



# ComEd Matrix Demand Control Ventilation Evaluation Report

**FINAL**  
**Energy Efficiency / Demand Response Plan:**  
**Plan Year 8 (PY8)**  
**(6/1/2015-5/31/2016)**

**Presented to**  
**Commonwealth Edison Company**

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## E. EXECUTIVE SUMMARY

This report presents a summary of the findings and results from the impact and process evaluation of the PY8<sup>1</sup> Matrix Demand Control Ventilation (DCV) program. The PY8 DCV program plan included marketing campaigns, energy assessments, direct installation of the demand-based ventilation fan controller (DBVFC), post-installation inspections, and customer satisfaction surveys. The DBVFC is a device that optimized the hours of operation of an HVAC supply air fan. Installing a DBVFC saved energy by turning the fan off when it was not required, thereby also reducing the energy needed to heat or cool the reduced amount of outside air brought into the building. The PY8 marketing and outreach for the DCV program was directed at restaurants and fitness centers with total demand less than 100 kW. There were electricity savings attributable from two projects, and no demand savings was associated with this program.<sup>2</sup>

### E.1. Program Savings

Table E-1 summarizes the electricity savings from the DCV program.

**Table E-1.PY8 Total Program Electric Savings**

Savings Category	Energy Savings (MWh)
Ex Ante Gross Savings	10.56
Verified Gross Savings	10.56
Verified Net Savings	8.45

Source: ComEd tracking data and Navigant team analysis.

### E.2. Program Savings by Channel and Measure

**Table E-2. PY8 Program Results by Measure**

Research Category	Ex Ante Gross Savings (MWh)	Verified Gross Savings (MWh)	Verified Gross Realization Rate	NTGR	Verified Net Savings (MWh)
DBVFC	10.56	10.56	100%	0.80†	8.45

Source: ComEd tracking data and Navigant team analysis.

† A deemed value. Source: "ComEd\_NTG\_History\_and\_PY8\_Recommendations.xls", found on the IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>. Accessed: September 30, 2016.

<sup>1</sup> The PY8 program year began June 1, 2015 and ended May 31, 2016.

<sup>2</sup> Regarding demand savings, this DCV measure saves electricity by turning off a fan motor for a maximum time of 30 minutes. Since peak energy is measured in hourly increments, there would be no demand savings associated with this measure. This DCV measure would not reduce demand over an entire peak period, but rather would reduce the demand for short time windows throughout the period.

### E.4. Program Volumetric Detail

The program had two participants in PY8 and installed two measures as shown in the following table.

**Table E-3. PY8 Volumetric Findings Detail**

Participation	
Participants	2
Total Measures	2

Source: ComEd tracking data and Navigant team analysis.

### E.5. Results Summary

The following table summarizes the key metrics from PY8.

**Table E-4. PY8 Results Summary**

Participation	Units	PY8
Ex Ante Gross Savings	MWh	10.56
Ex Post Gross Savings	MWh	10.56
Verified Net Savings	MWh	8.45
Program Realization Rate	%	100
Program NTG Ratio †	#	0.80
DBVFCs Installed	#	2
Customers Touched	#	11*

Source: ComEd tracking data and Navigant team analysis.

† A deemed value. Source: "ComEd\_NTG\_History\_and\_PY8\_Recommendations.xls", found on the IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>. Accessed: September 30, 2016.

\* "Customers Touched" is defined by the number of customers who signed "participation agreements."

## E.6. Findings and Recommendations

The following provides insight into key program findings and recommendations.

The DCV PY8 program had an installation target of 412 projects, of which two were completed. One additional project was installed, but subsequently was removed from the program since the customer closed their electrical account before the invoice was processed. The implementer identified 3,457 potential businesses over the course of PY8, confirmed 532 projects as feasible, 181 projects as eligible, sent marketing packages to 83 projects, signed 11 projects, was able to install three, and verified two.

### Program Volumetric Findings.

**Finding 1.** Only two projects were completed as part of this program. The PY8 target number of completed projects was 412.

**Recommendation 1.** Expand marketing activities beyond restaurants and fitness centers, or reduce target goal, as only 181 projects were confirmed eligible for the program out of 3,457 identified.

### Process Evaluation.

**Finding 2.** Implementation contractor currently has no local presence in Chicago.

**Recommendation 2.** Navigant recommends, and implementation contractor is pursuing, hiring additional personnel to work in Chicago.

## 1. INTRODUCTION

### 1.1 Program Description

This report presents a summary of the findings and results from the impact and process evaluation of the PY8<sup>3</sup> Matrix Demand Control Ventilation (DCV) program. The PY8 DCV program plan included marketing campaigns, energy assessments, direct installation of the demand-based ventilation fan controller (DBVFC), post-installation inspections, and customer satisfaction surveys. The DBVFC is a device that optimized the hours of operation of an HVAC supply air fan. Installing a DBVFC saved energy by turning the fan off when it was not required, thereby also reducing the energy needed to heat or cool the reduced amount of outside air brought into the building. The PY8 marketing and outreach for the DVC program was directed at restaurants and fitness centers with total demand less than 100 kW. There were electricity savings attributable from two projects, and no demand savings was associated with this program.<sup>4</sup>

### 1.2 Evaluation Objectives

The evaluation team identified the following key researchable questions for PY8.

#### 1.2.1 Impact Questions

1. What are the program's verified gross savings?
2. What are the program's verified net savings?
3. What updates are recommended for the Illinois Technical Reference Manual (TRM)?

#### 1.2.2 Process Questions

1. What caused the program's low participation in PY8?
2. What are the changes for PY9?

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<sup>3</sup> The PY8 program year began June 1, 2015 and ended May 31, 2016.

<sup>4</sup> Regarding demand savings, this DCV measure saves electricity by turning off a fan motor for a maximum time of 30 minutes. Since peak energy is measured in hourly increments, there would be no demand savings associated with this measure. This DCV measure would not reduce demand over an entire peak period, but rather would reduce the demand for short time windows throughout the period.

## 2. EVALUATION APPROACH

We prepared a two-year evaluation plan to identify tasks by year on a preliminary basis (Table 2-1). Final activities will be determined annually to reflect current program conditions.

**Table 2-1: Evaluation Plan Summary**

Activity	PY8	PY9
Gross Impact Approach	Engineering File Review/Tracking Data Review	Engineering File Review/Tracking Data Review
Verified Net Impact Approach	Deemed Value	Deemed Value
Program Manager and Implementer Interviews/ Review Materials	Yes	Yes

### 2.1 Overview of Data Collection Activities

The core data collection activities included engineering reviews of the installed projects, and an in depth interview with the program manager and implementer staff. The full set of data collection activities is shown in the following tables.

**Table 2-2. Primary Data Collection Activities**

What	Who	Target Completes	Completes Achieved	When	Comments
Engineering Review	Participating Customers	15	2	October	Only two projects completed
In Depth Interviews	Program Manager/Implementer Staff	4	2	October	

**Table 2-3. Additional Resources**

Reference Source	Author	Gross Impacts
Supply Fan Cycling for Small Packaged HVAC Workpaper <sup>5</sup>	Matrix Energy Services	X

### 2.2 Verified Savings Parameters

Verified gross and net savings (energy and coincident peak demand) resulting from the PY8 program were calculated using the following algorithms as defined in the Matrix workpaper regarding the DBVFC.<sup>6</sup>

$$\text{Verified Gross Annual kWh Savings} = \text{System Tons} \times \text{Deemed Energy Savings}$$

Where

**System Tons** = total tons of heating/cooling of the HVAC system in question.

**Deemed Energy Savings** = 704 kWh/ton for businesses running 24/7  
528 kWh/ton for businesses running 18/7

<sup>5</sup> "Supply Fan Cycling for Small Packaged HVAC." Matrix Energy Services, Inc., April 12, 2014

<sup>6</sup> "Supply Fan Cycling for Small Packaged HVAC." Matrix Energy Services, Inc., April 12, 2014



The value for 18/7 businesses, those businesses operating 18 hours per day seven days per week, is equal to the 24/7 business savings multiplied by 18/24. Since most cooling and heating takes place during the day, and off hours for 18/7 businesses are generally at night, this is likely a conservative savings estimate for this measure.

### **2.2.1 Verified Gross Program Savings Analysis Approach**

The program key gross impact evaluation activities for EPY8 were based on (1) reviewing the tracking system to determine whether all fields are appropriately populated, (2) reviewing measure algorithms and savings values in the tracking system to assure that the TRM are appropriately applied, and (3) cross-checking measure totals and savings recorded in the tracking database.

### **2.2.2 Verified Net Program Savings Analysis Approach**

Verified net energy and demand (coincident peak and overall) savings were calculated by multiplying the verified gross savings estimates by a net-to-gross ratio (NTGR). In PY8, the NTGR estimates used to calculate the net verified savings were defined through a negotiation process through SAG as documented in a spreadsheet.<sup>7</sup>

## **2.3 Process Evaluation**

Navigant conducted a limited process evaluation for this program to try to determine the cause of the low participation in PY8 as well as the changes for PY9 via a telephone interview with the program and technical managers at the implementation contractor.<sup>8</sup>

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<sup>7</sup> A deemed value. Source: "ComEd\_NTG\_History\_and\_PY8\_Recommendations.xls", found on the IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>. Accessed: September 30, 2016.

<sup>8</sup> Telephone interview with Matrix program manager and technical lead, October 14, 2016.

### 3. GROSS IMPACT EVALUATION

#### 3.1 Program Volumetric Findings

There were only two total projects included in the PY8 tracking system.

**Table 3-1. PY8 Volumetric Findings Detail**

Participation	
Participants	2
Total Measures	2

*Source: ComEd tracking data and Navigant team analysis.*

Interviews with the Program Manager and the Technical Lead for the DCV program indicated that the prior Program Manager left Matrix Energy Services in April 2016, near the end of PY8, and since that date Matrix has not had a presence in the Chicago area. In October 2016, Matrix is seeking to hire additional personnel in Chicago to have a presence in the ComEd service territory in PY9.

#### 3.2 Gross Program Impact Parameter Estimates

As described in Section 2, energy and demand savings are estimated using the following formula as specified in the workpaper:

$$\text{Verified Gross Annual kWh Savings} = \text{System Tons} \times \text{Deemed Energy Savings}$$

The EM&V team conducted research to validate the parameters that were not specified in the TRM. The results are shown in the following table.

**Table 3-2. Verified Gross Savings Parameters**

Gross Savings Input Parameters	Value	Deemed ‡ or Evaluated?
Quantity		Evaluated
Measure Type and Eligibility		Evaluated
Gross Savings per Unit, Sampled Deemed Measures		Deemed
Verified Realization Rate on Ex-Ante Gross Savings (Non-Lighting)		Evaluated

‡ State of Illinois Technical Reference Manual version 4.0 from <http://www.ilsag.info/technical-reference-manual.html>.

#### 3.3 Verified Gross Program Impact Results

The resulting total program verified gross savings is 10.56 MWh as shown in the following table.

**Table 3-3. PY8 Verified Gross Impact Savings Estimates by Measure Type**

	Sample Size	Gross Energy Savings (MWh)	90/10 Significance
<b>Non-Lighting Measures</b>			
Ex-Ante Gross Savings		10.56	
Verified Gross Realization Rate	2	100%	Yes
Verified Gross Savings		10.56	
<b>Total</b>			
Ex-Ante Gross Savings		10.56	
Verified Gross Realization Rate	2	100%	Yes
Verified Gross Savings		10.56	

Source: Evaluation Team analysis.

†NA when the TRM determines the gross savings.

## 4. NET IMPACT EVALUATION

SAG determined<sup>9</sup> that the NTG values for this program should be deemed prospectively and used to calculate verified net savings. The table below shows the deemed NTG values and the PY8 verified net savings.

**Table 4-1. PY8 Verified Net Impact Savings Estimates by Measure Type**

	Sample Size	Energy Savings (MWh)	90/10 Significance
Ex-Ante PY8 Gross Savings	2	10.56	Yes
Realization Rate	2	100%	Yes
Verified Gross Savings	2	10.56	Yes
NTG	2	0.8	
Verified Net Savings	2	8.45	

Source: Evaluation Team analysis.

<sup>9</sup> A deemed value. Source: "ComEd\_NTG\_History\_and\_PY8\_Recommendations.xls", found on the IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>. Accessed: September 30, 2016.

## 5. PROCESS EVALUATION

Navigant conducted a limited process evaluation for this program. Through a telephone interview with the implementation contractor's program manager and technical lead<sup>10</sup>, Navigant learned that the previous program manager, who had conceived of the program, left the company in March 2016. In addition, the new program manager assessed that the marketing and outreach was not sufficient to meet the target participation levels in PY8. Also, the staff member that had been conducting the majority of the outreach and assessments in Chicago also left the company in March 2016. The new program manager, in conjunction with WECC, is relaunching the program with a broader outreach plan to more types of businesses, refreshed marketing materials, and a slightly enhanced product offering. Another reason the program manager believed contributed to the low participation numbers is that often there was a long period of time in between the initial contact with the customer and the follow-up.

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<sup>10</sup> Telephone interview with Matrix program manager and technical lead, October 14, 2016.