estimated average voltage reductions are all based on these operating parameters. There will naturally be some demand reduction on some circuits during the 8760 hours of operation of the system in a given year, but the timing and amount of any demand reduction during AIC system peak has not been determined. Since the program is not designed to reduce peak demand, Ameren Illinois has not estimated the amount of peak demand reduction that will result from this VO deployment; thus, peak demand reduction has not been included as a benefit in the TRC analysis.

- The energy savings associated with the VO Plan can be categorized into two forms: end-use load reductions and distribution line loss reductions. The majority of the savings come from end-use load reductions. Consistent with Ameren Illinois energy efficiency filings, Ameren Illinois has included the benefit of line loss reduction of the VO program in the TRC analysis.

- From the 2,474 distribution circuits that are candidates for the analysis, potential energy savings per circuit was estimated using the actual average 2014-2016 delivered energy on the circuit based on connected metered electric energy, the 0.8 CVR factor, and the 3% voltage reduction established above.

- The average cost to implement VO on each circuit, including the necessary infrastructure upgrades, control and communication devices, and appropriate circuit enhancements, was estimated.

- These costs and energy savings were analyzed using a model to evaluate the TRC or benefit-cost ratio of each circuit. The TRC analysis identified 1,047 distribution circuits that are estimated to be cost-effective (TRC score equal to or greater than 1.0) for VO deployment, and these circuits make up the final candidate circuit population for the VO program.

- Based on the estimated 422 GWh-yr total energy savings on 1,047 distribution circuits that the VO program would yield, Ameren Illinois established energy savings targets and investment required to achieve these targets, for every year of the program.

- The 422 GWh-yr target is a percent annual cumulative persisting savings of 1.5% in 2025. This exceeds the cumulative persisting savings of 1.0% established in section 8-103B (b-20) of FEJA.

- The 1,047 cost-effective circuits are spread across Ameren Illinois' service territory, and provide service to communities identified as the top 20 Tier One[3], and to communities with populations below the poverty level.

- Ameren Illinois will use an initial-year voltage reduction analysis to determine the amount of energy savings achieved per implemented circuit. This initial-year proven reduction amount will be considered to occur each of the remaining 14 years of operation of the given circuit after confirming continued VO operation each year.

- Consistent with Ameren Illinois' Energy Efficiency programs, Ameren Illinois will use an independent third-party evaluation, measurement and verification evaluator to review implementation of the plan and confirm estimated savings were achieved.

- Starting in 2018, Ameren Illinois will conduct detailed engineering analysis to determine which circuits to implement in a given year. The detailed engineering analysis could result in a different number of circuits, higher or lower, being deployed with VO than outlined in this Plan; however, the Company is committed to meeting the savings targets outlined in this VO Plan and will adjust circuit deployments as necessary. Ameren Illinois' cadence for implementing the VO Plan for a given program year ***N***, is as follows:

  - Year ***N-2***: Detailed engineering analysis to determine:
    - ✧ Select circuits to meet target for year ***N***.
    - ✧ Complete detailed engineering analysis and design on enhancements selected circuits and determine associated costs.
  - Year ***N-1***: Construct and install VO upgrades per engineering design. Turn VO on and place into service.
  - Year ***N***: 1st full year of VO operation on selected circuits. Measure and record average voltage reduction on circuits.
  - Year ***N+1***: Calculate energy savings and report on savings achieved in Year ***N***.

- **Results**

  The VO TRC benefit-cost analysis estimated the total potential cost-effective energy savings for the VO program to be 422 GWh-yr. These results are based on total investment cost of approximately $122 million, to implement VO on 1,047 distribution circuits. It is also estimated that the yearly O&M costs to operate and maintain the VO program is $7.4 million upon full deployment. A summary of the estimated VO plan results are presented in Tables 1 & 2, and Figure 1, below.

[3] As defined in the "Impact and Process Evaluation of the 2016 (PY9) Ameren Illinois Company Home Efficiency Income Qualified Program", dated December 28, 2017, by Opinion Dynamics.

	VO Plan Results
Estimated VO Savings Potential (Energy MWh/yr)	421,568
Estimated Number of Cost-Effective VO Circuits	1,047
Number of Customers Served by Estimated Cost-Effective VO Circuits	763,958
Average Energy Savings (MWh/yr) per Estimated Cost-Effective Circuit	403
Estimated VO Investment Cost	$122 M
Average VO Deployment Cost per Estimated Cost-Effective Circuits	$ 116,642

Table 1. Summary of VO Program

Year Ending	2018	2019	2020	2021	2022	2023	2024	2025
Estimated Cumulative Persisting Annual Savings (MWh)	0	7,650	59,994	128,433	201,725	275,006	348,287	421,568
% Cumulative Persisting Annual Savings	0%	0.03%	0.21%	0.46%	0.72%	0.98%	1.25%	1.50%
Estimated Incremental # of Circuits Deployed	19	130	170	182	182	182	182	0
Estimated Incremental Construction Cost (Capital Cost)	$2M	$14M	$18M	$19M	$19M	$19M	$19M	$0
Estimated Incremental Total Investment Cost (Construction Capital, Construction O&M, Upfront Capital)	$5M	$17M	$20M	$20M	$20M	$20M	$20M	$0

Table 2. Summary of Ameren Illinois' roll-out plan for the VO program

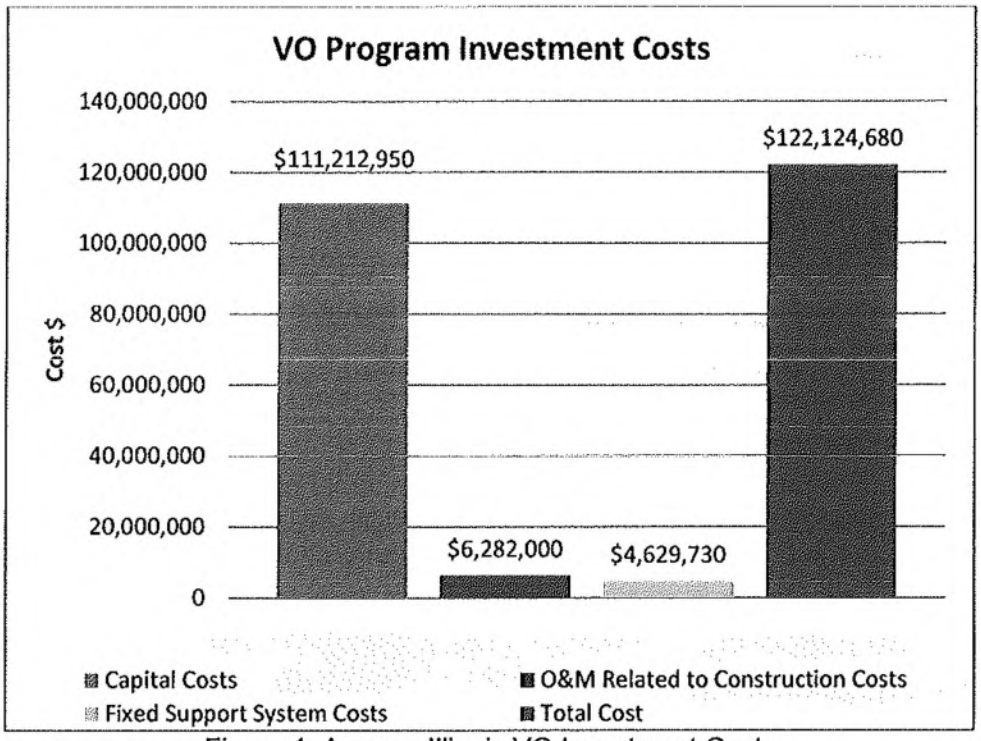

Figure 1. Ameren Illinois VO Investment Costs

Three considerations:

1. The estimated 1.5% of cumulative persisting annual savings after full deployment is based on the total normalized sales of electric power and energy during the calendar years 2014-2016 of 27,960 GWh, after excluding energy delivered to exempt customers identified as of September 1, 2017. If this baseline value is adjusted, the estimated persistent savings percentage will change as well.

2. As part of its EIMA Infrastructure Investment Plan, Ameren Illinois was already in the process of deploying VO on 19 circuits in 2017-2018. Ameren Illinois will incorporate these initial 19 circuits as its initial deployment of its FEJA VO Plan. Ameren Illinois will use these 19 circuits to gain experience designing, implementing, and operating a VO system, as well as determine which of three VO management software systems to use for the remainder of the deployment. Commensurate with an approved VO Plan, Ameren Illinois will begin engineering analysis in 2018 on the circuits it will deploy in 2019.

3. Table 2 shows the estimated number of circuits to be deployed and the estimated capital spend each year. Verification of achieved voltage reductions and realization of savings will occur in the year after deployment. For example, for the year 2020, Ameren Illinois plans to deploy an estimated 130 circuits at an estimated capital spend of approximately $14 Million in

2019, so that by the end of year 2020, an estimated 59,994 MWh are saved and the 0.21% persisting savings target is met.

2. Introduction

Under 220 ILCS 5/8-103B(b-20) of the Future Energy Jobs Act ("FEJA," SB 2814, 2016), Ameren Illinois Company d/b/a Ameren Illinois is required to file "a plan with the Commission that identifies the cost-effective voltage optimization investment the electric utility plans to undertake through December 31, 2024." The statute requires that Ameren Illinois file its voltage optimization plan ("VO Plan") within 270 days of the effective date of FEJA, or by February 26, 2018.

"Voltage optimization measures" are included in the overall "energy efficiency" definition in the IPA Act at 20 ILCS 3855/1-10, and described as "measures that optimize the voltage at points on the electric distribution voltage system and thereby reduce electricity consumption by electric customers' end-use devices." Ameren Illinois defines Voltage Optimization ("VO") as a combination of Volt/VAR Optimization ("VVO") and Conservation Voltage Reduction ("CVR"), which are implemented to first reduce the VAR flows on a circuit, and then lower the voltage to reduce end-use customer energy consumption and utility distribution system losses. VVO optimizes capacitor bank operations to improve power factor and reduce system losses. CVR utilizes voltage regulators, transformer load tap changers and capacitors to control and reduce end-user voltages, which, in turn, lowers customers' energy consumption.

In subsequent sections, Ameren Illinois will provide information on pilot and initial projects that support its VO Plan, identify the goals Ameren Illinois seeks to accomplish with its VO investments, and then identify the VO investments selected to accomplish those goals. Each planned VO investment is then evaluated under the "total resource cost test" or "TRC test," and the results of those TRC tests are summarized. Ameren Illinois explains the estimated "cumulative persisting annual savings" for the VO measures, and how the measures will fit with the savings goals established pursuant to Section 8-103B. The overall schedule for VO measures, or overall VO Plan, is then established. Ameren Illinois concludes by describing the data collection process for the VO Plan, the evaluation, measurement, and verification (EM&V) process, and the process for Ameren Illinois to report results to the Illinois Commerce Commission ("ICC").

3. Background

Ameren Illinois has been piloting and investing in voltage control and management technologies for many years. More recently, since 2012, Ameren Illinois began testing and implementing specific VO approaches and technologies which will be explained further below.

3.1 *Pilot VO Project*

In Docket 10-0568, the ICC ordered Ameren Illinois to conduct a pilot VO project ("Pilot VO Project") to determine the benefits of wider adoption of an Ameren Illinois' VO program. Docket 10-0568, Dec. 21, 2010 Order, at 28. As part of that Docket, the ICC ordered Ameren Illinois to conduct a conservation voltage reduction pilot to test the feasibility of kWh and kW reduction from reduced voltage. The Pilot was conducted from 2012-2013.

Under Ameren Illinois' Pilot VO Project, Ameren Illinois employed CVR on four AIC circuits – the Mt. Zion substation circuit 173, and the Peoria University substation circuits 01, 03, 04. The results of the CVR Pilot Program resulted in determination of a CVR factor that relates percentage change in energy delivered to percentage change in voltage. The average CVR factor was 0.97 and 0.44 for the Mt. Zion test for the summer and fall, respectively. The average CVR factor for the University test was found to be 0.7 and 1.24 for summer and fall, respectively. These values are within the range of CVR factors reported in other industry CVR project results.

Substation	Summer CVRf	Fall CVRf	Average
Mt. Zion	0.97	0.44	0.71
University	0.78	1.24	1.01

Table 3. Ameren Illinois CVR Pilot Results

3.2 *Primary Distribution Volt/VAR Control Infrastructure Investment Program*

In addition to the CVR pilot discussed above, as part of its EIMA Infrastructure Investment Plan, AIC developed a primary distribution Volt/VAR program. The intent of this program is to provide for Dynamic Voltage Control and optimal Reactive Power flow (Volt/VAR Control or Volt/VAR Optimization) on select primary distribution circuits. Phase 1 (2013 engineering with 2014 construction) focused on ensuring all switched low voltage distribution capacitors in the Metro-East area that were controlled by an obsolete system would interact with the new ADMS (Advanced Distribution Management System). Phase 2 (2016/2017 engineering with 2017/2018 construction) is an initial implementation of the VO deployment across 19 AIC primary distribution level (<15kV) circuits by controlling switching capacitor banks, voltage regulators, and transformer load tap changers (LTCs) using a VO computerized control technology solution. This second phase will also focus on the evaluation of three voltage optimization vendor software control solutions for the further voltage optimization deployment. Since AIC plans to have these initial 19 circuits operable in 2018, these circuits will be incorporated as the initial circuits implemented as part of AIC's VO Plan.

Substation	Circuit	Software
Northwest Ckt 002	B00002	Vendor 1
Northwest Ckt 003	B00003	Vendor 1
Quincy 24th & Cherry Lane Ckt 556	V40533	Vendor 2
Quincy 28th & Adams Ckt 533	V42556	Vendor 2
Limit Ckt 015	D31015	Vendor 1
Ridge Ckt 002	C52002	Vendor 1
Ridge Ckt 001	C52001	Vendor 1
Shelbyville Ckt 500	Y79500	Vendor 2
Charleston S. EIU Ckt 501	K11376	Vendor 1
Bethalto Ckt 377	J34377	Vendor 2
Bethalto Ckt 357	J34357	Vendor 2
Caseyville Gardens Ckt 376	K11376	Vendor 1
E. Belleville Ckt 132	L93132	Vendor 2
Belleville 44th Ckt 140	J83140	Vendor 2
Mt. Zion Rt121	P69173	Vendor 3
Quincy 30th & Hampshire	V42572	Vendor 3
Tuscola East	Y98532	Vendor 3
Quincy 36th & College	V45574	Vendor 3
Mt. Vernon 27th St	P58155	Vendor 3

Table 4. Ameren Illinois Primary Distribution Volt/Var Control Infrastructure Program and Initial VO Deployment Circuits

3.3 Goals of VO Plan

A primary objective of this VO Plan is to identify and provide the roadmap to implement the cost-effective voltage optimization investment that AIC plans to undertake through December 31, 2024, as well as outline the reporting and evaluation, measurement, and verification methodology that will be used. Ameren Illinois' approach to identify viable, cost-effective circuits, estimate potential energy savings for the candidate population per viable VO feeder, TRC analysis for viable VO feeder, deployment and implementation schedule per year, and reporting and evaluation, measurement, and verification analysis, is detailed in the sections below.

4. The VO Plan

This plan provides a detailed description of the approach used to perform VO assessment of Ameren Illinois' distribution network to determine energy savings potential and associated costs. Prioritization methods, assumptions, related formulations and process steps are described.

Ameren Illinois' VO Plan was designed using:

1. Proven industry-standard engineering methods that have been used at other utilities similar to Ameren.

2. Reliable analysis and financial modeling techniques that provide representative and reasonable program level VO benefits and costs, consistent with other regulatory proceedings.

3. Reviewed and supported by the collective experience of Accenture consulting services.

4.1 Candidate Feeder Selection

Ameren Illinois operates a high-voltage distribution system (a.k.a. subtransmission system), with voltage levels 34.5kV and 69kV. The subtransmission system at Ameren Illinois includes networked lines, with multiple sources serving low-voltage distribution substations and some industrial customers. Ameren Illinois' distribution system directly serves most of Ameren Illinois' residential, commercial and small industrial customers. This system operates at voltages less than 34.5kV. The most common distribution voltage levels are 4.16kV and 12.47kV.

Ameren Illinois' bulk-supply subtransmission system was excluded from consideration for VO deployment, due to the following reasons:

1. Ameren Illinois' subtransmission system serves a small number of customers that are predominantly industrial customers.

2. Many portions of Ameren Illinois' subtransmission system are networked[4], making VO operation unviable.

3. A substantial number of subtransmission lines have no controllable voltage devices, such as a substation transformer with LTC.

Based on the information above, Ameren Illinois' population of candidate circuits for VO deployment is based on the evaluation of 2,474 distribution circuits through a total resource cost (TRC) analysis, which uses estimated per feeder deployment costs and estimated feeder benefits/savings. This will be explained in more detail under the "TRC Methodology" section.

[4] "Ameren Illinois Utilities Electric Subtransmission System Planning Criteria and Guidelines", Electric Planning Standard No.1, Transmission & Distribution Design Department, Energy Delivery Technical Services 2015.

4.2 *Estimation of Energy Reduction*

Consistent with FEJA, Ameren Illinois' VO Plan is being designed and implemented as an energy efficiency measure, and has not considered peak demand reduction as a benefit of the program. Therefore, for the purposes of this plan, Ameren Illinois considers the term "load" to be consistent with the term "energy".

The energy savings from CVR is the product of three key parameters:

$$Energy\ Savings\ (kWh) = Load \cdot CVR_f \cdot \Delta V$$

Where:

- $Load$: is the load expressed as energy (kWh) prior to VO implementation
- CVR_f: is the factor which represents the percent change in load for each percent change in voltage
- ΔV: is the percent change in average voltage on a circuit as a result of VO implementation

Determination of these three values drives the estimated energy savings calculations. These items are addressed for the Ameren Illinois' VO program in the sections below.

Load

Baseline loads used to estimate energy savings per circuit for the VO Plan are defined below:

- *Ameren Illinois Program Baseline Load:* Ameren Illinois' average delivery of energy during the calendar years 2014-2016 was 36,900 GWh. This value was then reduced to exclude energy delivered during the same time period to exempt customers, resulting in the baseline of 27,960 GWh. The baseline is the basis for AIC's EE savings goals, including savings achieved through this VVO Plan. The % of cumulative persisting annual savings targets within this VO Plan are based on this 27,960 GWh value. The percentage target values will change if this baseline is adjusted.
- *Candidate VO Circuit Baseline Load:* The total energy delivered for candidate VO circuits was based on the 2014-2016 average MWh.

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CVR Factor (CVR_f)

Based on AIC's 2012 – 2013 Pilot VO Project, and other industry studies, a CVR factor of 0.8 was selected for use across all feeders and aligns with CVR factors reported in industry literature and regulatory filings. The tables below summarize CVR factors from a variety of industry projects as well as extracted from regulatory filings in other jurisdictions.

Utility	CVR Factor
California IOUs	0.75
New York State Electric & Gas	0.6
Central Florida Electric Cooperative	0.5-0.75
Clay Electric Cooperative (Florida)	1.0
Progress Energy – Florida	1.0
Georgia Power	0.8-1.7
Cobb EMC	0.75
Progress Energy – Carolinas	0.4
NRECA[5]	0.80
OG&E[6]	0.70
KCP&L[7]	0.80
Avista Utilities	1.09
Clatskanie PUD	1.4
Inland Power & Light	0.93
Snohomish PUD	0.65
Seattle City Light	0.13
Average	0.8

Table 5[8]. CVR Factors from a Variety of Industry Projects

The data in the above table combined with the results of the Ameren Illinois Pilot VO Project support use of a CVR factor of 0.8 for the evaluation, measurement, and verification of the VO Plan.

[5] National Rural Electric Cooperative Association, Costs and Benefits of Conservation Voltage Reduction – CVR Warrants Careful Examination, Final Report (Technical Report) (Arlington, VA: May 2014).

[6] Oklahoma Gas & Electric, 2015 Oklahoma Demand Programs Annual Report, Attachment H IVVC Impact and Capability Report, http://www.occeweb.com/pu/EnergyEfficiency/2015OGE_DemandProgramsAnnualReport.pdf

[7] "Voltage and Power Optimization Saves Energy and Reduces Peak Power", https://www.smartgrid.gov/files/Voltage-Power-Optimization-Saves-Energy-Reduces-Peak-Power.pdf

[8] "Distribution Efficiency Initiative, Market Progress Evaluation report, No.1", NEEA 1207, Northwest Energy Efficiency Alliance 2007, http://neea.org/docs/reports/distribution-efficiency-initiative-e05-139.pdf?sfvrsn=7

Voltage Change (ΔV)

Ameren Illinois utilized a 3.0% voltage reduction for the assessment of candidate feeder energy savings resulting from VO deployment. The 3.0% voltage reduction was selected based on Ameren Illinois' Pilot VO Project, evaluation of results from VO implementations reported by other utilities, and Ameren Illinois' design and operating practices.

4.3 Loss Reduction

VO-related energy savings consists of two principal items: end-use load reduction and loss reduction. In general, loss reductions are small relative to end use load reductions.

Loss reductions arise as a "side effect" of the VO implementation. Distribution line losses are reduced through two principal mechanisms: 1) reduced customer load reduces the magnitude of the load on lines and transformers, resulting in a corresponding reduction of losses across these elements, and; 2) improved distribution primary power factor from reactive power (capacitor bank) dispatch can further reduce the magnitude of load on lines.

Ameren Illinois captured the benefits associated with loss improvements through use of loss factors in the TRC analysis. However, reporting energy reductions due to VO will be based on metered energy without loss gross up. Reporting will be explained in a later section.

4.4 Peak Demand Reduction

Determination of peak demand savings presents challenges that are not encountered in forecasting and reporting energy savings. Specifically, peak demand is subject to far greater variation from year to year than annual energy, due to variations in weather characteristics. Additionally, due to system electrical characteristics in combination with variable peak loading (due to aforementioned weather characteristics) the voltage reduction effected at peak is subject to greater variation and does not offer the balance of the year offset variation as provided in energy reductions. Finally, peak CVR factors can demonstrate variation due to the unique load mix at the time of peak (and depending on the peak load level in a given year). These factors make projections of peak demand savings difficult and subject to significant variation.

Ameren Illinois' VO Plan is being designed and implemented as an energy reduction measure, consistent with the FEJA. The VO functionality is intended to operate 24 hours a day, 365 days a year. The analysis, CVR factor, and estimated average voltage reductions are all based on these operating parameters.

4.5 VO Technology

Ameren Illinois identified multiple technology upgrades required for the successful deployment of a VO program. These technology upgrades have hardware, software and communication components. Each component is described below.

Hardware: Hardware upgrades are necessary to enable the execution of VO strategies on the distribution circuit. Upgrades include the installation of new controllers, monitors and metering packages.

- LTC (Load Tap Changer) Controls
- Voltage Regulator Controls
- Capacitor Controls
- Substation Metering
- Voltage Monitors (AMI, Substation SCADA, Field Devices, etc.)

Software: Software is a fundamental piece to the enablement of VO. It is responsible for taking inputs from field devices, circuit models and other sources of information for a given distribution circuit, and then using advanced algorithms to make decisions that optimally operate the circuit so maximum safe voltage reduction can be achieved. Ameren Illinois will deploy software that can:

- Dynamically monitor, optimize and control devices on the distribution circuit to achieve circuit specific maximum safe voltage reduction.
- Use real-time measurements from distribution circuit field devices and AMI meters, so all customer voltages remain in compliance while achieving energy savings.
- Use real-time electrical connectivity circuit models that would reflect the real-time configuration of the distribution circuit, identifying outages, abnormal switching and back-feed scenarios, and adjusting controls and commands according to the system's real-time configuration.

Communications: The reliable communication between the optimization software and field devices is key to achieving maximum attainable savings per distribution circuit. Each controller (voltage regulator controller, capacitor bank controller, LTC controller) as well as each metering package and line voltage monitor, will require a communication device that will connect them to the optimization software.

Circuit Enhancements: To enhance the voltage reduction capability of a distribution circuit, a number of additional enhancements will be done as appropriate. These enhancements may include:

- Phase Balancing

- Power Factor Correction
- Upgrading Distribution Transformers
- Moving Secondary Services
- Adding Line Voltage Regulators

AMI: Ameren Illinois sees significant advantages in using AMI voltage reads that can be fed as inputs to the optimization software and can be used by the software to determine the maximum amount of savings that can be achieved on the circuit, as well as limit the potential for voltage violations on a circuit. AMI voltage data will also be used in the engineering design process.

4.6 TRC Methodology

This evaluation identifies the cost and benefit components using the Total Resource Cost (TRC) analysis. The Act states that an overall portfolio of energy efficiency and demand-response measures is determined cost-effective using the TRC test. The TRC test is a benefit-cost ratio of the net present value of total benefits of the program to the net present value of the total costs, as calculated over the lifetime of the measures. A program is considered cost-effective if this ratio is greater than one. The also Act states that the TRC shall have the meaning set forth in the Illinois Power Agency Act.

"Total Resource Cost test" or "TRC test" means a standard that is met if, for an investment in energy efficiency or demand-response measures, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, as well as other quantifiable societal benefits, including avoided natural gas utility costs, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric utility would otherwise have had to acquire, reasonable estimates shall be included of financial costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases."

The TRC test compares benefits (energy costs times energy savings, plus the value of resulting carbon reduction) to costs (incremental capital, installation and O&M costs of measures + utility implementation and administration costs). The formal expression of the Illinois TRC test is as follows:

TRC = Benefits/Costs

$$BTRC = \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}}$$

$$CTRC = \sum_{t=1}^{N} \frac{PRC_t + PCN_t + UIC_t}{(1+d)^{t-1}}$$

Where:

BTRC = Benefits of the program/measure

CTRC = Costs of the program/measure

UAC_t = Utility avoided supply costs plus avoided O&M costs in year t

UIC_t = Utility increased supply costs in year t

PRC_t = Program Administrator (Utility) program costs in year t

PCN = Net Participant Costs

BenCost Modeling Tool: The TRC analysis utilized a modeling tool called BenCost. The BenCost modeling tool is a powerful modeling tool that is used to evaluate the costs, benefits, and risks of DSM programs and services. It is a Microsoft Excel-based tool built by Applied Energy Group (AEG) to conduct robust cost-effectiveness evaluations consistent with industry best practices and individual client needs. The model utilizes information obtained directly from Ameren Illinois to ensure that results are accurate and reliable. AEG's approach to cost-effectiveness analysis has been honed over decades of experience with program planning, design, and evaluation. BenCost is used by more than 25 utilities and state agencies, including Ameren Illinois, for DSM program planning.

4.7 TRC Analysis Results

Ameren utilized the BenCost tool to conduct the TRC analysis on each viable circuit, based on the estimated incremental cost of implementing the circuit, and the estimated energy reduction that could be realized from the circuit. Program fixed costs not directly dependent on the number of circuits implemented (such as the initial and ongoing software costs, and overall administration, measurement, and evaluation, etc.) were not included in the individual circuit TRC analysis. The results of this analysis yielded 1,047 cost-effective circuits, with an estimated total energy savings after full deployment of 422 GWh. The overall TRC of the VO Plan assuming implementation of all circuits with an individual TRC greater than 1.0 is 1.36.

	VO Plan Results
Estimated VO Savings Potential (Energy MWh/yr)	421,568
Estimated Number of Cost-Effective VO Circuits	1,047
Number of Customers Served by Estimated Cost-Effective VO Circuits	763,958
Average Energy Savings (MWh/yr) per Estimated Cost-Effective Circuit	403
Estimated VO Investment Cost	$122M
Average VO Deployment Cost per Estimated Cost-Effective Circuits	$ 116,642

Table 6. Summary of VO Plan Results.

4.8 Distribution of Cost-Effective Circuits

The population of cost-effective candidate circuits for the VO program deployment is currently estimated at 1,047 circuits, which corresponds to approximately 64% of Ameren Illinois' customers. Unlike other energy efficiency programs, all customers served from one of these circuits, will directly benefit from VO, as they do not have to decide to opt-in. These customers are spread across the full territory of Ameren Illinois.

Locations	Circuits / Division	Customers in Division	Estimated # of Customers on Cost Effective Circuits
Division 1	260	267,824	213,988
Division 2	103	123,978	53,684
Division 3	132	152,003	112,636
Division 4	231	250,323	151,181
Division 5	107	147,170	83,572
Division 6	214	263,078	148,897
Totals	1047	1,204,376	763,958

Table 7. Cost effective circuits by Division.

Based on zip codes of customers served by the proposed feeders, these circuits also serve portions of the top 20 Tier One communities (defined below), with the exception of Springfield and Peru which are not totally within AIC electric service territory. The below table provides the names of 20 Tier One communities, ranked in terms of the number of estimated eligible households. Tier One communities are defined as communities where over 50% of households are low-

income, less than 10% of households are multifamily, and less than 10% of households participated in previous residential energy efficiency programs.

Ranking (Top 10)	Name*	Estimated Eligible Households	Estimated Population Below Poverty Level	Estimated # of Customers on Cost-Effective Circuits	Ranking (11-20)	Name*	Estimated Eligible Households	Estimated Population Below Poverty Level	Estimated # of Customers on Cost-Effective Circuits
1	Springfield[1]	13,897	8,807	6,600	11	Belleville	2,675	4,542	37,490
2	Decatur	4,888	7,773	29,202	12	Jacksonville	2,294	3,702	9,798
3	Bloomington	4,370	7,416	19,264	13	Ottawa	1,954	3,426	9,584
4	Centralia	4,100	4,399	4,874	14	Alton	1,917	6,702	4,958
5	East Saint Louis	3,519	5,790	1,457	15	Salem	1,623	1,652	1,222
6	Danville	3,439	10,286	11,316	16	Marseilles	1,470	1,310	3,719
7	Galesburg	2,980	6,788	13,674	17	Olney	1,442	1,960	3,105
8	Carbondale	2,956	10,688	7,590	18	Quincy	1,338	6,522	12,022
9	Mount Vernon	2,897	4,471	5,381	19	Peru[1]	1,283	1,034	330
10	Granite City	2,887	7,612	6,777	20	Monmouth	1,233	1,911	3,340

[1] Ameren Illinois Only Serves a small portion of the Springfield & Peru Zip Codes

* Communities named based on the city to which they belong.[9]

Table 8. EE Top 20 Tier One Communities

4.9 *VO Plan Implementation Costs*

The Ameren Illinois VO team has conducted a detailed cost assessment of the VO program to determine the capital and operations and maintenance (O&M) costs associated with the VO deployment. Table 9 shows the total estimated project costs broken down by category.

[9] "Impact and Process Evaluation of the 2016 (PY9) Ameren Illinois Company Home Efficiency Income Qualified Program", dated December 28, 2017, by Opinion Dynamics

Project Costs	Total (M)
Capital Construction-Automation, Communications	$48
Capital Construction- Circuit Enhancements	$63
O&M Related to Construction Costs	$6
Fixed Support System Capital Costs	$5

Table 9. Total VO Program Costs

4.9.1 Capital & O&M Related to Construction

Based on the candidate cost-effective VO circuit population of 1,047, the number of devices necessary to implement the VO program was assessed. For each circuit, Ameren Illinois' VO team identified the following items for the enablement of the VO implementation:

- Number of LTC Controllers
- Number of Voltage Regulator Controllers
- Number of Voltage Regulators
- Number of Capacitor Banks
- Number of Capacitor Controllers
- Number of Communication Devices
- Number of Substation Metering Installations

The Ameren Illinois VO team also identified circuit enhancement work that is necessary to enable the successful operations of VO, and to achieve the estimated 3% voltage reduction outlined in the plan. The potential circuit enhancement work was assessed by the Ameren Illinois team as follows:

- Phase Balancing
- Power Factor Correction
- Upgrading Distribution Transformers
- Moving Secondary Services
- Adding Line Voltage Regulators

Circuit Enhancement Work	Cost per Circuit
Phase Balancing – for 20% or more phase unbalance	$10,000
Power Factor Correction – for circuits with Power Factor worse than 98% lagging/leading. Estimated adding a capacitor bank and relocating another.	$20,000
Upgrading Distribution Transformer – estimated for replacing one distribution transformer.	$2,500
Moving Secondary Services – for low voltage conditions. Estimated moving three secondary services.	$2,500
Adding Line Voltage Regulators – for low voltage zones within circuits. Estimated adding one set of three-phase voltage regulators.	$25,000
Total	$60,000

Table 10. Estimated Circuit Enhancement Costs

Ameren Illinois' VO team also identified the following items necessary for the implementation of the VO program and are independent of the number of circuits implemented. This includes the implementation of a VO software system that is integrated with our Advanced Distribution Management System (ADMS) and AMI system. It also includes the enhancement of the existing AMI system to retrieve voltage values from the meters and store in a data warehouse. These total fixed costs are estimated to be $4.6M.

Material and labor costs were estimated through the use of equipment quantities known for each of the 1,047 circuits, as well as labor estimates from internal work management systems, or directly from vendors.

The figure below further summarizes the VO Plan investment costs.

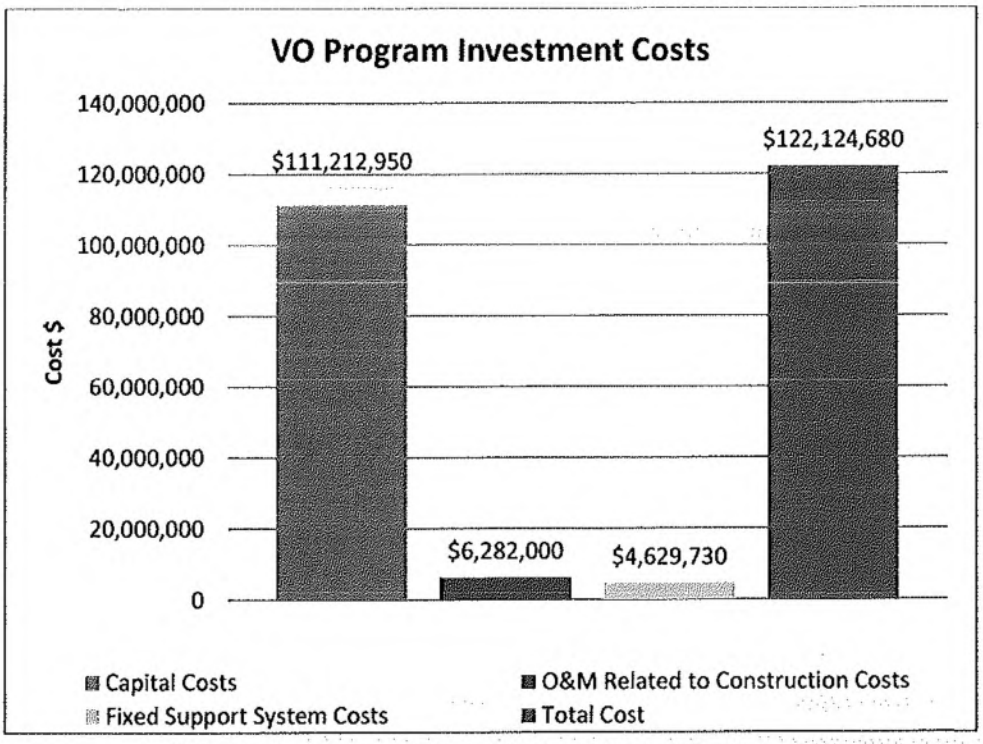

Figure 2. Ameren Illinois VO investment Cost.

4.9.2 Ongoing O&M

The ongoing operating and maintenance cost of the VO Plan is estimated at $7.4M (these estimates include engineering, operating, engineering technician and substation/lineman support to maintain the VO systems and equipment).

5. Timeframe and Implementation Plan

Based on the estimated 422 GWh-yr total energy savings on 1,047 distribution circuits that the VO program would yield, Ameren Illinois established energy savings targets, as well as the estimated investment required to achieve these targets, for every year of the program. Starting in 2018, Ameren Illinois will conduct further detailed engineering analysis and determine which circuits to implement in a given year. The detailed engineering analysis could result in some of the 1,047 circuits falling out of the cost effective candidate list, while other circuits might be determined cost-effective and are added as candidates. Therefore, the number of circuits deployed in any given year may differ from those outlined in the Plan to meet savings goals.

Ameren Illinois' cadence for implementing the VO plan for a given program year ***N***, is as follows:

- Year ***N-2***: Detailed engineering analysis to determine:
  - Select circuits to meet or exceed energy savings target for year ***N***
  - ✧ Complete detailed engineering analysis and design on selected circuits and determine associated costs
- Year ***N-1***: Construct and install VO upgrades per engineering design. Turn VO on and place in service.
- Year ***N***: 1st full year of VO operation on selected circuits. Monitor voltage reduction.
- Year ***N+1***: Calculate energy savings and report on savings captured in Year ***N***

The summary of Ameren Illinois' roll-out for the VO Plan is shown in Table 11 below. All investments and amounts shown are subject to revision as AIC refines and adapts the VO Plan in light of future analysis, findings and circumstances. The work may evolve from that originally planned; and planned schedules may be either accelerated or delayed. Implementation of the VO Plan may also involve the increase or reduction in the number of cost-effective circuits deployed, at lower or higher cost than originally estimated. Such occurrences shall not imply the imprudence or unreasonableness of the VO Plan, including, but not limited to, its programs, cost or schedule.

Year Ending	2018	2019	2020	2021	2022	2023	2024	2025
Estimated Cumulative Persisting Annual Savings (MWh)	0	7,650	59,994	128,433	201,725	275,006	348,287	421,568
% Cumulative Persisting Annual Savings	0%	0.03%	0.21%	0.46%	0.72%	0.98%	1.25%	1.50%
Estimated Incremental # of Circuits Deployed	19	130	170	182	182	182	182	0
Estimated Incremental Construction Cost (Capital Cost)	$2M	$14M	$18M	$19M	$19M	$19M	$19M	$0
Estimated Incremental Total Investment Cost (Construction Capital, Construction O&M, Upfront Capital)	$5M	$17M	$20M	$20M	$20M	$20M	$20M	$0

Table 11. Summary of Ameren Illinois' roll-out plan for the VO program.

Ameren Illinois' VO Plan, as proposed, is estimated to yield a percent annual cumulative persisting savings of 1.5% in 2025. This exceeds the cumulative persisting savings of 1.0% established in section 8-103B (b-20) of FEJA, as outlined in the table below. The estimated 1.5% of persisting annual savings after full deployment is based on the total normalized sales of electric power and energy during the calendar years 2014-2016 of

27,960 GWh, after excluding energy delivered to exempt customers identified as of September 1, 2017. If this baseline value is adjusted, the estimated persistent savings percentage will change as well.

Year Ending	2018	2019	2020	2021	2022	2023	2024	2025
Estimated Cumulative Persisting Annual Savings (MWh)	0	7,650	59,994	128,433	201,725	275,006	348,287	421,568
% Cumulative Persisting Annual Savings	0.00%	0.03%	0.21%	0.46%	0.72%	0.98%	1.25%	1.50%
% Cumulative Persisting Annual Savings from Section 8-103B (b-20) of FEJA	0.00%	0.17%	0.17%	0.33%	0.50%	0.67%	0.83%	1.00%

Table 12. VO Plan cumulative savings target percentages compared to FEJA.

6. Voltage Data Collection

For purposes of evaluation, measurement and verification of the VO program, Ameren Illinois will collect voltage data from multiple sources that will be utilized to verify the execution of VO and measure the savings that result from its execution.

As discussed in the EM&V section below, Ameren Illinois will rely on voltage values pre-VO execution and post-VO execution to evaluate the energy savings. The general approach to collecting voltage data will be as follows:

- **Pre-VO Deployment Voltage**
  For pre-VO deployment voltage values, data will be collected based on one of the options listed below in order of priority:

  - AMI Measurement Values: Hourly Averages for each meter on the circuit for the pre-VO deployment.
  - SCADA Measurement Values: Hourly Averages for all SCADA-enabled devices for the pre-VO deployment year.

  Ameren Illinois plans to complete AMI deployment by the end of 2019. Therefore, it is expected that the AMI Measurement Values option for pre-VO deployment voltage data will be the option used after 2020.

  Substations at Ameren Illinois differ in design, configuration and available metering. The sections below provide detail and guidance to the data collection process for the different substation and feeder types.

Substation LTC

Some of Ameren Illinois Distribution substations are fed by an LTC (Load Tap Changer) Transformer. An LTC Transformer has built-in voltage regulators that are used to ensure that distribution feeders provide proper voltage levels to customers. For substations that have LTCs, there are no individual feeder regulators, and the LTC is responsible for providing regulation to downstream feeders.

There are three main types of available data at LTC locations:

1. LTC-Controlled Circuits with AMI deployed
   Data to be collected is the average hourly voltage value for each meter.

2. LTC SCADA – Three-phase Voltage
   Data to be collected from this location is the average hourly voltage value for each phase; then average the three phases into one average reading.

3. LTC SCADA – Bus Voltage
   Data to be collected from this location is the average hourly voltage value.

Voltage Regulators

Unlike substations with LTC Transformers, the majority of Ameren Illinois distribution substations have independent phase voltage regulation for each individual circuit. This is done by having a set of three single-phase voltage regulators that ensure that each circuit phase from the substation provides proper voltage. Unlike substation LTC transformers, Ameren Illinois does not have metering for all circuit voltage regulators. Ameren Illinois will rely on the following methods to collect voltage values:

1. Voltage Regulator Controlled Circuits with AMI deployed
   Data to be collected is the average hourly voltage value for each meter.

2. Voltage Regulator SCADA – Three-phase Voltage
   Data to be collected from this location is the average hourly voltage value for each phase; then average the three phases into one average reading.

- **Post-VO Deployment Voltage**
  For post-VO deployment voltage values, data will be collected based on one of the options listed below in order of priority:
  - AMI Measurement Values: Hourly Averages for each meter on the circuit for the post-VO deployment.
  - SCADA Measurement Values: Hourly Averages for all SCADA-enabled devices on the circuit the post-VO deployment year.

Part of the VO implementation plan is to allow for circuit voltage metering to be captured and collected. It is also part of the VO implementation plan to allow for AMI metering to make interval voltage data available to be collected. These two methods will be used to collect voltage data post-VO deployment.

7. EM&V

Ameren Illinois proposes evaluation, measurement and validation of the VO program benefits, utilizing a continuous operation approach to ensure achievement of the greatest customer benefits. Ameren Illinois considered use of an "on/off' testing approach for every deployed circuit; however, such approaches sacrifice up to half of the customer energy savings that might otherwise be achieved during the testing period. On/off testing subjects voltage regulating equipment to increased number of operations, which reduces the life of these devices. Also, on/off testing requires increased labor resources, due to manipulation and monitoring of the VO control solution, as well as data analysis efforts to assess the operational performance data.

7.1 Savings Evaluation

Energy savings are computed in a manner similar to that outlined above, and is based on the average annual energy use in the 2014-2016 timeframe less energy use by exempt customers. The energy savings from conservation voltage reduction is the product of three key parameters:

$$Energy\ Savings = Annual\ Energy\ Use\ 2014-2016 \cdot CVR_f \cdot \Delta V$$

Where:

- *Annual Energy Use 2014-2016* is the average annual customer energy use over the 2014-2016 timeframe, less energy use by exempt customers.
- CVR_f is the factor which represents the percent change in load for each percent change in voltage
- ΔV is the percent change in voltage as a result of VO implementation

These three items are discussed further below:

Annual Energy Use

Annual energy use is taken as the 2014-2016 annual energy use for each feeder as outlined above and consistent with the direction provided in FEJA that energy reduction is to be measured based on a 2014-2016 baseline.

CVR Factor

A CVR factor of 0.8 was selected based on the pilot results and survey of industry reported CVR factors.

Voltage Change (ΔV)

The voltage change is the average hourly voltage reduction achieved throughout the initial full year of deployment compared to pre-deployment (i.e., average annual voltage change). Importantly, the average annual voltage change shall be from voltages measured from the same system level (i.e., either customer level (meter) voltages shall be used for both pre- and post-VO voltage measurements or primary SCADA based voltages shall be used for both pre- and post-VO voltage measurements).

Pre Deployment Voltage

Hourly pre-deployment voltages will be captured as described in the section above for one year prior to the enablement of VO on the subject circuits. (Note: the availability of pre-deployment AMI voltages will determine whether AMI voltages can be used to support M&V.)

Missing or zero data points will be removed from the dataset, as such points are not representative of normal system operation (i.e., missing voltages may be due to loss of remote terminal unit communications, resulting in missing periods of data across all measurement types for a particular feeder).

Post Deployment Voltage

Hourly post-deployment voltages will be captured as described in the section above for the initial full year of the enablement of VO on the subject circuits. Note: The post- deployment voltages collected shall align with the locations for the pre-deployment voltages (i.e., if customer meter voltages are used for pre-deployment annual average voltages, customer meter should also be used for post-deployment annual average voltage determination).

Missing, zero and outlying data points will be removed from the dataset, as such points are not representative of normal system operation (i.e., missing voltages may be due to loss of remote terminal unit communications, resulting in missing periods of data across all measurement types for a particular feeder). An overall average annual post deployment voltage will be computed, based on the dataset with missing or zero data points excluded.

Average Annual Voltage Change

The average annual voltage change shall be computed from the difference between the average annual pre-deployment voltage and the average annual post-deployment voltage.

7.2 Ongoing Evaluation, Measurement & Verification Methodology

Consistent with Ameren Illinois' Energy Efficiency programs, Ameren Illinois will use an independent third-party evaluation, measurement, and verification evaluator to review Ameren Illinois' implementation of this plan and confirm estimated savings were achieved. The evaluator will review and confirm the following:

1. The new circuits were deployed with VO in the year reported.
2. The new circuits were appropriately operating for the initial evaluation, measurement, and verification year.
3. The resulting % voltage reduction pre- vs. post-deployment of the newly deployed circuits.
4. The resulting energy savings calculation realized from the newly deployed circuits using the plan approved CVR factor and savings calculation methodology.
5. Circuits deployed and verified in previous years are still in operation.
6. The new cumulative persisting annual savings of all deployed circuits.

Once the voltage reduction is verified for a circuit in its initial-year of operation, and thereby the energy savings is calculated using the plan approved CVR factor, this initial-year proven energy savings is considered to occur the full 15-year life of the VO operation, provided VO continues to be operated on the circuit throughout the entire 15-year life of the program. No subsequent voltage reduction calculations, CVR factor adjustment, or delivered energy verification, will be made on a deployed circuit, once the savings on a circuit has been calculated and verified in its initial year of operation.

As a confirmation that the proven CVR factor of 0.8 is still valid for the VO deployment outlined in this plan, and to further confirm the relationship among typical circuit delivered energy, voltage, and other appropriate parameters, in 2020 Ameren Illinois plans to conduct a test of the CVR factor and other appropriate parameters using appropriate analysis methods on a representative sample of the estimated 130 circuits deployed in 2019. If the resultant CVR factor materially differs from the proven 0.8 factor used in the plan development and implementation to that point, then Ameren Illinois will use the new CVR factor in all engineering and economic analysis related to the plan in all subsequent years beginning in 2021, and resulting energy savings verification in all subsequent years beginning in 2023. Changes to the CVR factor will not change the 15-year deemed savings of circuits already deployed.

8. Reporting

As outlined in the legislation, Ameren Illinois will provide the utility data to its independent evaluator 30 days after the calendar year. The independent evaluator will have draft evaluations completed by March 15 and circulated to the Stakeholders Advisory Group for comment. These draft evaluations will provide the annual incremental and cumulative persisting savings related to the VO program. Interested stakeholders will be provided a comment period, after which evaluators will review and address. Final evaluations will be delivered no later than April 30. The VO program results will be incorporated into an annual integrated report detailing all Ameren Illinois Efficiency program annual persisting, and annual incremental savings.

9. 2017 / 2018 Detailed Plan

As mentioned above, Ameren Illinois will use the 19 circuits already planned for VO implementation as part of its EIMA Infrastructure Investment Plan as the initial implementation of this VO plan.

In 2017, Ameren Illinois began deployment of VO technologies on 14 of the 19 circuits. Seven of these circuits will be deployed with a Vendor 1 VO control software package. The other seven will be deployed with a second Vendor VO control software package. Table 13 below shows the 14 circuits that are being deployed.

Substation	Circuit	Software
Northwest Ckt 002	B00002	Vendor 1
Northwest Ckt 003	B00003	Vendor 1
Quincy 24th & Cherry Lane Ckt 556	V40533	Vendor 2
Quincy 28th & Adams Ckt 533	V42556	Vendor 2
Limit Ckt 015	D31015	Vendor 1
Ridge Ckt 002	C52002	Vendor 1
Ridge Ckt 001	C52001	Vendor 1
Shelbyville Ckt 500	Y79500	Vendor 2
Charleston S. EIU Ckt 501	K11376	Vendor 1
Bethalto Ckt 377	J34377	Vendor 2
Bethalto Ckt 357	J34357	Vendor 2
Caseyville Gardens Ckt 376	K11376	Vendor 1

Substation	Circuit	Software
E. Belleville Ckt 132	L93132	Vendor 2
Belleville 44th Ckt 140	J83140	Vendor 2

Table 13. Ameren Illinois' 2017 Primary Distribution Volt/VAR Control Infrastructure Investment Program Circuits

An additional 5 circuits will be deployed in 2018 for a total of 19 circuits. The additional 5 circuits will be deployed with a third Vendor VO control software package. These circuits are listed in Table 14.

Substation	Circuit	Software
Quincy 36th & College	V45574	Vendor 3
Quincy 30th & Hampshire	V42572	Vendor 3
Tuscola East	Y98532	Vendor 3
Mt. Zion Rt121	P69173	Vendor 3
Mt. Vernon 27th St	P58155	Vendor 3

Table 14. Ameren Illinois' 2018 Primary Distribution Volt/VAR Control Infrastructure Investment Program Circuits

In 2018, Ameren Illinois will also perform a more detailed engineering assessment of the 19 VO circuits consistent with this proposed VO Plan. The assessment will be used to further determine the circuit enhancement requirements of each circuit. The assessment will include the following:

- Voltage High/Low Study
- Power Factor Correction
- Load Imbalance

The circuit enhancement work that will result from these studies will be done in 2018. Once the circuit enhancement work is complete for each circuit, VO will start operations and verification of voltage reduction capabilities of each circuit. The three software packages will also be tested to determine which provides the most appropriate solution for full VO deployment. Ameren Illinois will use the chosen software solution for the subsequent circuits deployed as part of this plan.

Based on the Plan, Ameren Illinois is estimating energy savings for the 19 circuits to be 7,650 MWh-yr. This savings is expected to begin during the first full year of operation of these circuits in 2019.

Ameren Illinois will use the learnings from the implementation and initial operation of these 19 circuits to inform the design, deployment, and operation of subsequent circuits deployed as part of the plan.

STATE OF ILLINOIS

ILLINOIS COMMERCE COMMISSION

Ameren Illinois Company d/b/a Ameren Illinois	:	
	:	**18-0211**
Petition for Approval of Voltage Optimization Plan pursuant to Section 8-103B(b-20).	:	

ORDER

By the Commission:

I. PROCEDURAL HISTORY

On January 25, 2018, Ameren Illinois Company d/b/a Ameren Illinois ("Ameren Illinois," "AIC," or the "Company") filed with the Illinois Commerce Commission ("Commission") its Petition for Approval of its Voltage Optimization Plan ("VO Plan") pursuant to Section 8-103B of the Public Utilities Act (the "Act"), 220 ILCS 5/1-101 *et seq.* The verified Petition ("Petition") seeks approval of AIC's VO Plan, which identifies the cost-effective voltage optimization investments the Company plans to undertake through December 31, 2024, including investments designed to provide meaningful energy savings to low- to moderate-income customers on all cost-effective circuits through the Ameren Illinois service territory, along with related estimated time and budget information; the proposed adjustments to be made to the unmodified and modified energy savings goals approved pursuant to Section 8-103B in Docket No. 17-0311; and the evaluation, measurement and verification of the savings achieved by the VO investments made by the Company. With its Petition, the Company also submitted the direct testimony and exhibits of Ameren Illinois witnesses Michael Abba (Ameren Exs. 1.0-1.2) and Andrew Cottrell (Ameren Exs. 2.0-2.1), who presented testimony and exhibits in support of the Company's Petition and requested relief.

The People of the State of Illinois ("AG") filed an appearance. The Natural Resources Defense Council ("NRDC"), Citizens Utility Board ("CUB"), Environmental Defense Fund ("EDF"), and Environmental Law and Policy Center ("ELPC") filed petitions to intervene, which were granted.

Pursuant to due notice as required by law and by the rules and regulations of the Commission, a prehearing conference was held on February 13, 2018 before a duly authorized Administrative Law Judge ("ALJ") of the Commission.

Pursuant to the schedule ordered by the ALJ, on March 6, 2018, Staff of the Commission ("Staff"), AG, NRDC, CUB, and EDF submitted their direct testimony. Staff witness Jennifer Morris presented testimony and exhibits addressing the Company's proposed Evaluation Measurement & Verification ("EM&V") plan (Staff Exs. 1.0-1.3). AG

witness Maximilian Chang presented testimony and exhibits addressing the prioritization of VO circuit implementation for low-income customers and the Company's proposed EM&V plan (AG Exs. 1.0C-1.1). NRDC, CUB, and EDF jointly filed the testimony of NRDC/CUB/EDF witness Christopher Neme, who presented testimony and exhibits addressing the prioritization of VO circuit implementation for low-income customers and the Company's proposed EM&V plan (NRDC/CUB/EDF Exs. 1.0-1.5).

On March 20, 2018, ELPC withdrew from this proceeding. On March 22, 2018, the Company submitted the rebuttal testimony and exhibits of Company witness Michael Abba (Ameren Exs. 3.0-3.2), which included an executed Settlement Stipulation (Ameren Ex. 3.2) resolving the contested issues in the docket and reflecting modifications to the Company's VO Plan agreed to by the Company, Staff, AG, NRDC, CUB, and EDF.

An evidentiary hearing was held on March 23, 2018, at which the written testimony and the exhibits of the Company, Staff, AG, and NRDC/CUB/EDF were admitted into the record via affidavit and without objection. There were no contested issues at the completion of the hearing. Ameren Illinois filed an Agreed Draft Proposed Order with the Commission on April 20, 2018, which all parties reviewed.

II. STATUTORY AUTHORITY

Section 8-103B of the Act sets forth the requirements for electric utilities to identify the cost-effective voltage optimization investments the electric utility plans to undertake through December 31, 2024 as part of its energy efficiency and demand response plan. Specifically, Section 8-103B(b-20) of the Act provides:

> Each electric utility subject to this Section may include cost-effective voltage optimization measures in its plans submitted under subsections (f) and (g) of this Section, and the costs incurred by a utility to implement the measures under a Commission-approved plan shall be recovered under the provisions of Article IX or Section 16-108.5 of this Act.
>
> . . .
>
> Within 270 days after the effective date of this amendatory Act of the 99th General Assembly, an electric utility that serves less than 3,000,000 retail customers but more than 500,000 retail customers in the State shall file a plan with the Commission that identifies the cost-effective voltage optimization investment the electric utility plans to undertake through December 31, 2024. The Commission, after notice and hearing, shall approve or approve with modification the plan within 120 days after the plan's filing and, in the order approving or approving with modification the plan, the Commission shall adjust the applicable cumulative persisting annual savings goals set forth in subsection (b-15) to reflect any amount of cost-effective energy savings approved by the Commission that is greater than or less than the following

cumulative persisting annual savings values attributable to voltage optimization for the applicable year:

(1) 0.0% of cumulative persisting annual savings for the year ending December 31, 2018;

(2) 0.17% of cumulative persisting annual savings for the year ending December 31, 2019;

(3) 0.17% of cumulative persisting annual savings for the year ending December 31, 2020;

(4) 0.33% of cumulative persisting annual savings for the year ending December 31, 2021;

(5) 0.5% of cumulative persisting annual savings for the year ending December 31, 2022;

(6) 0.67% of cumulative persisting annual savings for the year ending December 31, 2023;

(7) 0.83% of cumulative persisting annual savings for the year ending December 31, 2024; and

(8) 1.0% of cumulative persisting annual savings for the year ending December 31, 2025.

220 ILCS 5/9-103B(b-20).

III. AMEREN ILLINOIS' VO PLAN

A. Ameren Illinois' Position

The Company states that its VO Plan meets the requirements of Section 8-103B(b-20) of the Act. As described in Ameren Exhibits 1.0-1.2, 2.0-2.1, and 3.0-3.2, the Company explains that its VO Plan properly identifies the cost effective voltage optimization the Company plans to undertake through December 31, 2024, and sets forth a prudent plan to design, deploy, and operate those cost effective voltage optimization measures on the Ameren Illinois primary distribution system. The Company further explains that its VO Plan proposes a reasonable and appropriate EM&V strategy in light of the complex nature of deploying voltage optimization measures and the fact that energy savings approved in the VO Plan will ultimately affect the overall energy efficiency savings goals recently approved by the Commission pursuant to the Act.

AIC witness Michael Abba presented testimony describing the process the Company used in the development of the VO Plan. Mr. Abba explains that the Company piloted VO on four test circuits in 2012 and 2013, proving the feasibility of using voltage reduction to reduce energy consumption on its circuits. Mr. Abba further explains that the Company, based on this experience, began reviewing the specific VO requirements identified in Section 8-103B(b-20) of the Act, and began analyzing the potential circuits on which VO could be feasibly applied in light of those requirements. This analysis included an estimation of the fixed costs for computer and other systems that would be needed regardless of how many circuits were implemented, an estimation of the automation and communication investments that would be needed on each circuit, an

estimation of the average circuit enhancement investments that would be needed on each circuit, an estimation of the yearly cost to operate and maintain VO on each circuit for the 15 year life of the measure, an estimation of the average voltage reduction that could be achieved on each circuit, and an estimation of the reduced energy (MWh) consumption that could be realized from such a voltage reduction. Mr. Abba further explains that the Company engaged the external firm Accenture to support the Company's cost and savings estimates, the CVR factor, and percent voltage reduction used in the analysis. The Company's VO Plan proposed to confirm these estimates through ongoing EM&V, including in 2020 a test of the CVR factor and other appropriate parameters using appropriate analysis methods on a representative sample of the estimated 130 circuits deployed in 2019. Mr. Abba also explains that the Company's VO Plan was designed to provide meaningful savings to low- to moderate-income customers on all cost-effective circuits through the Ameren Illinois service territory, and that the 1,047 circuits estimated to be cost effective provide energy savings to customers in the top 20 Tier One communities, Ameren Illinois' proxy for geographic areas serving Ameren Illinois' low-income customers.

Finally, in Ameren Exhibit 3.0, Mr. Abba proposes that the savings adjustments to the unmodified savings goals and the modified savings goals approved in Docket No. 17-0311, be filed as part of an updated compliance filing in Docket No. 17-0311. As a basis for those adjustments, Mr. Abba proposes to use the figures in the following Table 1, which was excerpted from Ameren Exhibit 1.1 and modified to reflect the last two rows. This Table 1 provides a comparison of the estimated percent annual cumulative persisting savings of the VO Plan with the cumulative persisting savings established in Section 8-103B(b-20) of the Act, and its values reflect the exempt customer list used during this docket:

TABLE 1:

Year Ending	2018	2019	2020	2021	2022	2023	2024	2025
Estimated Cumulative Persisting Annual Savings (MWh) in VO Plan	0	7,650	59,994	128,433	201,725	275,006	348,287	421,568
% Cumulative Persisting Annual Savings in VO Plan	0.00%	0.03%	0.21%	0.46%	0.72%	0.98%	1.25%	1.50%

Cumulative Persisting Annual Savings (MWh) from Section 8-103B (b-20) of FEJA	0	47,532	47,532	92,268	139,800	187,332	232,068	279,600
% Cumulative Persisting Annual Savings from Section 8-103B (b-20) of FEJA	0.00%	0.17%	0.17%	0.33%	0.50%	0.67%	0.83%	1.00%
Difference between VO Plan and Section 8-103B (b-20) of FEJA (MWh)	0	-39,882	12,462	36,165	61,925	87,674	116,219	141,968
Difference between VO Plan and Section 8-103B (b-20) of FEJA (%)	0.00%	-0.14%	0.04%	0.13%	0.22%	0.31%	0.42%	0.50%

AIC witness Andrew Cottrell presented testimony describing the Total Resource Cost ("TRC") test that was applied to individual circuits, as well as to the VO Plan, to determine cost effectiveness of VO. Mr. Cottrell explains that the TRC test was first applied to individual circuits, and then, all cost-effective circuits were packaged together and the TRC test was applied at the Plan level. Mr. Cottrell explains that a total of 2,474 circuits were analyzed for cost-effectiveness, with 1,047 circuits found to be cost-effective with a TRC ratio greater than or equal to 1.0. Mr. Cottrell further explains that applying the TRC test to the VO Plan consisting of those 1,047 circuits resulted in a finding that the VO Plan was cost-effective with a TRC ratio of 1.36.

B. AG's Position

AG witness Maximilian Chang presented testimony which included certain recommendations regarding the VO Plan. Mr. Chang proposes that the Commission require the Company to prioritize the installation of voltage optimization in Tier One communities and to investigate voltage optimization opportunities for low-income customers outside of its definition of Tier One communities so that the Company's low-income customers will benefit from the energy savings provided by the VO plan as quickly as possible. While the Company concludes that its overall program is cost-effective, Mr. Chang found that the TRC benefit-cost ratio of the 621 circuits in the Company's 20 top Tier One (low income) communities to be 1.85, as compared with Ameren Illinois' computed overall average of the circuit-specific ratio for the 1,047 circuits of 1.88. The comparability of the Tier One community and VO plan ratios makes clear that investment in low income communities will deliver significant benefits to communities with primarily economically challenged customers.

Mr. Chang also proposes that the Commission order the Company to provide the Commission with updated CVR factors based on installed circuits for purposes of any future modifications or adjustments to ensure overall cost-effectiveness of the VO plan and an accurate assessment of energy savings achieved annually. Mr. Chang recommends that the analysis and updating should begin within 90 days of the date of the Commission's order. Mr. Chang further asks the Commission to direct the Company to apply the results of those evaluations to the deemed CVR factor value and to use the deemed 0.8 CVR factor for planning purposes, but utilize actual CVR factors verified through evaluation for purposes of computing annual energy savings performance.

C. Staff's Position

Staff witness Jennifer Morris presented testimony which included certain recommendations regarding the VO Plan. Ms. Morris proposes that the Commission direct that any peak demand savings achieved by the VO investments be evaluated and included as a benefit in future TRC test calculations done for the purposes of future implementation decisions. Ms. Morris also takes issue in her direct testimony with AIC's proposed EM&V plan, stating it does not lead to accurate evaluation of savings and may allow AIC to earn bonus returns even if VO performs poorly. Further, Ms. Morris claims AIC's proposed EM&V plan for VO measures is not consistent with existing Commission-approved energy efficiency policies. Ms. Morris recommends the Commission require the VO Plan to undergo a retrospective evaluation of savings using rigorous on/off testing methodology starting the first year of operation. Ms. Morris further proposes that the VO evaluation results be submitted to the IL-TRM Update Process for possible inclusion in future versions of the IL-TRM.

D. NRDC/CUB/EDF's Position

NRDC/CUB/EDF witness Christopher Neme presented testimony which included certain recommendations regarding the VO Plan. Mr. Neme proposes that if deployment on circuits serving lower income communities first can be accomplished without significant adverse effects on cost of deployment and/or the ability of the Company to meet its savings goals, the Company should do so and that guidance should be memorialized in any Commission ruling on the plan. Mr. Neme further proposes that the

Commission direct that any peak demand savings achieved by the VO investments be evaluated and included as a benefit in future TRC test calculations done for the purposes of future implementation decisions. Mr. Neme acknowledges that the deeming of the CVR factor of 0.8 is reasonable as consistent with both the Company's past pilot program results and results from a variety of utility VO projects across the country, but recommends that the evaluation results of the VO investments from 2018 and 2019 be used to update the CVR factor that would be used to evaluate either the 2020 savings (evaluated in 2021) or the 2021 savings (evaluated in 2022).

E. Settlement Stipulation

Following the submission of direct testimony, the Company, AG, Staff, NRDC, CUB, and EDF (the "Stipulating Parties") entered into discussions in an attempt to find a collaborative solution to the contested issues in this docket. As a result of these negotiations, the Stipulating Parties entered into a Settlement Stipulation ("Stipulation") addressing agreed-to modifications to AIC's VO Plan. AIC witness Michael Abba presented a copy of the Settlement Stipulation, executed on March 22, 2018, as Ameren Exhibit 3.2. As reflected in the Stipulation, and notwithstanding the positions previously stated in the Stipulating Parties' direct or rebuttal testimony, the Stipulating Parties agree that the agreement reflected in the Stipulation should be adopted and that the VO Plan, as modified by the Stipulation, should be approved. The Stipulation thus resolves all outstanding issues among the Stipulating Parties.

The Stipulation reflects the full agreement of the parties, but highlights include: (1) modifications to the proposed EM&V plan (Ameren Ex. 3.2, ¶ 1(a)-(g)); (2) agreement regarding the evaluation of peak demand savings (*id.* at ¶ 2); and (3) modification to the proposed prioritization of implementation of the planned VO investments to circuits serving low-income customers (*id.* at ¶ 3). As noted above, the Stipulation was agreed to by the parties to this docket, and it was entered into the record without objection.

IV. COMMISSION ANALYSIS AND CONCLUSION

In light of the Stipulation, the Commission notes that it is uncontested that Ameren Illinois' VO Plan, as modified by the Stipulation, satisfies the requirements of Section 8-103B of the Act. The Commission acknowledges and appreciates the collective efforts of the parties that resulted in the Stipulation.

Under Section 8-103B of the Act, the Commission can approve or approve with modification the VO Plan submitted by Ameren Illinois. 220 ILCS 5/8-103B(b-20). The Commission has reviewed the evidence in this proceeding, including the testimony, exhibits, and particularly the Stipulation, and finds that Ameren Illinois' VO Plan, as modified by the Stipulation, meets the requirements of the Act and should be approved. The VO Plan, as modified by the Stipulation, identifies the cost-effective voltage optimization measures the Company plans to undertake through December 31, 2024, sets forth a prudent plan to design, deploy, and operate those cost-effective voltage optimization measures on the Ameren Illinois primary distribution system, identifies a reasonable EM&V plan to evaluate the VO investments, and identifies the adjustments to the unmodified and modified goals set by the Commission pursuant to Section 8-103B in Docket No. 17-0311. The Commission further applauds the VO Plan's commitment to

low- and moderate-income utility customers, and, in particular, the commitment to prioritize implementation of VO on circuits serving low-income utility customers.

In light of the above, the Commission finds that the provisions of the VO Plan and Stipulation are reasonable, consistent with Section 8-103B of the Act, and supported by substantial evidence in the record. Accordingly, the Commission approves all aspects of Ameren Illinois' VO Plan, as modified by the Stipulation, including the proposed adjustments to the unmodified and modified goals set by the Commission pursuant to Section 8-103B in Docket No. 17-0311. The Company is directed to make a compliance filing in Docket No. 17-0311 identifying the revised unmodified and modified savings goals in Docket No. 17-0311, as required by Section 8-103B(b-20) of the Act.

V. FINDINGS AND ORDERING PARAGRAPHS

The Commission, having given due consideration to the entire record and being fully advised in the premises, is of the opinion and finds that:

(1) Ameren Illinois Company d/b/a Ameren Illinois is an Illinois corporation that is engaged in the transmission, distribution, and sale of electricity and the distribution and sale of natural gas to the public in Illinois and is a public utility within the meaning of Section 3-105 of the Act;

(2) the Commission has jurisdiction over Ameren Illinois Company d/b/a Ameren Illinois and the subject matter of the proceeding;

(3) the findings of fact and conclusions of law set forth in the Commission Analysis and Conclusion portions of this Order are supported by the evidence in the record and are hereby adopted as findings of fact and conclusions of law;

(4) the testimony and exhibits admitted into the record provide substantial evidence that Ameren Illinois Company d/b/a Ameren Illinois' Voltage Optimization Plan, as modified by the terms of the Stipulation, meets the requirements of Section 8-103B(b-20) of the Act;

(5) the VO Plan, as modified by the Stipulation filed as Ameren Exhibit 3.2 shall be approved and adopted;

(6) the proposed adjustments set forth in the Table 1 of this Final Order to the unmodified and modified goals set by the Commission pursuant to Section 8-103B in Docket No. 17-0311 shall be approved; and

(7) within 60 days of the date of this Final Order, the Company is directed to make a compliance filing in Docket No. 17-0311 identifying the revised unmodified and modified savings goals in Docket No. 17-0311, as required by Section 8-103B(b-20) of the Act.

IT IS THEREFORE ORDERED that the verified Petition filed by Ameren Illinois Company d/b/a Ameren Illinois requesting approval of its Voltage Optimization Plan, as modified by the terms of the Stipulation, is hereby approved.

IT IS FURTHER ORDERED that the VO Plan, as modified by the terms of the Stipulation filed as Ameren Exhibit 3.2, is hereby approved.

IT IS FURTHER ORDERED that Ameren Illinois Company d/b/a Ameren Illinois is authorized to and directed to file a compliance filing in Docket No. 17-0311 setting forth the savings adjustments to the unmodified savings goals and modified savings goals approved in that docket as required by Section 8-103B(b-20) of the Act.

IT IS FURTHER ORDERED that any objections, motions, or petitions filed in this proceeding that remain unresolved should be disposed of in a manner consistent with the ultimate conclusions contained in this Order.

IT IS FURTHER ORDERED that pursuant to Section 10-113(a) of the Public Utilities Act and 83 Ill. Adm. Code 200.880, any application for rehearing shall be filed within 30 days after service of the Order on the party.

IT IS FURTHER ORDERED that, subject to the provisions of Section 10-113 of the Act and 83 Ill. Adm. Code 200.880, this Order is final; it is not subject to the Administrative Review Law.

By Order of the Commission this 7th day of May, 2018.

(SIGNED) BRIEN SHEAHAN

Chairman

2021 Federal Poverty Levels (US 48 States, minus Hawaii and Alaska)

Family Size	25%	50%	75%	100% (SNAP net)	125%	130% (SNAP gross)	135% (LIHEAP)	150% (Keeping Current)	200% (WAP) (Keeping Current COVID)	250% (Keeping Cool COVID)
1	$3,220	$6,440	$9,660	$12,880	$16,100	$16,744	$17,388	$19,320	$25,760	$32,200
2	$4,355	$8,710	$13,065	$17,420	$21,775	$22,646	$23,517	$26,130	$34,840	$43,550
3	$5,490	$10,980	$16,470	$21,960	$27,450	$28,548	$29,646	$32,940	$43,920	$54,900
4	$6,625	$13,250	$19,875	$26,500	$33,125	$34,450	$35,775	$39,750	$53,000	$66,250
5	$7,760	$15,520	$23,280	$31,040	$38,800	$40,352	$41,904	$46,560	$62,080	$77,600
6	$8,895	$17,790	$26,685	$35,580	$44,475	$46,254	$48,033	$53,370	$71,160	$88,950
7	$10,030	$20,060	$30,090	$40,120	$50,150	$52,156	$54,162	$60,180	$80,240	$100,300
8	$11,165	$22,330	$33,495	$44,660	$55,825	$58,058	$60,291	$66,990	$89,320	$111,650

The Supplemental Nutrition Assistance Program (SNAP) is the largest federal nutrition assistance program. SNAP provides benefits to eligible low-income individuals and families via an Electronic Benefits Transfer card. This card can be used like a debit card to purchase eligible food in authorized retail food stores.

- Gross income means a household's total, non-excluded income, before any deductions have been made.
- Net income means gross income minus allowable deductions.

The Low Income Home Energy Assistance Program (LIHEAP) assists eligible low-income households with their heating and cooling energy costs, bill payment assistance, energy crisis assistance, weatherization and energy-related home repairs.

The Weatherization Assistance Program (WAP) reduces energy costs for low-income households by increasing the energy efficiency of their homes, while ensuring health and safety. WAP is part of the Weatherization and Intergovernmental Programs Office and supports DOE's objectives to lower energy bills while expanding cost-effective energy choices for all American communities.

Applied Public Policy Research

APPRISE

Institute for Study and Evaluation

Ameren Keeping Current Program
Bill Payment Assistance Design Study
Final Report

November 2020

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Executive Summary

Ameren Missouri introduced the Keeping Current Program in October 2010. The energy assistance program has two components – the Keeping Current year-round program and the Keeping Cooling summer assistance program. The Keeping Current Program provides monthly bill credits and arrearage reduction for customers who continue to make monthly bill payments. The Keeping Cooling Program provides bill credits in the summer months, primarily June, July, and August to offset the costs of air conditioning usage.

APPRISE has conducted four process and impact evaluations of the Keeping Current and Keeping Cooling programs. These evaluations assessed program design, implementation, participation, retention, and impacts; and made recommendations for program improvements. The evaluations found that the program has been successful in enrolling low-income households, improving energy affordability, improving participants' bill payment regularity and coverage rates, and reducing collections actions. The evaluations made recommendations for program refinements that Ameren implemented and that resulted in improved outcomes for the participants. This report presents the results from a program design review requested by stakeholders to assess whether alternative program designs could lead to improved outcomes.

Design Study

The following research activities were conducted.

- Needs Assessment: We analyzed the number and characteristics of customers potentially eligible for Keeping Current within Ameren's service territory under various assumptions about eligibility criteria.

- Goal Setting: We assessed potential goals for bill payment assistance programs. There are many different goals that can conflict with one another, so the program should acknowledge how these goals are incorporated and prioritized.

- Parameter Selection: We reviewed program parameters that can impact the success of Keeping Current and that have been implemented by other low-income bill payment assistance programs around the country.

- Outcomes: We analyzed the outcomes of other bill payment assistance programs that have been evaluated.

- Best Practices: We assessed the best practices for low-income energy bill payment assistance programs based on the other research in this study.

- Recommendations: We offer guidance for Ameren's Keeping Current Program based upon a synthesis of this study's findings, stakeholder feedback, and the current and expected economic impact of the Coronavirus.

Needs Assessment

This section provides an analysis of the characteristics of customers in Ameren Missouri's electric service territory who had income at various poverty levels. Key findings from the analysis are summarized below.

- *Service Type*: The majority of households in Ameren's service territory had non-electric heating service. Non-electric heating was especially prevalent among low-income households in the St. Louis area, northeast Missouri, and St. Charles. Electric heating customers were more likely to have income at lower poverty levels.

- *Households at or Below Indicated Poverty Levels*: Ten percent of the households in Ameren Missouri's service territory had income at or below the poverty level and 17 percent had income at or below 150 percent of the poverty level. If Keeping Current eligibility was expanded to 250 percent of the poverty level, 34 percent of Ameren's customers would be income eligible.

  Households at or below 150 percent of the poverty level were more heavily concentrated in the southeast part of Ameren's service territory, the city of St. Louis, and northeast Missouri.

- *Vulnerable Households*: Thirty-six percent of households at or below 150 percent of the poverty level had a child under 18, 31 percent had a household member over 62, and 39 percent had a disabled household member. These vulnerable households may have the greatest need for bill assistance.

- *Language*: Approximately eight percent of low-income households spoke a language other than English, and approximately three percent spoke Spanish. Spanish-speaking households were most heavily concentrated in the southeast part of Ameren's territory. Households that spoke languages other than English and Spanish were most heavily concentrated in the St. Louis area, Boone, and St. Charles. These are the areas where multilingual outreach is most needed.

- *Energy Burden*: The mean energy burden ranged from four percent for households between 250 and 300 percent of the poverty level to 19 percent for households at or below 100 percent of the poverty level. The mean energy burden was consistently higher for electric heating households.

- *Keeping Current Participation*: Only 1.2 percent of households at or below 150 percent of the poverty level participated in Ameren's Keeping Current or Keeping Cooling Programs.

  However, the Keeping Current program is targeted to those households who agencies feel will be able to make their monthly payments, remain on the program, and receive arrearage forgiveness, so this is only a subset of the income-eligible population.

If eligibility was increased to 250 percent of the Federal Poverty Level (FPL) and households participated at the same rate as the currently eligible participate, expected participation would be 1.2 percent of 368,418 households or 4,421 households. However, the number of households at these poverty levels has probably increased due to the economic downturn.

Goal Setting

This section assesses potential goals for bill payment assistance programs. Key information on potential goals for utility bill payment assistance programs is summarized below.

- *Participation*: Given a set or limited budget, the program may prioritize affordability, with fewer participants; participation rates, with lower benefit levels; or a balance between these two goals.

- *Retention*: Goals for program retention may include enrollment for a specified duration, until pre-program arrearages are removed, until customers can afford the full bill, or as long as customers are eligible for the program.

- *Energy Burden*: Programs may aim for a fixed benefit level, potentially varying by income or poverty level; a fixed post-benefit energy burden for all participants; or a post-benefit energy burden that varies by poverty level.

- *Equity*: Goals for equity may relate to equal benefits or equal post-benefit energy burdens.

- *Arrearages*: Some programs focus on the current bill and others also aim to eliminate arrearages that were developed prior to program participation.

- *Other Needs*: Some programs focus strictly on the energy bill, others provide referrals with a goal of increasing the affordability of other household expenses, and others provide energy efficiency services or repair referral services to improve the home condition and energy efficiency.

- *Incentives*: Programs sometimes design benefits with the goal of improving bill payment compliance or stabilizing or reducing energy usage.

- *Other Benefits*: Programs may have goals for other benefit receipt including LIHEAP, the Weatherization Assistance Program (WAP), or other needed services or assistance.

Parameter Selection

APPRISE conducted a program design review to characterize the parameters of bill payment assistance programs around the country. Key findings from the review are summarized below.

- *Administration and Enrollment*: Customer intake for the bill payment assistance programs is conducted by many different organizations, including local agencies, state government departments, community-based organizations, contractors, and utility companies.

  Intake for these programs is often conducted by local community agencies. These agencies interact with the low-income households on other program benefits and have often already developed a trusted relationship with the client.

- *Budget*: Most of the programs are funded by ratepayers, but there are significant differences between the programs in terms of the budget, number of customers served, and benefit levels. These differences will impact the type of administration that is needed for the program.

  The annual budget ranges from $37,769 for a small utility program to $220.8 million for a statewide electric program. The mean budget is $38 million. The number of households served ranges from 180 to 359,655 households with a mean of 55,588. The average annual benefit ranges from $72 to $1,206 with a mean of $600 and can depend on the customer's fuel type.

- *Outreach*: The programs use a variety of outreach methods to spread awareness to potential clients. These methods include utility bill inserts; mailings to targeted groups; partnering with local agencies; and providing information at community events, on the company's website, through company representatives, or the United Way. The most common outreach methods are postings on the company website and partnering with local agencies.

- *Intake*: Customers can submit their application in-person, via email, mail, online, telephone, and other methods, such as fax. The most common intake method is in-person, with 18 programs that use this method, followed by mail, with 13 programs that use this method. Online application is becoming more common and participants are more frequently requesting this option if it is not available.

- *Income Eligibility*: Nineteen programs determine eligibility based on percent of the Federal Poverty Level (FPL), two use percent of the State Median Income (SMI), and others base eligibility on household income, energy usage, or LIHEAP eligibility. The FPL values range from 125 to 200 percent, and the most common is 150 percent of the FPL.

- *Other Eligibility Requirements*: Some programs require customers to be payment-troubled, enroll in budget billing, enroll in LIHEAP, and/or receive weatherization