments simply to demonstrate the fundamental mechanisms driving DPL's revenue requirements. After making these heuristic adjustments (see appendix), rate payers would actually spend $173.56 over the 15 years instead of $189.25, primarily due to lower tax payments.[5] Despite these adjustments, the overarching point remains – consumers pay substantially more revenues than the original amount that DPL invested in the grid. It is the financial equivalent of rate payers taking on a 15 year loan that has an interest rate of 8.99%.[6] Other realistic adjustments push that annual percentage rate up to 10%.[7]

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[5] The appendix applies accelerates taxable depreciation using a 150% variable declining balance schedule. Similar to the assumption of a straight line depreciation, this choice is only meant to demonstrate the concept of accumulated deferred income taxes and its general impact on rate payer revenues. The actual choice of which schedule to use depends on many different factors behind DPL's investment.

[6] Using similar assumptions for a $100 asset that fully depreciates after 30 years implies that customers pay an interest rate of 9.74%.

[7] Calculating the analysis as a monthly total instead of as a year-end total raises the annual percentage rate to 10.0% for a 15 year asset and 10.1% for a 30 year asset.

A Review of Delmarva Power & Light’s Investments

Now that the basic framework for converting investments to rate payer expenses has been outlined, the history of DPL’s grid investments will be reviewed. The discussion in this section will show that DPL has greatly increased its capital spending on the grid.

Figure 2 shows DPL’s total annual capital expenditure (blue line), which is comprised of investments in delivery, generation, and other services (e.g. natural gas) for its entire service area.[8] The amount of capital invested in delivery (red line) supports the distribution and transmission of electricity.[9] The figure also indicates DPL’s peak summer load (dashed green line).

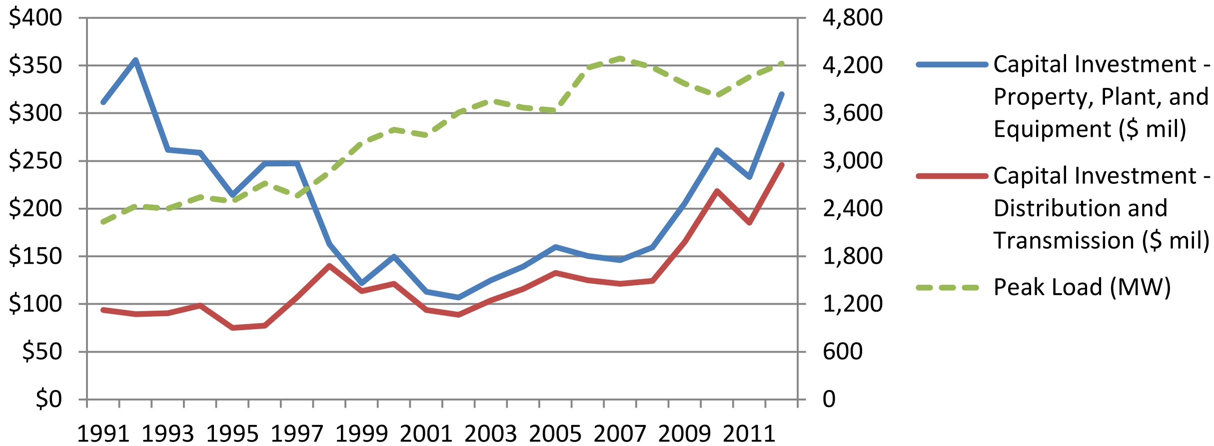
This review segments DPL’s capital expenditures into four different eras of the company’s history: 1991 to 1997, 1998 to 2002, 2003 to 2008, and 2009 to the present. The first era, 1991 to 1997, is prior to deregulation, when DPL was responsible for generating and delivering electricity. The majority of DPL’s investments went to generation capabilities, while the delivery share of DPL’s total investment was stable. On average, DPL invested about $90 million per year in distribution and transmission during this time period.

In January 1998, the PSC officially took the position that DPL should divest itself of its generation operations and use market forces to make power generation more economically efficient. Once DPL’s forward looking business model focused just on delivering electricity, its investment in generation dropped to almost zero. Delivery investments, on the other hand, increased 81% between 1996 and 1998. Thereafter, DPL began reducing its capital investment in distribution and transmission until it was investing nearly the same amount in 2001 as it had in 1991, despite continued load and customer growth. Around this time, the PSC began holding workshops and circulating draft regulations to ensure that DPL maintained minimum standards for reliable electric service.

[8] Although the series applies to DPL’s entire service territory, including Delaware, Maryland, and Virginia, the company has had similar timing to their rate case requests before Maryland’s Public Service Commission. Virginia was part of DPL’s service territory from 1999 to 2007 and represented approximately 3% of its sales. Nearly two-thirds of DPL’s electricity is delivered to Delaware.

[9] It is well known that inflation gradually lowers the value of money over time, so that a dollar in the past went further a dollar today. The tables and figures in this section adjust dollars upwards according to the Consumer Price Index so that the inherent value of money is always expressed in terms of 2012 prices. For example, if DPL spent $100 in 1990, it would be expressed as $175.33 to account for the importance that the spending would have had in 2012.

Figure 2 Annual Capital Investment (mil of 2012 $) and Summer Peak Load (MW) in DPL Service Territories



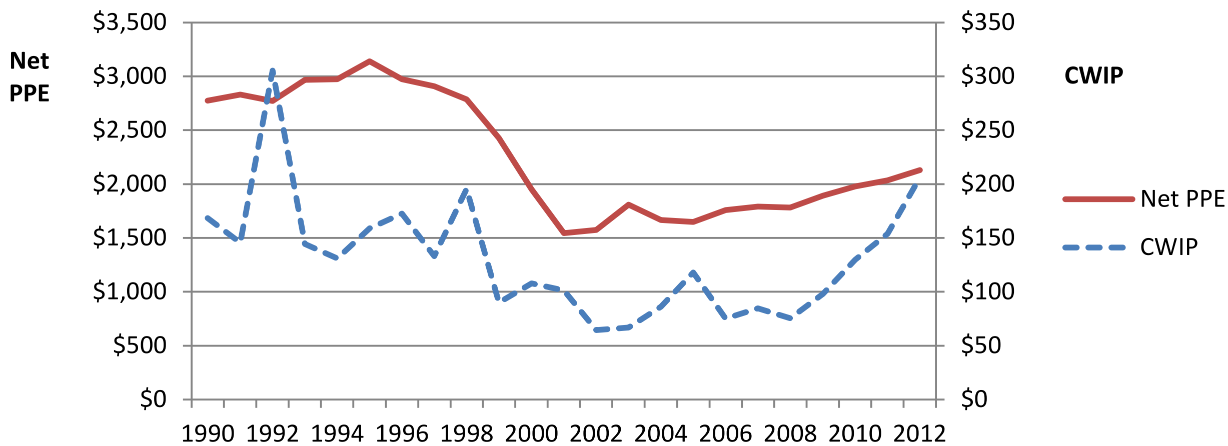
- Peak load data comes from Energy Information Administration Form 826 and Form 861.
- Capital investment data comes from DPL's Annual Reports (10-K). Distribution and transmission investments were estimated between 2001 and 2007 based on past and future investment shares.
- The Consumer Price Index for all items in the Philadelphia-Wilmington-Atlantic City urban area was used to adjust for inflation.

In 2002, DPL merged with Pepco Holdings, Inc. and incorporated itself with nearby utilities Atlantic City Electric and Pepco. As part of the deal, DPL extended the rate caps that had been put into place in response to deregulation through 2006 and invested in the reliability of its transmission network to address growing congestion issues. Between 2002 and 2005, total investment increased 49%. Once the rate caps were lifted, DPL raised rates considerably but held investment steady. DPL's capital investments in 2008 ($159 million) were not much different than they were in 2004 ($160 million).

In the final time period, investments in distribution and transmission have increased dramatically. In 2009, capital expenditures on the delivery side totaled $165 million, a 33% increase in one year. In 2010, investments increased another 32% to $219 million. Capital expenditures remained high in 2011 ($185 million), before reaching another record of $246 million in 2012. The increased investment was not associated with a corresponding increase in peak summer load.

To sum up, DPL is on track to spend twice as much on delivering electricity than it did before. That investment is of similar magnitude to the investments DPL used to make when it was in control of generating and delivering its own electricity.

Figure 3 DPL's Net Property, Plant, and Equipment and Construction Work in Progress (mil of 2012 $)



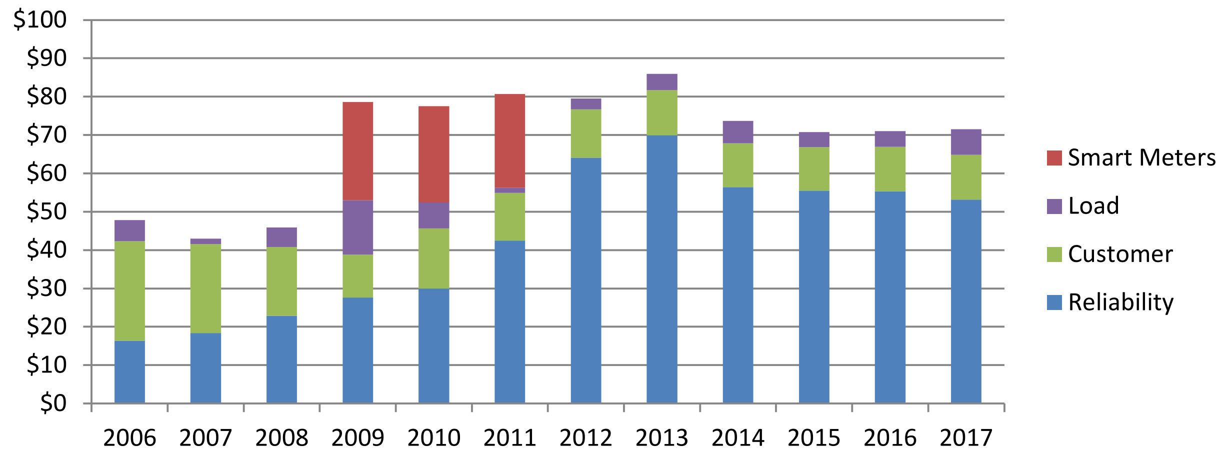
- Net PPE excludes CWIP. Data comes from DPL's Annual Reports (10-K) and applies to all service areas.
- The Consumer Price Index for all items in the Philadelphia-Wilmington-Atlantic City urban area was used to adjust for inflation.

The history of DPL's net property, plant, and equipment (PPE) and construction work in progress (CWIP) tells a similar story. Deregulation sharply cut back the amount of net PPE that enters the rate base, falling from a peak of $3.14 billion in 1995 to $1.55 billion in 2001. Following the merger with Pepco Holdings Inc., DPL's net PPE was $1.81 billion in 2003. Net PPE then dipped and gradually rose over the next five years, reaching approximately the same level in 2008 ($1.78 billion) as it had in 2003. By 2012, Net PPE had reached $2.13 billion, a 20% increase in just 4 years.

Figure 3 shows a similar trend in CWIP. Prior to deregulation, CWIP averaged $173 million per year. After deregulation but before 2009, CWIP fluctuated between $64 million and $118 million, averaging just $87 million during this time period.[10] In 2008, CWIP was just $75 million, but increased rapidly after that. By 2012, CWIP had reached $206 million, a growth of 175% in just four years. Again, the rate at which DPL is currently placing new assets into service is on par with DPL's operations prior to deregulation.

[10] The uptick in 2005 coincided with DPL's agreement to address congestion issues in their transmission lines in order to secure a merger with Pepco Holdings, Inc.

Figure 4 DPL's Actual and Expected Construction Budget (mil of 2012 $) for Distribution in Delaware



- Source: William Gausman and Jay Ziminsky testimonies in PSC Docket No. 11-528 and Michael Maxwell testimony in PSC Docket No. 13-115.
- The total installation cost for smart meters ($72 million) was averaged across 2009, 2010, and 2011.
- The construction budget for load, customer driven, and reliability improvements use actual figures for 2006 to 2010 and for 2012. Forecasted amounts are used for 2011 and for 2013 to 2017.
- The Consumer Price Index for all items in the Philadelphia-Wilmington-Atlantic City urban area was used to adjust for inflation.

Figure 4 indicates how DPL invested and expects to invest in Delaware's distribution network since 2006. The installation of smart meters has also been included in this list. Spending to address customer issues, such as serving new customers or responding to highway construction, fell between 2006 and 2009, and is projected to remain about $12 million each year in the future. Construction spending that addressed load related issues reached a maximum of $14 million in 2009 and was not expected to be a large component in DPL's future construction budget. The cost of implementing smart meters was quite large, adding an average of$24 million to DPL's annual capital expenditures between 2009 and 2011.

Reliability investments in Delaware's distribution network tell a very different story. While customer related expenditures fell an average of $2.6 million each year between 2006 and 2010, annual reliability expenditures increased approximately $3.4 million to more than offset that decline. In 2012, annual expenditures for reliability increased to $64 million, a 114% increase in just two years. DPL forecasts that its spending for reliable distribution in Delaware will increase to $70 million in 2013, and then stabilize at roughly $55 million in the future. This means that DPL plans to spend nearly 3.4 times as much for reliability in 2016 as it did in 2006. Viewed another way, DPL plans to spend the same amount on reliability as it did for smart meters every year in the foreseeable future.

The Reliability of Delmarva Power & Light's Electric Service in Delaware

Because DPL has invested and plans to invest such large sums in reliability, it is important to discuss what is meant by reliability. Although the concept is foreign to most customers, definitions and measures of reliability do exist. The three most common performance measures are the System Average Interruption Duration Index (SAIDI), the System Average Interruption Frequency Index (SAIFI), and the Customer Average Interruption Duration Index (CAIDI). For each measure of reliability, a smaller index implies better reliability.

1) $$SAIDI = \frac{Total\ Minutes\ in\ Which\ Customers\ Experienced\ Interrupted\ Service\ in\ a\ Year}{Total\ Number\ of\ Customers}$$

2) $$SAIFI = \frac{Total\ Number\ of\ Customers'\ Sustained\ Interruptions\ in\ a\ Year}{Total\ Number\ of\ Customers}$$

3) $$CAIDI = \frac{Total\ Minutes\ in\ Which\ Customers\ Experienced\ Interrupted\ Service\ in\ a\ Year}{Total\ Number\ of\ Customers'\ Sustained\ Interruptions\ in\ a\ Year} = \frac{SAIDI}{SAIFI}$$

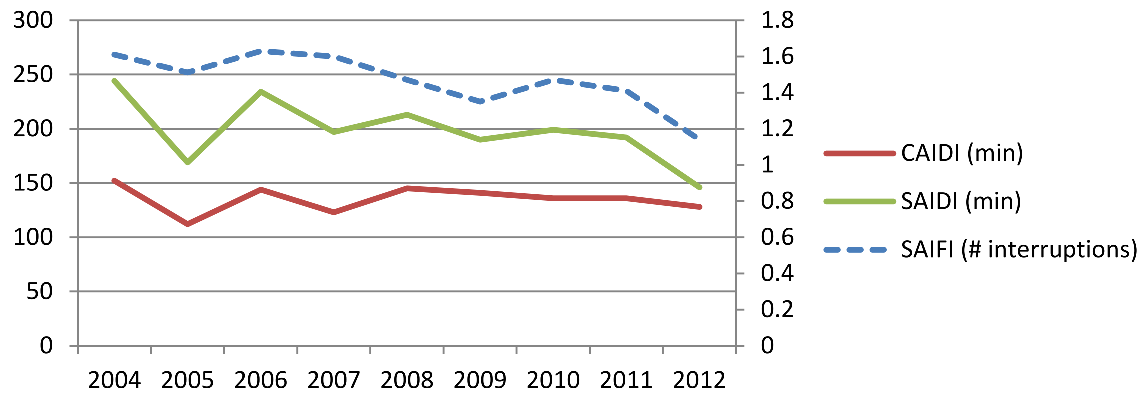
The SAIDI represents the average duration (in minutes) that service is interrupted for a customer over a year. The PSC's acceptable standard for the SAIDI is a maximum of 295 minutes. This means that, on average, DPL is expected to deliver electricity to customers no less than 99.944% of the time.[11]

The SAIFI measures the average number of sustained interruptions a customer experiences during one year.[12] The PSC's acceptable standard for SAIFI is a maximum of 2.3 sustained interruptions.[13]

Finally, the CAIDI measures the duration (in minutes) of the average interruption, and is considered to be the average response time to restore electric service. The acceptable standard for the CAIDI is 141 minutes, which basically says that DPL is expected to restore service in less than 2 hours and 21 minutes, on average, when the outage is not caused by a major event such as a hurricane or tornado.

[11] There are 525,600 minutes per year (60×25×365). Hence, 100% - (295/525,600) = 99.944%.
[12] Sustained interruptions do not include the "flickering" of electric power, outages that last less than 5 minutes, or power outages caused by major events.
[13] Delaware Public Service Commission. (2003). *In the Matter of the Consideration of Rules, Standards, and Indices to Ensure Reliable Electrical Service by Electric Distribution Companies.* Order No. 6298. PSC Regulation Docket No. 50. http://depsc.delaware.gov/orders/6298.pdf

Figure 5 Reliability Indices for DPL Distribution and Transmission in Delaware



- Reliability measures come from Delmarva Power's Electric Service Reliability and Quality Standards Annual Performance Reports. 2012 data comes from Michael W. Maxwell's testimony for Docket 13-115. Reliability measures exclude major event days.

One would expect that DPL's investment in reliability should coincide with more reliable service. The figure above indicates that there has been a gradual improvement in both the average duration and frequency of interrupted service since 2006.[14] The reliability measures experienced a particularly sharp drop in 2005 and in 2012 when DPL's investments in reliability were substantially higher.

On the other hand, the average time to repair service, as measured by the CAIDI, tells a slightly different story with respect to DPL's service. In 2004, 2006, and 2008, DPL breached PSC's maximum acceptable limit by 11, 3, and 4 minutes, respectively. But in 2005 and 2007, DPL beat that limit by 29 and 18 minutes respectively. Since 2008, restoration times have improved steadily each year. In 2012, DPL restored electrical service with 13 minutes to spare, on average.

The gradual improvement to system wide reliability in recent years also seems to match DPL's increased spending on reliability. Of course, the smart meters that were also recently installed between 2009 and 2011 would help DPL improve the reliability of their service.[15]

[14] Unfortunately, publicly available data could not be found on the reliability of DPL's service prior to 2004.
[15] Also an increased number of days classified as a major event day would affect DPL's measure of reliability trends, but in general DPL's spending on reliability and smart meters coincides with better service.

Table 2 Summary of Reliability Performance of Investor Owned Utilities in 2006, by Census Division

	SAIDI	SAIFI
New England	198	1.44
Middle Atlantic	225	1.28
East North Central	498	1.46
West North Central	166	1.31
South Atlantic	320	1.86
West South Central	134	1.38
Mountain	118	1.22
Pacific	296	1.99
US	244	1.49
DPL	234	1.63
PSC's Max Standard	295	2.30

- Eto, Joseph H. and LaCommare, Kristina Hamachi. (2008). *Tracking the Reliability of the US Power System: An Assessment of Publicly Available Information Reported to State Public Utility Commissions.* An Ernest Orlando Lawrence Berkeley National Laboratory report.

Another way to understand DPL's reliability is by comparing the company's service to similar utilities. The table above presents the average reliability standards reported by statewide public service commissions for investor owned utilities in each of their respective states in 2006. In 2006, DPL's SAIDI was 234 and its SAIFI was 1.63. (Recall that lower numbers represent improved reliability.) Although the comparison is imperfect[16], DPL's reliability seemed to be on par with other privately owned utilities in 2006.

In addition, Eto et al. (2012) conducted a statistical study to evaluate reliability trends for utilities across the country.[17] They conclude that in general, reliability of the average utility has gotten worse over time, with the average SAIFI and SAIDI each increasing approximately 2% annually for the typical, privately owned utility. As shown in Figure 5, however, DPL has markedly improved its own reliability. Thus, DPL's reliability is likely to be significantly better than its peers.

[16] This comparison is a first-pass approach and should be viewed cautiously since the underlying data contains discrepancies between the inclusion or omission of major events. Selection and other reporting issues may also be present.

[17] Eto, Joseph H., et al. (2012). *An Examination of Temporal Trends in Electricity Reliability Based on Reports from U.S. Electric Utilities*. An Ernest Orlando Lawrence Berkeley National Laboratory report.

Discussion and Conclusion

It is important to emphasize that annual investments are necessary to maintain accepted standards of service and to prevent operating costs from escalating quickly. As more homes and businesses are built, or as existing infrastructure wears out, or as demand pushes the limits of the current grid's capabilities, investments are necessary to maintain service. Some of those investments are unavoidable and will not directly take the public's benefit into account. For example, the Federal Energy Regulatory Commission can require DPL to upgrade certain segments of its transmission infrastructure or install enhanced security features to prevent cyber terrorism. But other investments, particularly those regarding the reliable distribution of electricity, are at DPL's discretion.

Given that consumers must pay profits and taxes on DPL's investments, the expected benefit to consumers should be substantially greater than the original investment. For example, consumers should gain nearly $1.94 in benefits for every $1 invested in the grid if they have to pay an interest rate of 9.75% on those investments. If this is not the case and consumers benefit less than what they pay, DPL's investments are both unfair and inefficient. By uncritically treating reliability as supremely beneficial, DPL avoids this very important check. Therefore inflating the rate base through large and discretionary investments could create long lasting economic harm to Delaware's rate payers.

DPL also has the financial incentive to scale up its investment as long as it believes the PSC will continue to raise rates to generate a higher return for DPL's shareholders. While the PSC should raise rates if the public benefits by more than what they have to pay, DPL has never calculated how much the public benefits from these investments.

In April 2013, the PSC staff filed a motion for DPL to consider the necessity and consumer benefits of their planned investments in reliability. The staff argued that the $309 million in planned investments may not be in the consumer's best interest, and that DPL needed to prove that such spending will bring consumers at least as much in benefits. DPL objected that such an inquiry was unnecessary outside the existing rate case (PSC Docket No. 13-115) and that allowing such a request would give the PSC too much interference in DPL's operations. Despite these objections, the PSC commissioners agreed to consider the staff's request (PSC Docket No. 13-152). That case is ongoing.

The real question underlying Docket 13-152 is how much consumers are willing and able to pay for one less power outage per year, one more minute of uninterrupted service, and one less minute waiting for power to be restored. There are at least two problems in answering that question. First, measuring the benefits of reliability is a fundamentally difficult thing to do, since most consumers cannot easily conceptualize, much less quantify, the impact of reliable service. Except for very energy intensive industrial or commercial businesses (which likely already have backup generators to compensate for breaks in service), the vast majority of consumers can only say that having reliable electricity is a good thing. Another problem is that customers cannot choose their own level of reliability, since any grid investments affect multiple customers at the same time.

Given that reliability is difficult for consumers to understand and cannot be commoditized, the justification will be tough to prove. Consumers certainly benefit in some way by having 8 more minutes of power every year or by waiting one less minute for power restoration, but quantifying that benefit is difficult.

A recent attempt to quantify the benefits of reliability (Sullivan et al, 2009) shows that many important details can greatly influence the public's benefit, such as time of day, class of customer, type of business, duration of event, and whether backup power is on hand.[18] Although there are many variables at play, an important conclusion of this work is that households benefit very little from reliability, hundreds of times less than small businesses and thousands of times less than large businesses.

The example on the next page puts this into context for DPL residential customers.

[18] Sullivan, Michael J., et al. (2009). *Estimated Value of Service Reliability for Electric Utility Customers in the United States.* An Ernest Orlando Lawrence Berkeley National Laboratory report. <http://certs.lbl.gov/pdf/lbnl-2132e.pdf>

Table 3 Estimated Average Customer Interruption Costs in the US (2008 prices), Anytime by Duration and Customer Type

Interruption Cost	Interruption Duration				
	Momentary	30 minutes	1 hour	4 hours	8 hours
Medium and Large C&I					
Cost Per Event	$6,558	$9,217	$12,487	$42,506	$69,284
Cost Per Average kW	$8.0	$11.3	$15.3	$52.1	$85.0
Cost Per Un-served kWh	$96.5	$22.6	$15.3	$13.0	$10.6
Cost Per Annual kWh	9.18E-04	1.29E-03	1.75E-03	5.95E-03	9.70E-03
Small C&I					
Cost Per Event	$293	$435	$619	$2,623	$5,195
Cost Per Average kW	$133.7	$198.1	$282.0	$1,195.8	$2,368.6
Cost Per Un-served kWh	$1,604.1	$396.3	$282.0	$298.9	$296.1
Cost Per Annual kWh	1.53E-02	2.26E-02	3.22E-02	$0.137	$0.270
Residential					
Cost Per Event	$2.1	$2.7	$3.3	$7.4	$10.6
Cost Per Average kW	$1.4	$1.8	$2.2	$4.9	$6.9
Cost Per Un-served kWh	$16.8	$3.5	$2.2	$1.2	$0.9
Cost Per Annual kWh	1.60E-04	2.01E-04	2.46E-04	5.58E-04	7.92E-04

- Sullivan, Michael J., et al. (2009). Table ES-5, pg. 23.

Table 3 reports the estimated benefits of reliability for each class of customers. To judge the appropriateness of DPL's investments, consider the following though experiment. Suppose that every DPL residential customer had electricity delivered with exactly the same reliability as reported in Figure 5. This would mean that every residential customer experienced 1.41 outages that lasted 136 minutes each in 2011 and 1.14 outages that lasted 128 minutes in 2012. Keep in mind that DPL delivers power to nearly 267,000 residential customers in Delaware.

Table 3 indicates that each hour long outage costs residential customers $3.30 and that each outage lasting four hours costs households $7.40. Linear interpolation implies that the 8 minute reduction in average outage time saved each DPL household $0.1718, for a total of $45,874. Similarly, reducing the number of outages from 1.41 to 1.14 per year benefited households by $406,282. Thus, Delaware households benefited $452,156 by the improvements in reliability. This is markedly less than the extra $27.3 million which DPL is asking residential consumers to pay each year for their continued investments in reliability. In short, residential customers would experience a net loss of $26.3 million ($26.8 million before inflation) every year in the future if DPL's planned reliability spending is approved and its performance is maintained.

Table 3 also indicates that the benefits of reliability are much greater to businesses than to residential customers – up to 10,000 times more beneficial for industrial users. This means that if the PSC is to maintain economically efficient service, then almost all of their investments in reliability should focus on providing reliable electric service to businesses. It also means that businesses, not households, should pay for these improvements.

Of course, making businesses pay for the benefit they receive will be difficult for three reasons. First, the benefits of reliability are largely hidden to businesses, but the rate increases would be explicit. Second, Delaware's relatively high regional electric rates already hurt the state's attractiveness to businesses, so any additional rate increases would not be viewed favorably by potential entrants. Finally, businesses with the greatest need for reliable service are also those most likely to operate their own primary or secondary power generation equipment. Improving DPL's reliability will not create much additional benefits to these companies. Thus, using Table 3 to calculate the benefits of commercial and industrial (C&I) customers will grossly exaggerate the benefits of DPL's investments.

Another issue is the timing of the benefits in reliability. Although it is likely true that increased spending in reliability has improved performance, what is not clear is how long these improvements will last. The spike in DPL's CWIP in 2005 (see Figure 3) indicated that DPL invested a significantly higher sum that year than in the preceding three years or in the following three years. There was also a significant and temporary improvement in all three reliability measures for that year (see Figure 5). The concern is that improvements in reliability will be short lived without DPL's continued spending. This new standard for reliability would therefore justify continuous increases in the cost of delivering electricity.

To be more general, a situation where rate payers constantly take on long term debt to finance short term benefits essentially creates a poison pill that will maintain the status quo. This is because any future generation which believes that delivery costs are unaffordable will have little incentive to curtail spending on reliability. Those future rate payers will still have to pay back debt, but they will only receive benefits if they perpetuate the cycle and force debt upon the next generation. Such financial scenarios have appealing and immediate benefits, but could create an insurmountable burden over time. Thus, it is extremely important for the PSC to maintain a long term perspective when deciding if DPL's investments are in the public's interest.

The strategy to invest in reliability creates other long term risks as well. The technological advances in extracting natural gas have created a world with relatively cheap power available on demand. While the supply costs have been falling, DPL has been raising delivery costs. But while fuel costs can be quite volatile, delivery costs depend on investment decisions and are therefore much more predictable. If DPL continues to invest in reliability, they will create a situation where the predictable costs (e.g. delivery costs) are high and the unpredictable costs (e.g. supply costs) are low. If events occur that push natural gas prices higher, such as the Environmental Protection Agency regulating methane leaks at the point of extraction, the loosening of export restrictions on US natural gas production, or the widespread adoption of natural gas for vehicular fuel, then natural gas prices could increase rapidly and drive up supply costs again. In each of these possible scenarios, DPL customers would have to purchase expensive electricity off of an expensive grid and will be increasingly unable to cope with price shocks. This is an undesirable outcome for Delawareans and DPL's long run interests.

If DPL is forced to justify the benefits of its discretionary investments, then the PSC will have to become intimately more involved with DPL's business decisions. This is quite different from previous PSC cases (e.g. PSC Docket No. 50) which were only meant to ensure that DPL service met a minimum standard of reliability. In the past, the used and usefulness check was sufficient as long as DPL only made investments that were necessary to maintain grid standards. But given DPL's changing strategy, the question is no longer at what point does service become inadequate, but rather how much reliability should consumers have to purchase. This question is much more difficult to answer and will necessitate considerably higher administrative costs to ensure that DPL does not abuse its monopoly power with wasteful investments.

If it is true that the public's benefit has not risen by a sufficient amount to justify DPL's capital expenditures, then DPL harms consumers, especially households, with every additional dollar they invest in reliability. Moreover, the PSC is stuck between two unappetizing choices: either let DPL earn less than their allowable return on the rate base or force consumers to pay a high price for something that yields them little benefit. Ensuring that the public benefits more than it pays for DPL's discretionary investments will avoid that scenario.

Appendix

This appendix expands the heuristic example given in Table 1 to be more in line with the accounting procedures that actually translate investments into higher revenues collected from rate payers. The example is adjusted to include the effects of the accumulated deferred income tax and the tax deduction for interest expenses.

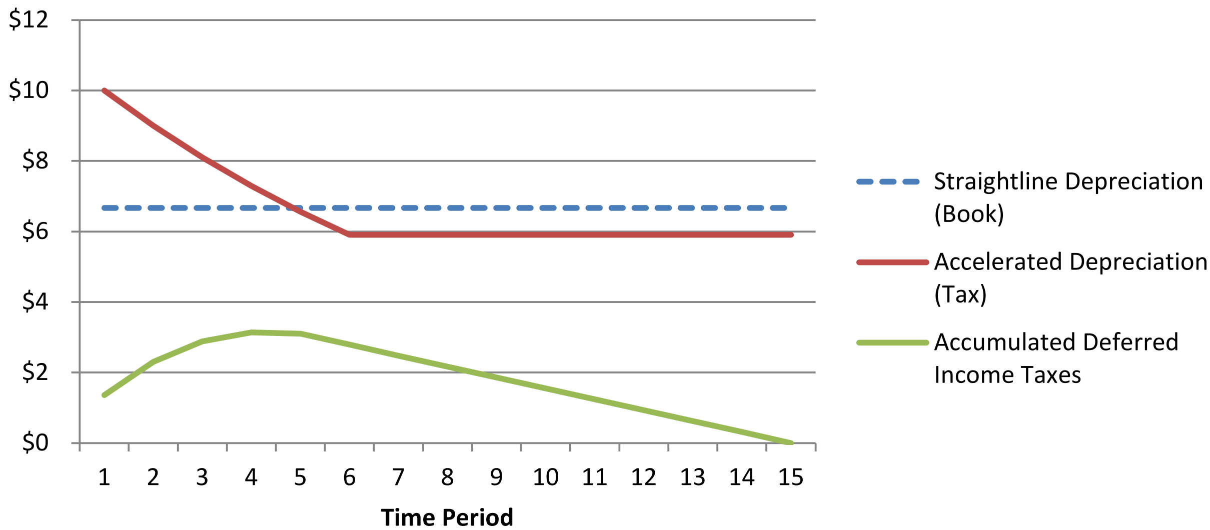
Like other businesses, DPL's income tax liabilities are determined by applying the state and federal tax rates to the earnings that remain after certain expenses have been paid. The company currently pays an effective tax rate of 40.655% to the federal (35%) and state government (8.7%) in income taxes.[19] For example, if DPL collected $100 in revenue and had $75 in deductible expenses, they would have to pay income taxes on the remaining $25. This comes to $10.16 at an effective tax rate of 40.655%.

Consider again the investment example described in the text. DPL invests $100 in grid reliability and that becomes an asset worth $100 in total plant at the beginning of year 1. The asset has a 15 year depreciation life, for which DPL uses a straight line depreciation schedule to adjust the net plant. DPL charges rate payers $6.67 per year over 15 years as the depreciation expense to recover its initial outlay.

However, DPL does not claim $6.67 each year as a depreciation expense for income tax purposes, because the tax code allows depreciation expenses to be accelerated for calculating its income tax liability. This means that for the first few years of the asset's lifetime, DPL will claim more than $6.67 of depreciation expense, but less than $6.67 each year later on in the asset's lifetime. By shifting the depreciation expense to earlier years, income taxes are deferred without accruing any interest, penalties, or fees. Thus, DPL can keep more of the revenue it collects for longer periods of time. Since DPL is free to put these deferred income taxes to use in other activities, accelerated depreciation is essentially an interest free loan.

[19] 8.7% + (100% - 8.7%) × 35% = 40.655%

Figure 6 Straight Line vs. 150% Variable Declining Balance Depreciation Schedules



The graph above indicates the difference that accelerated depreciation will make on income tax payments. The dotted line shows the annual depreciation expense ($6.67) on the books according to the straight line calculation method. The solid line shows a 150% variable declining balance schedule, which accelerates the depreciation expense to claim more expenses earlier in the asset's lifetime.[20] Assuming DPL used this method for income tax purposes, they would claim $10.00 in depreciation expenses in the asset's first year instead of $6.67. In other words, depreciation expense would be $3.33 higher in the first year, so DPL would pay $1.36 less in taxes. Similarly, DPL would reduce its tax liabilities by $0.95 in the second year, by $0.58 in the third year, and by $0.25 in the fourth year.

[20] The formula for calculating the depreciation balance using the 150% variable declining balance method divides the undepreciated asset value by the life of the asset, 15 years in this case, and multiplies that number by 150%. This formula continues to be used to calculate the time period's annual depreciation amount until the straight line depreciation method on the remaining undepreciated balance produces a larger depreciation expense. The straight line depreciation method is then used for this time period and in all future time periods in the asset's lifetime.

Table 4 How a $100 Investment with a 15 Year Straight Line Depreciation Affects the Rate Base – Accumulated Deferred Income Taxes Included

A	B	C	D	E	F	G	H	I	J	K	L
		B_t / 15	$D_{t-1} + C_t$	$B_t - D_t$	$C_t \times 41\%$	Footnote 20	$G_t \times 41\%$	$H_t - F_t$	$J_{t-1} + I_t$	$E_t - J_t$	$K_t \times 7.5\%$
Time	Total Plant	Depreciation Expense (Booked)	Accumulated Depreciation (Booked)	Net Plant	Depreciation Tax Reduction (Booked)	Accelerated Depreciation Expense (Taxed)	Depreciation Tax Reduction (Actual)	Deferred Income Taxes	Accumulated Deferred Income Taxes	Rate Base	Fair Return (@7.5%)
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1	$100	$6.67	$6.67	$93.33	$2.71	$10.00	$4.07	$1.36	$1.36	$91.98	$6.90
2	$100	$6.67	$13.33	$86.67	$2.71	$9.00	$3.66	$0.95	$2.30	$84.36	$6.33
3	$100	$6.67	$20.00	$80.00	$2.71	$8.10	$3.29	$0.58	$2.89	$77.11	$5.78
4	$100	$6.67	$26.67	$73.33	$2.71	$7.29	$2.96	$0.25	$3.14	$70.19	$5.26
5	$100	$6.67	$33.33	$66.67	$2.71	$6.56	$2.67	-$0.04	$3.10	$63.57	$4.77
6	$100	$6.67	$40.00	$60.00	$2.71	$5.90	$2.40	-$0.31	$2.79	$57.21	$4.29
7	$100	$6.67	$46.67	$53.33	$2.71	$5.90	$2.40	-$0.31	$2.48	$50.86	$3.81
8	$100	$6.67	$53.33	$46.67	$2.71	$5.90	$2.40	-$0.31	$2.17	$44.50	$3.34
9	$100	$6.67	$60.00	$40.00	$2.71	$5.90	$2.40	-$0.31	$1.86	$38.14	$2.86
10	$100	$6.67	$66.67	$33.33	$2.71	$5.90	$2.40	-$0.31	$1.55	$31.78	$2.38
11	$100	$6.67	$73.33	$26.67	$2.71	$5.90	$2.40	-$0.31	$1.24	$25.43	$1.91
12	$100	$6.67	$80.00	$20.00	$2.71	$5.90	$2.40	-$0.31	$0.93	$19.07	$1.43
13	$100	$6.67	$86.67	$13.33	$2.71	$5.90	$2.40	-$0.31	$0.62	$12.71	$0.95
14	$100	$6.67	$93.33	$6.67	$2.71	$5.90	$2.40	-$0.31	$0.31	$6.36	$0.48
15	$100	$6.67	$100.00	$0.00	$2.71	$5.90	$2.40	-$0.31	$0.00	$0.00	$0.00
										Total	$50.50

The total amount of taxes that DPL has shifted to later years is referred to as the Accumulated Deferred Income Tax (ADIT). In the second year of the asset's lifetime, for example, DPL would have postponed paying the government ($1.36 + $0.95) $2.31 in income taxes as a result of accelerated depreciation. By year 4, DPL would have deferred $3.14 in tax liabilities. Between years 5 through 15, however, DPL would gradually repay the government by paying a little extra in income taxes each year. By the end of the asset's lifetime, all deferred income taxes would be paid and ADIT would equal 0.

The main takeaway from the previous discussion is that DPL could use the ADIT in any way it saw fit, including being invested in other activities or even returned to investors. Because ADIT is not money that is actually at risk from the investor's stand point, the PSC does not allow investors to earn a fair return on it. Consequently, the ADIT is removed from the rate base. This is shown in Table 4 on the previous page, where the rate base equals net plant minus ADIT.

Reducing the rate base by ADIT lowers the fair profits that DPL is allowed to earn. However, the size of ADIT is relatively small compared to the increase in net plant, so the allowable profits are not substantially lower than what was calculated under the original example. DPL's fair return sums to $50.50 over the asset's lifetime after accounting for ADIT, a decrease of $2.00 from the original example in the text.

Finally, we turn our attention to the interest expense deduction adjustment when calculating income taxes. Like the popular mortgage interest deduction available to homeowners, businesses are allowed to write-off interest expenses when calculating their income tax liability. How much interest accumulates when DPL undertakes a $100 investment depends on their choice of financing. For example, if DPL takes on long term debt to generate its capital, DPL must pay their bondholders interest. On the other hand, DPL pays no interest expense when using equity to finance its investment (but is expected to return profits to its shareholders).

Currently, DPL finances approximately half of its capital needs through debt and half through equity. Since DPL pays approximately 5% on its long term debt, its interest expense equals approximately 2.5% of the ongoing capital necessary to finance the investment. In other words, the interest expense is approximately 2.5% of the rate base.

To calculate the state and federal income tax liabilities owed by DPL, the 40.655% effective tax rate is applied to revenues minus allowable expenses, which include the accelerated depreciation expense and the interest expense. Income taxes are therefore determined from the following equation:

4) $Income\ Taxes = 40.655\% \times (Revenues - Taxable\ Depreciation - Interest\ Expense)$

But recall that under standard ratemaking principles, the revenue paid by ratepayers needs to cover DPL's depreciation expense, the fair return on that investment, and any associated taxes. Revenues can therefore be determined by the following equation:

5) $Revenue = Booked\ Depreciation + Fair\ Return + Income\ Taxes$

The two equations above indicate that DPL's income taxes depend on its revenues, but also that DPL's revenues depend on its income taxes. Solving these two equations with algebraic manipulation implies that:

6) $Income\ Taxes = \frac{40.655\% \times (Fair\ Return - Interest\ Expense) - Deferred\ Income\ Taxes}{(100\% - 40.655\%)}$

Moreover, because the fair return equals 7.5% times the rate base and the interest expense equals 2.5% times the rate base, DPL's income tax liability can be calculated as follows:

7) $Income\ Taxes = \frac{40.655\% \times 5\% \times Rate\ Base - Deferred\ Income\ Taxes}{(100\% - 40.655\%)}$

The point is that DPL's income taxes can be estimated by knowing just the rate base and DPL's deferred income taxes. Since $100 invested in reliability affects both of these variables as described in Table 4, the impact on income taxes is a direct application of Equation 7.

Table 5 Example of a $100 Grid Investment, adjusted for Accumulated Deferred Income Taxes and Interest Expense

Time Period	Total Plant	Net Plant	Deferred Income Taxes	Accum. Deferred Income Taxes	Rate Base	Booked Depreciation Expense	Fair Return (@7.5%)	Income Taxes (Eq. 7)	Revenue Needed
0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1	$100	$93.33	$1.36	$1.36	$91.98	$6.67	$6.90	$0.87	$14.43
2	$100	$86.67	$0.95	$2.30	$84.36	$6.67	$6.33	$1.29	$14.29
3	$100	$80.00	$0.58	$2.89	$77.11	$6.67	$5.78	$1.66	$14.11
4	$100	$73.33	$0.25	$3.14	$70.19	$6.67	$5.26	$1.98	$13.91
5	$100	$66.67	-$0.04	$3.10	$63.57	$6.67	$4.77	$2.25	$13.68
6	$100	$60.00	-$0.31	$2.79	$57.21	$6.67	$4.29	$2.48	$13.44
7	$100	$53.33	-$0.31	$2.48	$50.86	$6.67	$3.81	$2.26	$12.74
8	$100	$46.67	-$0.31	$2.17	$44.50	$6.67	$3.34	$2.05	$12.05
9	$100	$40.00	-$0.31	$1.86	$38.14	$6.67	$2.86	$1.83	$11.36
10	$100	$33.33	-$0.31	$1.55	$31.78	$6.67	$2.38	$1.61	$10.66
11	$100	$26.67	-$0.31	$1.24	$25.43	$6.67	$1.91	$1.39	$9.97
12	$100	$20.00	-$0.31	$0.93	$19.07	$6.67	$1.43	$1.18	$9.27
13	$100	$13.33	-$0.31	$0.62	$12.71	$6.67	$0.95	$0.96	$8.58
14	$100	$6.67	-$0.31	$0.31	$6.36	$6.67	$0.48	$0.74	$7.88
15	$100	$0.00	-$0.31	$0.00	$0.00	$6.67	$0.00	$0.52	$7.19
					Total	$100.00	$50.50	$23.06	$173.56

Table 5 above demonstrates the effect that ADIT and the interest expense deduction have on the revenues collected from rate payers.[21] The ADIT still lowers the rate base slightly and reduces DPL's fair return by $2.00 over the asset's lifetime. However, the ADIT and the interest expense greatly reduce DPL's income tax liability, especially in the first few years of the investment. DPL's income taxes cost rate payers $23.06 over 15 years, instead of $36.75 as calculated in Table 1. In total, Delaware rate payers are expected to pay $173.56 on the $100 investment.

We end this appendix by noting that the example above, while more complicated than Table 1, is still a drastic simplification of the actual calculations undertaken in actual rate cases. For example, depreciation, the fair return, and income tax liabilities, accrue more frequently than once a year, so profits and income taxes are calculated slightly differently. Investments typically use labor, which adds to payroll expenses and other taxes. Cash flows are also adjusted to account for timing differentials in customer payments and business expenses. Because such real life adjustments are difficult to convey in any single example and do not add much insight, they are not incorporated in this analysis.

[21] Since Table 5 extends the analysis in Table 4, only a select few columns reported previously are shown above.