2023 Indiana Conservation Voltage Program EM&V Report

Prepared for:

Indiana Michigan Power

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1. Introduction

This report addresses the measuring, verifying and evaluating of energy savings and demand reductions that resulted from the implementation by Indiana Michigan Power Company (I&M) in 2023 of its Conservation Voltage Program (CVR) Program. I&M implemented this program in conjunction with Utilidata, Inc.

1.1 Description of Program

Under ANSI Standard C84.1 Electric Power Systems and Equipment, a utility system is to deliver electricity to end-users at a voltage within the range of 120 ± 5% volts (i.e., 114 – 126). With the usual system design, customers close to a substation receive voltages closer to 126 volts and customers farther from the substation receive lower voltages. Voltage regulating equipment is applied as necessary to ensure the required minimum voltages are provided.

The CVR program is based on implementing Conservation Voltage Reduction (CVR), which is a process by which the utility systematically reduces voltages in its distribution network, resulting in a proportional reduction of load on the network. Because most devices operated by electricity (especially motors) are designed to operate most efficiently at 115 volts, any "excess" voltage is typically wasted, usually in the form of heat. Tighter voltage regulation allows end-use devices to operate more efficiently without any action on the part of consumers. Consumers receive a lower but still acceptable voltage and use less energy to accomplish the same tasks.

Voltage is controlled for the circuits at the substations using Utilidata's AdaptiVolt™ Volt/VAR Optimization platform. AdaptiVolt™ uses secure digital communications to implement a closed-loop control system. Using AdaptiVolt™ allows I&M to dispatch voltage-based demand control within seconds. The system measures end-of-line voltage and sends the voltage information back to the controller at the substation in real time.

1.2 Impact Evaluation Findings

Table 1-1 below presents the total aggregated annual gross and net energy (kWh) savings achieved by the CVR Program during PY2023.

Table 1-1. Summary of Ex Post PY2023 kWh Savings

Ex Ante Annual kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Annual Gross kWh Savings*	*Gross Realization Rate*	*Ex Post Annual Net kWh Savings*	*Net-to-Gross Ratio*
19,735,646	19,735,646	19,735,646	27,071,349	137%	27,071,349	100%

Table 1-2 presents the total gross and net peak demand (kW) impacts achieved by the CVR Program during PY2023.

Table 1-2. Summary of Ex Post PY2023 kW Peak Demand Impacts

Ex Ante Gross kW Savings	*Gross Audited kW Savings*	*Gross Verified kW Savings*	*Ex Post Gross kW Savings*	*Gross Realization Rate*	*Ex Post Net kW Savings*	*Net-to-Gross Ratio*
4,013.31	4,013.31	4,013.31	5,818.24	145%	5,818.24	100%

1.3 Organization of Report

This report is organized as follows:

- Chapter 2: Data Collection
- Chapter 3: Impact Evaluation Methods
- Chapter 4:Impact Evaluation Findings

2. Data Collection

The effects of voltage optimization for 2023 were analyzed using voltage and power data extracted from I&M's SCADA system.

I&M and Utilidata used an "on/off" procedure for voltage reductions during various parts of 2023.[1] This procedure involves disengaging the CVR system during specified days to enable the provision of data sets with measurements of voltages and energy use that include both regular voltages (measured on "off" days, during which the CVR system is disengaged) and reduced voltages (measured on "on" days, during which the CVR system is engaged).

During 2023, data were collected for regulated source voltages by phase and power by circuit. Voltage and power were measured at 30 second intervals, giving 120 data-points per hour for each element. Voltages were measured at the substation level for three phases.

While CVR was initially engaged prior to 2023 for most circuits included in the analysis, the CVR system was initially engaged during 2023 for the circuits listed below in Table 2-1. VVO was initially engaged for Blaine circuits at the end of August 2023. Due to very limited availability of interspersed days of VVO engagement and disengagement for these circuits, energy savings achieved during late 2023 through VVO system engaged could not be estimated for these circuits.

Table 2-1. Initial CVR System Engagement During 2023 by Circuit by Date

Circuit ID	*Date CVR System Initially Engaged*
Blaine-4098021	8/30/2023
Blaine-4098024	8/30/2023
Blaine-4098025	8/30/2023
IllinoisRoad-4510721	8/17/2023
IllinoisRoad-4510722	8/17/2023
IllinoisRoad-4510723	8/17/2023
LusherAvenue-4094021	9/19/2023
LusherAvenue-4094022	9/19/2023
LusherAvenue-4094023	9/19/2023
LusherAvenue-4094024	9/19/2023
LusherAvenue-4094025	9/19/2023
LusherAvenue-4094026	9/19/2023
Mackey-4535221	7/11/2023
Mackey-4535222	7/11/2023
Mackey-4535223	7/11/2023

[1] For discussion of "on / off" testing, see, for example, Pacific Northwest Regional Technical Forum, *Standard Protocol #1 for Automated CVR,* November 2011.

Circuit ID	*Date CVR System Initially Engaged*
Mackey-4535224	7/11/2023
Mackey-4535225	7/11/2023

Hourly temperature readings were available from the quality controlled local climatological data program of the National Climatic Data Center[2] for 2023 for the multiple weather stations selected based on proximity to the substations for which CVR is enabled. This temperature data was used for the analysis.

Table 2-2 shows the time during 2023 during which the CVR system was engaged, as well as associated average CVR factors and energy savings rate. Where CVR engagement rates were uniform across circuits, information is presented by station; otherwise, results are shown by group of circuits at a station with uniform CVR engagement rates.

Table 2-2 PY2023 CVR System Engagement, CVR Engaged State Energy Savings, and CVR Factors by Station

Substation / Circuit Group	*Average CVR Factor*	*Hours Engaged*	*Engaged State kWh Consumption*	*Engaged State kWh Savings*	*kWh Savings Rate*
Daleville	0.73	6,236	40,078,884	1,034,832	2.6%
EastSide (4093121, 4093122, 4093123)	0.50	2,058	13,485,639	311,066	2.3%
EastSide (4093124, 4093125, 4093126)	0.78	6,671	43,619,843	1,825,465	4.2%
Elcona	0.18	3,365	30,883,388	302,852	1.0%
Farmland	0.51	6,471	19,119,851	405,990	2.1%
Grabill	0.68	5,025	41,163,311	982,448	2.4%
Hacienda (4933521, 4933523, 4933524)	1.07	1,338	768,533	41,017	5.3%
Hacienda (4933525, 4933526, 4933527)	1.02	238	2,043,289	72,772	3.6%
Harper	0.58	6,433	50,695,474	1,179,783	2.3%
IllinoisRoad	0.15	2,137	14,383,138	76,407	0.5%
Lincoln	0.48	4,387	51,180,048	426,713	0.8%
LusherAvenue (4094021, 4094022)	0.41	1,444	6,342,855	96,412	1.5%
LusherAvenue (4094023, 4094024, 4094025, 4094026)	0.50	1,613	7,589,023	176,221	2.3%
Mackey (4535221, 4535225)	0.01	2,165	9,981,622	14,905	0.1%
Mackey (4535222, 4535223, 4535224)	0.79	1,104	9,892,144	270,142	2.7%
McKinley (4055921,4055922, 4055926)	0.53	3,673	42,490,855	501,420	1.2%
McKinley (4055923, 4055924, 4055925)	0.80	1,778	13,770,350	401,424	2.9%

[2] For information on the QCLCD data, see http://www.ncdc.noaa.gov/data-access/land-based-station-data/land-based-datasets/quality-controlled-local-climatological-data-qclcd

Substation / Circuit Group	*Average CVR Factor*	*Hours Engaged*	*Engaged State kWh Consumption*	*Engaged State kWh Savings*	*kWh Savings Rate*
Northland (4933421, 4933422, 4933423)	0.86	5,733	39,733,339	658,902	1.7%
Northland (4933424, 4933425, 4933426)	1.06	116	1,061,039	33,786	3.2%
Osolo (4058021, 4058022, 4058024)	0.83	4,061	38,571,352	1,032,218	2.7%
Osolo (4058023, 4058025, 4058026)	0.95	4,657	35,384,255	1,043,768	2.9%
PettitAvenue	0.50	3,069	20,151,064	227,272	1.1%
SouthBend	0.75	6,559	57,920,716	1,652,432	2.9%
Southside (4094621, 4094622, 4094623, 4094624)	0.72	6,262	36,858,829	1,235,682	3.4%
Southside (4099921, 4099922, 4099923)	0.52	2,790	22,438,309	501,625	2.2%
Spyrun	0.46	6,741	53,867,995	558,531	1.0%
StateStreet	0.79	5,746	47,960,112	1,105,866	2.3%
Summit	0.90	1,868	1,646,174	32,758	2.0%
Trier	1.01	5,501	2,913,350	114,470	3.9%
Wallen (4923421, 4923422, 4923423)	0.84	6,048	3,957,937	119,768	3.0%
Wallen (4923424, 4923425, 4923426)	0.86	4,575	2,469,295	66,773	2.7%
Total			762,422,014	16,503,719	2.2%

3. Impact Evaluation Methods

This chapter discusses the method used for analysis of data to determine energy savings attributable to the CVR Program.

3.1 Determination of CVR Factors

CVR system data analysis was performed using Stata, a statistical software program used for data analysis, data management, and graphics. Stata code was used to analyze CVR data to assess the performance of the system based on the energy usage and voltage data across different time intervals and conditions.

The panel data is organized in a structured manner that represents multiple circuits of stations for which CVR is enabled. Circuit-level data is further broken down into its respective phases. This means for every single circuit in the dataset, there are three corresponding entries or groups – one for each phase of that circuit. Each circuit-phase combination (e.g., Circuit 1 - Phase A, Circuit 1 - Phase B, Circuit 1 - Phase C, and so forth) serves as an individual group within the panel, allowing for detailed analysis and comparison of CVR's performance across different circuits and their respective phases.

The raw data files contain circuit-phase-level 30-second time series data, including energy usage, voltage, and CVR operating status information. Three files are conveyed for each hour, with data for the various stations and circuits divided between the three files.

The data analysis is aimed at creation of two products facilitating calculation of energy savings:

- **Circuit-Phase Operational Report**: This comprehensive report provides circuit-phase-level insights, including voltage levels, power consumption, and the operating status of the CVR system for each circuit and its respective phase. It serves as a detailed snapshot of the system's operational history, with information presented for each month of system operation.
- **Regression Analysis Report**: This report presents the results of regression analyses performed on data samples. It provides detailed information on CVR factors and related data.

Regression analysis is used to relate circuit power data to month of year, day type (business day/non-business day), CVR operating state and weather. The regression model used is given in Equation 3-1 below.

Equation 3-1

$$kWh_i = \beta_0 + \beta_1 Engaged_j + \beta_2 CDH_i + \beta_3 HDH_i + \beta_4 Hour_i + \beta_4 Month_i + \beta_5 Day\_Type_i + e_i$$

Regression analysis model variables are described in Table 3-1.

Table 3-1. Regression Analysis Model Variables

Variable Name	*Variable Description*
kWh	Dependent variable; hourly power (kW).
Engaged	1 if CVR is engaged; otherwise 0.
CDH	MAX (Outdoor Temperature - 65°F, 0)
HDH	MAX (65°F - Outdoor Temperature, 0)
Hour * Day_Type	Group of dummy variables for hour of the day, by day type (business day, non-business day).
Month	Group of dummy variables for month.

For each circuit and phase, regression models using the specification in Equation 3-1 are estimated. Regression models are performed using a sample of data generated through pairing hourly observations occurring during CVR system engagement with hourly observations occurring during CVR system disengagement. Paired observations occurred during consecutive days of the same day type (business/non-business) and during the same hour of day. The approach to selection of paired observations is intended to minimize the impact of non-CVR-related variables impacting energy usage that are not otherwise controlled for by model independent variables.

The regression model reference a full year of data, when available. This full-year reference holds true not only for annual analyses, which have been presented in annual Energy Measurement & Verification (EM&V) reports, but also for any preliminary, mid-year investigations undertaken.

The value for β_1 estimated through the regression analysis captures the impact of CVR system engagement on circuit-level energy usage, controlling for month of year, weather, day type, and hour of day.

The results of the regression analyses and associated voltage reduction reflected in the regression data set are used to determine applicable conservation voltage reduction factor (*CVRf*) for each circuit and phase. A *CVRf* measures the relationship between changes in energy in response to changes in voltage effected under the operation of the CVR system. Mathematically, *CVRf* is calculated as the ratio between the percentage change in energy usage and the percentage change in voltage, as shown below in Equation 3-2.

Equation 3-2

$$CVRf = -(\beta_1 / (kWh_{engaged\_sample} + \beta_1)) / ((V_{idle\_sample} - V_{engaged\_sample}) / V_{idle\_sample})$$

Inputs to the calculation of *CVRf* are described in Table 3-2.

Table 3-2. CVRf Calculation Input Variables

Variable Name	*Variable Description*
β_1	Coefficient of *Engaged* variable of applicable circuit-phase regression analysis, which is the estimate of the change in energy usage associated with CVR system engagement.
$kWh_{engaged\_sample}$	Average hourly kWh electric energy usage for the applicable circuit-phase when the CVR system is engaged, based on the selected sample of data used in the regression analysis.
$V_{engaged\_sample}$	Average voltage for the applicable circuit-phase when the CVR system status is engaged, taken from the same data subset utilized for regression analysis.
V_{idle_sample}	Average voltage for the applicable circuit-phase when the CVR system status is idle, also derived from the data subset used for the regression analysis.

The Regression Analysis Report presents the results of the regression analyses performed for each circuit and phase. The CVR factors presented in the report are then referenced along with the system data presented in the Circuit-Phase Operational Report to estimate ex post energy savings. This is facilitated by estimating the applicable baseline energy usage ($kWh_{baseline\_pop}$) using Equation 3-3 shown below.

Equation 3-3

$$kWh_{baseline\_pop} = (kWh_{engaged\_pop} * V_{idle\_pop}) / (-CVRf * V_{idle\_pop} + CVRf * V_{engaged\_pop} + V_{idle\_pop})$$

Inputs to the calculation of CVRf are described in Table 3-2.

Table 3-3. Baseline Energy Usage Calculation Input Variables

Variable Name	*Variable Description*
CVRf	Applicable CVR factor calculated by using Equation 3-2.
$kWh_{engaged\_pop}$	kWh electric energy usage for the applicable circuit-phase when the CVR system is engaged, based on the population of observations for the applicable circuit and phase.
$V_{engaged\_pop}$	Average voltage for the applicable circuit-phase when the CVR system status is engaged, taken from the same population of observations.
V_{idle_pop}	Average voltage for the applicable circuit-phase when the CVR system status is idle, also derived from the population of observations.

The calculation of $kWh_{baseline\_pop}$ enables calculation of energy savings ($kWh_{savings}$) using Equation 3-4 shown below.

Equation 3-4

$$kWh_{savings} = kWh_{baseline\_pop} - kWh_{engaged\_pop}$$

3.2 Determination of Meta-Regression CVR Factors

The savings analyses described in section 3.1 are based on regression analyses performed over a data span of up to 365 days ("365-day regression analysis"). These regression models are designed to account for overall energy consumption by employing specific independent variables, including a dummy variable designed to discern the incremental impact of CVR system engagement on energy consumption. However, for certain circuits and phases, there may be marked energy consumption deviations caused by factors that are not accounted for by the model. Even with data sampling methodology outlined in section 3.1, unaccounted factors may still influence the results. Hence, there is a possibility that results derived from any specific 365-day data frame could be disproportionately influenced by distinct variables not considered in our model.

To mitigate the potential impact of unaccounted-for factors, we carried out a meta-analysis spanning multiple 365-day periods. This holistic approach aims to critically evaluate the integrity of our various models and subsequently establish refined CVR factors grounded in the comprehensive meta-review.

All 365-day regression analyses available over a 365 day period were included in the meta-regression analysis.

For each 365-day regression analysis, Equation 3-5 and Equation 3-6 were used to create data quality metric variable n_{norm} and f_{norm}, based on number of hourly observations and F-statistic, which measures model goodness of fit.

Equation 3-5

$$n_{norm} = (n_i - n_{min}) / (n_{max} - n_{min})$$

Equation 3-6

$$f_{norm} = (f_i - f_{min}) / (f_{max} - f_{min})$$

Table 3-4 describes the inputs to the calculation of n_{norm} and f_{norm}.

Table 3-4. Data Quality Score Input Variables

Variable Name	*Variable Description*
n_i	Number of hourly observations on which the applicable 365-day regression analysis is based.
n_{min}	Number of hourly observations for the 365-day regression analysis with the fewest observations, to be included in the meta-analysis for the applicable circuit and phase.
n_{max}	Number of hourly observations for the 365-day regression analysis with the most observations, to be included in the meta-analysis for the applicable circuit and phase.
f_i	F-statistic of the applicable 365-day regression analysis.
f_{min}	F-statistic for the 365-day regression analysis with the lowest F-statistic to be included in the meta-analysis for the applicable circuit and phase.
f_{max}	F-statistic for the 365-day regression analysis with the highest F-statistic to be included in the meta-analysis for the applicable circuit and phase.

The data quality metrics described by Equation 3-5 and Equation 3-6 were then referenced to create a score variable using Equation 3-7 shown below.

Equation 3-7

$$score = (n_{norm} + f_{norm}) / 2$$

Meta-regression analysis is then performed to generate preliminary meta-CVR factors for each circuit and phase based on the CVRf and score of the 365-day regression analyses included in the analysis, as shown in Equation 3-8.

Equation 3-8

$$CVRf_{meta\_preliminary} = \beta_0 + \beta_1 CVRf_i + \beta_2 Score_i + e_i$$

Using the coefficients from the regression model specified above, predicted $CVRf_{meta\_preliminary}$ values are generated for each observation included in the meta-analysis for the applicable circuit and phase. These preliminary meta-analysis CVR factors require further refinement.

Given the variability in the reliability and significance of different datasets, we calculate a weighted CVR factor. Each predicted $CVRf_{meta\_preliminary}$ is weighted by its associated *score*, ensuring that more reliable and significant datasets have a larger influence on the final updated CVR factor, and the final meta-regression CVR factor is calculated as the mean of the weighted predicted $CVRf_{meta\_preliminary}$ values as shown below in Equation 3-9.

Equation 3-9

$$CVRf_{meta} = \sum(CVRf_{meta\_preliminary,i} * Score_i) / \sum Score_i$$

The meta-analysis CVR factor is representative of the collective behavior across all datasets, with due consideration given to the characteristics of all the 365-day regression analyses.

Meta-analysis CVR factors were referenced to support calculation of PY2023 CVR Program energy savings.

3.3 Ex Post Savings Calculations

The meta-analysis CVR factors the system data presented in the Circuit-Phase Operational Report (described in section 3.1) were referenced to estimate ex post energy savings. This is facilitated by estimating the applicable average baseline energy usage ($kWh_{avg\_baseline}$) using Equation 3-10 shown below.

Equation 3-10

$$kWh_{avg\_baseline} = (kWh_{avg\_engaged} * V_{baseline}) / (-CVRf * V_{idle\_pop} + CVRf * V_{engaged} + V_{baseline})$$

Inputs to the calculation of CVRf are described in Table 3-5.

Table 3-5. Baseline Energy Usage Calculation Input Variables

Variable Name	*Variable Description*
CVRf	If available, use meta-analysis CVR factor calculated by using Equation 3-9; otherwise use CVR factor calculated by using Equation 3-2.
$kWh_{avg\_engaged}$	Average hourly kWh electric energy usage for the applicable circuit-phase when the CVR system status is engaged during the applicable year.
$V_{engaged}$	Average voltage for the applicable circuit-phase when the CVR system status is engaged during the applicable year.
$V_{baseline}$	Use average voltage when the CVR system status was idle, derived from the population of observations of the 365-day regression analyses associated with CVRf.

The calculation of $kWh_{avg\_baseline}$ enables calculation of the energy savings rate ($kWh_{savings\_rate}$) using Equation 3-11 shown below.

Equation 3-11

$$kWh_{savings\_rate} = (kWh_{avg\_baseline} - kWh_{avg\_engaged}) / kWh_{avg\_baseline}$$

To calculate ex post energy savings, the energy savings rate is factored by energy consumption during eligible operating periods. Eligible operating periods includes times when the CVR system

is engaged and times when the CVR system is not engaged due to reasons beyond the utility's control.[3] Eligible and ineligible operating periods are described in Table 3-6.

Table 3-6. Eligible and Ineligible Operating Periods

Status	*Description*	*Note*	*Category*
CVR Engaged	The CVR system is engaged.	N/A	Eligible
Test Schedule	Any time the system is disengaged due to employment of an on/off testing schedule.	If deemed CVR factors are not applicable, schedules are implemented that disengage the CVR system for approximately 18% of the year to support performance of impact evaluation.	Eligible
Feeder Outage	Any time the majority of a feeder is out due to any reason.	Feeder outages are typically not predictable or planned and are outside of I&M's control. They are an anomaly and are not certain to occur on the same feeder in subsequent years.	Eligible
Repair / Maintenance	Repair or maintenance work is performed on a CVR feeder causing CVR to be disabled.	Repair and maintenance of I&M's system is an operational necessity to provide customers with safe and reliable electric service. These events are not certain to occur on the same feeder in subsequent years.	Eligible
Switching	Dispatch disables CVR on the feeder for any necessary switching event.	I&M will perform switching for storms, outages, repair, maintenance, safety, and work to support new customer growth. These events are not certain to occur on the same feeder in subsequent years.	Eligible
Technology	A failure of the Information and/or Communication Technology which results in "all" CVR feeders being disabled simultaneously due to events outside of I&M's control.	CVR is dependent upon third party infrastructure that I&M has no control over. Examples include the loss of the cellular communications network (AT&T and Verizon), the failure of the CVR software provided by the outside vendor, or a cyber event. Events of this nature are an anomaly and are not certain to occur year after year. This event is not predictable or planned and is outside of I&M's control.	Eligible

[3] For an example of a similar CVR savings calculation provision, see 2023 Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 11.0, Volume 4, p. 22-31 (Section 6.2.1 Voltage Optimization). Created in collaboration with the Illinois Energy Efficiency Stakeholder Advisory Group (SAG). Available at: https://www.ilsag.info/wp-content/uploads/IL-TRM-Version-11.0-Volumes-1-4-Compiled-Final.pdf.

Status	*Description*	*Note*	*Category*
Worldwide Pandemic / Orders by Civil Authorities	Repairs and maintenance may take longer due to limited crew availability or other restrictions/priorities.	Due to restrictions, repairs and maintenance may take longer. This reasonable delay is outside the control of I&M.	Eligible
Disaster Recovery (DR) Testing	I&M periodically performs Disaster Recovery testing on systems (AMI, ADMS, CVR, etc.) which could result in CVR disabling. Typically all CVR feeders would be affected during DR testing.	Disaster Recovery testing is necessary and critical to ensure that I&M can operate safely and effectively during an unforeseen event.	Ineligible
Server patching/issues	Anytime servers go down or patching takes place and the CVR system does not come back online due to servers not rebooting correctly.	Events of this nature are unavoidable, but should be addressed by I&M in a timely fashion. This should result in negligible impacts to energy savings.	Ineligible
Configuration Changes	Anytime CVR is disabled for making updates to the Orion, go-live testing, or to make changes on the system resulting in shutting down services.	Events of this nature are unavoidable, but should be addressed by I&M in a timely fashion. This should result in negligible impacts to energy savings.	Ineligible
CVR field hardware failures	The loss or failure of a voltage regulator control, LTC control, or switched capacitor control on a feeder.	Events of this nature are unavoidable, but should be addressed by I&M in a timely fashion. This should result in negligible impacts to energy savings.	Ineligible
Loss of communications	Anytime a device has a communications failure that would result in CVR disabling. This event does not include 3rd party cellular communications network (AT&T and Verizon) failures.	Events of this nature are unavoidable, but should be addressed by I&M in a timely fashion. This should result in negligible impacts to energy savings.	Ineligible

Ex post energy savings ($kWh_{savings}$) are calculated using Equation 3-12, where $kWh_{eligible}$ is the total electric energy consumption during the eligible operating periods.

Equation 3-12

$$kWh_{savings} = (kWh_{eligible} * (1 + kWh_{savings\_rate})) - kWh_{eligible}$$

Ex post peak demand savings ($kW_{savings}$) are calculated using Equation 3-13, where $kWh_{eligible\_peak}$ is the electric energy consumption during the eligible operating periods during the applicable peak period, and $hours_{peak}$ is the number of hours comprising the applicable peak period.

Equation 3-13

$$kW_{savings} = ((kWh_{eligible\_peak} * (1 + kWh_{savings\_rate})) - kWh_{eligible\_peak}) / hours_{peak}$$

4. Impact Evaluation Findings

This chapter presents the results from the analysis of data for the Indiana CVR program in 2023 to determine kWh savings and CVR factors associated with voltage reduction for the various circuits and phases.

4.1 Circuit/Phase-Level Energy Savings and CVR Factors

For each circuit and phase, kWh savings and CVR factors were calculated. The percentage savings from reducing voltage was calculated and divided by the percentage reduction in voltage to determine the CVR factor. The resulting estimates of engaged state kWh savings and CVR factors for the various phases of the circuits and phases are reported by substation in Table 4-1 through Table 4-22.

Table 4-1 PY2023 Energy Savings and CVR Factors by Phase: Daleville Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Daleville-4927921	A	125.24	121.31	121,967	6,869,471	1.74%	0.56
	B	126.09	122.05	159,926	5,561,051	2.80%	0.87
	C	126.07	122.11	274,601	7,371,786	3.59%	1.14
	Total /Average	125.79	121.81	556,495	19,802,308	2.73%	0.87
Daleville-4927922	A	125.24	121.31	29,176	1,619,633	1.77%	0.56
	B	126.06	122.04	38,083	2,173,294	1.72%	0.54
	C	126.09	122.11	30,799	2,119,388	1.43%	0.45
	Total /Average	125.85	121.87	98,058	5,912,314	1.63%	0.52
Daleville-4927923	A	125.28	121.35	81,162	3,303,146	2.40%	0.76
	B	126.10	122.08	144,028	4,510,335	3.09%	0.97
	C	126.09	122.13	155,090	6,550,781	2.31%	0.74
	Total /Average	125.91	121.94	380,280	14,364,262	2.58%	0.82

Table 4-2 PY2023 Energy Savings and CVR Factors by Phase: EastSide Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
EastSide-4093121	A	125.05	119.63	11,925	645,296	1.81%	0.42
	B	125.14	119.63	18,883	811,690	2.27%	0.52
	C	125.34	119.53	19,130	787,176	2.37%	0.51
	Total /Average	125.18	119.59	49,938	2,244,163	2.18%	0.49
EastSide-4093122	A	125.06	119.64	32,182	1,970,564	1.61%	0.37
	B	125.15	119.63	41,809	1,624,000	2.51%	0.57
	C	125.35	119.53	37,079	1,771,977	2.05%	0.44
	Total /Average	125.18	119.60	111,070	5,366,542	2.03%	0.45
EastSide-4093123	A	125.03	119.61	34,608	1,904,657	1.78%	0.41
	B	125.12	119.60	62,307	1,897,715	3.18%	0.72
	C	125.33	119.51	53,143	2,072,562	2.50%	0.54
	Total /Average	125.16	119.57	150,058	5,874,934	2.49%	0.56
EastSide-4093124	A	125.24	119.06	251,479	4,965,916	4.82%	0.98
	B	125.30	119.01	276,336	5,140,176	5.10%	1.02
	C	125.34	118.99	270,441	5,138,656	5.00%	0.99
	Total /Average	125.29	119.02	798,256	15,244,748	4.98%	0.99
EastSide-4093125	A	125.26	119.08	238,915	5,238,340	4.36%	0.88
	B	125.33	119.03	240,626	5,524,120	4.17%	0.83
	C	125.37	119.01	243,603	5,376,336	4.33%	0.85
	Total /Average	125.32	119.04	723,144	16,138,796	4.29%	0.86
EastSide-4093126	A	125.31	119.13	61,994	3,717,621	1.64%	0.33
	B	125.33	119.04	118,699	4,180,062	2.76%	0.55
	C	125.41	119.06	123,372	4,338,615	2.76%	0.55
	Total /Average	125.35	119.08	304,065	12,236,299	2.42%	0.48

Table 4-3 PY2023 Energy Savings and CVR Factors by Phase: Elcona Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Elcona-4938121	A	125.28	119.32	8,681	2,698,081	0.32%	0.07
	B	125.27	119.43	14,731	2,956,123	0.50%	0.11
	C	125.43	119.55	7,569	2,704,956	0.28%	0.06
	Total /Average	125.32	119.43	30,981	8,359,159	0.37%	0.08
Elcona-4938122	A	125.30	119.34	3,917	1,607,528	0.24%	0.05
	B	125.29	119.45	14,845	1,845,264	0.80%	0.17
	C	125.41	119.54	25,976	1,905,757	1.34%	0.29
	Total /Average	125.33	119.45	44,738	5,358,549	0.83%	0.18
Elcona-4938123	A	125.28	119.31	78,877	5,685,591	1.37%	0.29
	B	125.25	119.42	93,114	5,621,900	1.63%	0.35
	C	125.41	119.54	55,143	5,858,188	0.93%	0.20
	Total /Average	125.31	119.43	227,133	17,165,680	1.31%	0.28

Table 4-4 PY2023 Energy Savings and CVR Factors by Phase: Farmland Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Farmland-4927321	A	125.06	119.42	71,211	2,939,238	2.37%	0.52
	B	125.09	120.00	32,258	2,330,973	1.37%	0.34
	C	125.16	119.96	60,254	2,423,005	2.43%	0.58
	Total /Average	125.10	119.77	163,723	7,693,216	2.08%	0.49
Farmland-4927322	A	125.10	119.47	16,267	703,255	2.26%	0.50
	B	125.10	120.00	8,824	383,783	2.25%	0.55
	C	125.18	119.98	23,396	834,163	2.73%	0.66
	Total /Average	125.13	119.80	48,488	1,921,201	2.46%	0.58
Farmland-4927323	A	125.07	119.45	83,480	2,535,542	3.19%	0.71
	B	125.11	120.03	67,430	3,618,995	1.83%	0.45
	C	125.19	120.00	42,868	3,350,897	1.26%	0.30
	Total /Average	125.13	119.87	193,779	9,505,434	2.00%	0.48

Table 4-5 PY2023 Energy Savings and CVR Factors by Phase: Grabill Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Grabill-4935221	A	124.34	120.17	62,400	4,064,561	1.51%	0.45
	B	124.60	120.49	79,223	3,509,650	2.21%	0.67
	C	125.36	121.07	102,827	4,574,422	2.20%	0.64
	Total /Average	124.80	120.60	244,450	12,148,633	1.97%	0.59
Grabill-4935222	A	124.36	120.19	208,126	7,113,781	2.84%	0.85
	B	124.59	120.47	198,887	7,977,627	2.43%	0.74
	C	125.35	121.05	158,840	6,759,424	2.30%	0.67
	Total /Average	124.75	120.56	565,853	21,850,832	2.52%	0.75
Grabill-4935223	A	124.44	120.27	44,441	1,927,174	2.25%	0.67
	B	124.68	120.56	30,325	2,315,522	1.29%	0.39
	C	125.44	121.13	97,380	2,921,150	3.23%	0.94
	Total /Average	124.93	120.72	172,145	7,163,846	2.35%	0.70

Table 4-6 PY2023 Energy Savings and CVR Factors by Phase: Hacienda Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Hacienda-4933521	A	125.15	119.67	4,649	98,603	4.50%	1.03
	B	125.32	119.21	6,300	113,723	5.25%	1.08
	C	125.15	118.82	3,587	65,123	5.22%	1.03
	Total /Average	125.22	119.28	14,536	277,449	4.98%	1.05
Hacienda-4933523	A	125.12	119.65	4,238	99,012	4.10%	0.94
	B	125.30	119.18	4,244	78,713	5.12%	1.05
	C	125.13	118.79	4,324	74,352	5.50%	1.08
	Total /Average	125.18	119.25	12,806	252,076	4.83%	1.02
Hacienda-4933524	A	125.14	119.66	4,883	89,389	5.18%	1.18
	B	125.30	119.17	4,441	77,973	5.39%	1.10
	C	125.14	118.81	4,351	71,646	5.73%	1.13
	Total /Average	125.19	119.25	13,675	239,009	5.41%	1.14
Hacienda-4933525	A	123.84	120.10	7,526	233,097	3.13%	1.03
	B	124.29	119.79	8,262	223,675	3.56%	0.98
	C	124.53	119.76	7,510	224,714	3.23%	0.84
	Total /Average	124.22	119.88	23,298	681,486	3.31%	0.95
Hacienda-4933526	A	123.91	120.17	9,088	190,712	4.55%	1.51
	B	124.37	119.87	11,126	210,714	5.02%	1.39
	C	124.57	119.80	12,050	191,241	5.93%	1.55
	Total /Average	124.29	119.94	32,264	592,667	5.16%	1.48
Hacienda-4933527	A	123.80	120.08	4,620	236,807	1.91%	0.64
	B	124.29	119.79	6,111	306,744	1.95%	0.54
	C	124.52	119.76	6,479	225,584	2.79%	0.73
	Total /Average	124.21	119.87	17,211	769,136	2.19%	0.63

Table 4-7 PY2023 Energy Savings and CVR Factors by Phase: Harper Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Harper-4928821	A	123.73	119.22	127,079	8,463,109	1.48%	0.41
	B	124.48	119.49	235,864	7,686,673	2.98%	0.74
	C	124.25	119.32	187,516	8,739,606	2.10%	0.53
	Total /Average	124.14	119.34	550,459	24,889,388	2.16%	0.56
Harper-4928822	A	123.72	119.21	174,437	6,935,459	2.45%	0.67
	B	124.46	119.47	255,685	10,059,615	2.48%	0.62
	C	124.27	119.32	199,202	8,811,012	2.21%	0.56
	Total /Average	124.20	119.35	629,324	25,806,086	2.38%	0.61

Table 4-8 PY2023 Energy Savings and CVR Factors by Phase: Illinois Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
IllinoisRoad-4510721	A	124.77	120.53	10,667	1,592,278	0.67%	0.20
	B	124.91	120.53	16,869	1,451,168	1.15%	0.33
	C	124.45	120.37	11,995	1,588,940	0.75%	0.23
	Total /Average	124.70	120.48	39,531	4,632,386	0.85%	0.25
IllinoisRoad-4510722	A	125.41	121.41	3,635	1,715,756	0.21%	0.07
	B	125.03	120.85	11,245	2,108,930	0.53%	0.16
	C	126.14	121.71	17,668	1,884,014	0.93%	0.26
	Total /Average	125.51	121.30	32,548	5,708,700	0.57%	0.17
IllinoisRoad-4510723	A	124.59	120.40	(2,286)	1,052,853	-0.22%	(0.06)
	B	124.78	120.62	(545)	1,519,134	-0.04%	(0.01)
	C	125.15	120.60	7,159	1,470,065	0.48%	0.13
	Total /Average	124.87	120.56	4,328	4,042,052	0.11%	0.03

Table 4-9 PY2023 Energy Savings and CVR Factors by Phase: Lincoln Circuit

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Lincoln-4051821	A	124.08	121.33	(24,354)	7,234,849	-0.34%	(0.15)
	B	124.02	121.35	(23,282)	7,119,509	-0.33%	(0.15)
	C	123.05	120.42	(23,070)	7,127,060	-0.32%	(0.15)
	Total /Average	123.72	121.03	(70,706)	21,481,419	-0.33%	(0.15)
Lincoln-4051822	A	122.33	120.00	119,676	5,880,933	1.99%	1.05
	B	123.78	121.36	117,587	5,626,089	2.05%	1.05
	C	124.29	121.84	118,631	5,629,659	2.06%	1.05
	Total /Average	123.45	121.05	355,894	17,136,682	2.03%	1.05
Lincoln-4051824	A	123.13	120.84	7,390	4,245,909	0.17%	0.09
	B	123.96	121.50	80,467	4,158,250	1.90%	0.96
	C	124.49	121.80	53,668	4,157,788	1.27%	0.59
	Total /Average	123.85	121.38	141,525	12,561,947	1.11%	0.56

Table 4-10 PY2023 Energy Savings and CVR Factors by Phase: Lusher Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
LusherAvenue-4094021	A	123.77	119.76	15,811	1,320,607	1.18%	0.37
	B	124.20	119.09	13,159	1,434,090	0.91%	0.22
	C	124.15	119.75	13,241	1,395,909	0.94%	0.27
	Total /Average	124.04	119.52	42,211	4,150,606	1.01%	0.28
LusherAvenue-4094022	A	124.21	118.88	18,790	683,048	2.68%	0.62
	B	124.93	119.00	18,558	755,666	2.40%	0.51
	C	124.43	119.01	16,853	753,535	2.19%	0.50
	Total /Average	124.53	118.96	54,201	2,192,249	2.41%	0.54
LusherAvenue-4094023	A	124.98	119.38	1,485	336,650	0.44%	0.10
	B	124.84	119.03	3,233	494,588	0.65%	0.14
	C	125.02	119.11	7,202	422,460	1.68%	0.35
	Total /Average	124.94	119.15	11,920	1,253,697	0.94%	0.20
LusherAvenue-4094024	A	125.16	119.56	22,537	586,886	3.70%	0.83
	B	125.22	119.40	30,568	674,796	4.33%	0.93
	C	125.25	119.30	26,283	357,144	6.85%	1.44
	Total /Average	125.20	119.44	79,388	1,618,826	4.67%	1.01
LusherAvenue-4094025	A	124.15	118.78	16,504	800,323	2.02%	0.47
	B	124.44	118.82	13,967	898,600	1.53%	0.34
	C	124.53	118.82	17,085	747,429	2.23%	0.49
	Total /Average	124.37	118.81	47,556	2,446,352	1.91%	0.43
LusherAvenue-4094026	A	125.04	119.65	9,436	725,172	1.28%	0.30
	B	124.94	119.06	13,642	794,155	1.69%	0.36
	C	125.10	119.60	14,279	750,821	1.87%	0.42
	Total /Average	125.03	119.43	37,357	2,270,148	1.62%	0.36

Table 4-11 PY2023 Energy Savings and CVR Factors by Phase: Mackey Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Mackey-4535221	A	124.98	121.09	617	2,294,272	0.03%	0.01
	B	124.99	121.08	17,369	2,290,589	0.75%	0.24
	C	124.75	120.98	6,014	2,486,251	0.24%	0.08
	Total /Average	124.90	121.05	24,000	7,071,112	0.34%	0.11
Mackey-4535222	A	124.99	121.22	31,965	1,040,047	2.98%	0.99
	B	125.13	121.18	22,588	1,011,930	2.18%	0.69
	C	125.17	121.18	27,037	1,126,281	2.34%	0.74
	Total /Average	125.10	121.20	81,590	3,178,258	2.50%	0.80
Mackey-4535223	A	124.62	120.50	48,967	1,602,615	2.96%	0.90
	B	124.83	120.58	48,163	1,528,803	3.05%	0.90
	C	124.91	120.62	47,981	1,510,087	3.08%	0.90
	Total /Average	124.78	120.57	145,111	4,641,505	3.03%	0.90
Mackey-4535224	A	124.95	121.17	13,814	680,085	1.99%	0.66
	B	125.13	121.23	14,527	693,704	2.05%	0.66
	C	125.03	121.01	15,099	698,592	2.12%	0.66
	Total /Average	125.04	121.13	43,440	2,072,381	2.05%	0.66
Mackey-4535225	A	124.94	120.97	(5,538)	920,978	-0.61%	(0.19)
	B	125.11	121.04	2,975	1,058,313	0.28%	0.09
	C	124.69	120.82	(6,532)	931,218	-0.71%	(0.23)
	Total /Average	124.92	120.95	(9,096)	2,910,510	-0.31%	(0.10)

Table 4-12 PY2023 Energy Savings and CVR Factors by Phase: McKinley Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Mckinley-4055921	A	123.59	120.20	21,970	5,840,395	0.37%	0.14
	B	123.90	120.79	29,401	6,218,141	0.47%	0.19
	C	124.27	121.67	75,004	6,742,884	1.10%	0.52
	Total /Average	123.94	120.92	126,375	18,801,420	0.67%	0.27
McKinley-4055922	A	123.69	120.22	83,665	3,174,300	2.57%	0.92
	B	124.10	120.81	79,145	2,885,256	2.67%	1.01
	C	124.56	121.74	54,189	2,337,698	2.27%	1.00
	Total /Average	124.07	120.85	216,999	8,397,253	2.52%	0.97
McKinley-4055923	A	123.42	119.03	49,979	1,595,839	3.04%	0.85
	B	123.35	119.04	39,117	1,221,684	3.10%	0.89
	C	123.39	119.05	39,186	1,179,056	3.22%	0.91
	Total /Average	123.39	119.04	128,281	3,996,578	3.11%	0.88
McKinley-4055924	A	123.39	119.00	50,591	1,973,544	2.50%	0.70
	B	123.30	118.99	57,284	1,931,702	2.88%	0.82
	C	123.28	118.94	64,704	2,071,880	3.03%	0.86
	Total /Average	123.32	118.98	172,579	5,977,125	2.81%	0.80
McKinley-4055925	A	123.40	119.00	39,471	1,383,290	2.77%	0.78
	B	123.30	118.99	29,155	1,113,450	2.55%	0.73
	C	123.26	118.93	31,937	1,299,906	2.40%	0.68
	Total /Average	123.32	118.97	100,563	3,796,646	2.58%	0.73
McKinley-4055926	A	123.84	120.22	54,480	5,221,502	1.03%	0.35
	B	124.52	120.81	54,576	5,135,180	1.05%	0.35
	C	125.14	121.66	48,990	4,935,500	0.98%	0.35
	Total /Average	124.49	120.88	158,045	15,292,182	1.02%	0.35

Table 4-13 PY2023 Energy Savings and CVR Factors by Phase: Northland Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Northland-4933421	A	123.81	121.51	72,359	4,553,703	1.56%	0.84
	B	124.16	121.91	63,169	4,551,258	1.37%	0.76
	C	123.39	121.05	49,857	3,986,820	1.24%	0.65
	Total /Average	123.80	121.51	185,385	13,091,782	1.40%	0.75
Northland-4933422	A	124.15	121.52	59,799	3,337,304	1.76%	0.83
	B	124.68	122.13	81,187	3,079,791	2.57%	1.25
	C	124.48	121.89	92,298	3,001,707	2.98%	1.43
	Total /Average	124.43	121.83	233,284	9,418,803	2.42%	1.16
Northland-4933423	A	124.13	121.50	82,220	5,671,224	1.43%	0.67
	B	124.65	122.10	72,579	5,751,576	1.25%	0.61
	C	124.43	121.84	85,434	5,799,956	1.45%	0.70
	Total /Average	124.41	121.81	240,233	17,222,755	1.38%	0.66
Northland-4933424	A	125.14	121.39	3,198	157,028	2.00%	0.67
	B	125.20	121.22	4,306	155,182	2.70%	0.85
	C	125.13	121.26	3,516	167,964	2.05%	0.66
	Total /Average	125.16	121.29	11,021	480,174	2.24%	0.73
Northland-4933425	A	125.15	121.40	4,525	120,971	3.61%	1.20
	B	125.21	121.24	3,992	112,072	3.44%	1.09
	C	125.11	121.26	5,585	131,451	4.08%	1.32
	Total /Average	125.15	121.30	14,102	364,494	3.72%	1.21
Northland-4933426	A	125.14	121.39	3,023	86,294	3.39%	1.13
	B	125.20	121.23	3,154	70,333	4.29%	1.35
	C	125.11	121.24	2,485	59,743	3.99%	1.29
	Total /Average	125.15	121.29	8,663	216,371	3.85%	1.25

Table 4-14 PY2023 Energy Savings and CVR Factors by Phase: Osolo Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Osolo-4058021	A	125.44	121.92	74,494	3,971,542	1.84%	0.66
	B	125.43	121.27	135,370	4,122,568	3.18%	0.96
	C	125.47	121.20	94,177	3,646,788	2.52%	0.74
	Total /Average	125.45	121.47	304,040	11,740,899	2.52%	0.80
Osolo-4058022	A	125.46	121.96	62,904	3,252,593	1.90%	0.68
	B	125.40	121.26	109,313	3,155,652	3.35%	1.01
	C	125.45	121.20	117,193	3,698,604	3.07%	0.91
	Total /Average	125.44	121.46	289,410	10,106,848	2.78%	0.88
Osolo-4058023	A	125.31	121.12	152,923	5,726,271	2.60%	0.78
	B	125.47	121.25	191,241	5,128,643	3.59%	1.07
	C	125.42	121.89	98,866	5,065,345	1.91%	0.68
	Total /Average	125.40	121.41	443,030	15,920,259	2.71%	0.85
Osolo-4058024	A	125.47	121.96	124,743	6,448,593	1.90%	0.68
	B	125.42	121.27	179,711	5,577,178	3.12%	0.94
	C	125.49	121.23	134,314	4,697,834	2.78%	0.82
	Total /Average	125.46	121.53	438,768	16,723,605	2.56%	0.82
Osolo-4058025	A	125.27	121.09	78,860	1,789,874	4.22%	1.26
	B	125.41	121.19	78,901	2,124,480	3.58%	1.07
	C	125.34	121.81	75,972	2,247,995	3.27%	1.16
	Total /Average	125.34	121.39	233,733	6,162,349	3.65%	1.16
Osolo-4058026	A	125.27	121.09	177,334	4,483,788	3.80%	1.14
	B	125.45	121.23	114,432	4,169,849	2.67%	0.79
	C	125.39	121.86	75,240	4,648,010	1.59%	0.57
	Total /Average	125.37	121.40	367,005	13,301,647	2.69%	0.85

Table 4-15 PY2023 Energy Savings and CVR Factors by Phase: Pettit Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
PettitAvenue-4917221	A	124.27	121.06	55,491	2,716,818	2.00%	0.78
	B	124.27	121.31	43,985	2,563,751	1.69%	0.71
	C	124.51	122.70	20,663	2,184,693	0.94%	0.64
	Total /Average	124.34	121.63	120,139	7,465,262	1.58%	0.73
PettitAvenue-4917222	A	124.20	120.99	32,838	2,625,207	1.24%	0.48
	B	124.24	121.28	25,891	2,959,615	0.87%	0.36
	C	124.41	122.60	19,025	3,250,544	0.58%	0.40
	Total /Average	124.29	121.68	77,754	8,835,366	0.87%	0.41
PettitAvenue-4917223	A	124.21	121.00	10,650	1,052,875	1.00%	0.39
	B	124.24	121.28	13,283	1,321,596	1.00%	0.42
	C	124.44	122.63	5,446	1,475,964	0.37%	0.25
	Total /Average	124.31	121.72	29,380	3,850,436	0.76%	0.36

Table 4-16 PY2023 Energy Savings and CVR Factors by Phase: SouthBend Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
SouthBend-4050321	A	124.36	119.58	172,440	8,896,885	1.90%	0.50
	B	124.24	119.44	245,029	10,272,959	2.33%	0.60
	C	124.67	119.52	277,933	8,233,939	3.27%	0.79
	Total /Average	124.41	119.51	695,402	27,403,783	2.47%	0.63
SouthBend-4050322	A	124.45	120.31	164,683	6,386,212	2.51%	0.75
	B	124.97	120.62	219,340	6,866,202	3.10%	0.89
	C	124.98	120.12	153,141	4,160,931	3.55%	0.91
	Total /Average	124.78	120.39	537,164	17,413,345	2.99%	0.85
SouthBend-4050323	A	125.14	120.36	132,969	4,501,651	2.87%	0.75
	B	124.87	120.04	141,029	4,736,048	2.89%	0.75
	C	125.06	119.74	145,867	3,865,889	3.64%	0.85
	Total /Average	125.02	120.06	419,865	13,103,588	3.10%	0.78

Table 4-17 PY2023 Energy Savings and CVR Factors by Phase: Southside Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
SouthSide-4094621	A	124.92	119.49	7,677	342,962	2.19%	0.50
	B	125.67	120.32	23,454	727,903	3.12%	0.73
	C	125.29	119.85	18,773	419,591	4.28%	0.99
	Total /Average	125.39	120.00	49,904	1,490,456	3.24%	0.75
SouthSide-4094622	A	124.94	119.51	248,792	7,112,153	3.38%	0.78
	B	125.71	120.35	238,848	6,484,682	3.55%	0.83
	C	125.33	119.87	265,486	7,499,342	3.42%	0.79
	Total /Average	125.32	119.90	753,126	21,096,178	3.45%	0.80
SouthSide-4094623	A	124.92	119.49	91,798	3,408,898	2.62%	0.60
	B	125.73	120.35	136,469	3,861,134	3.41%	0.80
	C	125.38	119.92	103,981	3,488,804	2.89%	0.67
	Total /Average	125.36	119.94	332,249	10,758,836	3.00%	0.69
SouthSide-4094624	A	124.89	119.47	12,935	825,474	1.54%	0.36
	B	125.67	120.32	39,264	1,190,143	3.19%	0.75
	C	125.32	119.88	48,204	1,497,742	3.12%	0.72
	Total /Average	125.34	119.93	100,403	3,513,358	2.78%	0.64
Southside-4099921	A	125.13	119.67	50,951	2,047,450	2.43%	0.56
	B	125.04	119.55	66,266	2,995,364	2.16%	0.49
	C	125.28	119.86	48,954	2,280,859	2.10%	0.49
	Total /Average	125.14	119.68	166,171	7,323,673	2.22%	0.51
Southside-4099922	A	125.16	119.69	64,345	3,220,477	1.96%	0.45
	B	125.06	119.57	67,275	3,348,373	1.97%	0.45
	C	125.31	119.89	63,748	3,221,869	1.94%	0.45
	Total /Average	125.17	119.72	195,369	9,790,719	1.96%	0.45
Southside-4099923	A	125.15	119.69	43,401	1,501,997	2.81%	0.64
	B	125.06	119.56	56,464	1,970,445	2.79%	0.63
	C	125.30	119.88	40,220	1,851,475	2.13%	0.49
	Total /Average	125.17	119.71	140,085	5,323,917	2.56%	0.59

Table 4-18 PY2023 Energy Savings and CVR Factors by Phase: Spyrun Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Spyrun-4923321	A	125.09	120.71	37,243	3,242,266	1.14%	0.32
	B	125.04	120.46	83,742	4,313,902	1.90%	0.52
	C	125.61	120.54	132,127	3,192,115	3.97%	0.99
	Total /Average	125.22	120.56	253,112	10,748,283	2.30%	0.62
Spyrun-4923322	A	125.08	120.69	(203,299)	10,647,010	-1.95%	(0.56)
	B	125.03	120.45	120,083	11,072,436	1.07%	0.29
	C	125.61	120.55	75,179	10,967,216	0.68%	0.17
	Total /Average	125.24	120.56	(8,036)	32,686,662	-0.02%	(0.01)
Spyrun-4923329	A	125.05	120.67	68,835	3,741,513	1.81%	0.52
	B	125.02	120.44	118,423	3,173,128	3.60%	0.98
	C	125.58	120.52	126,198	3,518,408	3.46%	0.86
	Total /Average	125.22	120.55	313,456	10,433,050	2.92%	0.78

Table 4-19 PY2023 Energy Savings and CVR Factors by Phase: StateStreet Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
StateStreet-4928721	A	123.79	120.35	111,367	8,407,224	1.31%	0.47
	B	123.63	119.81	227,166	8,123,842	2.72%	0.88
	C	123.79	120.35	186,898	8,239,002	2.22%	0.80
	Total /Average	123.74	120.17	525,431	24,770,068	2.08%	0.72
StateStreet-4928722	A	123.93	120.65	128,419	5,046,753	2.48%	0.94
	B	123.93	120.65	164,577	4,902,101	3.25%	1.23
	C	123.93	120.65	150,653	5,123,853	2.86%	1.08
	Total /Average	123.93	120.65	443,648	15,072,707	2.86%	1.08
StateStreet-4928723	A	123.78	120.34	41,216	2,651,532	1.53%	0.55
	B	123.62	119.80	47,687	2,753,259	1.70%	0.55
	C	123.78	120.34	47,883	2,712,545	1.73%	0.62
	Total /Average	123.73	120.16	136,786	8,117,337	1.66%	0.57

Table 4-20 PY2023 Energy Savings and CVR Factors by Phase: Summit Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Summit-4937824	A	124.27	121.82	5,514	275,841	1.96%	0.99
	B	124.37	121.98	5,953	285,676	2.04%	1.06
	C	124.32	121.99	5,838	303,633	1.89%	1.01
	Total /Average	124.32	121.93	17,305	865,150	1.96%	1.02
Summit-4937825	A	125.27	122.25	5,491	261,257	2.06%	0.85
	B	125.13	121.99	5,154	260,814	1.94%	0.77
	C	125.30	122.18	4,809	258,953	1.82%	0.73
	Total /Average	125.23	122.14	15,454	781,024	1.94%	0.79

Table 4-21 PY2023 Energy Savings and CVR Factors by Phase: Trier Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Trier-4936421	A	125.30	119.79	21,105	583,057	3.49%	0.80
	B	125.32	120.09	21,975	596,681	3.55%	0.85
	C	125.40	119.86	20,609	571,678	3.48%	0.79
	Total /Average	125.34	119.92	63,689	1,751,415	3.51%	0.81
Trier-4936422	A	125.22	120.22	11,402	283,605	3.86%	0.97
	B	125.27	120.39	10,301	249,412	3.97%	1.02
	C	125.29	120.30	14,090	342,244	3.95%	0.99
	Total /Average	125.26	120.30	35,793	875,261	3.93%	0.99
Trier-4936423	A	125.08	119.88	4,490	88,776	4.81%	1.16
	B	125.11	120.06	5,193	103,144	4.79%	1.19
	C	125.27	120.16	5,306	94,754	5.30%	1.30
	Total /Average	125.15	120.04	14,989	286,675	4.97%	1.22

Table 4-22 PY2023 Energy Savings and CVR Factors by Phase: Wallen Circuits

Circuit ID	*Phase*	*Baseline Voltage*	*Engaged State Voltage*	*Engaged State kWh Savings*	*Engaged State kWh Consumption*	*Percent Savings*	*CVR Factor*
Wallen-4923421	A	125.45	120.79	16,236	507,107	3.10%	0.84
	B	125.48	120.82	18,580	419,142	4.24%	1.14
	C	125.56	120.85	17,856	426,170	4.02%	1.07
	Total /Average	125.49	120.82	52,672	1,352,420	3.75%	1.01
Wallen-4923422	A	124.92	120.47	18,182	656,568	2.69%	0.76
	B	125.02	120.52	18,605	734,722	2.47%	0.69
	C	124.84	120.44	10,164	609,652	1.64%	0.47
	Total /Average	124.93	120.48	46,950	2,000,942	2.29%	0.64
Wallen-4923423	A	125.31	120.69	7,804	225,829	3.34%	0.91
	B	125.38	120.74	3,797	131,482	2.81%	0.76
	C	125.31	120.69	8,545	247,265	3.34%	0.91
	Total /Average	125.33	120.70	20,146	604,576	3.22%	0.87
Wallen-4923424	A	125.40	121.25	2,426	65,518	3.57%	1.08
	B	124.97	120.87	5,353	131,500	3.91%	1.19
	C	125.34	120.96	3,925	109,174	3.47%	0.99
	Total /Average	125.19	120.99	11,703	306,192	3.68%	1.10
Wallen-4923425	A	124.01	120.48	6,725	327,378	2.01%	0.71
	B	124.72	120.48	11,464	348,078	3.19%	0.94
	C	124.61	120.56	11,384	354,990	3.11%	0.96
	Total /Average	124.45	120.51	29,573	1,030,446	2.79%	0.88
Wallen-4923426	A	124.96	120.39	6,848	381,536	1.76%	0.48
	B	125.29	120.67	9,674	414,492	2.28%	0.62
	C	125.44	120.82	8,975	336,629	2.60%	0.71
	Total /Average	125.22	120.62	25,497	1,132,657	2.20%	0.60

The percentage savings rates presented in Table 4-1 through Table 4-22 were applied to electric energy usage occurring during eligible periods outlined in Table 3-6. Table 4-27 shows the circuit-level and total eligible and ineligible period energy usage during PY2023.

Table 4-23 PY2023 Energy Usage during Eligible and Ineligible Operating Periods

Circuit ID	*Total Ineligible Period*	*CVR Engaged*	*Test Schedule*	*Feeder Outage*	*Repair / Maintenance*	*Switching*	*Total Eligible Period*
Daleville-4927921	2,286,217	19,802,308	4,078,109	-	-	-	23,880,417
Daleville-4927922	604,146	5,912,314	1,219,935	-	-	-	7,132,250
Daleville-4927923	1,609,221	14,364,262	3,020,358	-	-	-	17,384,620
EastSide-4093121	637,015	2,244,163	1,351,361	-	4,166,298	-	7,761,822

Circuit ID	*Total Ineligible Period*	*CVR Engaged*	*Test Schedule*	*Feeder Outage*	*Repair / Maintenance*	*Switching*	*Total Eligible Period*
EastSide-4093122	380,331	5,366,542	1,117,382	-	355,147	-	6,839,071
EastSide-4093123	2,205,844	5,874,934	4,851,383	-	18,657,754	-	29,384,071
EastSide-4093124	391,613	15,244,748	3,150,417	-	733,421	-	19,128,586
EastSide-4093125	395,542	16,138,796	3,226,578	-	407,903	-	19,773,278
EastSide-4093126	324,010	12,236,299	2,372,782	-	256,038	-	14,865,118
Elcona-4938121	2,024,229	8,359,159	3,835,108	-	-	10,146,505	22,340,772
Elcona-4938122	1,045,632	5,358,549	2,408,205	-	-	7,674,124	15,440,879
Elcona-4938123	2,584,711	17,165,680	6,190,869	-	-	10,547,011	33,903,560
Farmland-4927321	537,275	7,693,216	1,484,935	-	-	-	9,178,151
Farmland-4927322	124,423	1,921,201	379,235	-	-	-	2,300,436
Farmland-4927323	656,757	9,505,434	1,779,398	-	-	-	11,284,832
Grabill-4935221	3,944,150	12,148,633	3,220,232	-	1,187,480	-	16,556,345
Grabill-4935222	7,679,864	21,850,832	6,026,632	-	2,193,441	-	30,070,905
Grabill-4935223	2,311,459	7,163,846	1,952,431	-	632,607	-	9,748,885
Hacienda-4933521	1,045,753	277,449	285,449	-	-	174,461	737,359
Hacienda-4933523	952,886	252,076	219,357	-	-	18,036	489,469
Hacienda-4933524	964,339	239,009	257,409	-	-	149,667	646,085
Hacienda-4933525	15,345,010	681,486	2,767,486	-	-	1,028,825	4,477,796
Hacienda-4933526	15,091,728	592,667	3,532,378	-	-	2,698,850	6,823,895
Hacienda-4933527	18,276,301	769,136	4,257,871	-	-	3,545,929	8,572,936
Harper-4928821	1,197,240	24,889,388	4,823,122	-	-	-	29,712,510
Harper-4928822	1,311,523	25,806,086	5,071,459	-	-	-	30,877,545
IllinoisRoad-4510721	1,328,863	4,632,386	875,833	-	-	-	5,508,218
IllinoisRoad-4510722	1,661,932	5,708,700	1,069,218	-	-	-	6,777,918
IllinoisRoad-4510723	1,154,191	4,042,052	753,896	-	-	-	4,795,948
Lincoln-4051821	12,742,966	21,481,419	5,000,005	-	-	-	26,481,424
Lincoln-4051822	10,307,717	17,136,682	3,986,461	-	-	-	21,123,143
Lincoln-4051824	7,702,953	12,561,947	3,017,501	-	-	-	15,579,448
LusherAvenue-4094021	3,156,209	4,150,606	1,182,818	-	-	973,534	6,306,958
LusherAvenue-4094022	1,195,374	2,192,249	677,349	-	-	234,269	3,103,868
LusherAvenue-4094023	474,204	1,253,697	330,498	-	-	-	1,584,195
LusherAvenue-4094024	678,227	1,618,826	428,149	-	-	-	2,046,975
LusherAvenue-4094025	995,334	2,446,352	640,588	-	-	-	3,086,941
LusherAvenue-4094026	1,193,973	2,270,148	668,002	-	-	240,694	3,178,845
Mackey-4535221	15,236,973	7,071,112	3,965,786	-	-	-	11,036,898

Circuit ID	*Total Ineligible Period*	*CVR Engaged*	*Test Schedule*	*Feeder Outage*	*Repair / Maintenance*	*Switching*	*Total Eligible Period*
Mackey-4535222	9,964,986	3,178,258	3,045,041	-	-	4,746,082	10,969,381
Mackey-4535223	14,555,795	4,641,505	4,277,053	-	-	6,871,530	15,790,088
Mackey-4535224	6,920,581	2,072,381	2,025,581	-	-	3,034,159	7,132,120
Mackey-4535225	6,143,403	2,910,510	1,523,370	-	-	-	4,433,880
Mckinley-4055921	3,398,948	18,801,420	5,144,434	-	8,048,499	-	31,994,353
Mckinley-4055922	1,845,760	8,397,253	2,465,419	-	4,568,518	-	15,431,190
Mckinley-4055923	1,115,048	3,996,578	1,939,750	-	3,017,930	2,748,978	11,703,236
Mckinley-4055924	3,539,374	5,977,125	4,467,879	-	4,973,099	11,425,758	26,843,861
Mckinley-4055925	2,263,911	3,796,646	2,771,296	-	3,699,412	5,598,146	15,865,501
Mckinley-4055926	3,275,391	15,292,182	4,038,208	-	3,086,420	-	22,416,810
Northland-4933421	907,192	13,091,782	2,795,875	-	-	1,976,217	17,863,873
Northland-4933422	590,355	9,418,803	2,004,758	-	-	1,106,280	12,529,841
Northland-4933423	1,182,488	17,222,755	3,663,749	-	-	2,575,659	23,462,163
Northland-4933424	4,507,707	480,174	5,767,855	4,359,990	-	22,518,648	33,126,668
Northland-4933425	1,386,809	364,494	483,510	758,523	-	961,165	2,567,692
Northland-4933426	1,803,633	216,371	2,217,894	1,309,947	-	8,347,880	12,092,092
Osolo-4058021	651,142	11,740,899	3,667,111	-	-	7,500,961	22,908,971
Osolo-4058022	621,271	10,106,848	3,277,210	-	-	7,320,596	20,704,655
Osolo-4058023	7,549,795	15,920,259	4,411,578	-	-	-	20,331,837
Osolo-4058024	814,002	16,723,605	4,801,931	-	-	8,376,072	29,901,608
Osolo-4058025	3,194,319	6,162,349	1,724,630	-	-	-	7,886,979
Osolo-4058026	6,470,812	13,301,647	3,592,603	-	-	-	16,894,251
PettitAvenue-4917221	2,232,559	7,465,262	4,046,430	-	-	13,061,746	24,573,438
PettitAvenue-4917222	1,961,595	8,835,366	3,769,622	-	-	10,630,045	23,235,034
PettitAvenue-4917223	810,917	3,850,436	1,577,691	-	-	4,224,388	9,652,515
SouthBend-4050321	812,660	27,403,783	5,325,578	-	-	-	32,729,360
SouthBend-4050322	575,684	17,413,345	3,644,664	-	-	1,362,263	22,420,272
SouthBend-4050323	395,680	13,103,588	2,670,171	-	-	513,326	16,287,084
SouthSide-4094621	264,924	1,490,456	364,509	-	-	433,275	2,288,241
SouthSide-4094622	1,081,037	21,096,178	4,223,145	-	-	492,895	25,812,218
SouthSide-4094623	834,941	10,758,836	2,133,614	-	-	513,122	13,405,573
SouthSide-4094624	191,408	3,513,358	697,113	-	-	97,502	4,307,974
Southside-4099921	1,560,314	7,323,673	3,211,060	-	-	8,639,078	19,173,811
Southside-4099922	2,189,346	9,790,719	4,609,947	-	-	12,551,906	26,952,573
Southside-4099923	1,106,935	5,323,917	2,371,319	-	-	6,482,952	14,178,188
Spyrun-4923321	548,252	10,748,283	2,151,476	-	-	-	12,899,759
Spyrun-4923322	1,757,109	32,686,662	6,049,757	-	-	-	38,736,419

Circuit ID	*Total Ineligible Period*	*CVR Engaged*	*Test Schedule*	*Feeder Outage*	*Repair / Maintenance*	*Switching*	*Total Eligible Period*
Spyrun-4923329	457,619	10,433,050	2,050,240	-	-	-	12,483,289
StateStreet-4928721	1,336,051	24,770,068	3,400,152	-	825,187	2,969,308	31,964,716
StateStreet-4928722	913,171	15,072,707	2,441,618	-	504,059	3,075,502	21,093,886
StateStreet-4928723	464,592	8,117,337	1,153,928	-	288,298	1,014,855	10,574,417
Summit-4937824	2,356,299	865,150	592,878	-	-	-	1,458,027
Summit-4937825	2,096,070	781,024	508,134	-	-	-	1,289,158
Trier-4936421	403,200	1,751,415	431,486	-	-	-	2,182,901
Trier-4936422	536,229	875,261	329,100	-	-	-	1,204,361
Trier-4936423	80,654	286,675	81,395	-	-	-	368,070
Wallen-4923421	154,007	1,352,420	298,159	-	-	-	1,650,579
Wallen-4923422	263,715	2,000,942	443,024	-	-	-	2,443,966
Wallen-4923423	96,413	604,576	131,701	-	-	-	736,277
Wallen-4923424	147,667	306,192	88,339	-	-	-	394,531
Wallen-4923425	790,377	1,030,446	343,679	-	-	-	1,374,125
Wallen-4923426	686,911	1,132,657	344,369	-	-	-	1,477,026
Total	251,565,189	762,422,014	225,067,020	6,428,460	57,601,509	198,602,203	1,250,121,207

Below, Table 4-24 shows circuit-level and total ex post kWh savings.

Table 4-24 PY2023 CVR Ex Post kWh Savings

Circuit ID	*Total Eligible Period kWh Consumption*	*CVR Savings Rate*	*Ex Post kWh Savings*
Daleville-4927921	23,880,417	2.8%	667,988
Daleville-4927922	7,132,250	1.7%	117,966
Daleville-4927923	17,384,620	2.6%	458,187
Total - Daleville	**48,397,287**	**2.6%**	**1,244,141**
EastSide-4093121	7,761,822	2.2%	169,395
EastSide-4093122	6,839,071	2.1%	141,016
EastSide-4093123	29,384,071	2.5%	734,613
EastSide-4093124	19,128,586	5.2%	991,497
EastSide-4093125	19,773,278	4.4%	879,015
EastSide-4093126	14,865,118	2.5%	367,916
Total - EastSide	**97,751,946**	**3.4%**	**3,283,452**
Elcona-4938121	22,340,772	0.4%	82,474
Elcona-4938122	15,440,879	0.8%	127,121
Elcona-4938123	33,903,560	1.3%	446,961
Total - Elcona	**71,685,210**	**0.9%**	**656,556**

Circuit ID	*Total Eligible Period kWh Consumption*	*CVR Savings Rate*	*Ex Post kWh Savings*
Farmland-4927321	9,178,151	2.1%	194,678
Farmland-4927322	2,300,436	2.5%	57,815
Farmland-4927323	11,284,832	2.0%	229,291
Total - Farmland	**22,763,419**	**2.1%**	**481,784**
Grabill-4935221	16,556,345	2.0%	331,382
Grabill-4935222	30,070,905	2.6%	773,380
Grabill-4935223	9,748,885	2.4%	233,278
Total - Grabill	**56,376,134**	**2.4%**	**1,338,040**
Hacienda-4933521	737,359	5.1%	37,417
Hacienda-4933523	489,469	5.0%	24,330
Hacienda-4933524	646,085	5.5%	35,706
Hacienda-4933525	4,477,796	3.3%	148,834
Hacienda-4933526	6,823,895	5.2%	354,234
Hacienda-4933527	8,572,936	2.2%	188,186
Total - Hacienda	**21,747,539**	**3.6%**	**788,706**
Harper-4928821	29,712,510	2.2%	654,737
Harper-4928822	30,877,545	2.4%	750,036
Total - Harper	**60,590,054**	**2.3%**	**1,404,773**
IllinoisRoad-4510721	5,508,218	0.9%	46,952
IllinoisRoad-4510722	6,777,918	0.6%	38,614
IllinoisRoad-4510723	4,795,948	0.1%	5,120
Total - IllinoisRoad	**17,082,085**	**0.5%**	**90,687**
Lincoln-4051821	26,481,424	-0.3%	(87,218)
Lincoln-4051822	21,123,143	2.1%	437,005
Lincoln-4051824	15,579,448	1.1%	175,234
Total - Lincoln	**63,184,014**	**0.8%**	**525,021**
LusherAvenue-4094021	6,306,958	1.0%	63,936
LusherAvenue-4094022	3,103,868	2.5%	76,199
LusherAvenue-4094023	1,584,195	0.9%	15,037
LusherAvenue-4094024	2,046,975	4.9%	99,374
LusherAvenue-4094025	3,086,941	1.9%	59,767
LusherAvenue-4094026	3,178,845	1.6%	52,069
Total - LusherAvenue	**19,307,782**	**1.9%**	**366,382**
Mackey-4535221	11,036,898	0.3%	37,440
Mackey-4535222	10,969,381	2.5%	276,932
Mackey-4535223	15,790,088	3.1%	483,120
Mackey-4535224	7,132,120	2.1%	147,331
Mackey-4535225	4,433,880	-0.3%	(13,873)

Circuit ID	*Total Eligible Period kWh Consumption*	*CVR Savings Rate*	*Ex Post kWh Savings*
Total - Mackey	**49,362,368**	**1.9%**	**930,950**
Mckinley-4055921	31,994,353	0.7%	214,617
Mckinley-4055922	15,431,190	2.6%	394,294
Mckinley-4055923	11,703,236	3.1%	367,554
Mckinley-4055924	26,843,861	2.8%	758,296
Mckinley-4055925	15,865,501	2.6%	411,967
Mckinley-4055926	22,416,810	1.0%	230,926
Total - Mckinley	**124,254,951**	**1.9%**	**2,377,654**
Northland-4933421	17,863,873	1.4%	251,977
Northland-4933422	12,529,841	2.5%	308,538
Northland-4933423	23,462,163	1.4%	326,031
Northland-4933424	33,126,668	2.2%	742,780
Northland-4933425	2,567,692	3.7%	96,129
Northland-4933426	12,092,092	3.9%	470,990
Total - Northland	**101,642,329**	**2.2%**	**2,196,444**
Osolo-4058021	22,908,971	2.6%	585,589
Osolo-4058022	20,704,655	2.8%	584,520
Osolo-4058023	20,331,837	2.8%	562,477
Osolo-4058024	29,901,608	2.6%	776,636
Osolo-4058025	7,886,979	3.8%	296,787
Osolo-4058026	16,894,251	2.7%	463,387
Total - Osolo	**118,628,299**	**2.8%**	**3,269,395**
PettitAvenue-4917221	24,573,438	1.6%	389,374
PettitAvenue-4917222	23,235,034	0.9%	203,252
PettitAvenue-4917223	9,652,515	0.8%	73,002
Total - PettitAvenue	**57,460,987**	**1.2%**	**665,628**
SouthBend-4050321	32,729,360	2.5%	827,098
SouthBend-4050322	22,420,272	3.1%	687,667
SouthBend-4050323	16,287,084	3.2%	518,659
Total - SouthBend	**71,436,716**	**2.8%**	**2,033,424**
SouthSide-4094621	2,288,241	3.3%	75,596
SouthSide-4094622	25,812,218	3.5%	915,681
SouthSide-4094623	13,405,573	3.1%	411,500
SouthSide-4094624	4,307,974	2.8%	122,451
Southside-4099921	19,173,811	2.2%	429,030
Southside-4099922	26,952,573	2.0%	531,155
Southside-4099923	14,178,188	2.6%	367,071
Total - Southside	**106,118,578**	**2.7%**	**2,852,485**

Circuit ID	*Total Eligible Period kWh Consumption*	*CVR Savings Rate*	*Ex Post kWh Savings*
Spyrun-4923321	12,899,759	2.3%	302,500
Spyrun-4923322	38,736,419	0.0%	(9,655)
Spyrun-4923329	12,483,289	3.0%	373,306
Total - Spyrun	**64,119,467**	**1.0%**	**666,151**
StateStreet-4928721	31,964,716	2.1%	673,544
StateStreet-4928722	21,093,886	2.9%	615,347
StateStreet-4928723	10,574,417	1.7%	177,501
Total - StateStreet	**63,633,019**	**2.3%**	**1,466,392**
Summit-4937824	1,458,027	2.0%	28,932
Summit-4937825	1,289,158	2.0%	25,320
Total - Summit	**2,747,186**	**2.0%**	**54,252**
Trier-4936421	2,182,901	3.6%	78,829
Trier-4936422	1,204,361	4.0%	48,722
Trier-4936423	368,070	5.2%	19,035
Total - Trier	**3,755,332**	**3.9%**	**146,587**
Wallen-4923421	1,650,579	3.9%	63,838
Wallen-4923422	2,443,966	2.3%	57,101
Wallen-4923423	736,277	3.3%	24,394
Wallen-4923424	394,531	3.8%	14,953
Wallen-4923425	1,374,125	2.8%	39,089
Wallen-4923426	1,477,026	2.2%	33,072
Total - Wallen	**8,076,503**	**2.9%**	**232,447**
Grand Total	**1,250,121,207**	**2.2%**	**27,071,349**

During 2023, a CVR system module that leverages AMI interval data – hereafter referenced as "AMI module" – was implemented for selected circuits to enable achievement of further voltage reduction through the CVR system. The incremental savings associated with the employment of the AMI module are included in the savings values presented throughout this report. To estimate the component of aggregate CVR savings that is associated with deployment of the AMI module, the circuit-level incremental voltage reduction achieved during times of AMI module employment was calculated. The following variables are defined as inputs to the AMI module savings calculation:

- *kwh_AMI* = kWh usage: AMI module-enabled, CVR system engaged state
- *volt_AMI* = voltage: AMI module enabled, CVR system engaged state
- *volt_non_AMI* = voltage: AMI module not enabled, CVR system engaged state
- CVR_f = applicable CVR factor developed through analysis of aggregate CVR savings

The variables defined above were used in the following equation to calculate the savings associated with the deployment of the AMI module.

Equation 4-1

$$AMI\ Module\ kWh\ Savings = kwh\_AMI + ((1 - (volt\_AMI / volt\_non\_AMI)) * CVR_f * kwh\_AMI)) - kwh\_AMI$$

Table 4-25 presents circuit-level energy savings associated with deployment of the AMI module.

Table 4-25 PY2023 AMI Module Ex Post kWh Savings

Circuit ID	*AMI Module kWh Savings*	*AMI Module Savings Share of Total Engaged State kWh Savings*	*AMI Module Enabled Time as Share of Total CVR Engaged Time*
EastSide-4093121	9,665	19.4%	93.1%
EastSide-4093122	20,712	18.6%	93.1%
EastSide-4093123	25,082	16.7%	93.1%
EastSide-4093124	251,412	31.5%	97.1%
EastSide-4093125	233,867	32.3%	97.1%
EastSide-4093126	66,484	21.9%	97.1%
Total - EastSide	**551,763**	**25.8%**	**95.1%**
Elcona-4938121	5,603	18.1%	86.8%
Elcona-4938122	2,640	5.9%	86.8%
Elcona-4938123	48,095	21.2%	86.8%
Total - Elcona	**56,337**	**18.6%**	**86.8%**
Farmland-4927321	39,624	24.2%	93.9%
Farmland-4927322	9,083	18.7%	93.9%
Farmland-4927323	65,613	33.9%	93.9%
Total - Farmland	**114,320**	**28.2%**	**93.9%**
Grabill-4935221	63,134	25.8%	84.5%
Grabill-4935222	214,316	37.9%	84.5%
Grabill-4935223	56,421	32.8%	84.5%
Total - Grabill	**333,870**	**34.0%**	**84.5%**
Hacienda-4933521	3,675	25.3%	83.3%
Hacienda-4933523	3,047	23.8%	83.3%
Hacienda-4933524	3,645	26.7%	83.3%
Hacienda-4933525	4,512	19.4%	76.9%
Hacienda-4933526	5,737	17.8%	76.9%
Hacienda-4933527	3,147	18.3%	76.9%
Total - Hacienda	**13,396**	**11.8%**	**80.1%**
Harper-4928821	140,459	25.5%	98.2%

Circuit ID	*AMI Module kWh Savings*	*AMI Module Savings Share of Total Engaged State kWh Savings*	*AMI Module Enabled Time as Share of Total CVR Engaged Time*
Harper-4928822	239,081	38.0%	98.2%
Total - Harper	**392,936**	**33.3%**	**98.2%**
Lincoln-4051822	195,497	54.9%	94.0%
Lincoln-4051824	12,982	9.2%	94.0%
Total - Lincoln	**208,479**	**48.9%**	**94.0%**
Mckinley-4055921	11,979	9.5%	82.8%
Mckinley-4055922	35,621	16.4%	82.8%
Mckinley-4055923	23,125	18.0%	94.0%
Mckinley-4055924	27,718	16.1%	94.0%
Mckinley-4055925	20,072	20.0%	94.0%
Mckinley-4055926	25,104	15.9%	82.8%
Total - Mckinley	**72,894**	**8.1%**	**88.4%**
Northland-4933421	129	0.1%	8.8%
Northland-4933422	688	0.3%	8.8%
Northland-4933423	771	0.3%	8.8%
SouthBend-4050321	13,412	1.9%	9.5%
SouthBend-4050322	8,953	1.7%	9.5%
SouthBend-4050323	11,745	2.8%	9.5%
Total - SouthBend	**34,110**	**2.1%**	**9.5%**
SouthSide-4094621	1,117	2.2%	16.7%
SouthSide-4094622	24,460	3.2%	16.7%
SouthSide-4094623	10,130	3.0%	16.7%
SouthSide-4094624	1,912	1.9%	16.7%
Southside-4099921	35,700	21.5%	58.4%
Southside-4099922	38,014	19.5%	58.4%
Southside-4099923	30,877	22.0%	58.4%
Total - Southside	**104,592**	**6.0%**	**34.6%**
Spyrun-4923321	6,310	2.5%	24.2%
Spyrun-4923329	10,160	3.2%	24.2%
Total - Spyrun	**16,470**	**2.9%**	**24.2%**
StateStreet-4928721	96,655	18.4%	99.1%
StateStreet-4928722	81,120	18.3%	99.1%
StateStreet-4928723	37,033	27.1%	99.1%
Total - StateStreet	**214,808**	**19.4%**	**99.1%**
Trier-4936421	6,770	10.6%	37.7%
Trier-4936422	4,210	11.8%	37.7%
Trier-4936423	1,562	10.4%	37.7%

Circuit ID	*AMI Module kWh Savings*	*AMI Module Savings Share of Total Engaged State kWh Savings*	*AMI Module Enabled Time as Share of Total CVR Engaged Time*
Total - Trier	**12,542**	**11.0%**	**37.7%**
Grand Total	**2,341,326**	**14.2%**	**47.4%**

4.2 Peak Reduction

This chapter presents the results of the analysis of demand reduction occurring during 2023 PJM 5CP hours. Demand reductions, accounting for those circuits for which the CVR system was enabled during the 5CP hours, are presented in Table 4-26.

Table 4-26. kW Reduction during PY2023 PJM 5CP

Circuit ID	*7/5/2023*	*7/27/2023*	*7/28/2023*	*9/5/2023*	*9/6/2023*
	5:00 PM - 6:00 PM	*5:00 PM - 6:00 PM*	*5:00 PM - 6:00 PM*	*4:00 PM - 5:00 PM*	*4:00 PM - 5:00 PM*
Daleville-4927921	140.26	158.17	148.92	147.56	129.47
Daleville-4927922	26.28	30.04	26.28	26.73	23.89
Daleville-4927923	99.22	107.34	97.91	95.51	87.73
EastSide-4093121	36.27	43.11	40.51	43.56	36.32
EastSide-4093122	-	-	-	-	-
EastSide-4093123	239.63	196.80	192.40	221.68	183.32
EastSide-4093124	246.01	277.77	264.05	290.18	238.37
EastSide-4093125	229.58	251.16	240.65	259.50	219.16
EastSide-4093126	62.34	65.99	64.92	73.24	69.38
Elcona-4938121	8.46	13.27	12.68	14.43	13.71
Elcona-4938122	24.92	28.43	25.42	31.30	30.56
Elcona-4938123	38.05	50.92	36.33	50.37	57.02
Farmland-4927321	41.69	-	39.83	40.72	36.13
Farmland-4927322	9.41	-	9.07	9.60	8.59
Farmland-4927323	40.13	-	40.05	52.13	48.48
Grabill-4935221	56.89	-	-	62.03	65.74
Grabill-4935222	234.90	-	-	198.30	208.35
Grabill-4935223	75.25	-	-	61.55	58.92
Hacienda-4933521	-	-	25.71	22.74	20.85
Hacienda-4933523	-	-	23.61	20.61	19.49
Hacienda-4933524	-	-	27.91	22.95	21.94
Hacienda-4933525	-	-	-	188.06	179.85
Hacienda-4933526	-	-	-	296.62	273.85
Hacienda-4933527	-	-	-	116.42	108.53
Harper-4928821	135.46	149.73	143.46	146.65	135.47
Harper-4928822	180.61	175.27	173.08	167.93	164.22
IllinoisRoad-4510721	-	-	-	42.21	33.92
IllinoisRoad-4510722	-	-	-	32.61	27.52
IllinoisRoad-4510723	-	-	-	4.68	3.90
Lincoln-4051821	(23.75)	(25.16)	(22.75)	-	(22.54)
Lincoln-4051822	129.77	136.21	133.04	-	122.21
Lincoln-4051824	39.29	44.68	39.44	-	40.40

Circuit ID	*7/5/2023*	*7/27/2023*	*7/28/2023*	*9/5/2023*	*9/6/2023*
	5:00 PM - 6:00 PM	*5:00 PM - 6:00 PM*	*5:00 PM - 6:00 PM*	*4:00 PM - 5:00 PM*	*4:00 PM - 5:00 PM*
LusherAvenue-4094021	-	-	-	89.20	77.42
LusherAvenue-4094022	-	-	-	86.88	63.60
LusherAvenue-4094023	-	-	-	14.78	12.36
LusherAvenue-4094024	-	-	-	-	83.34
LusherAvenue-4094025	-	-	-	-	48.78
LusherAvenue-4094026	-	-	-	-	48.07
Mackey-4535221	-	-	10.58	-	13.85
Mackey-4535222	-	-	109.20	131.79	112.39
Mackey-4535223	-	-	188.00	183.50	169.52
Mackey-4535224	-	-	61.35	64.53	56.21
Mackey-4535225	-	-	(3.56)	-	(3.93)
Mckinley-4055921	15.30	36.31	33.23	38.25	36.02
Mckinley-4055922	118.83	127.68	119.50	116.78	101.79
Mckinley-4055923	56.84	59.17	58.01	55.81	48.71
Mckinley-4055924	146.06	151.37	145.41	221.12	198.55
Mckinley-4055925	81.18	71.60	80.45	80.86	73.85
Mckinley-4055926	24.72	62.27	54.22	56.47	52.39
Northland-4933421	21.63	36.11	26.65	37.01	34.93
Northland-4933422	83.94	91.39	85.35	90.24	73.72
Northland-4933423	36.17	60.87	42.23	60.52	56.20
Northland-4933424	105.34	114.03	113.41	140.59	144.11
Northland-4933425	-	-	-	-	-
Northland-4933426	133.51	144.75	136.02	153.67	123.29
Osolo-4058021	93.80	119.82	99.37	125.00	115.17
Osolo-4058022	116.33	131.56	121.82	134.97	122.03
Osolo-4058023	146.54	-	-	170.89	154.01
Osolo-4058024	134.35	-	-	171.07	156.45
Osolo-4058025	87.90	-	-	104.50	90.67
Osolo-4058026	93.56	-	-	129.67	114.90
PettitAvenue-4917221	133.11	138.46	132.89	132.09	109.00
PettitAvenue-4917222	58.24	60.78	58.03	58.11	48.53
PettitAvenue-4917223	17.65	19.92	18.99	17.97	15.34
SouthBend-4050321	167.39	187.75	180.35	199.60	172.40
SouthBend-4050322	150.94	164.77	160.49	181.64	150.80
SouthBend-4050323	115.85	121.18	118.35	125.33	109.61
SouthSide-4094621	10.71	12.23	11.67	12.34	10.28
SouthSide-4094622	210.31	229.50	223.05	247.61	209.10
SouthSide-4094623	83.00	86.70	86.89	94.11	79.94
SouthSide-4094624	24.63	25.64	25.74	27.12	24.21

Circuit ID	*7/5/2023*	*7/27/2023*	*7/28/2023*	*9/5/2023*	*9/6/2023*
	5:00 PM - 6:00 PM	*5:00 PM - 6:00 PM*	*5:00 PM - 6:00 PM*	*4:00 PM - 5:00 PM*	*4:00 PM - 5:00 PM*
Southside-4099921	86.61	-	86.04	89.09	75.54
Southside-4099922	112.21	-	103.82	104.09	91.52
Southside-4099923	71.03	-	75.29	72.93	59.70
Spyrun-4923321	59.65	60.74	60.83	57.43	54.34
Spyrun-4923322	(2.29)	(2.47)	(2.31)	(2.23)	(2.23)
Spyrun-4923329	90.38	96.16	92.36	91.62	81.63
StateStreet-4928721	153.50	163.78	157.95	152.48	137.99
StateStreet-4928722	151.98	164.01	158.27	142.05	129.39
StateStreet-4928723	47.32	49.62	47.75	44.67	40.29
Summit-4937824	-	-	-	-	13.82
Summit-4937825	-	-	-	-	13.38
Trier-4936421	24.39	26.68	-	22.55	21.56
Trier-4936422	14.32	14.79	-	12.70	11.87
Trier-4936423	6.97	7.45	-	6.07	5.52
Wallen-4923421	18.26	19.80	18.09	14.62	14.87
Wallen-4923422	16.83	16.93	16.40	14.33	14.22
Wallen-4923423	6.74	6.92	6.26	6.05	5.67
Wallen-4923424	4.26	4.83	4.25	4.03	3.53
Wallen-4923425	17.86	20.36	18.74	16.16	15.59
Wallen-4923426	12.22	13.11	12.13	10.57	10.53
Total	5,430.73	4,620.27	5,136.03	7,153.08	6,751.07

The summarized results for each PJM 5CP hour are presented in Table 4-26 below.

Table 4-27. Summary of kW Reductions during PJM 5CP Hours

Date	*Hour Start*	*Hour End*	*Ex Post Net kW Savings*
7/5/2023	5:00 PM	6:00 PM	5,430.73
7/27/2023	5:00 PM	6:00 PM	4,620.27
7/28/2023	5:00 PM	6:00 PM	5,136.03
9/5/2023	4:00 PM	5:00 PM	7,153.08
9/6/2023	4:00 PM	5:00 PM	6,751.07
Maximum Peak kW Reduction			7,153.08
Average Peak kW Reduction			5,818.24