Memorandum

TO: CONSERVATION LAW FOUNDATION

FROM: JOE DANIEL, SPENCER FIELDS, AND DOUG HURLEY

DATE: FEBRUARY 25, 2014

RE: UPDATE OF SCHILLER UNITS 4 & 6 ECONOMIC ANALYSIS

Background and Summary

In 2011, Synapse Energy Economics completed an analysis of the economics of the Schiller station coal units.[1] The report concluded that the two coal units, Schiller 4 and Schiller 6, were already losing money as of 2010, and forecasted that the two units would continue to lose money even under optimistic scenarios. The report also concluded that they were forecasted to lose even more money as compliance with new environmental regulations would require costly new retrofits. Conservation Law Foundation asked Synapse to update our previous review of the economics of Schiller units 4 and 6. In addition to updating the historic cash flow analysis in the 2011 report, Synapse examined five different forward looking scenarios utilizing our newly developed Coal Asset Valuation Tool (CAVT), providing an analysis of the future economics of the Schiller units.

As forecasted in our 2011 report, the update to the historic cash flow reveals that the Schiller units operated at a loss during 2011 and 2012. Although the actual losses are lower than originally forecasted due to a steep decline in the capacity factor of the two units, the resulting drop in energy revenues indicates that the Schiller units are not able to recover existing fixed costs, let alone the costs associated with compliance with future emissions regulations such as MATS. Taking this and other factors into account, the forward looking projections from CAVT are even more bleak, predicting that the units will continue to operate at a loss in every year forecasted. The net present value of these losses is expected to reach $272 million under our Reference Case.

[1] White, David, et. al, "Economic Analysis of Schiller Station Coal Units," *Synapse Energy Economics*, July 27, 2011, available at: www.synapse-energy.com.

Historic Analysis

All independently owned utilities are required to submit operations data to the Federal Energy Regulatory Commission annually. The data, which electric utilities must provide in FERC Form 1, includes revenue and expense information for the utility as a whole, as well as for each individual unit owned by the utility. In order to update our 2011 analysis, we added actual expenses and costs for the Schiller units detailed on page 402 of the 2011 and 2012 FERC Form 1 filings by PSNH.[2] Using this information in conjunction with energy and capacity price information provided in Synapse's 2013 Avoided Energy Supply Costs report and ISO-NE's 2013 Capacity, Energy, Loads, and Transmission Report and 2012 Annual Markets Report, we were able to update the cash flow model for the two Schiller Units.[3]

As seen in Figure 1, overall operating expenses and revenues have dropped significantly in the last two years, as the capacity factor for the two units has dropped from 83% in 2008 to 12% in 2012. Aside from the precipitous drop in capacity factor over the horizon of our analysis, the other major difference between our two analyses is in the expense column. As a result of running far less often, the units are spending less than we forecasted on fuel, fuel related expenses, and non-fuel O&M. Additionally, where in our earlier analysis we assumed future air emission costs based on a capacity factor consistent with the 52% seen in 2010, the actual emission costs for the Schiller units have decreased significantly since 2010 as they are operating less and emitting less each year.

Although the units' market revenue nearly covered their variable costs in 2011 and 2012, **that revenue has not been enough to cover fixed costs**. As Synapse expected, Schiller 4 & 6 have continued to lose money each year since our 2011 analysis.

[2] The data updated includes Total Non-Fuel O&M, Fuel and Fuel Related Expenses, Generation, Capacity, Capacity Price and Energy Price. We maintain previous assumptions for Gross Plant Value, Depreciation values, and Average Return on Rate Base.

[3] Hornby, Rick, et. al, "Avoided Energy Supply Costs in New England: 2013 Report," *Synapse Energy Economics*, July 12, 2013, available at: www.synapse-energy.com. And: ISO-NE, "CELT Report," May 1, 2013, available at: http://www.iso-ne.com/trans/celt/report/2013/2013_celt_report.pdf. Also: ISO-NE, "2012 Annual Markets Report," May 15, 2013, available at: http://www.iso-ne.com/markets/mkt_anlys_rpts/annl_mkt_rpts/2012/amr12_final_051513.pdf.

Figure 1: Revenue Requirement Analysis for Schiller Units 4 & 6

(All values in $1,000 nominal.)	Historic				
	2008	2009	2010	2011	2012
Expenses					
Non-Fuel O&M	13,012	11,764	10,022	8,846	3,247
Additional Environmental O&M					
Allowances	2,760	3,560	3,171	466	38
Total Non-Fuel O&M	15,773	15,324	13,193	9,312	3,285
Fuel and Fuel Related Expenses	32,222	28,229	24,836	10,673	4,187
Property Tax	416	416	416	416	416
Depreciation Expense	2,078	2,078	2,078	2,078	2,078
Total Expenses	**50,488**	**46,046**	**40,522**	**22,479**	**9,965**
Plant Values					
Capital Additions - General	0	0	0	0	0
Capital Additions - Environmental	0	0	0	0	0
Gross Plant Value	83,107	83,107	83,107	83,107	83,107
Accum. Depreciation	40,694	42,771	44,849	46,927	49,004
Net Plant Value	42,413	40,336	38,258	36,180	34,103
Working Capital					
Year End Fuel Inventory	*7,945*	*6,960*	*6,124*	*2,632*	*1,032*
Emissions Inventory					
Accum. Deferred Income Tax					
M&S Inventory					
Total Rate Base	50,358	47,296	44,382	38,812	35,135
Average Return on Rate Base	10.80%	10.98%	10.63%	10.63%	10.63%
Return on Rate Base	5,439	5,193	4,718	4,126	3,735
Revenue Requirements	**55,926**	**51,239**	**45,239**	**26,604**	**13,700**
Revenues					
Generation (GWh)	693.4	481.1	434.3	231.5	98.9
Average Price ($/MWh)	80	44	54	46	36
Energy Revenue	55,473	21,122	23,642	10,664	3,554
Capacity (MW)	96.01	96.01	96.01	96.01	96.01
Capacity Price	40	46	48	43	35
Capacity Revenue	3,802	4,449	4,604	4,148	3,400
Ancillary	0	0	0	0	0
Total Revenue	**59,275**	**25,572**	**28,247**	**14,812**	**6,954**
Net Revenue	**3,349**	**-25,668**	**-16,993**	**-11,793**	**-6,746**
Net Cash Flow	8,787	-20,475	-12,275	-7,667	-3,011
Generation Operations					
Variable Expenses	34,982	31,789	28,007	11,139	4,225
Energy Revenue	55,473	21,122	23,642	10,664	3,554
Net Margin	20,491	-10,667	-4,364	-475	-671

Analyzed Scenarios

Synapse investigated the capital and operational impacts of five different forward looking scenarios. The first scenario is entitled "no new environmental requirements." This scenario assumes that the Schiller 4 & 6 units would come into compliance with MATS with dry sorbent injection (DSI), activated carbon injection (ACI), and pulse-jet fabric filters (commonly known as baghouses). Additionally, this scenario

incorporates the Synapse mid-price natural gas forecast, excludes any forecasted market price for CO_2 beyond RGGI, and does not address future costs resulting from other pending environmental requirements, such as the National Ambient Air Quality Standards (NAAQS), Section 316(b) of the Clean Water Act, the Coal Combustion Residuals rule (CCR), and Effluent Limitation Guidelines (ELGs).[4] Overall, the "no new environmental requirements" scenario represents a very optimistic future for the two Schiller units.

To account for reasonably anticipated future costs, Synapse developed a "Reference Case." The Reference Case expands upon the first case, including the installation of selective catalytic reduction (SCR) to comply with NAAQS regulations by 2020. This scenario also incorporates a CO_2 price to account for future federal regulation of GHGs. The Reference Case does not address any future costs of compliance with Clean Water Act requirements. However, it is important to note that inclusion of such costs would only make Schiller 4 & 6 even less economic.

Further, Synapse ran two sensitivity cases around natural gas prices. Beginning with the reference case, these sensitivities merely alter the natural gas price projection: where all other scenarios use our mid-price forecast, the two gas sensitivities employ either a high or low natural gas price forecast.

The final scenario represents a possible future under stringent environmental regulations. The "strict emissions requirements case" deviates from the reference case in two ways: first, it assumes the Synapse High CO_2 price forecast; and second, it assumes that the compliance date for new NOx regulations under NAAQS will be 2018 as opposed to 2020. Table 1 lists the various assumptions made in each scenario Synapse analyzed.

Table 1: Matrix of Scenarios Analyzed[5]

Scenario	Environmental Controls				Market Forecasts	
	DSI	SCR	Baghouse	ACI	CO_2	Natural Gas Forecast
No New Environmental Requirements	2015	None	2015	2015	None	Mid
Ref Case	2015	2020	2015	2015	Mid	Mid
High Gas	2015	2020	2015	2015	Mid	High
Low Gas	2015	2020	2015	2015	Mid	Low
Strict Emissions Requirements	2015	2018	2015	2015	High	Mid

[4] NAAQS compliance focuses on PM2.5, ozone and NOx; Section 316(b) of the Clean Water Act covers cooling water intake structures in electric generating units; the CCR rule governs the treatment of the waste-product of coal generation; and the ELGs, which are required by section 304(m) of the Clean Water Act, limit toxic effluent from industrial facilities.

[5] These scenarios do not address any future costs of compliance with Section 316(b) of the Clean Water Act, CCR, and ELGs.

Economic Analysis with CAVT

To account for existing and impending financial pressures on coal units nationwide, Synapse developed the Coal Asset Valuation Tool (CAVT). CAVT is a spreadsheet-based database and model that forecasts the costs of compliance with environmental regulations for individual coal units, and combines them with forecasts of electricity market prices. It includes cost estimates for all expected environmental retrofits and possible carbon prices.[6] CAVT aggregates publicly available data—including capacity, generated power, heat rate and other information—on non-cogenerating coal units, which it then combines with publicly available cost estimates and methodologies in order to calculate the cost of complying with future environmental regulations. In addition to national-level analyses, CAVT can provide detailed cost analyses, and comparisons to market costs, for individual coal units. The calculated future cost of each coal unit—that is, the discounted present value of costs from 2013 to 2042—is compared to the estimated future cost of wholesale electricity market purchases to determine the future economic viability of continuing to operate a specific unit.

For this analysis, Synapse ran CAVT Version 4.23, which uses data last updated on February 14, 2014. All source data for coal unit characteristics comes from a combination of sources: U.S. Energy Information Agency's Form 860[7] and Form 923,[8] and the U.S. Environmental Protection Agency's (EPA's) Air Markets Dataset.[9] To develop market price data, Synapse employs the U.S. Energy Information Agency's Annual Energy Outlook 2012 Electricity Market Module Assumptions.[10] The capital and operating costs of environmental controls are based on Sargent & Lundy cost estimates developed as inputs for EPA's assumptions to ICF's Integrated Planning Model (IPM) v.4.10, and analysis of cost compliance with the Resource Conservation and Recovery Act.

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[6] Knight, P., E. A. Stanton, J. Fisher, B. Biewald. 2013. Forecasting Coal Unit Competitiveness: Coal Retirement Assessment Using Synapse's Coal Asset Valuation Tool (CAVT). Synapse Energy Economics for The Energy Foundation.

[7] U.S. Energy Information Agency (2013) *Form EIA-860 detailed data*. Retrieved from http://www.eia.gov/electricity/data/eia860/index.html

[8] U.S. Energy Information Agency (2013) *Form EIA-923 detailed data*. Retrieved from http://www.eia.gov/electricity/data/eia923/

[9] U.S. Environmental Protection Agency (2012) *Air Markets Program Data.* Retrieved from http://ampd.epa.gov/ampd/

[10] U.S. Energy Information Agency (2012) AEO 2012 Electricity Market Module. Retrieved from http://www.eia.gov/forecasts/aeo/assumptions/pdf/electricity.pdf

Environmental Controls and CO_2 Forecast

Table 2. Environmental control requirement assumptions

Environmental Control	Source of Environmental Control Cost Data
Selective Catalytic Reduction (SCR)	Sargent & Lundy (2010) *IPM Model – Revisions to Cost and Performance for APC Technologies: SCR Cost Development Methodology*. Retrieved from http://www.epa.gov/airmarkets/progsregs/epa-ipm/docs/v410/Appendix52A.pdf
Baghouse	Sargent & Lundy (2011) *IPM Model – Revisions to Cost and Performance for APC Technologies: Particulate Control Cost Development Methodology*. Reference no longer available online.
Activated Carbon Injection (ACI)	Sargent & Lundy (2011) *IPM Model – Revisions to Cost and Performance for APC Technologies: Mercury Cost Development Methodology*. Reference no longer available online.
Carbon Price (RGGI)	Regional Greenhouse Gas Initiative (2013) *Regional Greenhouse Gas Initiative Summary of Model Rule Changes*. Retrieved from http://www .rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Model_Rule_Summary.pdf
Carbon Price (Synapse)	Synapse Energy Economics (2012) 2012 *Carbon Dioxide Price Forecast*. Retrieved from http://www.synapse-energy.com/Downloads/SynapseReport.2012-10.0.2012-CO2-Forecast.A0035.pdf

Source: Modified from "Forecasting Coal Unit Competitiveness: Coal Retirement Assessment Using Synapse's Coal Asset Valuation Tool (CAVT)." Knight, P., E. A. Stanton, J. Fisher, B. Biewald. 2013.

Fuel Prices (Natural Gas and Coal)

To project the price of fuel in future years, Synapse uses AEO 2012 projections. For natural gas:

> CAVT uses regional natural gas price data from the EIA's 2012 Annual Energy Outlook to inform projections of future natural gas price changes.[11] [Synapse] mid natural gas prices are the EIA's 2013 reference case price escalated over time using the EIA's 2012-2035 percent change in its reference case natural gas prices.[12]

The same methodology is used for calculating coal prices; however the EIA regional coal prices are used in place of natural gas prices.[13]

[11] EIA (2012) *2012 Annual Energy Outlook*, supplemental tables 11-20. Retrieved from http://www.eia.gov/forecasts/archive/aeo12/data.cfm

[12] Knight, P., E. A. Stanton, J. Fisher, B. Biewald. 2013. Forecasting Coal Unit Competitiveness: Coal Retirement Assessment Using Synapse's Coal Asset Valuation Tool (CAVT). Synapse Energy Economics for The Energy Foundation.

[13] CAVT V 4.23

Economic Forecast of Schiller 4 & 6

In our analysis, the Schiller coal units (Schiller 4 & 6) operate at a loss in every year forecasted. In fact, in every year of the study, including 2013 and 2014, the costs of running Schiller are greater than the revenue that would be generated through the energy and capacity market despite the fact that both of these markets are projected to rise over the next 30 years. Even in the most optimistic future, where there are no new regulations restricting emissions of NOx, no regulations pertaining to CO_2 beyond RGGI, and no cost of compliance for any other environmental requirements, the Schiller coal units will not be able to recover their expenses.

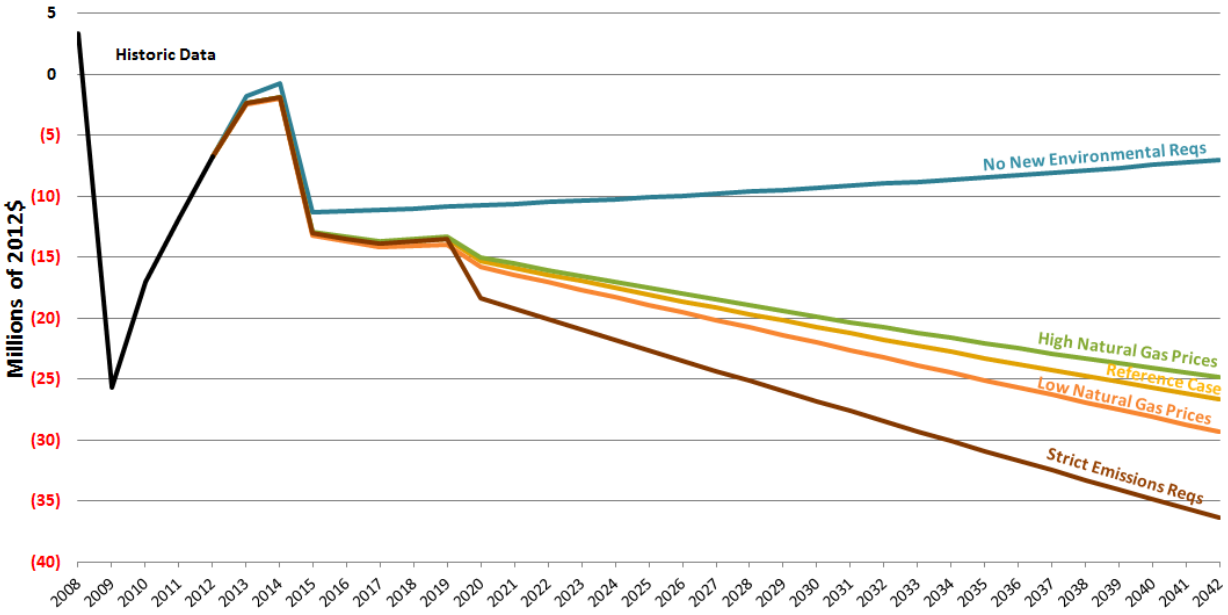
Figure 2 illustrates the annual combined net revenue for Schiller 4 & 6. Because the costs of operating these plants are greater than the revenue generated by the plants, the net of revenue minus costs is negative, and in every year Schiller 4 & 6 show losses. As seen in Figure 3, the cumulative present value of the Schiller units' losses is significant as it accumulates into the hundreds of millions of dollars over the next two decades. The values displayed in Figure 3 are discounted to present value. To do this Synapse assumed a pre-tax nominal WACC of 8%, which translates to an after tax WACC of 6.8% or a discount rate of 4.71% in real (constant) terms.[14]

The economic outlook for Schiller 4 & 6 does not improve when the two units are analyzed separately. Figure 4 and Figure 5 show the annual and cumulative losses at Schiller 4. In no year, under any scenario, is Schiller 4 able to generate more revenue than it costs to operate the plant. The same is true for Schiller 6. Figure 6 and Figure 7 illustrate that, again, for every scenario, in no year does Schiller 6 net any revenue.

[14] CAVT V 4.23

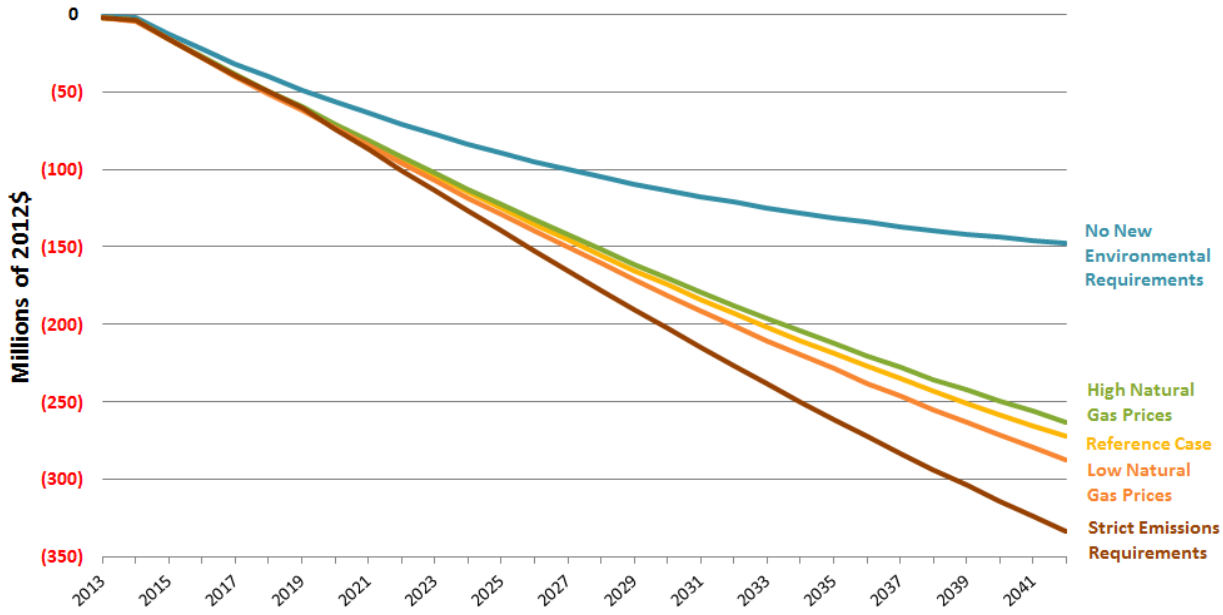
Schiller 4 & 6 Combined

Figure 2: Annual Net Revenue (Losses) For Schiller 4 & 6 Combined



Source CAVT V.4.23

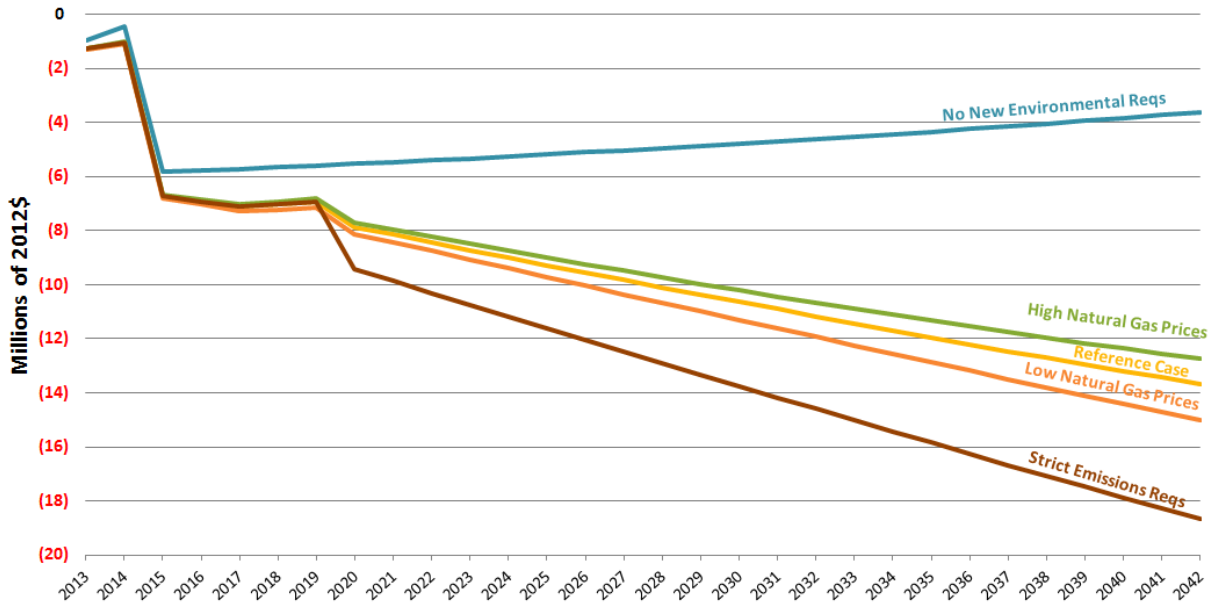
Figure 3: Cumulative Present Value of Net Revenue (Losses) for Schiller 4 & 6 Combined



Source: CAVT V 4.23

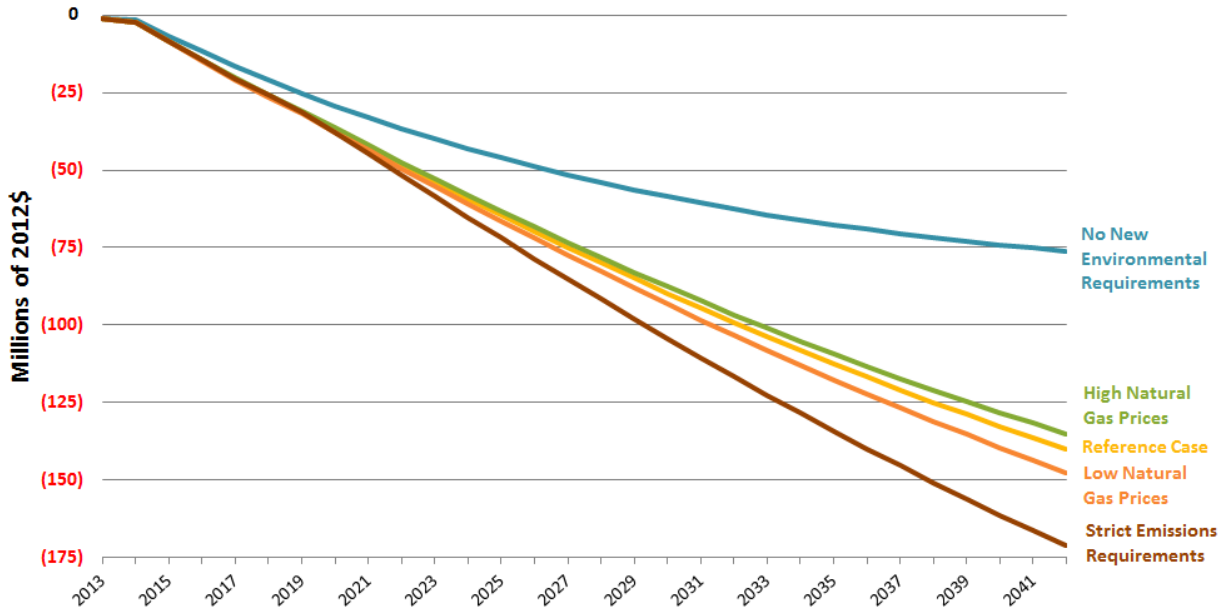
Schiller 4

Figure 4: Annual Net Revenue (Losses) For Schiller 4



Source: CAVT V 4.23

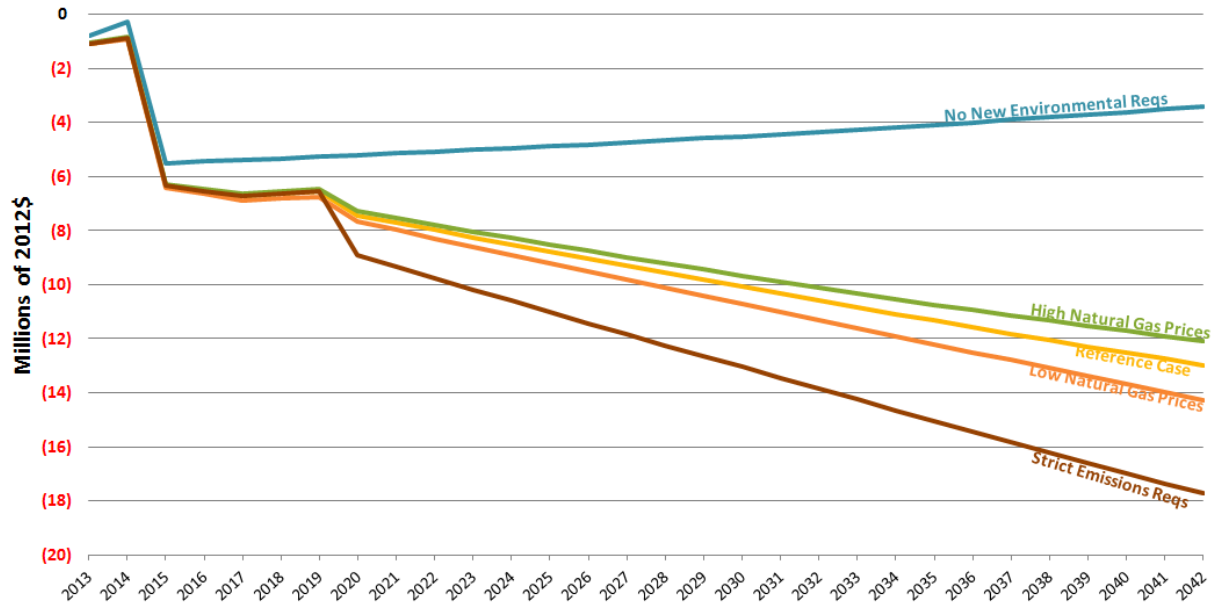
Figure 5: Cumulative Present Value of Net Revenue (Losses) for Schiller 4



Source: CAVT V 4.23

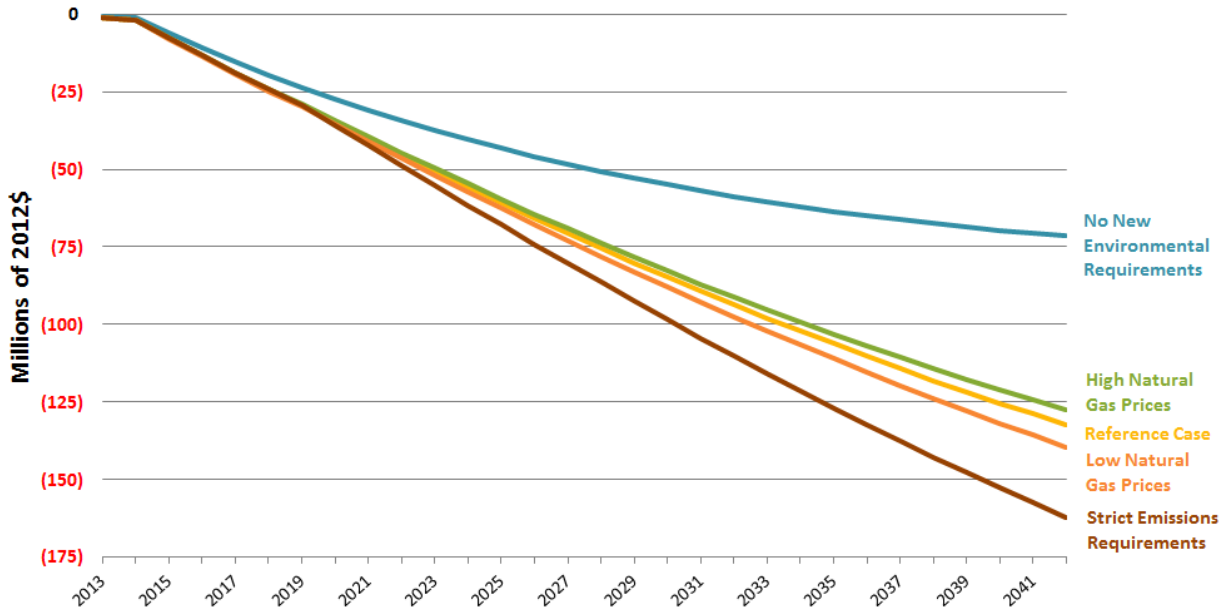
Schiller 6

Figure 6: Annual Net Revenue (Losses) For Schiller 6



Source: CAVT V 4.23

Figure 7: Cumulative Present Value of Net Revenue (Losses) for Schiller 6



Source: CAVT V 4.23

Appendix A: CAVT Outputs

The following ten pages present the net present value (NPV) of Schiller 4 and Schiller 6 under the array of different scenarios described in the Memorandum above. Each page lists the breakdown of costs for the coal-fired power plant as well as the all in market price (which is the assumed revenue stream for the plant (including revenue from the energy and capacity market). In each of the bar charts current costs are in blue while future costs are in orange.

State	NH
Unit	Schiller 4

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

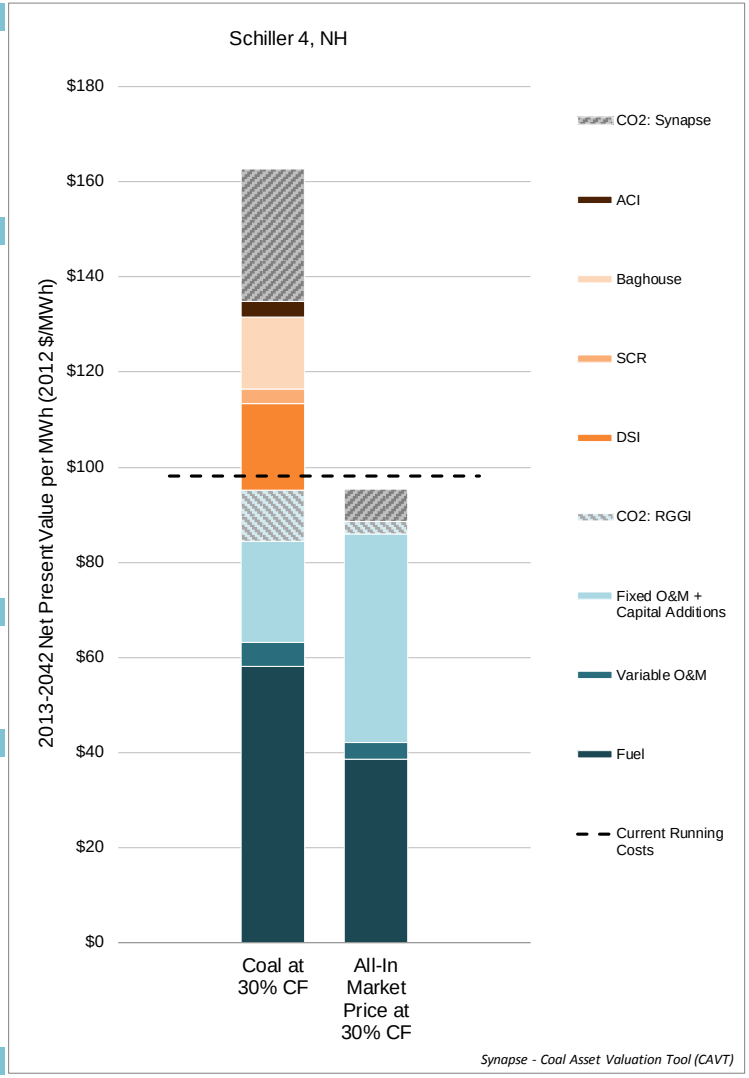
Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	4	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	30%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1952 (61 years old)	*EIA 860 2012*
Analysis Case	Ref. Case	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.30	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$21.18	*NERC EPA Assessment 2010, AEO 2013*
Total	**$84.24**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
DSI	$-	$18.20	*EPA IPM v4.1 Appdx 5-4 (Sargent & Lundy)*
SCR	$3.17	$-	*EPA IPM v4.1 Appdx 5-2a (Sargent & Lundy)*
Baghouse	$-	$15.12	*EPA IPM v4.1 Appdx 5-5 (Sargent & Lundy)*
ACI	$-	$3.25	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
Coal Combustion Residuals	$-	$-	*EEI Env. Reg. 2011, EPRI Cost Assessment 2010*
Effluent	$-	$-	*EPA Effluent Limitations Guidelines 2013*
Total	**$3.17**	**$36.57**	
CO2	$10.77	$27.87	
Total Cost with CO2	**$13.94**	**$64.44**	
Grand Total (Existing and Future)	**$162.61**		

Alternate Options (2013-2042 NPV, 2012 $/MWh)		Source
All-In Market Price at 30% CF	$85.79	*AEO 2012*
All-In Market Price at 30%CF w/ CO2	$95.19	



Notes

(1) New Natural Gas Combined Cycle Fixed O&M costs include ammortized cost of construction.

(2) Future environmental control costs include both ammortized capital costs and ongoing O&M costs, whereas capital costs are considered to be "sunk" for existing controls, and are not shown.

State: NH

Unit: Schiller 6

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

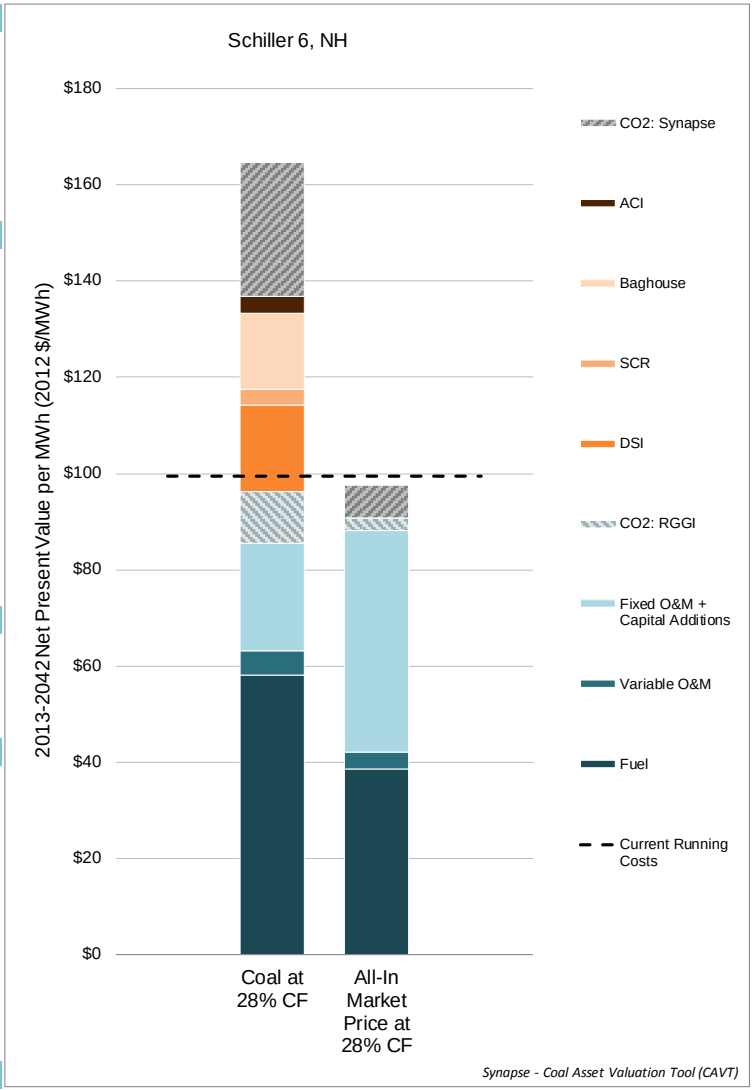
Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	6	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	28%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1957 (56 years old)	*EIA 860 2012*
Analysis Case	Ref. Case	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.16	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$22.28	*NERC EPA Assessment 2010, AEO 2013*
Total	**$85.34**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
DSI	$-	$17.93	*EPA IPM v4.1 Appdx 5-4 (Sargent & Lundy)*
SCR	$3.28	$-	*EPA IPM v4.1 Appdx 5-2a (Sargent & Lundy)*
Baghouse	$-	$15.90	*EPA IPM v4.1 Appdx 5-5 (Sargent & Lundy)*
ACI	$-	$3.38	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
Coal Combustion Residuals	$-	$-	*EEI Env. Reg. 2011, EPRI Cost Assessment 2010*
Effluent	$-	$-	*EPA Effluent Limitations Guidelines 2013*
Total	**$3.28**	**$37.22**	
CO2	$10.78	$27.90	
Total Cost with CO2	**$14.06**	**$65.13**	
Grand Total (Existing and Future)	**$164.53**		

Alternate Options (2013-2042 NPV, 2012 $/MWh)		Source
All-In Market Price at 28% CF	$88.07	*AEO 2012*
All-In Market Price at 28%CF w/ CO2	$97.47	



Notes

(1) New Natural Gas Combined Cycle Fixed O&M costs include ammortized cost of construction.

(2) Future environmental control costs include both ammortized capital costs and ongoing O&M costs, whereas capital costs are considered to be "sunk" for existing controls, and are not shown.

State: NH

Unit: Schiller 4

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

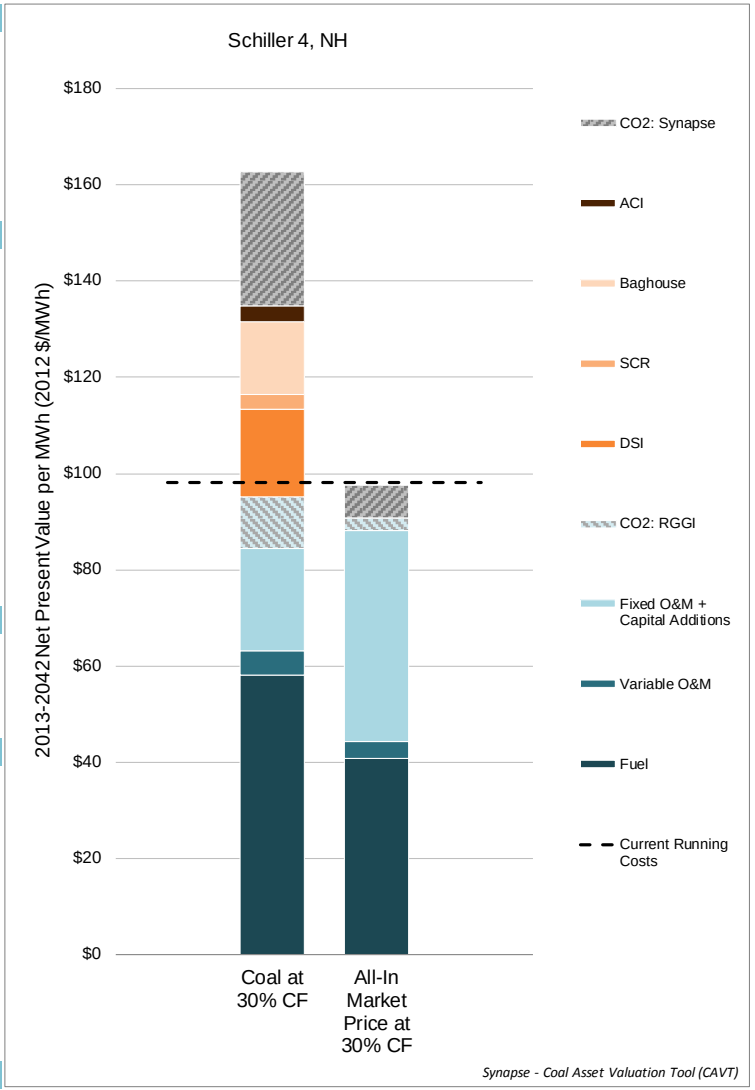
Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	4	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	30%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1952 (61 years old)	*EIA 860 2012*
Analysis Case	High Gas	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.30	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$21.18	*NERC EPA Assessment 2010, AEO 2013*
Total	**$84.24**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
DSI	$-	$18.20	*EPA IPM v4.1 Appdx 5-4 (Sargent & Lundy)*
SCR	$3.17	$-	*EPA IPM v4.1 Appdx 5-2a (Sargent & Lundy)*
Baghouse	$-	$15.12	*EPA IPM v4.1 Appdx 5-5 (Sargent & Lundy)*
ACI	$-	$3.25	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
Coal Combustion Residuals	$-	$-	*EEI Env. Reg. 2011, EPRI Cost Assessment 2010*
Effluent	$-	$-	*EPA Effluent Limitations Guidelines 2013*
Total	**$3.17**	**$36.57**	
CO2	$10.77	$27.87	
Total Cost with CO2	**$13.94**	**$64.44**	
Grand Total (Existing and Future)	**$162.61**		

Alternate Options (2013-2042 NPV, 2012 $/MWh)		Source
All-In Market Price at 30% CF	$88.04	*AEO 2012*
All-In Market Price at 30%CF w/ CO2	$97.45	



Notes

(1) New Natural Gas Combined Cycle Fixed O&M costs include ammortized cost of construction.

(2) Future environmental control costs include both ammortized capital costs and ongoing O&M costs, whereas capital costs are considered to be "sunk" for existing controls, and are not shown.

State: NH

Unit: Schiller 6

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

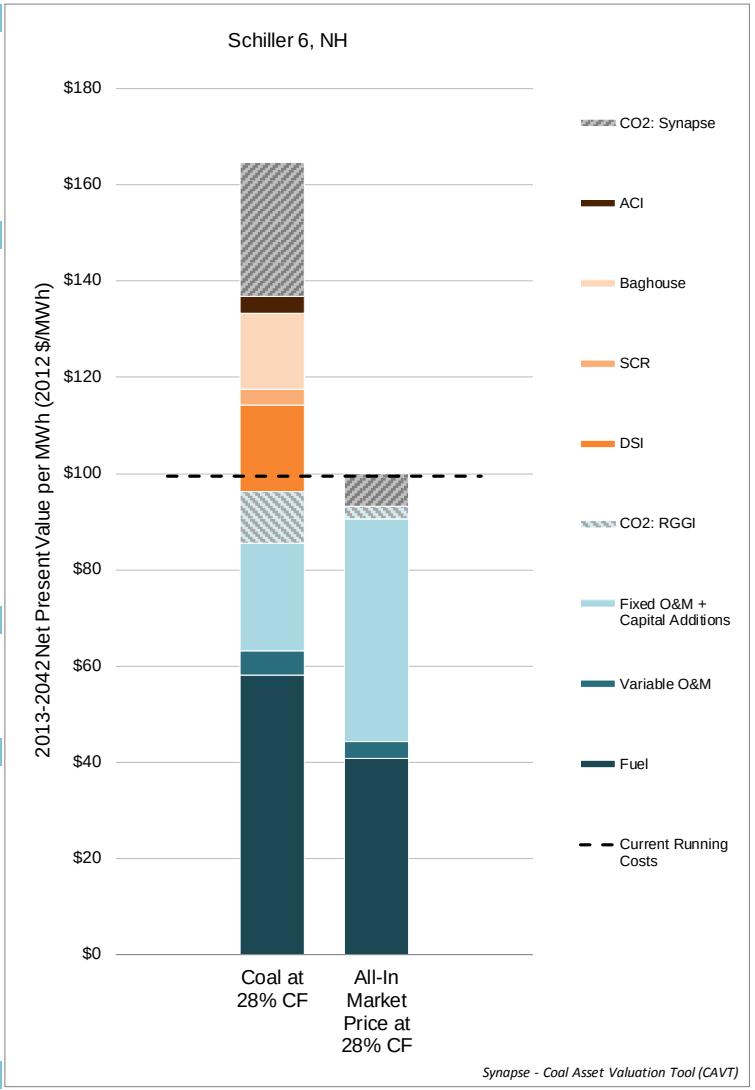
Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	6	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	28%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1957 (56 years old)	*EIA 860 2012*
Analysis Case	High Gas	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.16	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$22.28	*NERC EPA Assessment 2010, AEO 2013*
Total	**$85.34**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
DSI	$-	$17.93	*EPA IPM v4.1 Appdx 5-4 (Sargent & Lundy)*
SCR	$3.28	$-	*EPA IPM v4.1 Appdx 5-2a (Sargent & Lundy)*
Baghouse	$-	$15.90	*EPA IPM v4.1 Appdx 5-5 (Sargent & Lundy)*
ACI	$-	$3.38	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
Coal Combustion Residuals	$-	$-	*EEI Env. Reg. 2011, EPRI Cost Assessment 2010*
Effluent	$-	$-	*EPA Effluent Limitations Guidelines 2013*
Total	**$3.28**	**$37.22**	
CO2	$10.78	$27.90	
Total Cost with CO2	**$14.06**	**$65.13**	
Grand Total (Existing and Future)	**$164.53**		

Alternate Options (2013-2042 NPV, 2012 $/MWh)		Source
All-In Market Price at 28% CF	$90.33	*AEO 2012*
All-In Market Price at 28%CF w/ CO2	$99.73	



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State: NH

Unit: Schiller 4

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	4	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	30%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1952 (61 years old)	*EIA 860 2012*
Analysis Case	Low Gas	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.30	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$21.18	*NERC EPA Assessment 2010, AEO 2013*
Total	**$84.24**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
DSI	$-	$18.20	*EPA IPM v4.1 Appdx 5-4 (Sargent & Lundy)*
SCR	$3.17	$-	*EPA IPM v4.1 Appdx 5-2a (Sargent & Lundy)*
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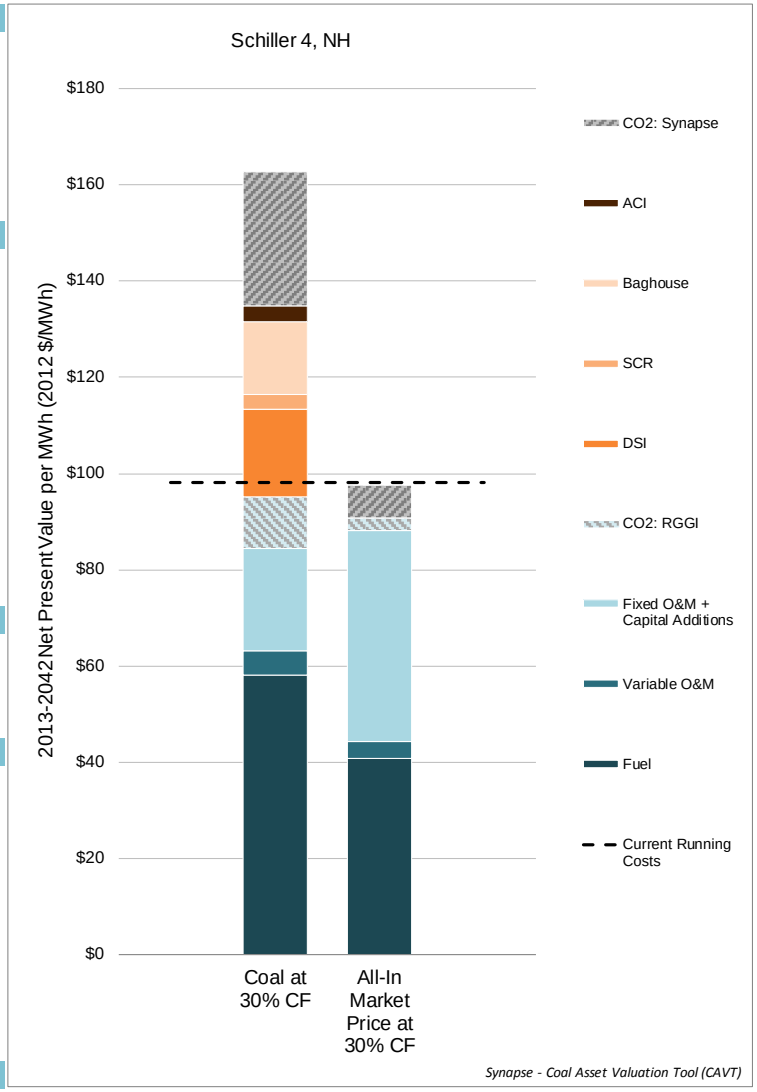
ACI	$-	$3.25	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
Coal Combustion Residuals	$-	$-	*EEI Env. Reg. 2011, EPRI Cost Assessment 2010*
Effluent	$-	$-	*EPA Effluent Limitations Guidelines 2013*
Total	**$3.17**	**$36.57**	
CO2	$10.77	$27.87	
Total Cost with CO2	**$13.94**	**$64.44**	
Grand Total (Existing and Future)	**$162.61**		

Alternate Options (2013-2042 NPV, 2012 $/MWh)		Source
All-In Market Price at 30% CF	$88.04	*AEO 2012*
All-In Market Price at 30%CF w/ CO2	$97.45	



Notes

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State: NH

Unit: Schiller 6

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	6	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	28%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1957 (56 years old)	*EIA 860 2012*
Analysis Case	Low Gas	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.16	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$22.28	*NERC EPA Assessment 2010, AEO 2013*
Total	**$85.34**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
DSI	$-	$17.93	*EPA IPM v4.1 Appdx 5-4 (Sargent & Lundy)*
SCR	$3.28	$-	*EPA IPM v4.1 Appdx 5-2a (Sargent & Lundy)*
Baghouse	$-	$15.90	*EPA IPM v4.1 Appdx 5-5 (Sargent & Lundy)*
ACI	$-	$3.38	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
Coal Combustion Residuals	$-	$-	*EEI Env. Reg. 2011, EPRI Cost Assessment 2010*
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Total	**$3.28**	**$37.22**	
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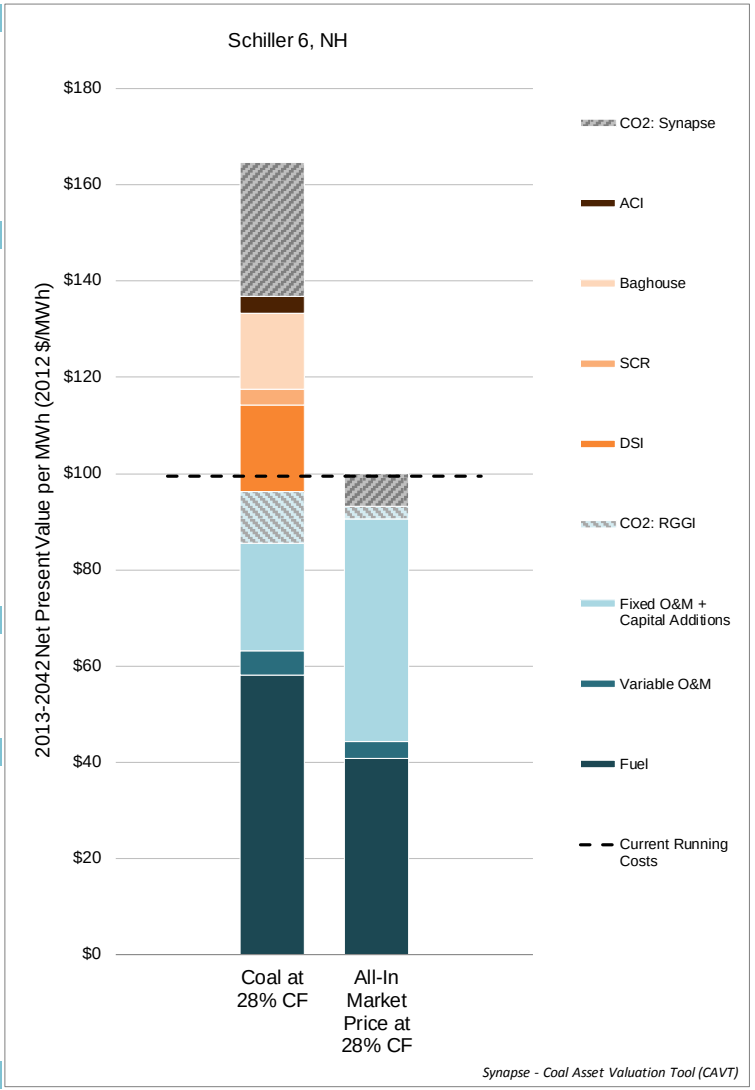
Grand Total (Existing and Future)	**$164.53**		

Alternate Options (2013-2042 NPV, 2012 $/MWh)		Source
All-In Market Price at 28% CF	$90.33	*AEO 2012*
All-In Market Price at 28%CF w/ CO2	$99.73	



Notes

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State: NH

Unit: Schiller 4

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	4	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	30%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1952 (61 years old)	*EIA 860 2012*
Analysis Case	Strict Enviro	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.30	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$21.18	*NERC EPA Assessment 2010, AEO 2013*
Total	**$84.24**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
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ACI	$-	$3.25	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
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All-In Market Price at 30% CF	$88.04	*AEO 2012*
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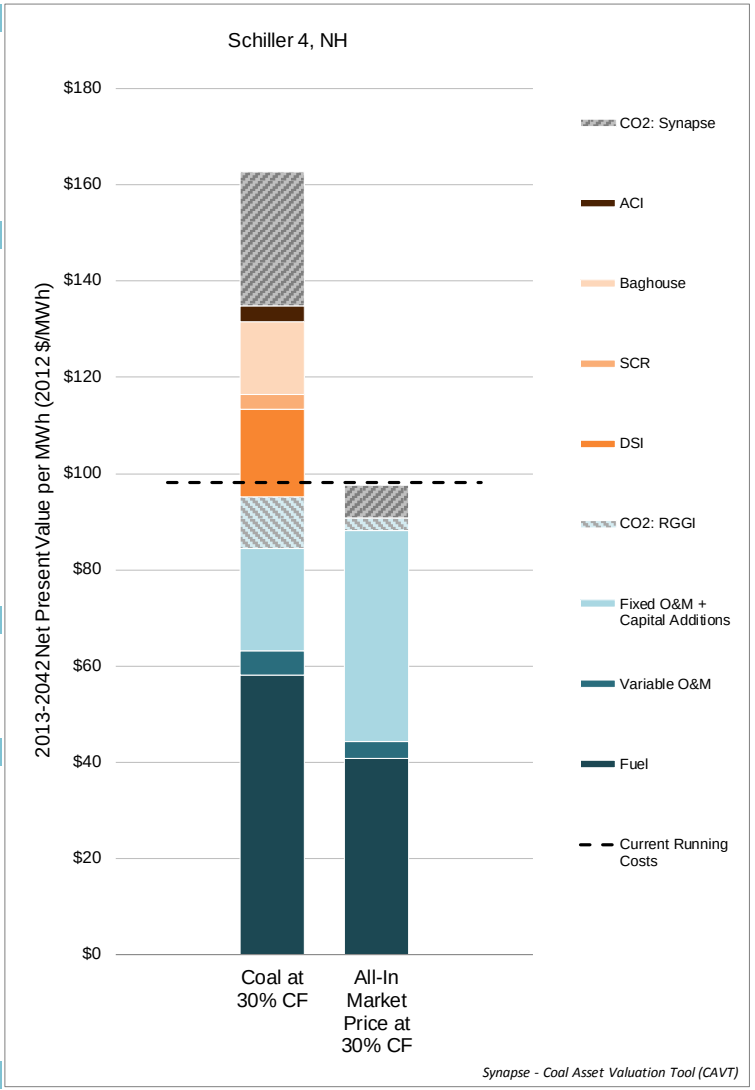

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State: NH

Unit: Schiller 6

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	6	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	28%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1957 (56 years old)	*EIA 860 2012*
Analysis Case	Strict Enviro	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.16	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$22.28	*NERC EPA Assessment 2010, AEO 2013*
Total	**$85.34**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
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ACI	$-	$3.38	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
Coal Combustion Residuals	$-	$-	*EEI Env. Reg. 2011, EPRI Cost Assessment 2010*
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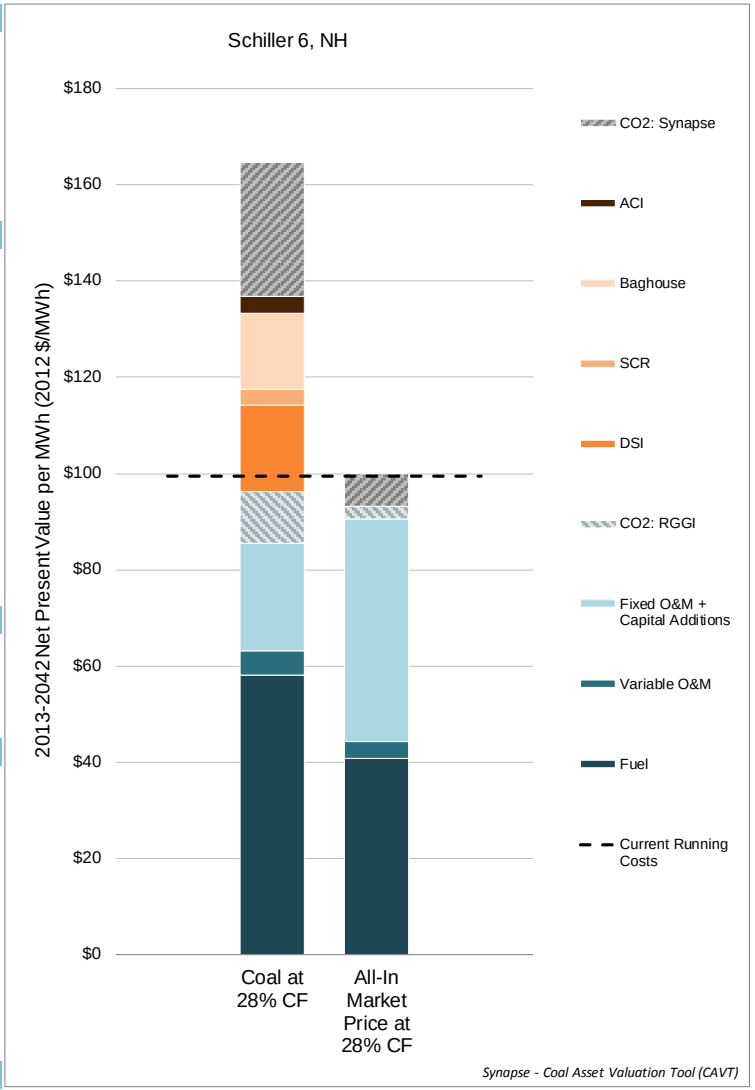

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State: NH

Unit: Schiller 4

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	4	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	30%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1952 (61 years old)	*EIA 860 2012*
Analysis Case	No New Enviro Regs	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.30	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
Controls	SNCR, Low NOx Burner Technology w/ Overfire Air	*EPA AMPD 2013*
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
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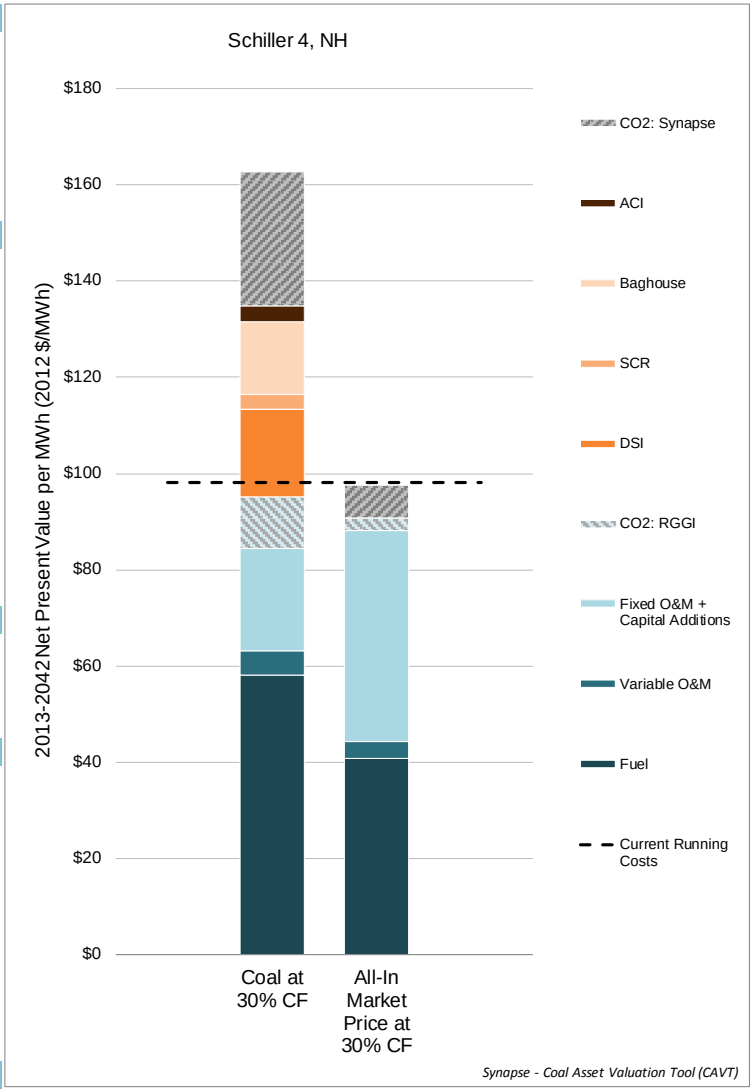

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State: NH

Unit: Schiller 6

Coal Asset Valuation Tool (CAVT) - 2013-2042 NPV

Control costs may not be accurate due to small size of this unit.

Plant Information		Source
Plant Name	Schiller	
Primary Owner	Public Service Co of NH	*EIA 860 2012*
Primary Owner Type	Investor Owned	*EIA 860 2012*
ORSPL	2367	*EIA 860 2012*
Generator Code	6	*EIA 860 2012*
Nameplate Capacity (MW)	50	*EIA 860 2012*
Capacity Factor, 2013-2042	28%	*EIA 860 2012, EIA 923 2010-2012*
Year in Operation	1957 (56 years old)	*EIA 860 2012*
Analysis Case	No New Enviro Regs	
Existing Environmental Controls		*Source*
SO2		
Controls, Status		*EIA 860 2012*
Controls		*EPA AMPD 2013*
Rate (lbs/MMBtu)	1.16	*EPA AMPD 2013*
NOx		
Controls, Status	Low NOx Burner, SNCR, Overfire Air, OP	*EIA 860 2012*
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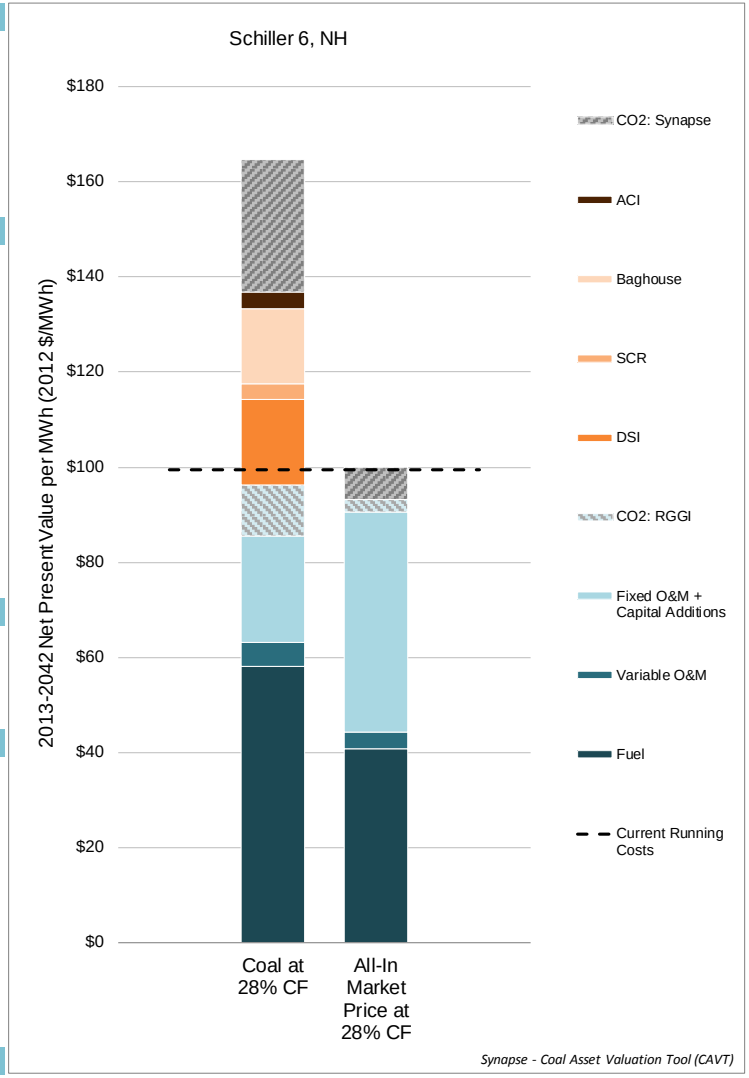
Rate (lbs/MMBtu)	0.27	*EPA AMPD 2013*
Particulates		
Controls, Status	ESP, cold side, w/out flue gas cond., OP	*EIA 860 2012*
Controls	ESP	*EPA AMPD 2013*
Mercury		
Controls		*EIA 860 2012*
Cooling		
Cooling Type	OS	*Synapse*
Tower Type	OS	*Synapse*

Levelized Existing Running Costs (2013-2042 NPV, 2012 $/MWh)		Source
Fuel (Coal)	$57.87	*EIA 923 2012*
Variable O&M	$5.20	*NERC EPA Assessment 2010*
Fixed O&M + Capital Additions	$22.28	*NERC EPA Assessment 2010, AEO 2013*
Total	**$85.34**	

Levelized Environmental Control Costs (2013-2042 NPV, 2012 $/MWh)	Existing Controls	Future Controls	Source
FGD	$-	$-	*EPA IPM v4.1 Appdx 5-1a (Sargent & Lundy)*
DSI	$-	$17.93	*EPA IPM v4.1 Appdx 5-4 (Sargent & Lundy)*
SCR	$3.28	$-	*EPA IPM v4.1 Appdx 5-2a (Sargent & Lundy)*
Baghouse	$-	$15.90	*EPA IPM v4.1 Appdx 5-5 (Sargent & Lundy)*
ACI	$-	$3.38	*EPA IPM v4.1 Appdx 5-3 (Sargent & Lundy)*
Recirculating Cooling	$-	$-	*EPA Tech. Development Doc. for 316(b)*
Coal Combustion Residuals	$-	$-	*EEI Env. Reg. 2011, EPRI Cost Assessment 2010*
Effluent	$-	$-	*EPA Effluent Limitations Guidelines 2013*
Total	**$3.28**	**$37.22**	
CO2	$10.78	$27.90	
Total Cost with CO2	**$14.06**	**$65.13**	
Grand Total (Existing and Future)	**$164.53**		

Alternate Options (2013-2042 NPV, 2012 $/MWh)		Source
All-In Market Price at 28% CF	$90.33	*AEO 2012*
All-In Market Price at 28%CF w/ CO2	$99.73	



Notes

(1) New Natural Gas Combined Cycle Fixed O&M costs include ammortized cost of construction.

(2) Future environmental control costs include both ammortized capital costs and ongoing O&M costs, whereas capital costs are considered to be "sunk" for existing controls, and are not shown.