Ohio | Public Utilities Commission

Application to Commit Energy Efficiency/Peak Demand Reduction Programs (Mercantile Customers Only)

Case No.: 18-0020-EL-EEC

Mercantile Customer: Ford Motor Co

Electric Utility: The Cleveland Electric Illuminating Company

Program Title or Description: Ford OHAP project

Rule 4901:1-39-05(F), Ohio Administrative Code (O.A.C.), permits a mercantile customer to file, either individually or jointly with an electric utility, an application to commit the customer's existing demand reduction, demand response, and energy efficiency programs for integration with the electric utility's programs. The following application form is to be used by mercantile customers, either individually or jointly with their electric utility, to apply for commitment of such programs in accordance with the Commission's pilot program established in Case No. 10-834-EL-POR

Completed applications requesting the cash rebate reasonable arrangement option in lieu of an exemption from the electric utility's energy efficiency and demand reduction (EEDR) rider will be automatically approved on the sixty-first calendar day after filing, unless the Commission, or an attorney examiner, suspends or denies the application prior to that time. Completed applications requesting the exemption from the EEDR rider for a period of up to 12 months will also qualify for the 60-day automatic approval. However, all applications requesting an exemption from the EEDR rider for longer than 12 months must provide additional information, as described within the Historical Mercantile Annual Report Template, that demonstrates additional energy savings and the continuance of the Customer's energy efficiency program. This information must be provided to the Commission at least 61 days prior to the termination of the initial 12 month exemption period to prevent interruptions in the exemption period.

Complete a separate application for each customer program. Projects undertaken by a customer as a single program at a single location or at various locations within the same service territory should be submitted together as a single program filing, when possible.

Check all boxes that are applicable to your program. For each box checked, be sure to complete all subparts of the question, and provide all requested additional information. Submittal of altered or incomplete applications may result in a suspension of the automatic approval process or denial of the application.

Any confidential or trade secret information may be submitted to Staff on disc or via email at ee-pdr@puc.state.oh.us.

Section 1: Mercantile Customer Information

Name:Ford Motor Co

Principal address:One American Road, Dearborn, Michigan 48126

Address of facility for which this energy efficiency program applies:650 Miller Road, Avon Lake, OH 44012

Name and telephone number for responses to questions:Alex Stefanou 3132486122

Electricity use by the customer (check the box(es) that apply):

☒ The customer uses more than seven hundred thousand kilowatt hours per year at the above facility. (Please attach documentation.)

☒ The customer is part of a national account involving multiple facilities in one or more states. (Please attach documentation.)

Section 2: Application Information

A) The customer is filing this application (choose which applies):

☐ Individually, without electric utility participation.

☒ Jointly with the electric utility.

B) The electric utility is: The Cleveland Electric Illuminating Company

C) The customer is offering to commit (check any that apply):

☒ Energy savings from the customer's energy efficiency program. (Complete Sections 3, 5, 6, and 7.)

☐ Capacity savings from the customer's demand response/demand reduction program. (Complete Sections 4, 5, 6, and 7.)

Both the energy savings and the capacity savings from the customer's energy efficiency program. (Complete all sections of the Application.)

Section 3: Energy Efficiency Programs

A) The customer's energy efficiency program involves (check those that apply):

☐ Early replacement of fully functioning equipment with new equipment. (Provide the date on which the customer replaced fully functioning equipment, and the date on which the customer would have replaced such equipment if it had not been replaced early. Please include a brief explanation for how the customer determined this future replacement date (or, if not known, please explain why this is not known)). **If Checked, Please see Exhibit 1 and Exhibit 2**

☒ Installation of new equipment to replace failed equipment which has no useful life remaining. The customer installed new equipment on the following date(s): _____.

☐ Installation of new equipment for new construction or facility expansion. The customer installed new equipment on the following date(s):

_____.

☒ Behavioral or operational improvement.

B) Energy savings achieved/to be achieved by the energy efficiency program:

1) If you checked the box indicating that the project involves the early replacement of fully functioning equipment replaced with new equipment, then calculate the annual savings [(kWh used by the original equipment) – (kWh used by new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: _____ kWh

2) If you checked the box indicating that the customer installed new equipment to replace failed equipment which had no useful life remaining, then calculate the annual savings [(kWh used by new standard equipment) – (kWh used by the optional higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: 1,413,209 kWh

See 18-0020_FordOHAP_CEI_EnergyProject.pdf Table 1.2 (pgs 1&2), items FIM6a and FIM 6b (the savings for these two items total 1, 413,209 kWh). See pgs 33&34 of same document for engr'g calcs.

Please describe any less efficient new equipment that was rejected in favor of the more efficient new equipment. **Please see Exhibit 1 if applicable**

3) If you checked the box indicating that the project involves equipment for new construction or facility expansion, then calculate the annual savings [(kWh used by standard new equipment) – (kWh used by optional higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

   Annual savings: _____ kWh

   Please describe the less efficient new equipment that was rejected in favor of the more efficient new equipment. **Please see Exhibit 1 if applicable**

4) If you checked the box indicating that the project involves behavioral or operational improvements, provide a description of how the annual savings were determined.

   Annual savings: 8,618,857 kWh
   See 18-0020_FordOHAP_CEI_EnergyProject.pdf Table 1.2 (pgs 1&2), items FIM1a thru FIM 5 (the savings for these eight items total 8,618,857 kWh). See paragraph 4.3 beginning on pg 11 and continuing thru paragraph 4.9 ending on pg 33 of the same document for engr'g calcs.

Section 4: Demand Reduction/Demand Response Programs

A) The customer's program involves (check the one that applies):

☒ This project does not include peak demand reduction savings.

☐ Coincident peak-demand savings from the customer's energy efficiency program.

☐ Actual peak-demand reduction. (Attach a description and documentation of the peak-demand reduction.)

☐ Potential peak-demand reduction (check the one that applies):

☐ The customer's peak-demand reduction program meets the requirements to be counted as a capacity resource under a tariff of a regional transmission organization (RTO) approved by the Federal Energy Regulatory Commission.

☐ The customer's peak-demand reduction program meets the requirements to be counted as a capacity resource under a program that is equivalent to an RTO program, which has been approved by the Public Utilities Commission of Ohio.

B) On what date did the customer initiate its demand reduction program?

_____

C) What is the peak demand reduction achieved or capable of being achieved (show calculations through which this was determined):

_____ kW

Section 5: Request for Cash Rebate Reasonable Arrangement, Exemption from Rider, or Commitment Payment

Under this section, check all boxes that apply and fill in all corresponding blanks.

A) The customer is applying for:

☒ A cash rebate reasonable arrangement.

☐ An exemption from the energy efficiency cost recovery mechanism implemented by the electric utility.

☐ Commitment payment

B) The value of the option that the customer is seeking is:

A cash rebate reasonable arrangement.

☒ A cash rebate of $747,969. (Rebate shall not exceed 50% project cost. Attach documentation showing the methodology used to determine the cash rebate value and calculations showing how this payment amount was determined.)

An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider.

☐ An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for _____ months (not to exceed 24 months). (Attach calculations showing how this time period was determined.)

☐ Ongoing exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for an initial period of 24 months because this program is part of the customer's ongoing efficiency program. (Attach documentation that establishes the ongoing nature of the program.) In order to continue the exemption beyond the initial 12 month period, the customer will need to complete, and file within this application, the Historical Mercantile Annual Report

Template to verify the projects energy savings are persistent.

☐ A commitment payment valued at no more than $_____. (Attach documentation and calculations showing how this payment amount was determined.)

Section 6: Cost Effectiveness

The program is cost effective because it has a benefit/cost ratio greater than 1 using the (choose which applies):

☐ Total Resource Cost (TRC) Test. The calculated TRC value is: _____(Continue to Subsection 1, then skip Subsection 2)

☒ Utility Cost Test (UCT) . The calculated UCT value is: **See Exhibit 3** (Skip to Subsection 2.)

<u>Subsection 1: TRC Test Used (please fill in all blanks).</u>

The TRC value of the program is calculated by dividing the value of our avoided supply costs (generation capacity, energy, and any transmission or distribution) by the sum of our program overhead and installation costs and any incremental measure costs paid by either the customer or the electric utility.

The electric utility's avoided supply costs were _______.

Our program costs were _______.

The incremental measure costs were _______.

Subsection 2: UCT Used (please fill in all blanks).

We calculated the UCT value of our program by dividing the value of our avoided supply costs (capacity and energy) by the costs to our electric utility (including administrative costs and incentives paid or rider exemption costs) to obtain our commitment.

Our avoided supply costs were **See Exhibit 3**

The utility's program costs were **See Exhibit 3**

The utility's incentive costs/rebate costs were **See Exhibit 3**

Section 7: Additional Information

Please attach the following supporting documentation to this application:

- Narrative description of the program including, but not limited to, make, model, and year of any installed and replaced equipment.
- A copy of the formal declaration or agreement that commits the program or measure to the electric utility, including:
  1) any confidentiality requirements associated with the agreement;
  2) a description of any consequences of noncompliance with the terms of the commitment;
  3) a description of coordination requirements between the customer and the electric utility with regard to peak demand reduction;
  4) permission by the customer to the electric utility and Commission staff and consultants to measure and verify energy savings and/or peak-demand reductions resulting from your program; and,
  5) a commitment by the customer to provide an annual report on your energy savings and electric utility peak-demand reductions achieved.
- A description of all methodologies, protocols, and practices used or proposed to be used in measuring and verifying program results. Additionally, identify and explain all deviations from any program measurement and verification guidelines that may be published by the Commission.

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Application to Commit Energy Efficiency/Peak Demand Reduction Programs (Mercantile Customers Only)

Case No.: 18-0020-EL-EEC

State of Ohio :

George Andraos, Affiant, being duly sworn according to law, deposes and says that:

1. I am the duly authorized representative of:

   Ford Motor Company
   [insert customer or EDU company name and any applicable name(s) doing business as]

2. I have personally examined all the information contained in the foregoing application, including any exhibits and attachments. Based upon my examination and inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete.

[signature] DIRECTOR, ENERGY
Signature of Affiant & Title

Sworn and subscribed before me this 31st day of August, 2017 Month/Year

[signature: Tracey Yvette Davis] Tracey Yvette Davis, Notary
Signature of official administering oath Print Name and Title

My commission expires on May 26, 2022

TRACEY YVETTE DAVIS
NOTARY PUBLIC - STATE OF MICHIGAN
COUNTY OF WAYNE
My Commission Expires May 28, 2022
Acting in the County of Wayne

Exhibit 1

Customer Legal Entity Name: Ford Motor Company

Site Address: Ohio Assembly Plant-Ford Motor Company
Principal Address: 650 Miller Road, Avon Lake, OH 44012

Project No.	Project Name	Narrative description of your program including, but not limited to, make, model, and year of any installed and replaced equipment:	Description of methodologies, protocols and practices used in measuring and verifying project results	What date would you have replaced your equipment if you had not replaced it early? Also, please explain briefly how you determined this future replacement date.	Please describe the less efficient new equipment that you rejected in favor of the more efficient new equipment.
1	FIM 1 - Enamel 1 Spraybooth	FIM 1a – Enamel Spray Booth Recirculating FIM 1b – Minimize the ventilation rate in the Paper Pull Zone FIM 1c – Install new PLC control equipment for idle operating mode FIM 1d – Implement downdraft reductions in the Clear Coat Manual and Flex zones Modifications necessary for the Enamel 1 recirculation system include changes to the spray booth air supply houses, exhaust fans, plenums, eliminators, abatement filter house, abatement fan, ductwork modifications, and updated control logic. The following is a more detailed summary of the recirculation project. Detailed engineering drawings are included in Attachments to Appendix I. Additionally, Appendix II Financial Analysis defines the existing and proposed changes in spray booth airflow and motor energy use.	Energy savings will be generated by reducing the amount of outdoor air being utilized by the BC and CC ventilation systems during production hours. Outdoor CFM post-retrofit and fan kW post-retrofit will be measured one-time after the measure is installed. Damper position and fan mode will be monitored continuously post-retrofit through the energy management controls in order to ensure the system schedule is being followed. The paper pull area will be reconfigured from 2 zones to 3 zones. The existing exhaust fans will be replaced with smaller exhaust fans, and the amount of outdoor air brought into the paper pull zone will also be decreased. Energy savings will be verified by taking post-retrofit	N/A	N/A
2	FIM 2 - Abatement Systems	Modifications necessary for the Enamel 1 abatement system include changes to the exhaust fans, abatement fans, ductwork modifications, and updated control logic. The following is a more detailed summary of the Abatement Consolidation project. Re-route the CC Bell Zone exhaust to the BC WEP System and the air stream will be combined with the BC Bell Zone exhaust, prior to flowing into the existing BC WEP System. Combining the two air steams into one (1) abatement system, will allow the Clearcoat Abatement system to be completely abandoned in place. Additionally, the Basecoat Abatement System will be minimized in that two (2) SLA fans and Solvent Concentrators will be abandoned and the system will operate with just one (1) SLA fan and Solvent Concentrator. The scope of work to implement the consolidation includes:	The BC and CC portion of the abatement area will be combined. This will create energy savings by reducing the number of KCR fans from 2 to 1, reducing the number of RTO units from 2 to 1, and also decreasing the load on the boiler. Additional fans will be added to the system. Energy savings will be verified by taking one-time post-retrofit measurement of fan and motor kW, and by continuously monitoring the annual operating hours of the equipment through the energy management system.	N/A	N/A
3	FIM 3 – Paintshop Ventilation Unit Control	a. Install BMS controls on twenty three (23) Heating and Ventilation units and twenty-nine (29) building exhaust fans. Bring control back to a central location for monitoring and control. Specific equipment to be controlled is listed in Table 1. b. The BMS network architecture will be high speed Ethernet with homerun cabling from the rooftop controllers to the nearest Ford MPN IDF's. The field controllers will communicate to the existing BAS server (Tridium) on the MPN for real time information. c. Control the equipment based on building pressure, space temperature, and time of day. Provide three (3) modes of operation; Production, Weekday night, and Weekends. d. Perform an overall air balance to assure conformance with Ford specs. e. Seven (7)	Energy savings will be verified by monitoring the run times of the associated HV equipment, as outlined in Table 1.6.1 below. Energy savings will be realized by scheduling this equipment to turn off when the space is not in use. Energy savings will be verified by taking one-time post-retrofit measurement of fan and motor kW, and by continuously monitoring the annual operating hours of the equipment through the energy management system.	N/A	N/A
4	FIM 4 – Bodyshop Ventilation Unit Control	Install BMS controls on eleven (11) truck dock heaters, seventeen (17) Heating and Ventilation units and twenty-four (24) building exhaust fans. Bring control back to a central location for monitoring and control. Specific equipment to be controlled is listed in Table 3. b. The BMS network architecture will be high speed Ethernet with homerun cabling from the rooftop controllers to the nearest Ford MPN IDF's. The field controllers will communicate to the existing BAS server (Tridium) on the MPN for real time information. c. Control the equipment based on building pressure, space temperature, and time of day. Provide three (3) modes of operation; Production, Weekday night, and Weekends.	Energy savings will be verified by monitoring the run times of the associated HV equipment, as outlined in Table 1.6.1 below. Energy savings will be realized by scheduling this equipment to turn off when the space is not in use. Energy savings will be verified by taking one-time post-retrofit measurement of fan and motor kW, and by continuously monitoring the annual operating hours of the equipment through the energy management system.	N/A	N/A
5	FIM5- Final Assembly Ventilation Unit Control	Furnish and install a new Siemens Building Management System to control the following equipment. Engineering drawings for typical HV, TDH, and Building EF control are included in Attachments to Appendix I. Details of repairs to be made to plant ventilation equipment are included in Attachments to Appendix I. a. Install EMS controls on thirteen (13) truck dock heaters, thirty-eight (38) Heating and Ventilation units and forty-nine (49) building exhaust fans. Bring control back to a central location for monitoring and control. Specific equipment to be controlled is listed in Table 5. b. The BMS network architecture will be high speed Ethernet with homerun cabling from the rooftop controllers to the nearest Ford MPN IDF's. The field controllers will communicate to the existing BAS server (Tridium) on the MPN for real time information.	Energy savings will be verified by monitoring the run times of the associated HV equipment, as outlined in Table 1.6.1 below. Energy savings will be realized by scheduling this equipment to turn off when the space is not in use. Energy savings will be verified by taking one-time post-retrofit measurement of fan and motor kW, and by continuously monitoring the annual operating hours of the equipment through the energy management system.	N/A	N/A
6	FIM 6 – Compressed Air System Improvements	Install Air Compressors for Non-Production Pressure Reduction. a. Furnish and install two (2) packaged 15 hp compressors with integral refrigerated dryer and tank; Atlas Copco GA11-125T or mutually approved other. Install near the Heavy Lift area. b. Furnish and install two (2) packaged 15 hp compressors with integral refrigerated dryer and tank; Atlas Copco GA11-125T or mutually approved other. Install near the Body Repair, Paint Repair and Repair Hole area. c. Install compressed air piping according to Ford specification to connect the new Heavy Lift compressor to the 2" and 1" lines that supply the Heavy Lift area. d. Install compressed air piping according to Ford specification. Connect the new Brake Hole compressor to the 2" line that supplies the Repair Hole. Connect the Repair Hole	Energy savings will be realized by operating the compressed air system at a lower pressure during weekends. Energy savings will be verified by taking a one-time instantaneous measurement of the kW associated with the compressed air system post- retrofit Energy savings will be realized by reducing the number of leaks in the existing compressed air system. A flow meter will be used to measure the flow rate pre and post-retrofit one-time post-retrofit in order to quantify the reduction in lost CFM due to leaks.	N/A	N/A

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Exhibit 2

Customer Legal Entity Name: Ford Motor Company
Site Address: Ohio Assembly Plant-Ford Motor Company
Principal Address: 650 Miller Road, Avon Lake, OH 44012

	Unadjusted Usage, kwh (A)	Weather Adjusted Usage, kwh (B)	Weather Adjusted Usage with Energy Efficiency Addbacks, kwh (c) *Note 1*
2016	94,035,328	94,035,328	94,035,328
2015	94,000,000	94,000,000	94,000,000
2014	94,000,000	94,000,000	94,000,000
Average	**94,011,776**	**94,011,776**	**94,011,776**

Project Number	Project Name	In-Service Date	Project Cost $	50% of Project Cost $	KWh Saved/Year (D) counting towards utility compliance	KWh Saved/Year (E) eligible for incentive	Utility Peak Demand Reduction Contribution, KW (F)	Prescriptive Rebate Amount (G) $	Eligible Rebate Amount (H) $ *Note 2*
1	FIM 1 - Enamel 1 Spraybooth	01/31/2017	$1,481,208	$740,604	3,392,479	3,392,479	-	$339,248	$250,000
2	FIM 2 - Abatement Systems	01/31/2017	$1,481,208	$740,604	238,487	238,487	-	$23,849	$17,887
3	FIM 3 – Paintshop Ventilation Unit Control	01/31/2017	$1,481,208	$740,604	1,247,610	1,247,610	-	$124,761	$93,571
4	FIM 4 – Bodyshop Ventilation Unit Control	01/31/2017	$1,481,208	$740,604	1,600,690	1,600,690	-	$160,069	$120,052
5	FIM5- Final Assembly Ventilation Unit Control	01/31/2017	$1,481,208	$740,604	2,139,591	2,139,591	-	$213,959	$160,469
6	FIM 6 – Compressed Air System Improvements	01/31/2017	$1,481,208	$740,604	1,413,209	1,413,209	-	$141,321	$105,991
					-	-	-		
		Total	**$8,887,248**		**10,032,066**	**10,032,066**	**0**	**$1,003,207**	**$747,969**

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Notes
(1) Customer's usage is adjusted to account for the effects of the energy efficiency programs included in this application. When applicable, such adjustments are prorated to the in-service date to account for partial year savings.

(2) The eligible rebate amount is based upon 75% of the rebates offered by the FirstEnergy Commercial and Industrial Energy Efficiency programs, not to exceed the lesser of 50% of the project cost or $250,000 per project.

Commitment Payment $
$0

Exhibit 3

UCT = Utility Avoided Costs / Utility Costs

Project	Utility Avoided Cost $ (A)	Utility Cost $ (B)	Cash Rebate $ (C)	Administrator Variable Fee $ (D)	Total Utility Cost $ (E)	UCT (F)
1	$ 1,683,518	$ 675	$ 250,000	$23,481	$ 274,156	**6.1**
2	$ 118,349	$ 675	$ 17,887	$2,385	$ 20,947	**5.65**
3	$ 619,126	$ 675	$ 93,571	$12,476	$ 106,722	**5.80**
4	$ 794,342	$ 675	$ 120,052	$16,007	$ 136,734	**5.81**
5	$ 1,061,772	$ 675	$ 160,469	$20,349	$ 181,493	**5.85**
6	$ 701,305	$ 675	$ 105,991	$14,132	$ 120,798	**5.81**
Total	**4,978,413**	**4,050**	**747,969**	**$88,830**	**840,849**	**5.9**

Notes

(A) Represents NPV of avoided energy and capacaity costs over a 10 year life multiplied by the annual project savings.

(B) Represents the utility's costs incurred for self-directed mercantile applications for applications filed and applications in progress. Includes incremental costs of legal fees, fixed administrative expenses, etc.

(C) This is the amount of the Rebate Payment paid to the customer for this

(D) Based on approximate Administrator's variable compensation for purposes of calculating the UCT, actual compensation may be less.

(E) = (B) + (C) + (D)

(F) =(A) / (E)

Ford Motor Company ~ Ohio Assembly Plant-Ford Motor Company
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APPENDIX II

FINANCIAL ANALYSIS

Performance Assurance Protocol

Section 1: Summary of Total Guaranteed Energy Savings

Guaranteed Energy Savings

The energy savings as shown in Tables 1.1 and 1.2 are based on utility rates provided by Ford Motor Land Development Energy Efficiency and Supply Group as described in Section 2. The energy use that will be eliminated and/or reduced after the retrofits are complete were calculated based on the current and future operating schedules as described in Section 3. Siemens' guarantee is based solely upon aggregate annual Total Energy and Water Cost Savings shown in Table 1.1 below and as measured in the protocol below.

Table 1.1 – Total Guaranteed Energy Savings

End of Year	Electric Energy Use Savings (KWH)	Electric Energy Cost Savings ($)	N.Gas Energy Use Savings (MMBtu)	N.Gas Energy Cost Savings ($)	Water Use Savings (MGAL)	Water Cost Savings ($)	Total Energy & Water Cost Savings ($)
1	10,032,066	$702,245	306,401	$1,286,884	6,404	$34,580	$2,023,709
2	10,032,066	$702,245	306,401	$1,286,884	6,404	$34,580	$2,023,709
3	10,032,066	$702,245	306,401	$1,286,884	6,404	$34,580	$2,023,709
4	10,032,066	$702,245	306,401	$1,286,884	6,404	$34,580	$2,023,709
5	10,032,066	$702,245	306,401	$1,286,884	6,404	$34,580	$2,023,709
6	10,032,066	$702,245	306,401	$1,286,884	6,404	$34,580	$2,023,709
TOTALS	**60,192,395**	**$4,213,467**	**1,838,405**	**$7,721,303.1**	**38,423**	**$207,482**	**$12,142,253**

Table 1.2 – Annual Guaranteed Energy Savings by FIM Type

Table 1.2 below breaks down the Total Guaranteed Energy Savings (shown in Table 1.1) by Facility Improvement Measure (FIM) Types.

FIMS 1 – 6b	Electric Energy Use Savings (KWH)	Electric Energy Cost Savings ($)	N.Gas Energy Use Savings (MMBtu)	N.Gas Energy Cost Savings ($)	Water Use Savings (MGAL)	Water Cost Savings ($)	Total Energy & Water Cost Savings ($)
FIM 1a – Enamel Spray Booth Recirculating	-380,463	($26,632)	29,457	$123,717	1,606	$8,670	$105,755
FIM 1b – Minimize the ventilation rate in the Paper Pull Zone	644,873	$45,141	14,929	$62,703	440	$2,376	$110,221
FIM 1c – Install new PLC control equipment for idle operating mode	2,521,994	$176,540	87,677	$368,245	4,426	$23,900	$568,684
FIM 1d – Implement downdraft reductions in the Clear Coat Manual and Flex zones	606,075	$42,425	-9,253	($38,862)	-68	($365)	$3,198
FIM 2a – Reroute the CC Bell zone to the BC abatement system	238,487	$16,694	93,064	$390,869			$407,563
FIM 3 – Paint Shop Ventilation	1,247,610	$87,333	20,660	$86,770			$174,103
FIM 4 – Body Shop Ventilation	1,600,690	$112,048	26,613	$111,774			$223,822

FIM 5 – Final Assembly Ventilation	2,139,591	$149,771	43,254	$181,667			$331,438
FIM 6a – Install Compressor for non-production pressure reduction	69,844	$4,889					$4,889
FIM 6b – Repair Air leaks to achieve 604 scfm off-shift reduction	1,343,365	$94,036					$94,036
TOTALS	**10,032,066**	**$702,245**	**306,401**	**$1,286,884**	**6,404**	**$34,580**	**$2,023,709**

Table 1.3 – Annual Projected Energy Savings by Month

Table 1.3 below breaks down the Total Guaranteed Energy Savings (shown in Table 1.1) by Facility Improvement Measure (FIM) Types projected on a monthly basis.

FIM	Jan Savings ($)	Feb Savings ($)	Mar Savings ($)	Apr Savings ($)	May Savings ($)	Jun Savings ($)	Jul Savings ($)	Aug Savings ($)	Sep Savings ($)	Oct Savings ($)	Nov Savings ($)	Dec Savings ($)	Total
FIM 1a – Enamel Spray Booth Recirculating	$ 19,424	$ 17,586	$ 15,083	$ 10,500	$ 6,087	$ 103	$ (139)	$ (341)	$ 2,325	$ 8,843	$ 12,959	$ 13,325	**$ 105,755**
FIM 1b – Minimize the ventilation rate in the Paper Pull Zone	$ 15,449	$ 13,979	$ 12,960	$ 10,177	$ 7,842	$ 4,765	$ 2,561	$ 4,758	$ 5,782	$ 9,364	$ 11,581	$ 11,003	**$ 110,221**
FIM 1c – Install new PLC control equipment for idle operating mode	$ 83,794	$ 75,765	$ 70,305	$ 54,080	$ 36,506	$ 20,309	$ 10,697	$ 20,024	$ 26,542	$ 48,373	$ 61,772	$ 60,518	**$ 568,684**
FIM 1d – Implement downdraft reductions in the Clear Coat Manual and Flex zones	$ (2,349)	$ (2,133)	$ (1,243)	$ (180)	$ 1,093	$ 2,890	$ 1,734	$ 3,131	$ 2,161	$ 305	$ (846)	$ (1,366)	**$ 3,198**
FIM 2a – Reroute the CC Bell zone to the BC abatement system	$ 36,728	$ 33,174	$ 36,728	$ 35,543	$ 36,728	$ 35,543	$ 20,141	$ 36,728	$ 35,543	$ 36,728	$ 35,543	$ 28,435	**$ 407,563**
FIM 3 – Paint Shop Ventilation	$ 18,116	$ 16,363	$ 17,997	$ 16,729	$ 15,054	$ 6,829	$ 11,305	$ 7,056	$ 12,998	$ 16,214	$ 17,324	$ 18,116	**$ 174,103**
FIM 4 – Body Shop Ventilation	$ 23,300	$ 21,046	$ 23,147	$ 21,515	$ 19,356	$ 8,761	$ 14,505	$ 9,053	$ 16,708	$ 20,849	$ 22,281	$ 23,300	**$ 223,822**
FIM 5 – Final Assembly Ventilation	$ 35,257	$ 31,845	$ 35,008	$ 32,439	$ 28,846	$ 11,711	$ 19,388	$ 12,101	$ 24,627	$ 31,273	$ 33,684	$ 35,257	**$ 331,438**
FIM 6a – Install Compressor for pressure reduction	$ 441	$ 398	$ 441	$ 426	$ 441	$ 426	$ 242	$ 441	$ 426	$ 441	$ 426	$ 341	**$ 4,889**
FIM 6b – Repair Air leaks to achieve 604 scfm off-shift reduction	$ 7,987	$ 7,214	$ 7,987	$ 7,729	$ 7,987	$ 7,729	$ 7,987	$ 7,987	$ 7,729	$ 7,987	$ 7,729	$ 7,987	**$ 94,036**
TOTALS	**$ 238,147**	**$ 215,236**	**$ 218,414**	**$ 188,959**	**$ 159,939**	**$ 99,066**	**$ 88,420**	**$ 100,939**	**$ 134,843**	**$ 180,376**	**$ 202,453**	**$ 196,916**	**$ 2,023,709**

Section 2: Utility Rate Structures and Escalation Rates

Electric, Gas, Water and Compressed Air Utility Rates

The utility rates were provided by Ford Motor Land Development Energy Efficiency and Supply Group. These rates are used for calculating the energy cost savings of this contract. These rates are fixed and will be in effect for the entire length of the contract. Siemens assumes no risk for variability of these utility rates and their corresponding effect on the realized cash flow.

Table 2.1 – Utility Rates

Section 3: Current Calculated Baseline Data

3.1 Current Calculated Baseline Data:

Table 3.1.1 – Actual Utility Consumption & Cost (Calendar Year 2016)

Utility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Electric KWH	8,232,064	8,390,144	8,414,720	8,392,576	7,319,680	6,652,800	7,114,880	8,562,432	7,197,312	7,796,736	7,815,296	8,146,688	94,035,328
Electric Cost	$576,244	$587,310	$589,030	$587,480	$512,378	$465,696	$498,042	$599,370	$503,812	$545,772	$547,071	$570,268	$6,582,473
N. Gas MMBtu	115,585	108,743	84,075	75,059	38,478	16,411	14,719	21,053	17,965	42,959	65,639	99,782	700,468
N. Gas Cost	$485,455	$456,722	$353,114	$315,249	$161,606	$68,926	$61,819	$88,423	$75,454	$180,429	$275,683	$419,086	$2,941,966
Water* MGAL	14,496	18,721	20,198	18,037	19,173	20,360	11,590	18,299	14,781	12,971	14,041	13,736	196,403
Water Cost	$78,278	$101,093	$109,069	$97,400	$103,534	$109,944	$62,586	$98,815	$79,817	$70,043	$75,821	$74,174	$1,060,576
Total $	**$1,139,978**	**$1,145,125**	**$1,051,214**	**$1,000,129**	**$777,518**	**$644,566**	**$622,446**	**$786,608**	**$659,083**	**$796,244**	**$898,575**	**$1,063,528**	**$10,585,015**
* 2012 data													

<u>2016 Actual Year Totals for electricity and natural gas and 2012 data for water based upon energy data provided by Ford Land and OHAP and Contract Rates</u>

Electric Consumption: 94,035,328 KWH	Electric Cost: $6,582,473	
Natural Gas Consumption:700,468 MMBtu	Natural Gas Cost: $2,941,966	
Water Consumption: 196,403 MGAL	Water Cost: $1,060,576	
2016 Total Plant Electrical and Natural Gas Costs: $ 9,524,438	2012 Total Water Cost $1,060,576	

Table 3.1.2 – Adjusted Utility Consumption & Cost (Calendar Year 2016)

Utility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Electric KWH	8,232,064	8,390,144	8,414,720	8,392,576	7,319,680	6,652,800	7,114,880	8,562,432	7,197,312	7,796,736	7,815,296	8,146,688	94,035,328
Electric Cost	$576,244	$587,310	$589,030	$587,480	$512,378	$465,696	$498,042	$599,370	$503,812	$545,772	$547,071	$570,268	$6,582,473
N. Gas MMBtu	126,098	123,670	117,182	68,307	42,715	16,411	14,719	21,053	17,965	83,106	93,812	99,380	824,419
N. Gas Cost	$529,611	$519,415	$492,165	$286,891	$179,405	$68,926	$61,819	$88,423	$75,454	$349,044	$394,009	$417,397	$3,462,559
Water* MGAL	14,496	18,721	20,198	18,037	19,173	20,360	11,590	18,299	14,781	12,971	14,041	13,736	196,403
Water Cost	$78,278	$101,093	$109,069	$97,400	$103,534	$109,944	$62,586	$98,815	$79,817	$70,043	$75,821	$74,174	$1,060,576
Total $	**$1,184,134**	**$1,207,819**	**$1,190,264**	**$971,772**	**$795,316**	**$644,566**	**$622,446**	**$786,608**	**$659,083**	**$964,859**	**$1,016,901**	**$1,061,839**	**$11,105,609**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016 HDD	1082	900	610	554	213	12	0	0	7	196	465	1003	5,042
30 Yr HDD	1180	1024	850	504	236	64	26	62	146	379	665	999	6,136
Adjustment	109.1%	113.7%	139.4%	91.0%	111.0%	N/A	N/A	N/A	NA	193.5%	142.9%	99.6%	

2016 Adjusted Year Totals:

Gas Use Adjusted to 30 Year Average Heating Degree Days
Utility Costs Adjusted for Contract Rates

Electric Consumption: 94,035,328 KWH	Electric Cost: $6,582,473	
Natural Gas Consumption:824,419 MMBtu	Natural Gas Cost: $3,462,559	
Water Consumption: 196,403 MGAL	Water Cost: $1,060,576	
2016 Total Plant Utility Costs: $ 11,105,609		

Table 3.1.3 – Calculated Baseline FIM Utility Consumption & Cost

	Electric Energy Use (KWH)	**Electric Energy Cost ($)**	**N.Gas Energy Use (MMBTu)**	**N.Gas Energy Cost ($)**	**Water Use (MGAL)**	**Water Cost ($)**	**Total Energy & Water Cost ($)**
FIM 1a – Enamel Spray Booth Recirculating	971,195	$67,984	34,456	$144,714	1,806	$9,754	$222,452
FIM 1b – Minimize the ventilation rate in the Paper Pull Zone	1,434,843	$100,439	32,658	$137,165	1,698	$9,170	$246,773
FIM 1c – Install new PLC control equipment for idle operating mode	2,046,621	$143,263	81,825	$343,667	4,269	$23,052	$509,982
FIM 1d – Implement downdraft reductions in the Clear Coat Manual and Flex zones	2,302,916	$161,204	45,973	$193,086	2,319	$12,524	$366,814
FIM 2a – Reroute the CC Bell zone to the BC abatement system	1,725,193	$120,764	106,084	$445,553			$566,316
FIM 3 – Paint Shop Ventilation	6,797,865	$475,851	40,168	$168,707			$644,557
FIM 4 – Body Shop Ventilation	5,187,199	$363,104	46,700	$196,139			$559,243
FIM 5 – Final Assembly Ventilation	6,797,865	$475,851	84,895	$356,560			$832,410
FIM 6a – Install Compressor for non-production pressure reduction	81,792	$5,725					$5,725
FIM 6b – Repair Air leaks to achieve 604 scfm off-shift reduction	14,042,331	$982,963					$982,963
TOTALS	**41,387,820**	**$2,897,147**	**472,759**	**$1,985,589**	**10,093**	**$54,500**	**$4,937,236**

Table 3.1.4 – Projected Baseline Energy Costs by Month

FIM	Jan Use ($)	Feb Use ($)	Mar Use ($)	Apr Use ($)	May Use ($)	Jun Use ($)	Jul Use ($)	Aug Use ($)	Sep Use ($)	Oct Use ($)	Nov Use ($)	Dec Use ($)	Total
FIM 1a – Enamel Spray Booth Recirculating	$ 31,333	$ 28,372	$ 25,738	$ 20,030	$ 16,884	$ 9,706	$ 5,733	$ 9,604	$ 11,534	$ 18,596	$ 23,127	$ 21,795	**$ 222,452**
FIM 1b – Minimize the ventilation rate in the Paper Pull Zone	$ 34,598	$ 31,303	$ 29,036	$ 22,817	$ 17,591	$ 10,616	$ 5,713	$ 10,602	$ 12,906	$ 20,980	$ 25,953	$ 24,659	**$ 246,773**
FIM 1c – Install new PLC control equipment for idle operating mode	$ 78,026	$ 70,592	$ 64,133	$ 48,409	$ 32,857	$ 15,868	$ 7,788	$ 15,410	$ 22,232	$ 43,018	$ 56,264	$ 55,384	**$ 509,982**
FIM 1d – Implement downdraft reductions in the Clear Coat Manual and Flex zones	$ 52,040	$ 47,090	$ 43,293	$ 33,525	$ 25,439	$ 15,955	$ 8,625	$ 16,071	$ 18,899	$ 30,520	$ 38,354	$ 37,002	**$ 366,814**
FIM 2a – Reroute the CC Bell zone to the BC abatement system	$ 51,034	$ 46,096	$ 51,034	$ 49,388	$ 51,034	$ 49,388	$ 27,987	$ 51,034	$ 49,388	$ 51,034	$ 49,388	$ 39,510	**$ 566,316**
FIM 3 – Paint Shop Ventilation	$ 45,150	$ 40,781	$ 44,665	$ 40,417	$ 68,941	$ 72,584	$ 72,584	$ 72,584	$ 61,476	$ 37,382	$ 42,844	$ 45,150	**$ 644,557**
FIM 4 – Body Shop Ventilation	$ 43,599	$ 39,380	$ 43,130	$ 39,028	$ 58,676	$ 54,298	$ 54,298	$ 54,298	$ 51,468	$ 36,098	$ 41,372	$ 43,599	**$ 559,243**
FIM 5 – Final Assembly Ventilation	$ 69,094	$ 62,408	$ 68,351	$ 61,851	$ 86,255	$ 72,584	$ 72,584	$ 72,584	$ 74,832	$ 57,207	$ 65,565	$ 69,094	**$ 832,410**
FIM 6a – Install Compressor for non-production pressure reduction	$ 516	$ 466	$ 516	$ 499	$ 516	$ 499	$ 283	$ 516	$ 499	$ 516	$ 499	$ 399	**$ 5,725**
FIM 6b – Repair Air leaks to achieve 604 scfm off-shift reduction	$ 83,485	$ 75,405	$ 83,485	$ 80,791	$ 83,485	$ 80,791	$ 83,485	$ 83,485	$ 80,791	$ 83,485	$ 80,791	$ 83,485	**$ 982,963**
TOTALS	**$488,875**	**$441,892**	**$453,382**	**$396,755**	**$441,678**	**$382,289**	**$339,079**	**$386,187**	**$384,026**	**$378,837**	**$424,159**	**$420,078**	**$ 4,937,236**

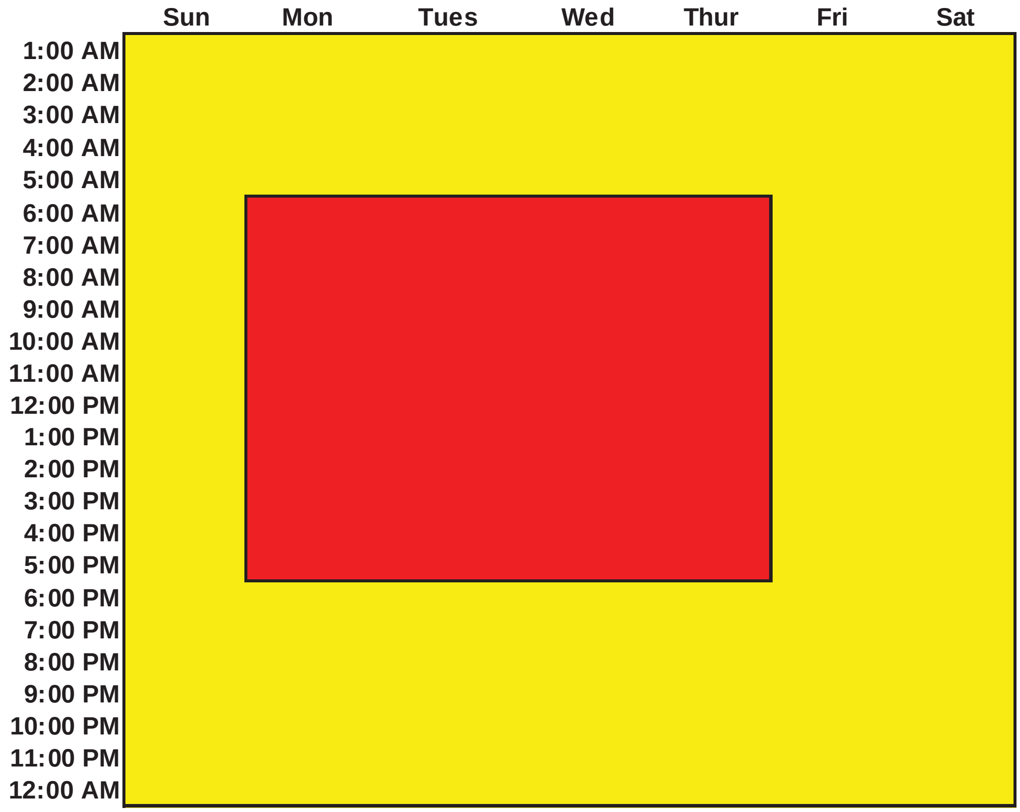
Note:

- These figures represent the calculated baseline energy usage and costs specifically for each FIM and equipment pertaining to that FIM. This table does not account for other Paint Shop energy users such as phosphate and e-coat tanks, building heating, production machinery and miscellaneous equipment.
- Actual use may vary based on weather, utility rates, production volumes and operating hours.
- 30 Year Average Weather Data for Cleveland, OH was utilized in the tables above.
- The contract guaranteed safety factor has not been included in the tables above.
- Utility Costs Based on Contract Rates

3.2 Contracted Baseline Operating Schedules: 1 Shift Production Operations
The following data of this section outlines the current and future operating characteristics that are required to be implemented under the FIM Work. This specific configuration of operating practices for one ten hour shift production operation is the Contracted Baseline.

Table 3.2.1 Contracted Baseline – Current Spray Booth Operating Schedule (Summer and Winter Conditions)

Current Baseline Spray Booth Schedule



Production Mode - Production Operation at 10 hr/shift, 1 shifts/day, 4 days/week
Non-Production Mode - Weekdays & Fri., Sat & Sun Shutdown

ASSUMPTIONS

Existing Production Energy Use
ASH currently in production mode at actual temperatures indicated below.

Enamel 1 Fresh Air	552,297	cfm	72.4^{o}F and 58.8%RH
	552,297	**cfm**	

Existing Non-Production Energy Use
ASH at same temps and humidities as current production mode.

Enamel 1 Fresh Air	552,297	cfm	72.4^{o}F and 58.8%RH
	552,297	**cfm**	

Table 3.2.2 Contract Baseline – Future Spray Booth Operating Schedule (Summer and Winter Conditions)

Future Spray Booth Schedule

	Sun	Mon	Tues	Wed	Thur	Fri	Sat
1:00 AM	2	2	2	2	2	2	2
2:00 AM	2	2	2	2	2	2	2
3:00 AM	2	2	2	2	2	2	2
4:00 AM	2	1	1	1	1	2	2
5:00 AM	2	1	1	1	1	2	2
6:00 AM	2	1	1	1	1	2	2
7:00 AM	2	1	1	1	1	2	2
8:00 AM	2	1	1	1	1	2	2
9:00 AM	2	1	1	1	1	2	2
10:00 AM	2	1	1	1	1	2	2
11:00 AM	2	1	1	1	1	2	2
12:00 PM	2	1	1	1	1	2	2
1:00 PM	2	1	1	1	1	2	2
2:00 PM	2	1	1	1	1	2	2
3:00 PM	2	1	1	1	1	2	2
4:00 PM	2	1	1	1	1	2	2
5:00 PM	2	1	1	1	1	2	2
6:00 PM	2	2	2	2	2	2	2
7:00 PM	2	2	2	2	2	2	2
8:00 PM	2	2	2	2	2	2	2
9:00 PM	2	2	2	2	2	2	2
10:00 PM	2	2	2	2	2	2	2
11:00 PM	2	2	2	2	2	2	2
12:00 AM	2	2	2	2	2	2	2

1	Future Production and Maintenance Mode - 10 hr/shift, 1 shifts/day, 4 days/wk with 2 hr/day startup and 2 hr shutdown
2	Future Non-Production Mode - Fri, Sat, Sun and Holiday Shutdowns

ASSUMPTIONS

1 — Future Recirc Production and Maintenance Mode

ASH at same temps and humidities as current production mode.

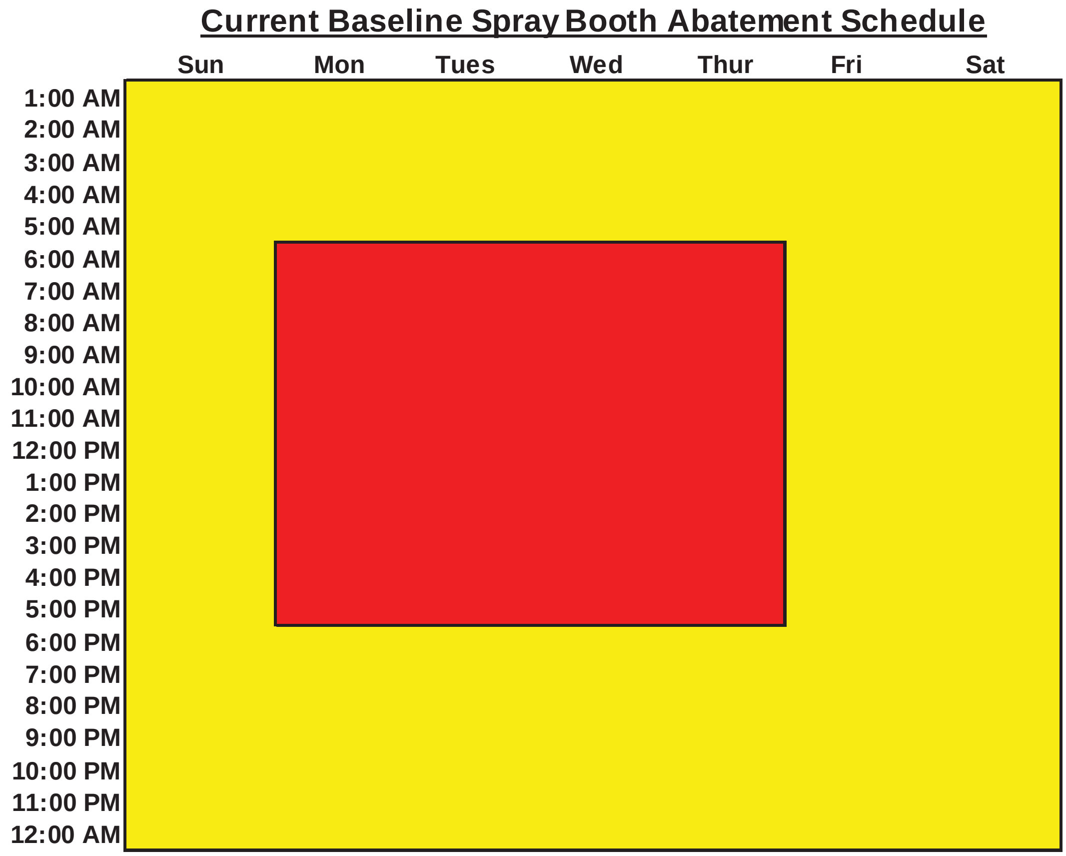
Enamel 1 Fresh Air	452,850	cfm	72.4°F and 58.8%RH
	452,850	**cfm**	

2 — Future Non-Production Mode

ASH setback to 60F temp setpoint and allow humidities to drift

Enamel 1 Fresh Air	52,500	cfm	60.0°F
	52,500	**cfm**	

Table 3.2.3 Contracted Baseline – Current Spray Booth Abatement Operating Schedule (Summer and Winter Conditions)



Production Mode - Production Operation at 10 hr/shift, 1 shift/day, 4 days/week

Non-Production Mode - Abatement system is running

ASSUMPTIONS

Existing Production Energy Use

Incinerator at 1415°F, Desorb at 270°F, and FH at 90°F setpoint temperatures

Basecoat	37,973	cfm
Clearcoat	52,992	cfm
Total Production Mode Abated Airflow	**90,965**	**cfm**

Existing Non-Production Energy Use

Incinerator at 1415°F, Desorb at 270°F, and FH at 90°F setpoint temperatures

Basecoat	37,973	cfm
Clearcoat	52,992	cfm
Total Production Mode Abated Airflow	**90,965**	**cfm**

Table 3.2.4 Contracted Baseline – Future Spray Booth Abatement Operating Schedule (Summer and Winter)

Future Spray Booth Abatement Schedule

	Sun	Mon	Tues	Wed	Thur	Fri	Sat
1:00 AM	2	3	4	4	4	2	2
2:00 AM	2	3	4	4	4	2	2
3:00 AM	2	3	3	3	3	2	2
4:00 AM	2	3	3	3	3	2	2
5:00 AM	2	3	3	3	3	2	2
6:00 AM	2	1	1	1	1	2	2
7:00 AM	2	1	1	1	1	2	2
8:00 AM	2	1	1	1	1	2	2
9:00 AM	2	1	1	1	1	2	2
10:00 AM	2	1	1	1	1	2	2
11:00 AM	2	1	1	1	1	2	2
12:00 PM	2	1	1	1	1	2	2
1:00 PM	2	1	1	1	1	2	2
2:00 PM	2	1	1	1	1	2	2
3:00 PM	2	1	1	1	1	2	2
4:00 PM	2	1	1	1	1	2	2
5:00 PM	2	1	1	1	1	2	2
6:00 PM	2	4	4	4	2	2	2
7:00 PM	2	4	4	4	2	2	2
8:00 PM	2	4	4	4	2	2	2
9:00 PM	2	4	4	4	2	2	2
10:00 PM	3	4	4	4	2	2	2
11:00 PM	3	4	4	4	2	2	2
12:00 AM	3	4	4	4	2	2	2

1	Future Production Mode - 10 hr/shift, 1 shift/day, 4 days/wk
2	Future Non-Production Mode - Shutdown of Abatement System
3	Future Non-Production Mode - Mode 2 + RTO in heat-up
4	Future Non-Production Mode - Mode 2 + RTO in setback

ASSUMPTIONS

1 Future Recirc Production Mode (Abatement at 211,800 cfm Booth Exhaust Air)

Abatement at same sepoint temperatures as current production mode

Basecoat	24,600 cfm
Clear Coat	0 cfm
	24,600 cfm

2 Future Non-Production Energy Use

Incinerator, Desorb, and Carbon Rotors Offline

Basecoat	0 cfm
Clear Coat	0 cfm
	0 cfm

3 Future Non-Production Energy Use

Incinerator, Desorb, and Carbon Rotors in heat up mode

4 Future Non-Production Energy Use

Incinerator, Desorb, and Carbon Rotors in setback

Section 4: Measurement and Verification Plan

4.1 General Overview –

(a) The purpose of the Measurement and Verification (M&V) Section is to identify the methods, measurements, procedures and tools that will be used to verify the savings for each Facility Improvement Measure (FIM). Savings were determined by comparing prior usage, consumption or efficiencies defined as the Baseline to the selected FIMS being implemented against the post FIM implementation usage, consumption or efficiencies. The Baseline usage, consumption or efficiencies is described in this Appendix. The usage, consumption or efficiencies associated with the FIM implementation is defined as the Contracted Baseline, and are described in this Appendix.

(b) The actual guaranteed savings associated with this contract are outlined in this Appendix, Section 1 - Table 1.1

(c) All pre-metering data will be provided prior to installation

(d) All trended data is to be provided by the Ford Ohio Assembly Plant to Siemens by the 5th business day of each month.

4.2 Savings Reporting Plan

Siemens shall prepare and submit annual savings reports that identify the energy savings using the methodologies described herein. The report shall identify the baseline usage, the guaranteed savings from each project, the actual measured savings and the difference between the guaranteed and actual savings.

Following the project completion, Siemens will prepare ongoing reports for the entire contract term. It is the responsibility of Ford Ohio Assembly Plant to provide trended data from the BMS related to the performance of the Equipment (Modes of operation, On/Off status of fans, VFD speeds, space temperatures, airstream temperatures and humidities, and actuator positions) to Siemens by the fifth business day of each month in order for Siemens to analyze the trended data and provide ongoing reporting.

4.3 FIM 1a – Enamel Spray Booth Recirculation

Location(s): Paint Shop, ASH #1, 2, 3, 4, 6

Overview:

Energy savings will be generated by reducing the amount of outdoor air being utilized by the BC and CC ventilation systems during production hours. Outdoor CFM post-retrofit and fan kW post-retrofit will be measured one-time after the measure is installed. Damper position and fan mode will be monitored continuously post-retrofit through the energy management controls in order to ensure the system schedule is being followed.

Pre-Retrofit Measurement\Calculations:

kW_{pre} = fan kW pre-retrofit, as shown in Table 1.1.1.
$AOHr_{pre}$ = pre-retrofit production hours, as shown in Table 1.1.1.
CFM_{pre} = pre-retrofit outdoor air (OA) CFM, as shown in Table 1.1.1.

Table 1.1.1 – Fan pre-retrofit data

Fan	kW_{pre}	$AOHr_{pre}$	CFM_{pre}	Specific Volume (cu.ft/lb)
ASH #1 SF	95	8256	148,310	13.94
ASH #1 EF A	0	8256		
ASH #1 EF B	39.6	8256		
ASH #2 SF	22	8256	34,921	14.12
ASH #2 EF C	29.3	8256		
ASH #3 SF	10.3	8256	26,108	14.12
ASH #3 EF D	32.7	8256		
ASH #4 SF	34.5	8256	53,452	14.01
ASH #4 EF E	58.8	8256		
ASH #6 SF	27.8	8256	55,368	14.12
ASH #6 EF G	17.3	8256		

Post-Retrofit Measurement\Calculations:

kW_{post} = post-retrofit motor kW during production mode, measured one-time post-retrofit.
CFM_{post} = post-retrofit outdoor air CFM of each supply fan during production mode, measured one-time post-retrofit.
Damper position will be continuously monitoring post-retrofit to assure that the reduced CFM (CFM_{post}) is being adhered to during production hours.

Measurement or Reference Tables

Below is outdoor air bin data for each ASH supply fan. This bin data was calculated from the engineering model (Section 6).
Dry bulb = dry bulb outdoor air temperature (See Tables 1.1.2 – 1.1.6)
Hours = hour per year per dry bulb temperature range, based on 30 year average weather data (See Tables 1.1.2 – 1.1.6).
Net heating required = average heating (mmbtu) required in paint booth for given temperature range (See Tables 1.1.2 – 1.1.6)
Net water required = average water needed for humidifying paint booth for given temperature range (gr/lbm) (See Tables 1.1.2 – 1.1.6)

Table 1.1.2 – Reference table for ASH #1

Dry Bulb (°F)	Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	13	27.615	64.200
-1-4	33	26.249	62.988
4-9	35	24.806	61.346
9-14	149	23.557	60.135
14-19	250	22.057	58.448
19-24	293	20.597	56.516
24-29	606	18.704	52.927
29-34	562	16.849	48.571
34-39	714	15.044	43.807
39-44	616	13.228	39.516
44-49	607	10.903	33.603
49-54	526	8.822	27.765
54-59	564	6.497	20.046
59-64	837	3.185	9.872
64-69	761	1.444	6.177
69-74	844	0.466	3.529
74-79	405	0.229	3.535
79-84	303	0.050	2.547
84-89	151	0.004	0.391
89-94	56	-	0.234
94-99	3	-	-
Total	8328	9.130	26.982

Table 1.1.3 – Reference table for ASH #2

Dry Bulb (°F)	Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	13	30.815	76.880
-1-4	33	29.449	75.668
4-9	35	28.006	74.026
9-14	149	26.757	72.815
14-19	250	25.257	71.128
19-24	293	23.797	69.196
24-29	606	21.904	65.607
29-34	562	20.049	61.251
34-39	714	18.244	56.487
39-44	616	16.428	52.196
44-49	607	14.103	46.283
49-54	526	12.022	40.445
54-59	564	9.697	32.615
59-64	837	6.325	19.105
64-69	761	3.764	12.670
69-74	844	1.803	8.457
74-79	405	1.143	8.294
79-84	303	0.576	6.796
84-89	151	0.045	2.432
89-94	56	-	1.027
94-99	3	-	-
Total	8328	11.766	36.988

Table 1.1.4 – Reference table for ASH #3

Dry Bulb (°F)	Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	13	30.815	76.880
-1-4	33	29.449	75.668
4-9	35	28.006	74.026
9-14	149	26.757	72.815
14-19	250	25.257	71.128
19-24	293	23.797	69.196
24-29	606	21.904	65.607
29-34	562	20.049	61.251
34-39	714	18.244	56.487
39-44	616	16.428	52.196
44-49	607	14.103	46.283
49-54	526	12.022	40.445
54-59	564	9.697	32.615
59-64	837	6.325	19.105
64-69	761	3.764	12.670
69-74	844	1.803	8.457
74-79	405	1.143	8.294
79-84	303	0.576	6.796
84-89	151	0.045	2.432
89-94	56	-	1.027
94-99	3	-	-
Total	8328	11.766	36.988

Table 1.1.5 – Reference table for ASH #4

Dry Bulb (°F)	Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	13	28.855	69.040
-1-4	33	27.489	67.828
4-9	35	26.046	66.186
9-14	149	24.797	64.975
14-19	250	23.297	63.288
19-24	293	21.837	61.356
24-29	606	19.944	57.767
29-34	562	18.089	53.411
34-39	714	16.284	48.647
39-44	616	14.468	44.356
44-49	607	12.143	38.443
49-54	526	10.062	32.605
54-59	564	7.737	24.783
59-64	837	4.367	12.897
64-69	761	2.177	8.342
69-74	844	0.858	5.117
74-79	405	0.469	5.056
79-84	303	0.176	3.852
84-89	151	0.012	0.916
89-94	56	-	0.493
94-99	3	-	-
Total	8328	10.112	30.658

Table 1.1.6 – Reference table for ASH #6

Dry Bulb (°F)	Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	13	30.815	76.880
-1-4	33	29.449	75.668
4-9	35	28.006	74.026
9-14	149	26.757	72.815
14-19	250	25.257	71.128
19-24	293	23.797	69.196
24-29	606	21.904	65.607
29-34	562	20.049	61.251
34-39	714	18.244	56.487
39-44	616	16.428	52.196
44-49	607	14.103	46.283
49-54	526	12.022	40.445
54-59	564	9.697	32.615
59-64	837	6.325	19.105
64-69	761	3.764	12.670
69-74	844	1.803	8.457
74-79	405	1.143	8.294
79-84	303	0.576	6.796
84-89	151	0.045	2.432
89-94	56	-	1.027
94-99	3	-	-
Total	8328	11.766	36.988

Savings Calculations:

Electric Savings (kWh/yr):

$kWh_S = (kW_{pre} – kW_{post}) * AOHr_{pre}$, summed over all fans

Natural Gas Savings (mmbtu/yr):

$MMBTU_S$ = Hours * Net heating required * ((CFM_{pre} – CFM_{post}) / Specific Volume) * ρ /β, summed across all dry bulb temperature bins for all ASH units

Water Savings (gallons/year):

$Gallons_S$ = Hours * Net water required * ((CFM_{pre} – CFM_{post}) / Specific Volume) * ρ /ξ/α, summed across all dry bulb temperature bins for all ASH units

Cost Savings ($/yr):

$\$_S = (kWh_S \times \$/kWh_{,x}) + (MMBTU_S \times \$/Natural\ Gas_{,x}) + (Gallons_S \times \$/Gallon_{,x})$

Where:

kWh_S = annual kilowatt-hour savings
$MMBTU_S$ = annual MMBTU of natural gas savings
ρ = 60 minutes per hour
ξ = conversion factor = 7,000 gr/lb
β = conversion factor – 1,000,000 btu per mmbtu
α = 8.34 pounds per gallon of water
$\$/kWh_{,x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol
$\$/Natural\ Gas_{,x}$ = energy unit cost per MMBtu of natural gas as defined in Section 2 of the Performance Assurance Protocol
$\$_S$ = Total annual cost savings

4.4 FIM 1b – Minimize the Ventilation Rate in the Paper Pull Zone

Location(s): Paint Shop, Paper Pull, ASH #7 SF, EF I

Overview:
The paper pull area will be reconfigured from 2 zones to 3 zones. The existing exhaust fans will be replaced with smaller exhaust fans, and the amount of outdoor air brought into the paper pull zone will also be decreased. Energy savings will be verified by taking post-retrofit measurements of the exhaust fan kW, and also taking a one-time measurement of the outdoor air being brought into the space post-retrofit.

Pre-Retrofit Measurement\Calculations:
kW_{pre} = fan kW pre-retrofit, as shown in Table 1.2.1.
$AOHr_{pre}$ = pre-retrofit production hours, as shown in Table 1.2.1.
CFM_{pre} = pre-retrofit outdoor air (OA) CFM, as shown in Table 1.2.1.
$Ratio_{pre}$ = pre-retrofit ratio of air to ASH#7 SF due to paper pull = 93,908CFM/149,055 CFM

Table 1.2.1. – Fan pre-retrofit data

Fan	kW_{pre}	$AOHr_{pre}$	CFM_{pre}	Specific Volume (cu.ft/lb)
Paper Pull			93,908	14.01
ASH #7 SF	124	8256		
ASH #7 EF I	95.7	8256		

Post-Retrofit Measurement\Calculations:
kW_{post} = post-retrofit motor kW during production mode, measured one-time post-retrofit.
$Ratio_{post}$ = post-retrofit ratio of air to ASH#7 EF H due to paper pull = 64,250 CFM/114,250 CFM
CFM_{post} = post-retrofit outdoor air CFM of each supply fan during production mode, measured one-time post-retrofit.
Damper position will be continuously monitoring post-retrofit to assure that the reduced CFM (CFM_{post}) is being adhered to during production hours.

Measurement or Reference Tables
Below is outdoor air bin data for each ASH supply fan. This bin data was calculated from the engineering model (Section 6).
Dry bulb = dry bulb outdoor air temperature
Hours = hour per year per dry bulb temperature range, based on 30 year average weather data (See Table 1.2.2).
Net heating required = average heating (mmbtu) required in paint booth for given temperature range (See Table 1.2.2.).
Net water required = average water needed for humidifying paint booth for given temperature range (gr/lbm) (See Table 1.2.2).

Table 1.2.2 – Reference table for Paper Pull

Dry Bulb (°F)	Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	13	28.855	69.040
-1-4	33	27.489	67.828
4-9	35	26.046	66.186
9-14	149	24.797	64.975
14-19	250	23.297	63.288
19-24	293	21.837	61.356
24-29	606	19.944	57.767
29-34	562	18.089	53.411
34-39	714	16.284	48.647
39-44	616	14.468	44.356
44-49	607	12.143	38.443
49-54	526	10.062	32.605
54-59	564	7.737	24.783
59-64	837	4.367	12.897
64-69	761	2.177	8.342
69-74	844	0.858	5.117
74-79	405	0.469	5.056
79-84	303	0.176	3.852
84-89	151	0.012	0.916
89-94	56	-	0.493
94-99	3	-	-
Total	8328	10.112	30.658

Savings Calculations:

Electric Savings (kWh/yr):

$kWh_S = kWh_{S,SF} + kWh_{S,EFI}$

$kWh_{S,SF} = (kW_{pre} * Ratio_{pre} – kW_{post} * Ratio_{post}) * AOHr_{pre}$

$kWh_{S,EFI} = (kW_{pre} – kW_{post}) * AOHR_{pre}$

Natural Gas Savings (mmbtu/yr):

$MMBTU_S$ = Hours * Net heating required * ((CFM_{pre} – CFM_{post}) / Specific Volume) * ρ /β, summed across all dry bulb temperature bins

Water Savings (gallons/year):

$Gallons_S$ = Hours * Net water required * ((CFM_{pre} – CFM_{post}) / Specific Volume) * ρ /ξ/α, summed across all dry bulb temperature bins

Cost Savings ($/yr):

$\$_S$ = (kWh_S x $/$kWh_{, x}$) + ($MMBTU_S$ x $/Natural $Gas_{, x}$) + ($Gallons_S$ x $/$Gallon_{, x}$)

Where:

kWh_S = annual kilowatt-hour savings

$kWh_{S,SF}$ = annual kilowatt-hour savings associated with ASH #7 supply fan

$kWh_{S,EFI}$ = annual kilowatt-hour savings associated with exhaust fan I

$MMBTU_S$ = annual MMBTU of natural gas savings

ρ = 60 minutes per hour

β = conversion factor – 1,000,000 btu per mmbtu

ξ = conversion factor = 7,000 gr/lb

α = 8.34 pounds per gallon of water
$/kWh, x = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol
$/Natural Gas, x = energy unit cost per MMBtu of natural gas as defined in Section 2 of the Performance Assurance Protocol
$_S = Total annual cost savings

4.5.1 FIM 1d – Implement downdraft reduction in the Clear Coat Manual and Flex Zones

Location(s): Paint Shop, ASH #5, 7 (SF and EF I)

Overview:
Energy savings will be verified by taking one-time post-retrofit measurements of fan kW and post-retrofit outdoor air CFM for each supply fan.

Pre-Retrofit Measurement\Calculations:
kW_{pre} = fan kW pre-retrofit, as shown in Table 1.3.1.
$AOHr_{pre}$ = pre-retrofit production hours, as shown in Table 1.3.1.
CFM_{pre} = pre-retrofit outdoor air (OA) CFM, as shown in Table 1.3.1.
$Ratio_{pre}$ = pre-retrofit ratio of air to ASH#7 SF due to BC/CC = 55,148 CFM/114,733 CFM

Table 1.3.1. – Fan pre-retrofit data

Fan	kW_{pre}	$AOHr_{pre}$	CFM_{pre}	Specific Volume (cu.ft/lb)
ASH #5 SF	74	8256	90,404	13.88
ASH #5 EF F	94.6	8256		
ASH #7 SF	124	8256	49,825	14.01
ASH #7 EF H	62.8	8256		

Post-Retrofit Measurement\Calculations:
kW_{post} = post-retrofit motor kW during production mode, measured one-time post-retrofit.
$Ratio_{post}$ = post-retrofit ratio of air to ASH#7 EF H due to BC/CC = 50,000 CFM/114,250 CFM
CFM_{post} = post-retrofit outdoor air CFM of each supply fan during production mode, measured one-time post-retrofit.
Damper position will be continuously monitoring post-retrofit to assure that the reduced CFM (CFM_{post}) is being adhered to during production hours.

Measurement or Reference Tables
Below is outdoor air bin data for each ASH supply fan. This bin data was calculated from the engineering model (Section 6).
Dry bulb = dry bulb outdoor air temperature
Hours = hour per year per dry bulb temperature range, based on 30 year average weather data (See Table 1.3.3 and 1.3.4).
Net heating required = average heating (mmbtu) required in paint booth for given temperature range (See Table 1.3.3 and 1.3.4).
Net water required = average water needed for humidifying paint booth for given temperature range (gr/lbm) (See Table 1.3.3 and 1.3.4).

Table 1.3.3 – Reference table for ASH #5

Dry Bulb (°F)	Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	13	26.415	59.650
-1-4	33	25.049	58.438
4-9	35	23.606	56.796
9-14	149	22.357	55.585
14-19	250	20.857	53.898
19-24	293	19.397	51.966
24-29	606	17.504	48.377
29-34	562	15.649	44.021
34-39	714	13.844	39.257
39-44	616	12.028	34.966
44-49	607	9.703	29.053
49-54	526	7.622	23.215
54-59	564	5.297	15.872
59-64	837	2.206	7.456
64-69	761	0.907	4.439
69-74	844	0.213	2.392
74-79	405	0.088	2.447
79-84	303	0.012	1.682
84-89	151	-	0.210
89-94	56	-	0.067
94-99	3	-	-
Total	8328	8.233	23.688

Table 1.3.4 – Reference table for ASH #7

Dry Bulb (°F)	Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	13	28.855	69.040
-1-4	33	27.489	67.828
4-9	35	26.046	66.186
9-14	149	24.797	64.975
14-19	250	23.297	63.288
19-24	293	21.837	61.356
24-29	606	19.944	57.767
29-34	562	18.089	53.411
34-39	714	16.284	48.647
39-44	616	14.468	44.356
44-49	607	12.143	38.443
49-54	526	10.062	32.605
54-59	564	7.737	24.783
59-64	837	4.367	12.897
64-69	761	2.177	8.342
69-74	844	0.858	5.117
74-79	405	0.469	5.056
79-84	303	0.176	3.852
84-89	151	0.012	0.916
89-94	56	-	0.493
94-99	3	-	-
Total	8328	10.112	30.658

Savings Calculations:

Electric Savings (kWh/yr):

$kWh_S = kWh_{S,SF7} + kWh_{S,EFI} + kWh_{S,SF5} + kWh_{S,EFF}$
$kWh_{S,SF7} = (kW_{pre} * Ratio_{pre} – kW_{post} * Ratio_{post}) * AOHr_{pre}$
$kWh_{S,EFI} = (kW_{pre} – kW_{post}) * AOHR_{pre}$
$kWh_{S,SF5I} = (kW_{pre} – kW_{post}) * AOHR_{pre}$
$kWh_{S,EFF} = (kW_{pre} – kW_{post}) * AOHR_{pre}$

Natural Gas Savings (mmbtu/yr):

$MMBTU_S$ = Hours * Net heating required * ((CFM_{pre} – CFM_{post}) / Specific Volume) * ρ /β, summed across all dry bulb temperature bins

Water Savings (gallons/year):

$Gallons_S$ = Hours * Net water required * ((CFM_{pre} – CFM_{post}) / Specific Volume) * ρ /ξ/α, summed across all dry bulb temperature bins

Cost Savings ($/yr):

$\$_S$ = (kWh_S x $/$kWh_{, x}$) + ($MMBTU_S$ x $/Natural $Gas_{, x}$) + ($Gallons_S$ x $/$Gallon_{, x}$)

Where:

kWh_S = annual kilowatt-hour savings
$kWh_{S,SF7}$ = annual kilowatt-hour savings associated with ASH #7 supply fan
$kWh_{S,EFH}$ = annual kilowatt-hour savings associated with exhaust fan H
$kWh_{S,SF5}$ = annual kilowatt-hour savings associated with ASH #5 supply fan
$kWh_{S,EFF}$ = annual kilowatt-hour savings associated with exhaust fan F
$MMBTU_S$ = annual MMBTU of natural gas savings
ρ = 60 minutes per hour
β = conversion factor – 1,000,000 btu per mmbtu
ξ = conversion factor = 7,000 gr/lb
α = 8.34 pounds per gallon of water
$/$kWh_{, x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol
$/Natural $Gas_{, x}$ = energy unit cost per MMBtu of natural gas as defined in Section 2 of the Performance Assurance Protocol
$\$_S$ = Total annual cost savings

4.6 FIM 1c – Install new PLC control equipment for idle operating mode

<u>Location(s):</u> Paint Shop, ASH #1through #7

<u>Overview:</u>
Time of day controls will be installed on ASH #1,3,5,7 and Paper Pull to turn supply and exhaust fans off from 6PM – 6AM Monday through Friday and all day Saturday and Sunday. This will save electric energy by turning fans off, and also reduce heating and water, due to conditioning less outdoor air. Production hours will be monitored to determine post-retrofit operating hours of the fans. Siemens will not be responsible for lost energy savings due to overriding equipment schedules.

<u>Pre-Retrofit Measurement\Calculations:</u>

kWpre = fan kW before the installation of time of day controls, as measured one-time post retrofit as part of FIMs 1.02, and 1.05.
$AOHr_{pre}$ = pre-retrofit production hours = 8,256 hours/year
MMBtupre = annual heat consumption (MMBtu) per year based on AOHrpre operation, re-circulation configuration and 30 year average weather data
CFM_{OA} = outdoor air CFM, as measured one-time post retrofit as part of FIMs 1.02, and 1.05.

Table 1.4.1. – Fan pre-retrofit data – MMBtu and Water Savings

Fan	MMBtu pre	Gallons pre	CFM_{OA}	Specific Volume (cu.ft/lb)
ASH #1 SF	54,830	2,788,956	measured	13.94
ASH #3 SF	9,494	511,808	measured	14.12
ASH #4 SF	No heat savings	984,492	measured	14.01
ASH #5 SF	25,341	1,250,400	measured	13.88
ASH #7 SF	27,773	1,444,109	measured	14.01
Paper Pull	17,131	890,731	measured	14.01

Post-Retrofit Measurement\Calculations:

kW_{post} = post-retrofit motor kW during production mode, measured one-time post-retrofit.
Production Hours = post-retrofit production hours, monitored continuously through energy management system.
$MMBtu_{post}$ = fuel consumption post-retrofit due to implementation of time of day controls, and adjusted for weather, as needed = Production Hours * Net heating required * (CFM_{OA}/ Specific Volume) * ρ /β, summed across all dry bulb temperature bins
$Gallons_{post}$ = water consumption post-retrofit due to implementation of time of day controls, and adjusted for weather, as needed = Production Hours * Net water required * ((CFM_{OA}) / Specific Volume) * ρ /ξ/α, summed across all dry bulb temperature bins

Measurement or Reference Tables

Below is outdoor air bin data for each ASH supply fan. This bin data was calculated from the engineering model (Section 6).
Dry bulb = dry bulb outdoor air temperature (See Table 1.4.2 through 1.4.5).
Net heating required = average heating (mmbtu) required in paint booth for given temperature range (See Table 1.4.2 through 1.4.5).
Net water required = average water needed for humidifying paint booth for given temperature range (gr/lbm) (See Table 1.4.2 through 1.4.5).

Table 1.4.2 – Reference table for ASH #1

Dry Bulb (°F)	Production Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	Monitored	27.6146	64.2000
-1-4	Monitored	26.2491	62.9879
4-9	Monitored	24.8060	61.3457
9-14	Monitored	23.5574	60.1349
14-19	Monitored	22.0570	58.4484
19-24	Monitored	20.5966	56.5164
24-29	Monitored	18.7043	52.9272
29-34	Monitored	16.8487	48.5710
34-39	Monitored	15.0445	43.8071
39-44	Monitored	13.2282	39.5159
44-49	Monitored	10.9033	33.6028
49-54	Monitored	8.8216	27.7650
54-59	Monitored	6.4969	20.0461
59-64	Monitored	3.1846	9.8719
64-69	Monitored	1.4436	6.1773
69-74	Monitored	0.4657	3.5289
74-79	Monitored	0.2292	3.5348
79-84	Monitored	0.0503	2.5469
84-89	Monitored	0.0038	0.3914
89-94	Monitored	-	0.2339
94-99	Monitored	-	-

Table 1.4.3 – Reference table for ASH #3

Dry Bulb (°F)	Production Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	Monitored	30.815	76.880
-1-4	Monitored	29.449	75.668
4-9	Monitored	28.006	74.026
9-14	Monitored	26.757	72.815
14-19	Monitored	25.257	71.128
19-24	Monitored	23.797	69.196
24-29	Monitored	21.904	65.607
29-34	Monitored	20.049	61.251
34-39	Monitored	18.244	56.487
39-44	Monitored	16.428	52.196
44-49	Monitored	14.103	46.283
49-54	Monitored	12.022	40.445
54-59	Monitored	9.697	32.615
59-64	Monitored	6.325	19.105
64-69	Monitored	3.764	12.670
69-74	Monitored	1.803	8.457
74-79	Monitored	1.143	8.294
79-84	Monitored	0.576	6.796
84-89	Monitored	0.045	2.432
89-94	Monitored	-	1.027
94-99	Monitored	-	-

Table 1.4.4 – Reference Table for ASH #7

Dry Bulb (°F)	Production Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	Monitored	28.855	69.040
-1-4	Monitored	27.489	67.828
4-9	Monitored	26.046	66.186
9-14	Monitored	24.797	64.975
14-19	Monitored	23.297	63.288
19-24	Monitored	21.837	61.356
24-29	Monitored	19.944	57.767
29-34	Monitored	18.089	53.411
34-39	Monitored	16.284	48.647
39-44	Monitored	14.468	44.356
44-49	Monitored	12.143	38.443
49-54	Monitored	10.062	32.605
54-59	Monitored	7.737	24.783
59-64	Monitored	4.367	12.897
64-69	Monitored	2.177	8.342
69-74	Monitored	0.858	5.117
74-79	Monitored	0.469	5.056
79-84	Monitored	0.176	3.852
84-89	Monitored	0.012	0.916
89-94	Monitored	-	0.493
94-99	Monitored	-	-

Table 1.4.5 – Reference Table for Paper Pull

Dry Bulb (°F)	Production Hours	Net heating required (mmbtu)	Net water required (gf/lbm)
-6--1	Monitored	28.855	69.040
-1-4	Monitored	27.489	67.828
4-9	Monitored	26.046	66.186
9-14	Monitored	24.797	64.975
14-19	Monitored	23.297	63.288
19-24	Monitored	21.837	61.356
24-29	Monitored	19.944	57.767
29-34	Monitored	18.089	53.411
34-39	Monitored	16.284	48.647
39-44	Monitored	14.468	44.356
44-49	Monitored	12.143	38.443
49-54	Monitored	10.062	32.605
54-59	Monitored	7.737	24.783
59-64	Monitored	4.367	12.897
64-69	Monitored	2.177	8.342
69-74	Monitored	0.858	5.117
74-79	Monitored	0.469	5.056
79-84	Monitored	0.176	3.852
84-89	Monitored	0.012	0.916
89-94	Monitored	-	0.493
94-99	Monitored	-	-

Equipment schedule is to be followed, as outlined in Section 3.2 of this Appendix II.

Savings Calculations:

Electric Savings (kWh/yr):

$kWh_S = (kW_{pre} * AOHr_{pre}) – (kW_{post} * \text{Production Hours})$, summed over all fans

Natural Gas Savings (mmbtu/yr):

$MMBTU_S = MMBtu_{pre} – MMBtu_{post}$, summed over all units

Water Savings (gallons/year):

$Gallons_S = Gallons_{pre} - Gallons_{post}$, summed over all units

Cost Savings ($/yr):

$\$_S = (kWh_S \times \$/kWh_{, x}) + (MMBTU_S \times \$/Natural\ Gas_{, x}) + (Gallons_S \times \$/Gallon_{, x})$

Where:

kWh_S = annual kilowatt-hour savings
$MMBTU_S$ = annual MMBTU of natural gas savings
ρ = 60 minutes per hour
β = conversion factor – 1,000,000 btu per mmbtu
α = 8.34 pounds per gallon of water
ξ = conversion factor = 7,000 gr/lb water
$\$/kWh_{, x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol
$\$/Natural\ Gas_{, x}$ = energy unit cost per MMBtu of natural gas as defined in Section 2 of the Performance Assurance Protocol
$\$_S$ = Total annual cost savings

4.7 FIM 2a – Reroute the CC Bell zone to the BC abatement system

Location(s): Paint Shop

Overview:

The BC and CC portion of the abatement area will be combined. This will create energy savings by reducing the number of KCR fans from 2 to 1, reducing the number of RTO units from 2 to 1, and also decreasing the load on the boiler. Additional fans will be added to the system. Energy savings will be verified by taking one-time post-retrofit measurement of fan and motor kW, and by continuously monitoring the annual operating hours of the equipment through the energy management system. Siemens will not be responsible for lost energy savings due to overriding equipment schedules.

Pre-Retrofit Measurement\Calculations:

kWpre = pre-retrofit fan kW, as measured during audit phase of project, as shown in Table 1.5.1.
$AOHr_{pre}$ = pre-retrofit annual operating hours = 8,232
kWh_{pre} = pre-retrofit electric consumption per Table 1.5.1 = $kW_{pre} * AOHr_{pre}$
$MMBtu_{pre}$ = pre-retrofit heating MMBtu consumed per Table 1.5.1, based on engineering calculations (see Section 7)

Table 1.5.1. – Fan pre-retrofit data

Fan	$AOHr_{pre}$	kW_{pre}	kWh_{pre}	$MMBtu_{pre}$
KCR BC	8,232	41.1	338,732	29310
KCR CC	8,232	38.4	316,367	38,091
BC RTO	8,232	58.9	484,688	0
CC RTO	8,232	28	234,483	12,872
Reheat boiler	8,232			12,940
Filter fans & abatement fans	8,232	42.6	350,922	

Post-Retrofit Measurement\Calculations:

$AOHr_{post}$ = post-retrofit annual operating hours, monitored continuously through energy management system. This will be weather adjusted, if needed.
Heater delta T = temperature differential across heater = 209 deg F
Heater efficiency = heater rated efficiency = 80%
Reheat delta T = temperature differential across reheat = 20 deg F
Reheat efficiency = reheat HW boiler efficiency = 81%
CC flow = flow rate through KCR CC unit post-retrofit = 5,721 SCFM
RTO Natural Gas input = natural gas input (BTU/hr) for RTO unit, per manufacturer's specifications
Base coat exhaust flow = 9,340 CFM
Clear coat exhaust flow = 15,260 CFM
EEAT = Exhaust entering air temperature = 74 deg F
ELAT = Exhaust leaving air temperature = 90 deg F
Base coat rash flow = 27,360 CFM
Clear coat rash flow = 41,040 CFM
REAT = rash entering air temperature = 74 deg F
RLAT = rash leaving air temperature =75 deg F
$kW_{post,KCR}$ = post-retrofit kW of KCR unit, measured one-time post-retrofit
$kW_{post,fans}$ = post-retrofit kW of filter and abatement fans (P-01,02,19,20) – measured one-time post-retrofit
$kW_{post,RTO}$ = post-retrofit kW of RTO unit, measured one-time post-retrofit.

Measurement or Reference Tables

Savings Calculations:

Electric Savings (kWh/yr):

$kWh_S = (kWh_{pre} – kWh_{post})$, summed over all units
$kWh_{post} = kWh_{KCR} + kWh_{RTO} + kWh_{Fans}$
$kWh_{KCR} = kW_{post,KCR} * AOHr_{post}$
$kWh_{RTO} = kW_{post,RTO} * AOHr_{post}$
$kWh_{Fans} = kW_{post,fans} * AOHr_{post}$

Natural Gas Savings (mmbtu/yr):

$MMBTU_S = MMBtu_{pre} – MMBtu_{post}$, summed over all units
$MMBtu_{post} = MMBtu_{KCR} + MMBtu_{RTO} + MMBtu_{boiler}$

efficiency) + ((1.08 * Reheat delta T * CC Flow * $AOHrs_{post}$) / Reheat efficiency) / 1,000,000 $^{Btu}/_{MMBtu}$
$MMBtu_{RTO}$ = (RTO natural gas input * $AOHrs_{post}$) / 1,000,000 $^{Btu}/_{MMBtu}$
$MMBtu_{boiler}$ = ((1.08 * (Base coat exhaust flow + Clear coat exhaust flow) * (ELAT – EEAT))/1,000,000 $^{Btu}/_{MMBtu}$ + ((1.08 * (Base coat rash flow + Clear coat rash flow) * (RLAT – ELAT))/1,000,000 $^{Btu}/_{MMBtu}$ * $AOHr_{post}$

Cost Savings ($/yr):

$\$_S = (kWh_S \times \$/kWh_{,x}) + (MMBTU_S \times \$/Natural\ Gas_{,x})$

Where:

kWh_S = annual kilowatt-hour savings
$MMBTU_S$ = annual MMBTU of natural gas savings
$\$/kWh_{,x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol
$\$/Natural\ Gas_{,x}$ = energy unit cost per MMBtu of natural gas as defined in Section 2 of the Performance Assurance Protocol

4.8 FIM 3 – Paint Shop Ventilation

Location(s): Paint Shop

Overview:

Energy savings will be verified by monitoring the run times of the associated HV equipment, as outlined in Table 1.6.1 below. Energy savings will be realized by scheduling this equipment to turn off when the space is not in use. Energy savings will be verified by taking one-time post-retrofit measurement of fan and motor kW, and by continuously monitoring the annual operating hours of the equipment through the energy management system. Siemens will not be responsible for lost energy savings due to overriding equipment schedules.

Pre-Retrofit Measurement\Calculations:

$AOHr_{pre}$ = pre-retrofit annual operating hours, as outlined in Table 1.6.1.

Post-Retrofit Measurement\Calculations:

$AOHr_{post}$ = post-retrofit annual operating hours, as outlined in Table 1.6.1.

Equipment schedule is to be followed, as outlined in Section 8 of this Appendix II.

Measurement or Reference Tables

kW = HV unit kW, as outlined in Table 1.6.1.
Design Volume = total design volume of air (CFM) per HV unit, as outlined in Table 1.6.1.
% OA = percentage of Outdoor air per unit, as outlined in Table 1.6.1.
Heating factor = heat (btu) needed to condition outdoor air, per HV unit as in Table 1.6.1. This value is based on 30 year average weather data, and the proposed post-retrofit operation schedule.

Table 1.6.1 – HV unit data

HV Unit	Operational Mode	Design Total Flowrate, cfm	Design OA Flowrate, cfm	Fan Power, kWpre	$AOHr_{pre}$	% OA CFM	Heating Factor, BTU/OA cfm
HV #1	1	50,000	42,500	22.31	6472	1%	120,022
HV #2	1	50,000	42,500	22.31	6472	1%	120,022
HV #3	1	100,000	85,000	22.31	6472	16%	120,022
HV #4	7	50,000	42,500				
HV #5	7	50,000	42,500				
HV #6	1	50,000	42,500	22.31	6472	0%	120,022
HV #7	1	50,000	42,500	22.31	6472	11%	120,022
HV #8	5	50,000	42,500	26.18	2288		
HV #9	4	50,000	42,500	26.18	827	39%	27,990
HV #11	4	50,000	42,500	26.18	827	39%	27,990
HV #12	4	50,000	42,500	26.18	827	39%	27,990
HV #13	4	50,000	42,500	26.18	827	39%	27,990
HV #14	1	50,000	42,500	22.31	6472	2%	120,022
HV #15	1	50,000	42,500	22.31	6472	2%	120,022
HV #16	4	50,000	42,500	26.18	827	39%	27,990
HV #17	4	50,000	42,500	26.18	827	39%	27,990
HV #18	1	50,000	42,500	22.31	6472	75%	120,022
HV #19	4	100,000	85,000	26.18	827	39%	27,990
HV #20	4	100,000	85,000	26.18	827	39%	27,990
HV #21	1	50,000	42,500	22.31	6472	66%	120,022
HV #22	1	50,000	42,500	22.31	6472	70%	120,022
HV #23	4	100,000	85,000	26.18	827	39%	27,990
HV #24	1	50,000	42,500	22.31	6472	4%	120,022
HV #25	4	100,000	85,000	26.18	827	39%	27,990
HV #26	1	50,000	42,500	22.31	6472	34%	120,022
HV #27	1	50,000	42,500	22.31	6472	5%	120,022
HV #28	1	100,000	85,000	22.31	6472	13%	120,022

Note: Operational Mode based on discussion with plant, location of unit and survey.

Mode	Winter	Summer	Type	Pre-Retrofit Annual Hours ($AOHr_{pre}$)		Post-Retrofit Annual Hours ($AOHr_{post}$)	
				Winter < 65 °F	Summer > 65 °F	Winter < 65 °F	Summer > 65 °F
1	on below 65 °F	off	Most TDHs, few H and Vs	6,472	-	2,728	-
2	on below 30 °F	off	Balance of TDHs	1,345	-	567	-
3	on below 30 °F	on above 65 °F	Most H and V units	1,345	2,288	567	965
4	on below 25 °F	off	The rest of the H and V units	827	-	349	-
5	off	on above 65 °F	Summer H and V units	-	2,288	-	965
6	on	on	Fume Areas	8,760	8,760	8,760	8,760
7	off	off	Decommissioned	-	-	-	-

Savings Calculations:

Electric Savings (kWh/yr):

$kWh_S = kW * (AOHr_{pre} – AOHr_{post})$ summed over all HV units

Natural Gas Savings (mmbtu/yr):

$MMBTU_S$ = Design Volume * % OA CFM * Heating Factor / 1,000,000 $^{Btu}/_{MMBtu}$

Cost Savings ($/yr):

$\$_S = (kWh_S \times \$/kWh_{,x}) + (MMBTU_S \times \$/Natural\ Gas_{,x})$

Where:

kWh_S = annual kilowatt-hour savings
$MMBTU_S$ = annual MMBTU of natural gas savings
$\$/kWh_{,x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol
$\$/Natural\ Gas_{,x}$ = energy unit cost per MMBtu of natural gas as defined in Section 2 of the Performance Assurance Protocol

4.8.1 FIM 4 – Body Shop Ventilation

Location(s): Body Shop

Overview:

Energy savings will be verified by monitoring the run times of the associated HV equipment, as outlined in Table 1.6.1 below. Energy savings will be realized by scheduling this equipment to turn off when the space is not in use. Energy savings will be verified by taking one-time post-retrofit measurement of fan and motor kW, and by continuously monitoring the annual operating hours of the equipment through the energy management system. Siemens will not be responsible for lost energy savings due to overriding equipment schedules.

Pre-Retrofit Measurement\Calculations:

$AOHr_{pre}$ = pre-retrofit annual operating hours, as outlined in Table 1.7.1.

Post-Retrofit Measurement\Calculations:

$AOHr_{post}$ = post-retrofit annual operating hours, as outlined in Table 1.7.1.

Equipment schedule is to be followed, as outlined in Section 8 of this Appendix II.

Measurement or Reference Tables

kW = HV unit kW, as outlined in Table 1.7.1.
Design Volume = total design volume of air (CFM) per HV unit, as outlined in Table 1.7.1.
% OA = percentage of Outdoor air per unit, as outlined in Table 1.7.1.
Heating factor = heat (btu) needed to condition outdoor air, per HV unit as in Table 1.7.1. This value is based on 30 year average weather data, and the proposed post-retrofit operation schedule.

Table 1.7.1 – HV unit data

HV Unit	Operational Mode	Design Total Flowrate, cfm	Design OA Flowrate, cfm	Fan Power, kWpre	AOHrpre	% OA CFM	Heating Factor, BTU/OA cfm
HV #001	1	20,000	20,000	22.31	6472	100%	120,022
DH #106	2	25,000	21,250	22.31	1345	39%	42,360
DH #107	1	35,000	29,750	22.31	6472	20%	120,022
DH #108	1	35,000	29,750	22.31	6472	2%	120,022
DH #109	1	50,000	42,500	22.31	6472	75%	120,022
DH #110	1	50,000	42,500	22.31	6472	37%	120,022
DH #111	1	25,000	21,250	22.31	6472	10%	120,022
DH #112	2	35,000	29,750	22.31	1345	39%	42,360
DH #113	1	25,000	21,250	22.31	6472	3%	120,022
DH #114	1	50,000	42,500	22.31	6472	7%	120,022
DH #115	1	60,000	42,000	22.31	6472	51%	120,022
DH #116	1	60,000	42,000	22.31	6472	119%	120,022
HV #114	1	50,000	42,500	22.31	6472	18%	120,022
HV #115	5	50,000	42,500	26.18	2288		-
HV #116	3	50,000	42,500	26.18	3633	16%	42,360
HV #117	3	50,000	42,500	26.18	3633	19%	42,360
HV #118	4	50,000	42,500	26.18	827	39%	27,990
HV #119	5	50,000	42,500	26.18	2288		-
HV #120	4	50,000	42,500	26.18	827	39%	27,990
HV #121	5	50,000	42,500	26.18	2288		-
HV #122	4	50,000	42,500	26.18	827	39%	27,990
HV #123	3	50,000	42,500	26.18	3633	19%	42,360
HV #124	5	50,000	42,500	26.18	2288		-
HV #125	4	50,000	42,500	26.18	827	39%	27,990
HV #126	4	50,000	42,500	26.18	827	39%	27,990
HV #126A	5	50,000	42,500	26.18	2288		-
HV #127	4	50,000	42,500	26.18	827	39%	27,990
HV #128	5	50,000	42,500	26.18	2288		-
HV #129	3	50,000	42,500	26.18	3633	16%	42,360
HV #130	5	50,000	42,500	26.18	2288		-
HV #131	5	50,000	42,500	26.18	2288		-
HV #132	5	50,000	42,500	26.18	2288		-
HV #133	4	50,000	42,500	26.18	827	39%	27,990
HV #134	4	50,000	42,500	26.18	827	39%	27,990
HV #135	4	50,000	42,500	26.18	827	39%	27,990
HV #136	5	50,000	42,500	26.18	2288		-
HV #137	4	50,000	42,500	26.18	827	39%	27,990
HV #138	4	50,000	42,500	26.18	827	39%	27,990
HV #139	5	50,000	42,500	26.18	2288		-
HV #140	4	50,000	42,500	26.18	827	39%	27,990
HV #141	3	50,000	42,500	26.18	3633	7%	42,360
HV #142	5	50,000	42,500	26.18	2288		-

Note: Operational Mode based on discussion with plant, location of unit and survey.

Mode	Winter	Summer	Type	Pre-Retrofit Annual Hours ($AOHr_{pre}$)		Post-Retrofit Annual Hours ($AOHr_{post}$)	
				Winter < 65 °F	Summer > 65 °F	Winter < 65 °F	Summer > 65 °F
1	on below 65 °F	off	Most TDHs, few H and Vs	6,472	-	2,728	-
2	on below 30 °F	off	Balance of TDHs	1,345	-	567	-
3	on below 30 °F	on above 65 °F	Most H and V units	1,345	2,288	567	965
4	on below 25 °F	off	The rest of the H and V units	827	-	349	-
5	off	on above 65 °F	Summer H and V units	-	2,288	-	965
6	on	on	Fume Areas	8,760	8,760	8,760	8,760
7	off	off	Decommissioned	-	-	-	-

Savings Calculations:

Electric Savings (kWh/yr):

kWh_S = kW * ($AOHr_{pre}$ – $AOHr_{post}$) summed over all HV units

Natural Gas Savings (mmbtu/yr):

$MMBTU_S$ = Design Volume * % OA CFM * Heating Factor / 1,000,000 $^{Btu}/_{MMBtu}$

Cost Savings ($/yr):

$\$_S = (kWh_S \times \$/kWh_{,x}) + (MMBTU_S \times \$/\text{Natural Gas}_{,x})$

Where:

kWh_S = annual kilowatt-hour savings

$MMBTU_S$ = annual MMBTU of natural gas savings

$\$/kWh_{,x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol

$\$/\text{Natural Gas}_{,x}$ = energy unit cost per MMBtu of natural gas as defined in Section 2 of the Performance Assurance Protocol

4.9 FIM 5: Final Assembly Ventilation

Location(s): General Assembly

Overview:

Energy savings will be verified by monitoring the run times of the associated HV equipment, as outlined in Table 1.6.1 below. Energy savings will be realized by scheduling this equipment to turn off when the space is not in use. Energy savings will be verified by taking one-time post-retrofit measurement of fan and motor kW, and by continuously monitoring the annual operating hours of the equipment through the energy management system. Siemens will not be responsible for lost energy savings due to overriding equipment schedules.

Pre-Retrofit Measurement\Calculations:

$AOHr_{pre}$ = pre-retrofit annual operating hours, as outlined in Table 1.8.1.

Post-Retrofit Measurement\Calculations:

$AOHr_{post}$ = post-retrofit annual operating hours, as outlined in Table 1.8.1.

Equipment schedule is to be followed, as outlined in Section 8 of this Appendix II.

Measurement or Reference Tables

kW = HV unit kW, as outlined in Table 1.8.1.
Design Volume = total design volume of air (CFM) per HV unit, as outlined in Table 1.8.1.
% OA = percentage of Outdoor air per unit, as outlined in Table 1.8.1.
Heating factor = heat (btu) needed to condition outdoor air, per HV unit as in Table 1.8.1. This value is based on 30 year average weather data, and the proposed post-retrofit operation schedule.

Table 1.8.1 – HV unit data

HV Unit	Operational Mode	Design Total Flowrate, cfm	Design OA Flowrate, cfm	Fan Power, kWpre	$AOHr_{pre}$	% OA CFM	Heating Factor, BTU/OA cfm
HV #2	7	50,000	42,500				
HV #3	3	50,000	42,500	26.18	3633	22%	42,360
HV #5	4	50,000	42,500	26.18	827	38%	27,990
HV #6	5	50,000	42,500	26.18	2288		
HV #7	4	50,000	42,500	26.18	827	38%	27,990
HV #8	4	50,000	42,500	26.18	827	38%	27,990
HV #9	4	50,000	42,500	26.18	827	38%	27,990
HV #10	5	50,000	42,500	26.18	2288		
HV #11	5	50,000	42,500	26.18	2288		
HV #12	4	50,000	42,500	26.18	827	38%	27,990
HV #13	4	50,000	42,500	26.18	827	38%	27,990
HV #14	5	50,000	42,500	26.18	2288		
HV #14A	4	50,000	42,500	26.18	827	38%	27,990
HV #15	4	50,000	42,500	26.18	827	38%	27,990
HV #16	4	50,000	42,500	26.18	827	38%	27,990
HV #16A	3	50,000	42,500	26.18	3633	41%	42,360
HV #19	5	50,000	42,500	26.18	2288		
HV #20	4	50,000	42,500	26.18	827	38%	27,990
HV #21	4	50,000	42,500	26.18	827	38%	27,990
HV #22	5	50,000	42,500	26.18	2288		
HV #23	4	50,000	42,500	26.18	827	38%	27,990
HV #24	4	50,000	42,500	26.18	827	38%	27,990
HV #25	5	60,000	60,000	26.18	2288		
HV #26	5	50,000	42,500	26.18	2288		
HV #27	4	50,000	42,500	26.18	827	38%	27,990
HV #28	7	50,000	42,500				
HV #30	4	50,000	42,500	26.18	827	38%	27,990
HV #31	5	50,000	42,500	26.18	2288		
HV #33	3	50,000	42,500	26.18	3633	16%	42,360
HV #101	5	50,000	42,500	26.18	2288		
HV #102	3	50,000	42,500	26.18	3633	8%	42,360
HV #103	4	50,000	42,500	26.18	827	38%	27,990
HV #104	4	50,000	42,500	26.18	827	38%	27,990
HV #105	4	50,000	42,500	26.18	827	38%	27,990
HV #106	5	50,000	42,500	26.18	2288		
HV #107	5	50,000	42,500	26.18	2288		
HV #108	4	50,000	42,500	26.18	827	38%	27,990
HV #109	5	50,000	42,500	26.18	2288		
HV #110	4	50,000	42,500	26.18	827	38%	27,990
HV #111	4	50,000	42,500	26.18	827	38%	27,990
HV #112	5	50,000	42,500	26.18	2288		
HV #113	7	50,000	42,500				
HV #150	3	60,000	51,000	26.18	3633	35%	42,360
HV #151	4	50,000	42,500	26.18	827	38%	27,990
HV #501	3	50,000	42,500	26.18	3633	18%	42,360
HV #502	4	50,000	42,500	26.18	827	38%	27,990
HV #503	4	50,000	42,500	26.18	827	38%	27,990
HV #504	3	50,000	42,500	26.18	3633	21%	42,360
HV #505	4	50,000	42,500	26.18	827	38%	27,990
HV #506	5	50,000	42,500	26.18	2288		
HV #511	3	50,000	42,500	26.18	3633	16%	42,360
HV #512	4	50,000	42,500	26.18	827	38%	27,990
HV #513	4	50,000	42,500	26.18	827	38%	27,990
HV #514	4	50,000	42,500	26.18	827	38%	27,990
HV #515	4	50,000	42,500	26.18	827	38%	27,990
HV #516	3	40,000	34,000	26.18	3633	1%	42,360
HV #517	3	50,000	42,500	26.18	3633	13%	42,360
HV #518	4	60,000	51,000	26.18	827	38%	27,990
DH #25	2	50,000	42,500	22.31	1345	38%	42,360
DH #101	1	60,000	51,000	22.31	6472	49%	120,022
DH #102	1	50,000	42,500	22.31	6472	75%	120,022
DH #103	1	50,000	42,500	22.31	6472	71%	120,022
DH #104	1	50,000	42,500	22.31	6472	58%	120,022
DH #105	1	60,000	51,000	22.31	6472	53%	120,022
DH #301	1	35,000	29,750	22.31	6472	50%	120,022
DH #401	1	35,000	29,750	22.31	6472	28%	120,022
DH #402	1	50,000	42,500	22.31	6472	67%	120,022
DH #403	1	35,000	29,750	22.31	6472	23%	120,022
DH #404	1	60,000	51,000	22.31	6472	83%	120,022
DH #405	1	50,000	42,500	22.31	6472	25%	120,022
DH #407	2	50,000	42,500	22.31	1345	38%	42,360

Note: Operational Mode based on discussion with plant, location of unit and survey.

Mode	Winter	Summer	Type	Pre-Retrofit Annual Hours ($AOHr_{pre}$)		Post-Retrofit Annual Hours ($AOHr_{post}$)	
				Winter < 65 °F	Summer > 65 °F	Winter < 65 °F	Summer > 65 °F
1	on below 65 °F	off	Most TDHs, few H and Vs	6,472	-	2,728	-
2	on below 30 °F	off	Balance of TDHs	1,345	-	567	-
3	on below 30 °F	on above 65 °F	Most H and V units	1,345	2,288	567	965
4	on below 25 °F	off	The rest of the H and V units	827	-	349	-
5	off	on above 65 °F	Summer H and V units	-	2,288	-	965
6	on	on	Fume Areas	8,760	8,760	8,760	8,760
7	off	off	Decommissioned	-	-	-	-

Savings Calculations:

Electric Savings (kWh/yr):

$kWh_S = kW * (AOHr_{pre} – AOHr_{post})$ summed over all HV units

Natural Gas Savings (mmbtu/yr):

$MMBTU_S$ = Design Volume * % OA CFM * Heating Factor / 1,000,000 $^{Btu}/_{MMBtu}$

Cost Savings ($/yr):

$\$_S = (kWh_S \times \$/kWh_{,x}) + (MMBTU_S \times \$/Natural\ Gas_{,x})$

Where:

kWh_S = annual kilowatt-hour savings

$MMBTU_S$ = annual MMBTU of natural gas savings

$\$/kWh_{,x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol

$\$/Natural\ Gas_{,x}$ = energy unit cost per MMBtu of natural gas as defined in Section 2 of the Performance Assurance Protocol

4.10 FIM 6a – Install Compressor for non-production pressure reduction

Location(s): General Assembly Compressed Air

Overview:

Energy savings will be realized by operating the compressed air system at a lower pressure during weekends. Energy savings will be verified by taking a one-time instantaneous measurement of the kW associated with the compressed air system post-retrofit

Pre-Retrofit Measurement\Calculations:

kW_{pre} = average pre-retrofit kW of compressed air system during non-production weekend = 1,343 kW at 95 psi, as measured during the detailed audit phase.

$kW_{reduced}$ = average pre-retrofit kW of compressed air system during same non-production weekend = 1,201 kW at 70 psi, as measured during the detailed audit phase.

Post-Retrofit Measurement\Calculations:
kW_{post} = post-retrofit average kW of small compressed air systems trended for one shift of post-retrofit installation

Savings Calculations:
Electric Savings (kWh/yr):

$kWh_S = (kW_{pre} – kW_{reduced} - kW_{post}) * Hours$

Cost Savings ($/yr):

$\$_S = (kWh_S \times \$/kWh_{,x})$

Where:

kWh_S = annual kilowatt-hour savings

Hours = annual production weekend hours where pressure can be reduced = 576 hours/year

$\$/kWh_{,x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol

4.11 FIM 6b – Repair Air leaks to achieve 604 SCFM leak reduction

Location(s): Compressed Air System

Overview:
Energy savings will be realized by reducing the number of leaks in the existing compressed air system. A flow meter will be used to measure the flow rate pre and post-retrofit one-time post-retrofit in order to quantify the reduction in lost CFM due to leaks.

Pre-Retrofit Measurement\Calculations:
$Flow_{pre,non-prod}$ = pre-retrofit air flow (CFM) through the compressed air system during non-production hours, measured one-time pre-retrofit at 72 psi
$kW/SCFM_{prod}$ = power consumption (kW) per SCFM generated by compressed air system during production hours = 0.20, as measured during the detailed energy audit.
$kW/SCFM_{non-prod}$ = power consumption (kW) per SCFM generated by compressed air system during non-production hours = 0.26, as measured during the detailed energy audit.
$Hours_{prod}$ = annual production hours = 4,608
$Hours_{non-prod}$ = annual non-production hours = 4,152

Post-Retrofit Measurement\Calculations:
$Flow_{post,non-prod}$ = post-retrofit air flow (CFM) through the compressed air system during non-production hours, measured one-time post-retrofit at 72 psi

Savings Calculations:
Electric Savings (kWh/yr):

$kWh_S = kWh_{S,prod} + kWh_{S,non-prod}$

$kWh_{S,prod} = ((Flow_{post,non-prod} – Flow_{pre,non-prod}) * Ratio) * kW/SCFM_{prod} * Hours_{prod}$

$kWh_{S,non-prod} = (Flow_{post,non-prod} – Flow_{pre,non-prod}) * kW/SCFM_{non-prod} * Hours_{non-prod}$

Cost Savings ($/yr):

$\$_S = (kWh_S \times \$/kWh_{,x})$

Where:

kWh_S = annual kilowatt-hour savings

Ratio = Ratio of absolue pressures = (95psi + 14.7) / (72psi + 14.7)

$\$/kWh_{,x}$ = blended unit cost of electricity per kWh as defined in Section 2 of the Performance Assurance Protocol

Section 5: Measurement and Verification Plan Methodology

The following summary outlines the energy baseline and proposed methodologies used to measure and quantify the project energy savings. The Performance Assurance Protocol details the plant utility and equipment baseline and specific project savings projections.

Baseline Information Recorded

1. Conducted analysis of the Paint Shop equipment and systems, including:
   a) Air Supply Houses
      i) Fans
      ii) Burners and Gas Trains
   b) Exhaust Fans
   c) Spray Booths
      i) Plenum
      ii) Eliminators
   d) Spray Booth Abatement Systems
      i) SLA Fans
      ii) Desorption Fans
      iii) RTO Exhaust Fans
   e) Oven Systems
   f) Oven Abatement Systems
2. A detailed study was performed by an independent firm measuring and recording the following:
   a) Air Supply Houses
      i) Air Flow (CFM)
      ii) Face Velocity
      iii) Static pressure
      iv) Fan Amps
      v) Fan RPM
      vi) Fan Volts
      vii) VFD Frequency
      viii) Discharge Air Temp
      ix) Discharge Air Humidity
      x) ASH Room Air Pressures
   b) Exhaust Fans

        i) Air Flow (CFM)
        ii) Air Velocity
        iii) Static Pressure
        iv) Fan Amps
        v) Fan Volts
        vi) Fan RPM
        vii) Air Temp
        viii) Ambient Barometric Pressure
        ix) Duct Barometric Pressure
        x) Discharge Air Temp
    c) Spray Booths
        i) Downdraft Air Flow
        ii) Empty Zone Air Flow (CFM)
    d) Spray Booth Abatement Systems
        i) Filter House Air Flows (CFM)
        ii) Filter House Face Velocity
        iii) Filter House Air Temperature
        iv) Static pressure
        v) Fan Amps
        vi) Fan RPM
        vii) Fan Volts
        viii) VFD Frequency
        ix) Air Temperatures
    e) Ovens
        i) Oven Exhaust Air Flows (CFM)
        ii) Oven Exhaust Temperature
    f) Oven Abatement Systems
        i) RTO Chamber Temperature
        ii) RTO Exhaust Temperature

3. Established operating savings for above equipment using actual measurements, operating characteristics and 30 year average weather conditions.
4. Reviewed existing and proposed operating strategies.
5. Surveyed equipment and spoke with plant staff to verify equipment operating characteristics during production, non production and plant shutdown periods.
6. Conducted meetings with paint shop engineering, discussing existing conditions, operating requirements, and proposed future plans.

<u>*Savings Measurements*</u>

1. FIM 1a – Enamel Spray Booth Recirculating: record post-retrofit power demand (kW), and air flow (CFM). Monitor damper position and fan status to ensure proper fan scheduling through EMS trending.

2. FIM 1b – Minimize the ventilation rate in the paper pull zone: record post-retrofit power demand (kW), and air flow (CFM). Monitor damper position and fan status to ensure proper fan scheduling through EMS trending.
3. FIM 1c – Install new PLC control equipment for idle operating mode: monitor unit mode (production, idle, fire/maintenance, off). Record post-retrofit fan demand (kW).
4. FIM 1d – Implement downdraft reduction in the clear coat manual and flex zones: record post-retrofit power demand (kW), and air flow (CFM). Monitor damper position and fan status to ensure proper fan scheduling through EMS trending.
5. FIM 2a – Reroute the CC Bell zone to the abatement system: record post-retrofit power demand (kW) and monitor equipment annual operating hours through EMS trending.
6. FIMs 3, 4, 5– Ventilation Unit Control: monitor equipment annual operating hours through EMS trending.
7. FIM 6a – Install Compressor for non-production pressure reduction: record post-retrofit power demand (kW) during non-production operation.
8. FIM 6b – Repair Air leaks to achieve 604 SCFM off-shift reduction: record leakage CFM during non-production hours pre and post-retrofit.

End of Performance Assurance Protocol

Section 6 – Engineering Model

Hourly Net Heat Required (Btu/lbm OA air) = (Design Enthalpy – Out Door Enthalpy)

Hourly Net Water Required (grain/lbm OA air) = (Design humidity – Out door humidity)

Total Yearly Value = ∑ hourly Air Flow x hourly values

Outdoor enthalpy and outdoor humidity based on TMY3 30 yr data from Cleveland Hopkins Int. Airport.

Design Criteria for Spraybooths						
	Dry Bulb	%Relative Humidity	Dew Point	Humidity Ratio	Enthalpy	Density
	^oF	%	^oF	gr/lb	btu/lb	lb/cu.ft.
BC - Automation	75	60%	60.19	80.38	30.57	0.0717
CC - Automation	75	60%	60.19	80.38	30.57	0.0717
ASH 1	70	60%	55.5	67.7	27.37	0.0724
ASH 2	75	60%	60.19	80.38	30.57	0.0717
ASH 3	75	60%	60.19	80.38	30.57	0.0717
ASH 4	72	60%	57.37	72.54	28.61	0.0721
ASH 5 - Clear Coat Manual	68	60%	59.15	63.15	26.17	0.0727
ASH 6	75	60%	60.19	80.38	30.57	0.0717
ASH 7	72	60%	57.37	72.54	28.61	0.0721
Paper Pull	72	60%	57.37	72.54	28.61	0.0721

CC Flex = ASH 7 - Paper Pull

Section 7 – Engineering Calculations

KCR
Natural Gas = Reheat Load + Desorb Load
Reheat Load = (1.08 x KCR Air Flow x DT x Annual Hours/ Boiler Eff.)/1,000,000
Desorb Load = (1.08 x RTO Air Flow x DT x Annual Hours/ Heat Eff.)/1,000,000

Electricity = Fan Power x Hours

KCR	KCR Air flow cfm	KCR DT F	Annual Hours	Boiler Eff.	RTO Air Flow cfm	RTO DT F	Heater Eff.	Fan Power kW
Base Coat	37,973	20	8,232	81%	9,002	209	80%	41.1
Clear Coat	52,992	20	8,232	81%	11,354	209	80%	38.4

RTO
Natural Gas = (1.08 x (RTO Air Flow x RTO DT + Burner Flow x Burner DT) + RTO Losses – VOC Contribution) x Annual Hours/ 1,000,000
RTO Losses = Radiation and Convection losses from the RTO
VOC Contribution = Lbs/Hr VOC burned x VOC Heating Value

Electricity = Fan Power x Annual Hours

RTO	RTO Air flow cfm	RTO DT F	Burner Flow	Burner DT	RTO Losses Btu/hr	VOC Contribution Btu/hr	Annual Hours	Fan Power kW
Base Coat	9,002	148	274	209	281,250	218,452	8,232	58.9
Clear Coat	11,354	102	274	159	412,500	146,711	8,232	28

Reheat Boiler Load
Reheat Boiler = Hours of operation x (Base Coat Airflow + Clear Coat Airflow) X DT/Boiler Eff)/1,000,000
Base Coat Airflow = 37,973 cfm
Clear Coat Airflow = 52,992 cfm
DT = 16
Boiler Eff = 81%

Section 8 - Contracted Parameters

Unit Schedules:

Plant Area	Net Floor Area (1000 ft^2)	Unit Type	Combined Total Air Flow (CFM) production hours	Total CFM/ft^2	Combined Outside Air Flow (CFM) production hours	OA CFM/ft^2	Annual Production Hours*	Non-production mode**
Body	480	TDH	600,000	1.25	180,000	0.375	1,920	Off – Cycle on to maintain space temp in winter
Body		HV						Off
Paint	677.5	HV	846,875	1.25	254,063	0.375	1,920	Off – Cycle on to maintain space temp in winter
Paint Kitchen	N/A	100% OA	No Change	N/A	No Change	N/A	No Change	No change from existing
Final	1,105	TDH	1,381,250	1.25	414,375	0.375	1,920	Off – Cycle on to maintain space temp in winter
Final		HV						Off
All	N/A	Exhaust Fans	Operated to maintain desired building pressurization			N/A	1,920	Off

*During the heating season production hours, plant areas involved in production will be maintained at 65 F

** During the heating season non-production hours, the plant areas will be allowed to fall below 60 F (adjustable) for three minutes after which the air handling units will cycle on to achieved 65 F (adjustable) temperatures in the area after which the air handling unit will cycle off.

Mercantile Customer Project Commitment Agreement
Cash Rebate Option

THIS MERCANTILE CUSTOMER PROJECT COMMITMENT AGREEMENT ("Agreement") is made and entered into by and between The Cleveland Electric Illuminating Company, its successors and assigns (hereinafter called the "Company") and Ford Motor Company, Taxpayer ID No. 38-0549190 its permitted successors and assigns (hereinafter called the "Customer") (collectively the "Parties" or individually the "Party") and is effective on the date last executed by the Parties as indicated below.

WITNESSETH

WHEREAS, the Company is an electric distribution utility and electric light company, as both of these terms are defined in R.C. § 4928.01(A); and

WHEREAS, Customer is a mercantile customer, as that term is defined in R.C. § 4928.01(A)(19), doing business within the Company's certified service territory; and

WHEREAS, R.C. § 4928.66 (the "Statute") requires the Company to meet certain energy efficiency and peak demand reduction ("EE&PDR") benchmarks; and

WHEREAS, when complying with certain EE&PDR benchmarks the Company may include the effects of mercantile customer-sited EE&PDR projects; and

WHEREAS, Customer has certain customer-sited demand reduction, demand response, or energy efficiency project(s) as set forth in attached Exhibit 1 (the "Customer Energy Project(s)") that it desires to commit to the Company for integration into the Company's Energy Efficiency & Peak Demand Reduction Program Portfolio Plan ("Company Plan") that the Company will implement in order to comply with the Statute; and

WHEREAS, the Customer, pursuant to the Public Utilities Commission of Ohio's ("Commission") September 15, 2010 Order in Case No. 10-834-EL-EEC, desires to pursue a cash rebate of some of the costs pertaining to its Customer Energy Project(s) ("Cash Rebate") and is committing the Customer Energy Project(s) as a result of such incentive.

WHEREAS, Customer's decision to commit its Customer Energy Project(s) to the Company for inclusion in the Company Plan has been reasonably encouraged by the possibility of a Cash Rebate.

WHEREAS, in consideration of, and upon receipt of, said cash rebate, Customer will commit the Customer Energy Project(s) to the Company and will comply with all other terms and conditions set forth herein.

NOW THEREFORE, in consideration of the mutual promises set forth herein, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties, intending to be legally bound, do hereby agree as follows:

1. **Customer Energy Projects.** Customer hereby commits to the Company and Company accepts for integration into the Company Plan the Customer Energy Project(s) set forth on attached Exhibit 1. Said commitment shall be for the life of the Customer Energy Project(s). Company will incorporate said project(s) into the Company Plan to the extent that such projects qualify. In so committing, and as evidenced by the affidavit attached hereto as Exhibit A, Customer acknowledges that the information provided to the Company about the Customer Energy Project(s) is true and accurate to the best of its knowledge.

    a. By committing the Customer Energy Project(s) to the Company, Customer acknowledges and agrees that the Company shall control the use of the kWh and kW reductions resulting from said projects for purposes of complying with the Statute. By committing the Customer Energy Project(s), Customer has the ability to either:

i. Take ownership of the Energy Efficiency resource credits resulting from their Customer Energy Project(s) and may be able to bid - or sell - the Energy Efficiency resource credits into the market operated by the grid operator, PJM Interconnection, Inc. (PJM), provided several prerequisites are met; or

ii. Allow the Company to take ownership of the Energy Efficiency resource credits associated with their Customer Energy Project(s). The Company shall, at its sole discretion, aggregate said capacity into the PJM market through an auction. Any proceeds from any such bids accepted by PJM will be used to offset the costs charged to the Customer and other of the Company's customers for compliance with state mandated energy efficiency and/or peak demand requirements.

Please indicate your preference as to the treatment of your Energy Efficiency resource credits:

☐ Customer would like to retain ownership of its Energy Efficiency resource credits.

☒ Customer assigns ownership of its Energy Efficiency resource credits to Company for purposes of bidding these credits into PJM.

b. The Company acknowledges that some of Customer's Energy Projects contemplated in this paragraph may have been performed under certain other federal and/or state programs in which certain parameters are required to be maintained in order to retain preferential financing or other government benefits (individually and collectively, as appropriate, "Benefits"). In the event that the use of any such project by the Company in any way affects such Benefits, and upon written request from the Customer, Company will release said Customer's Energy Project(s) to the extent necessary for Customer to meet the prerequisites for such Benefits. Customer acknowledges that such release (i) may affect Customer's cash rebate discussed in Article 3 below; and (ii) will not affect any of Customer's other requirements or obligations.

c. Any future Customer Energy Project(s) committed by Customer shall be subject to a separate application and, upon approval by the Commission, said projects shall become part of this Agreement.

d. Customer will provide Company or Company's agent(s) with reasonable assistance in the preparation of the Commission's standard joint application for approval of this Agreement ("Joint Application") that will be filed with the Commission, with such Joint Application being consistent with then current Commission requirements.

e. Upon written request and reasonable advance notice, Customer will grant employees or authorized agents of either the Company or the Commission reasonable, pre-arranged access to the Customer Energy Project(s) for purposes of measuring and verifying energy savings and/or peak demand reductions resulting from the Customer Energy Project(s). It is expressly agreed that consultants of either the Company or the Commission are their respective authorized agents.

2. **Joint Application to the Commission.** The Parties will submit the Joint Application using the Commission's standard "Application to Commit Energy Efficiency/Peak Demand Reduction Programs" ("Joint Application") in which they will seek the Commission's approval of (i) this Agreement; (ii) the commitment of the Customer Energy Project(s) for inclusion in the Company Plan; and (iii) the Customer's Cash Rebate.

The Joint Application shall include all information as set forth in the Commission's standard form which, includes without limitation:

i. A narrative description of the Customer Energy Project(s), including but not limited to, make, model and year of any installed and/or replaced equipment;
ii. A copy of this Agreement; and
iii. A description of all methodologies, protocols, and practices used or proposed to be used in measuring and verifying program results.

3. **Customer Cash Rebate.** Upon Commission approval of the Joint Application, Customer shall provide Company with a W-9 tax form, which shall at a minimum include Customer's tax identification number. Within the greater of 90 days of the Commission's approval of the Joint Application or the completion of the Customer Energy Project, the Company will issue to the Customer the Cash Rebate in the amount set forth in the Commission's Finding and Order approving the Joint Application.

   a. Customer acknowledges: i) that the Company will cap the Cash Rebate at the lesser of 50% of Customer Energy Project(s) costs or $250,000; ii) if the Customer Energy Project qualifies for a rebate program approved by the Commission and offered by the Company, Customer may still elect to file such project under the Company's mercantile customer self direct program, however the Cash Rebate that will be paid shall be discounted by 25%; and

   b. Customer acknowledges that breaches of this Agreement, include, but are not limited to:

      i. Customer's failure to comply with the terms and conditions set forth in the Agreement, or its equivalent, within a reasonable period of time after receipt of written notice of such non-compliance;

      ii. Customer knowingly falsifying any documents provided to the Company or the Commission in connection with this Agreement or the Joint Application.

   c. In the event of a breach of this Agreement by the Customer, Customer agrees and acknowledges that it will repay to the Company, within 90 days of receipt of written notice of said breach, the full amount of the Cash Rebate paid under this Agreement. This remedy is in addition to any and all other remedies available to the Company by law or equity.

4. **Termination of Agreement.** This Agreement shall automatically terminate:

   a. If the Commission fails to approve the Joint Agreement;

   b. Upon order of the Commission; or

   c. At the end of the life of the last Customer Energy Project subject to this Agreement.

Customer shall also have an option to terminate this Agreement should the Commission not approve the Customer's Cash Rebate, provided that Customer provides the Company with written notice of such termination within ten days of either the Commission issuing a final appealable order or the Ohio Supreme Court issuing its opinion should the matter be appealed.

5. **Confidentiality.** Each Party shall hold in confidence and not release or disclose to any person any document or information furnished by the other Party in connection with this Agreement that is designated as confidential and proprietary ("Confidential Information"), unless: (i) compelled to disclose such document or information by judicial, regulatory or administrative process or other

provisions of law; (ii) such document or information is generally available to the public; or (iii) such document or information was available to the receiving Party on a non-confidential basis at the time of disclosure.

a. Notwithstanding the above, a Party may disclose to its employees, directors, attorneys, consultants and agents all documents and information furnished by the other Party in connection with this Agreement, provided that such employees, directors, attorneys, consultants and agents have been advised of the confidential nature of this information and through such disclosure are deemed to be bound by the terms set forth herein.

b. A Party receiving such Confidential Information shall protect it with the same standard of care as its own confidential or proprietary information.

c. A Party receiving notice or otherwise concluding that Confidential Information furnished by the other Party in connection with this Agreement is being sought under any provision of law, to the extent it is permitted to do so under any applicable law, shall endeavor to: (i) promptly notify the other Party; and (ii) use reasonable efforts in cooperation with the other Party to seek confidential treatment of such Confidential Information, including without limitation, the filing of such information under a valid protective order.

d. By executing this Agreement, Customer hereby acknowledges and agrees that Company may disclose to the Commission or its Staff any and all Customer information, including Confidential Information, related to a Customer Energy Project, provided that Company uses reasonable efforts to seek confidential treatment of the same.

6. **Taxes.** Customer shall be responsible for all tax consequences (if any) arising from the payment of the Cash Rebate.

7. **Notices.** Unless otherwise stated herein, all notices, demands or requests required or permitted under this Agreement must be in writing and must be delivered or sent by overnight express mail, courier service, electronic mail or facsimile transmission addressed as follows:

If to the Company:

FirstEnergy Service Company
76 South Main Street
Akron, OH 44308
Attn: Mercantile Energy Efficiency Program A-GO-8
Telephone: 330 384 4504
Fax: 330 777 6051
Email: mercantile@firstenergycorp.com

If to the Customer:

Ford Motor Company
330 Town Center Drive, Suite 1100
Dearborn, Michigan 48126
Attn:George Andraos
Telephone:313-390-3423
Fax:
Email:gandraos@ford.com

or to such other person at such other address as a Party may designate by like notice to the other Party. Notice received after the close of the business day will be deemed received on the next business day; provided that notice by facsimile transmission will be deemed to have been received by the recipient if the recipient confirms receipt telephonically or in writing.

8. **Authority to Act.** The Parties represent and warrant that they are represented by counsel in connection with this Agreement, have been fully advised in connection with the execution thereof, have taken all legal and corporate steps necessary to enter into this Agreement, and that the undersigned has the authority to enter into this Agreement, to bind the Parties to all provisions herein and to take the actions required to be performed in fulfillment of the undertakings contained herein.

9. **Non-Waiver.** The delay or failure of either party to assert or enforce in any instance strict performance of any of the terms of this Agreement or to exercise any rights hereunder conferred, shall not be construed as a waiver or relinquishment to any extent of its rights to assert or rely upon such terms or rights at any later time or on any future occasion.

10. **Entire Agreement.** This Agreement, along with related exhibits, and the Company's Rider DSE, or its equivalent, as amended from time to time by the Commission, contains the Parties' entire understanding with respect to the matters addressed herein and there are no verbal or collateral representations, undertakings, or agreements not expressly set forth herein. No change in, addition to, or waiver of the terms of this Agreement shall be binding upon any of the Parties unless the same is set forth in writing and signed by an authorized representative of each of the Parties. In the event of any conflict between Rider DSE or its equivalent and this document, the latter shall prevail.

11. **Assignment.** Customer may not assign any of its rights or obligations under this Agreement without obtaining the prior written consent of the Company, which consent will not be unreasonably withheld. No assignment of this Agreement will relieve the assigning Party of any of its obligations under this Agreement until such obligations have been assumed by the assignee and all necessary consents have been obtained.

12. **Severability.** If any portion of this Agreement is held invalid, the Parties agree that such invalidity shall not affect the validity of the remaining portions of this Agreement, and the Parties further agree to substitute for the invalid portion a valid provision that most closely approximates the economic effect and intent of the invalid provision.

13. **Governing Law.** This Agreement shall be governed by the laws and regulations of the State of Ohio, without regard to its conflict of law provisions.

14. **Execution and Counterparts.** This Agreement may be executed in multiple counterparts, which taken together shall constitute an original without the necessity of all parties signing the same page or the same documents, and may be executed by signatures to electronically or telephonically transmitted counterparts in lieu of original printed or photocopied documents. Signatures transmitted by facsimile shall be considered original signatures.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed by their duly authorized officers or representatives as of the day and year set forth below.

The Cleveland Electric Illuminating Company_
(Company)

By: ________________________

Title: **V.P. Of Energy Efficiency**

Date: 12-18-17

Ford Motor Company_
(Customer)

By: ________________________

Title: DIRECTOR, ENERGY

Date: 8-31-17

Affidavit of Ford Motor Company – Exhibit _A_

STATE OF OHIO)
) SS:
COUNTY OF Cuyahoga)

I, George Andraos ,being first duly sworn in accordance with law, deposes and states as follows:

1. I am the Derector, Energy of Ford Motor company ("Customer") As part of my duties, I oversee energy related matters for the Customer.

2. The Customer has agreed to commit certain energy efficiency projects to The Cleveland Electric Illuminating Company ("Company"), which are the subject of the agreement to which this affidavit is attached ("Project(s)").

3. In exchange for making such a commitment, the Company has agreed to provide Customer with Cash ("Incentive"). This Incentive was a critical factor in the Customer's decision to go forward with the Project(s) and to commit the Project(s) to the Company.

4. All information related to said Project(s) that has been submitted to the Company is true and accurate to the best of my knowledge.

FURTHER AFFIANT SAYETH NAUGHT.

[signature]

Sworn to before me and subscribed in my presence this 31st day of Aug, 2017.

Tracey Yvette Davis
Notary

TRACEY YVETTE DAVIS
NOTARY PUBLIC - STATE OF MICHIGAN
COUNTY OF WAYNE
My Commission Expires May 28, 2022
Acting in the County of Wayne