

BEFORE THE PUBLIC UTILITIES COMMISSION OF OHIO

In the matter of the application to Commit)
Energy Efficiency/Peak Demand)
Reduction Programs of The Cleveland) Case No. 14-2067-EL-EEC
Electric Illuminating Company and)
Evergreen Packaging)

NOTICE OF FILING AMENDMENT TO JOINT APPLICATION

The Cleveland Electric Illuminating Company hereby provides notice of its filing of an amendment to the Application to Commit Energy Efficiency/Peak Demand Reduction Program that it filed jointly with Evergreen Packaging on December 9, 2014. The parties file this amendment to provide updated energy savings calculations.

Respectfully submitted,

/s/ Lindsey Sacher

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Company*



Public Utilities Commission

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

Case No.: 14-2067-EL-EEC

Mercantile Customer: Evergreen Packaging

Electric Utility: The Cleveland Electric Illuminating Company

Program Title or
Description: VFD & Compressor Retrofits

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: Evergreen Packaging

Principal address: 7920 Mapleway Drive, Olmsted Falls, Ohio 44138

Address of facility for which this energy efficiency program applies: 7920 Mapleway Drive, Olmsted Falls, Ohio 44138

Name and telephone number for responses to questions: Richard Stewart, 440.235.7238

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: 179,192 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: _____ kWh

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: _____ kWh

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?

3/01/2011

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

26 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 \$10,751.25. (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.)

Subsection 1: TRC Test Used (please fill in all blanks).

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.



Public Utilities Commission

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

Case No.: 14-2067-EL-EEC

State of Ohio :

Richard Stewart, Affiant, being duly sworn according to law, deposes and says that:

1. I am the duly authorized representative of:

Evergreen Packaging

[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.

MAINTENANCE MANAGER

Signature of Affiant & Title

Sworn and subscribed before me this 25 day of November, 2014 Month/Year

Signature of official administering oath

Frances Cajka / Banker

Print Name and Title

My commission expires on 5.3.2017



FRANCES CAJKA
Notary Public, State of Ohio
My Comm. Expires 5.3.2017

Customer Legal Entity Name: Evergreen Packaging Inc.

Site Address: Evergreen Packaging
Principal Address: 7920 Mapleway Dr

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	Air Compressor Replacement	Replaced old air compressor with new variable speed screw LR90 compressor. Units run 7970 hours annually.	Plant logs show 7970 hours of operation and 310 CFM average loading. The old compressor was rated at 23.6 KW/100 CFM. The new compressor is rated at 20.06 KW/100 CFM. The calculation is the (Kw per 100 CFM old * CFM- KW per 100 CFM new* CFM)* hours use= KWH saved. See attached spreadsheet.	N/A	N/A
2	Main Drive Upgrades	Converter 4 Press Replaced Reliance MaxPax Drive and 50 HP DC motor with AB Powerflex 70 Drive and Marathon AC motor. This machines runs at an average speed of 32Hz and 3767 run time hours per year. Sealer 2 Replaced reliance DC drive and 40hp DC motor with AB Powerflex 70 drive and Marathon AC motor. This machine run at an average speed of 28HZ and 1579 run time hours per year. Converter 7 Press-Replaced reliance DC drive and 40hp DC motor with AB Powerflex 755 drive and Marathon AC motor. This machine runs at an average speed of 36HZ and	DC motor and drive are more than ten years old, efficiencies can be substantially less than what is represented in specifications. Poor efficiencies in DC systems are a result of poor brush and commutator maintenance, multiple motor rewinds, improper field settings, or weak Silicon Controlled Rectifiers (SCR) in the DC drive. The hours use and the percent loading were used to calculate each system. The KW was calculated by the HP* % Load *.746/ Drive eff / Motor eff. KW * run hours= KWH.	N/A	N/A

Exhibit 2

Customer Legal Entity Name: Evergreen Packaging Inc.

Site Address: Evergreen Packaging

Principal Address: 7920 Mapleway Dr

	Unadjusted Usage, kwh (A)	Weather Adjusted Usage, kwh (B)	Weather Adjusted Usage with Energy Efficiency Addbacks, kwh (C) <i>Note 1</i>
2013	5,014,621	5,014,621	5,102,096
2012	5,014,621	5,014,621	5,087,956
2011	5,014,621	5,014,621	5,014,621
Average	5,014,621	5,014,621	5,068,224

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) \$ <i>Note 2</i>
1	Air Compressor Replacement	03/01/2011	\$50,000	\$25,000	87,475	87,475	11	\$6,998.00	\$5,248.50
2	Main Drive Upgrades	06/28/2013	\$46,600	\$23,300	91,717	91,717	15	\$7,337.00	\$5,502.75
					-	-	-		
					-	-	-		
					-	-	-		
					-	-	-		
					-	-	-		
Total			\$96,600		179,192	179,192	26	\$14,335.00	\$10,751.25

Docket No. 14-2067

Site: 7920 Mapleway Dr

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 or 75% of \$0.08/kWh for custom programs for all energy savings eligible for a cash rebate as defined in the PUCO order in Case NO.10-834-EL-EEC dated 9/15/2010, not to exceed the lesser of 50% of the project cost or \$250,000 per project. The rebate also cannot exceed \$500,000 per customer per year, per utility service territory.

Exhibit 3 Utility Cost Test

UCT = Utility Avoided Costs / Utility Costs

Project	Total Annual Savings, MWh (A)	Utility Avoided Cost \$/MWh (B)	Utility Avoided Cost \$ (C)	Utility Cost \$ (D)	Cash Rebate \$ (E)	Administrator Variable Fee \$ (F)	Total Utility Cost \$ (G)	UCT (H)
1	87	\$ 308	\$ 26,967	\$ 2,025	\$5,249	\$875	\$ 8,148	3.3
2	92	\$ 308	\$ 28,275	\$ 2,025	\$5,503	\$917	\$ 8,445	3.35
Total	179	\$ 308	55,241	4,050	\$10,751	\$1,792	16,593	3.3

Notes

- (A) From Exhibit 2, = kWh saved / 1000
- (B) This value represents avoided energy costs (wholesale energy prices) from the Department of Energy, Energy Information Administration's 2009 Annual Energy Outlook (AEO) low oil prices case. The AEO represents a national average energy price, so for a better representation of the energy price that Ohio customers would see, a Cinergy Hub equivalent price was derived by applying a ratio based on three years of historic national average and Cinergy Hub prices. This value is consistent with avoided cost assumptions used in EE&PDR Program Portfolio and Initial Benchmark Report, filed Dec 15, 2009 (See Section 8.1, paragraph a).
- (C) = (A) * (B)
- (D) 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.
- (E) This is the amount of the cash rebate paid to the customer for this project.
- (F) Based on approximate Administrator's variable compensation for purposes of calculating the UCT, actual compensation may be less.
- (G) = (D) + (E) + (F)
- (H) = (C) / (G)

Evergreen Packaging Inc. ~ Evergreen Packaging
Docket No. 14-2067

Site: 7920 Mapleway Dr

Summary

	KWH	KWH New	KWh Save	KW old	KW New
Sealer 6	66,830	45,527			
Sealer 4	118,697	108,240			
Sealer 2	36,303	24,719			
Converter Press 4	120,506	84,313			
Converter Press 7	45,843	33,661			
	388,178	296,461	91,717	174.0667	158.7323

40 DC HP		Base Projected without VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	DC Motor- Drive Eff	DC Motor Eff	KW	KWH
0.433333	70%	2,156	40%	40	1	80%	75%	19.9	42,890
	20%	616	50%	40	1	80%	75%	24.9	15,318
	10%	308	60%	40	1	82%	78%	28.0	8,622
	0%	0	70%	40	1	84%	82%	30.3	0
	0%	0	80%	40	1	86%	85%	32.7	0
	0%	0	90%	40	1	90%	90%	33.2	0
TOTAL	100%	3,080	44.00%						66,830
40 AC HP		with VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	AC Motor- Drive Eff	AC Motor Eff	KW	KWH
	70%	2,156	40%	40	1	94%	95.0%	13.4	28,972
	20%	616	50%	40	1	94%	95.0%	16.8	10,347
	10%	308	60%	40	1	94%	95.0%	20.2	6,208
	0%	0	70%	40	1	94%	95.0%	23.5	0
	0%	0	80%	40	1	94%	95.0%	26.9	0
	0%	0	90%	40	1	94%	95.0%	30.2	0
TOTAL	100%	3,080	0.44						45,527
									21,303 KWH SAVED
									32% % Saved

Evergreen Sealer 4

40 DC HP		Base Projected without VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	DC Motor- Drive Ef	DC Motor Eff	KW	KWH
0.916667	0%	0	40%	40	1	80%	75%	19.9	0
	0%	0	50%	40	1	80%	75%	24.9	0
	0%	0	60%	40	1	82%	78%	28.0	0
	0%	0	70%	40	1	84%	82%	30.3	0
	0%	0	80%	40	1	86%	85%	32.7	0
	100%	3,580	90%	40	1	90%	90%	33.2	118,697
TOTAL	100%	3,580	90.00%						118,697
40 AC HP		with VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	AC Motor- Drive Ef	AC Motor Eff	KW	KWH
	0%	0	40%	40	1	94%	95.0%	13.4	0
	0%	0	50%	40	1	94%	95.0%	16.8	0
	0%	0	60%	40	1	94%	95.0%	20.2	0
	0%	0	70%	40	1	94%	95.0%	23.5	0
	0%	0	80%	40	1	94%	95.0%	26.9	0
	100%	3,580	90%	40	1	94%	95.0%	30.2	108,240
TOTAL	100%	3,580	0						108,240
									10,457 KWH SAVED
									9% % Saved

Evergreen Sealer 2

40 DC HP		Base Projected without VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	DC Motor- Drive Ef	DC Motor Eff	KW	KWH
0.466667	44%	695	40%	40	1	80%	75%	19.9	13,821
	46%	726	50%	40	1	80%	75%	24.9	18,062
	10%	158	60%	40	1	82%	78%	28.0	4,420
	0%	0	70%	40	1	84%	82%	30.3	0
	0%	0	80%	40	1	86%	85%	32.7	0
	0%	0	90%	40	1	90%	90%	33.2	0
TOTAL	100%	1,579	46.60%						36,303
40 AC HP		with VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	AC Motor- Drive Ef	AC Motor Eff	KW	KWH
	44%	695	40%	40	1	94%	95.0%	13.4	9,336
	46%	726	50%	40	1	94%	95.0%	16.8	12,200
	10%	158	60%	40	1	94%	95.0%	20.2	3,183
	0%	0	70%	40	1	94%	95.0%	23.5	0
	0%	0	80%	40	1	94%	95.0%	26.9	0
	0%	0	90%	40	1	94%	95.0%	30.2	0
TOTAL	100%	1,579	0.466						24,719
									11,584 KWH SAVED
									32% % Saved

Evergreen Converter Press 4

50 DC HP		Base Projected without VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	DC Motor- Drive Ef	DC Motor Eff	KW	KWH
0.533333	14%	527	40%	50	1	80%	75%	24.9	13,114
	45%	1,695	50%	50	1	80%	75%	31.1	52,691
	35%	1,318	60%	50	1	82%	78%	35.0	46,133
	6%	226	70%	50	1	84%	82%	37.9	8,568
	0%	0	80%	50	1	86%	85%	40.8	0
	0%	0	90%	50	1	90%	90%	41.4	0
TOTAL	100%	3,767	53.30%						120,506
50 AC HP		with VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	AC Motor- Drive Ef	AC Motor Eff	KW	KWH
	14%	527	40%	50	1	94%	95.0%	16.8	8,858
	45%	1,695	50%	50	1	94%	95.0%	21.0	35,592
	35%	1,318	60%	50	1	94%	95.0%	25.2	33,219
	6%	226	70%	50	1	94%	95.0%	29.4	6,644
	0%	0	80%	50	1	94%	95.0%	33.6	0
	0%	0	90%	50	1	94%	95.0%	37.8	0
TOTAL	100%	3,767	0.533						84,313
									36,193 KWH SAVED
									30% % Saved

Evergreen Converter Press 7

40 DC HP		Base Projected without VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	DC Motor- Drive Ef	DC Motor Eff	KW	KWH
0.6	10%	167	40%	40	1	80%	75%	19.9	3,322
	25%	418	50%	40	1	80%	75%	24.9	10,382
	30%	501	60%	40	1	82%	78%	28.0	14,024
	25%	418	70%	40	1	84%	82%	30.3	12,661
	10%	167	80%	40	1	86%	85%	32.7	5,454
	0%	0	90%	40	1	90%	90%	33.2	0
TOTAL	100%	1,670	60.00%						45,843
40 AC HP		with VFD							
	RUN TIME	HOURS	SPEED	Total HP	MOTORS	AC Motor- Drive Ef	AC Motor Eff	KW	KWH
	10%	167	40%	40	1	94%	95.0%	13.4	2,244
	25%	418	50%	40	1	94%	95.0%	16.8	7,013
	30%	501	60%	40	1	94%	95.0%	20.2	10,098
	25%	418	70%	40	1	94%	95.0%	23.5	9,818
	10%	167	80%	40	1	94%	95.0%	26.9	4,488
	0%	0	90%	40	1	94%	95.0%	30.2	0
TOTAL	100%	1,670	60.00%						33,661
									12,181 KWH SAVED
									27% % Saved

Total savings from all VFDs

115,941 KWH

In situations where the DC motor and drive are more than ten years old, efficiencies can be substantially less than what is represented in specifications. Poor efficiencies in DC systems are a result of poor brush and commutator maintenance, multiple motor rewinds, improper field settings, or weak Silicon Controlled Rectifiers (SCR) in the DC drive.

is probably because they are quite diverse in design and relatively rare compared to general purpose induction motors. Baldor Electric, a manufacturer of motors, drives, and generators, provides a chart that shows the full-load efficiency of typical standard DC motors operating at 1750 RPM. The chart shows efficiency values of 93.0% to 93.5% for motors rated to provide 200 hp to 400 hp. We can provide some additional information that can guide in deciding whether or not to convert to AC variable speed motor/drive systems.

First, refer to the "Question and Answer" regarding efficiency of an existing Motor/Generator (MG) set and the efficiency of replacement opportunities. The response discusses the efficiency of the various system components, as well as benefits of DC motors in general: MG SET EFFICIENCY: We want to calculate potential energy savings of replacing an MG set driving a DC motor with a new AC motor and VSD.

Another useful reference is "Using ASDs with Variable Torque Applications " by John Malinowski, Energy Matters, U.S. Department of Energy, March/April 2000. Here is a summary of his article:

"Constant torque applications such as conveyors don't offer the same energy savings as variable torque applications because power is only linear with speed. Again production improvements may be seen with the addition of ASDs. Changing out older, less efficient DC motors to current premium efficiency designs will reduce energy usage."

"Many older conveyors are already adjustable speed, but powered by DC motors and SCR (thyristor) controls. Typically these DC drive systems have efficiencies in the 80-85% range compared to newer AC drives with efficiencies in the mid-90s. Power factor on DC drives may be in the 50% range whereas power factor for AC drives is approaching unity. Changing an older DC SCR system to an AC Vector Drive can provide better performance than the old DC drive. The AC Vector with encoder feedback can provide constant torque from base speed all the way to zero speed. Besides the energy savings, the maintenance required by the brushes and commutator of the DC motor is eliminated (downtime and costs). A larger or oversized AC motor is sometimes required for low-speed, constant-torque applications."

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Case No(s). 14-2067-EL-EEC

Summary: Amended Application Notice of Filing Amendments to Joint Application of The Cleveland Electric Illuminating Company and Evergreen Packaging electronically filed by Ms. Jennifer M. Sybyl on behalf of The Cleveland Electric Illuminating Company and Evergreen Packaging