KCP&L GREATER MISSOURI OPERATIONS COMPANY

DEMAND-SIDE RESOURCE ANALYSIS

INTEGRATED RESOURCE PLAN

4 CSR 240-22.050

JUNE, 2017

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VOLUME 5: DEMAND-SIDE RESOURCE ANALYSIS

HIGHLIGHTS

Great Plains Energy (GPE) completed its Demand-Side Management (DSM) Potential Study in April 2017, which included:

- Primary market research of the residential and non-residential sectors
- Four levels of measure-level potential for 2019-2037: technical potential, economic potential, realistic achievable potential (RAP) and maximum achievable potential (MAP) energy efficiency potential
- Demand response and demand side rate potential
- Combined heat and power (CHP) potential
- Four scenarios of program-level potential

INTRODUCTION

GPE engaged Applied Energy Group (AEG) to conduct a 2016 Demand Side Management (DSM) Potential Study in November 2015. The DSM study encompassed the KCP&L-MO, KCP&L-KS, and KCP&L-Greater Missouri Operations (GMO) service territories and was delivered to GPE in April 2017 and included both a RAP and a MAP level of DSM, as defined in the IRP Rules. This Potential Study was used as the basis for the scenarios evaluated in this integrated analysis.

PURPOSE: *This rule specifies the principles by which potential demand-side resource options shall be developed and analyzed for cost effectiveness, with the goal of achieving all cost-effective demand-side savings. It also requires the selection of demand-side candidate resource options that are passed on to integrated resource analysis in 4 CSR 240-22.060 and an assessment of their maximum achievable potentials, technical potentials, and realistic achievable potentials.*

SECTION 1: POTENTIAL DEMAND-SIDE RESOURCES

(1) ***The utility shall identify a set of potential demand-side resources from which demand-side candidate resource options will be identified for the purposes of developing the alternative resource plans required by 4 CSR 240-22.060(3). A potential demand-side resource consists of a demand-side program designed to deliver one (1) or more energy efficiency and energy management measures or a demand-side rate. The utility shall select the set of potential demand-side resources and describe and document its selection —***

1.1 DESCRIBE AND DOCUMENT SELECTIONS

(A) To provide broad coverage of —

1.1.1 MARKET SEGMENTS COVERAGE

1. Appropriate market segments within each major class; —

(B) AEG identified GPE's market segments by categorizing billing and customer data, residential and non-residential customer surveys, and secondary sources to allocate energy use and customers to the various sectors and segments such that the total customer count, energy consumption, and peak demand matched the KCP&L system totals from the 2015 billing data. The market segments included:

- Residential: Single Family, Single Family Low-Income, Multi-family, Multi-family Low-Income
- Commercial: Small Office, Large Office, Restaurant, Retail, Grocery, College, School, Healthcare, Lodging, Warehouse, Data Center, Miscellaneous
- Industrial: Food Production, Chemicals & Pharmaceuticals, Transportation Equipment, Electronic Equipment, Stone-clay-and-glass, Primary Metals, Rubber & Plastics, Other Industrial

The total number of households and residential electricity sales for the service territory were obtained from GMO's customer database. AEG adjusted the number of

customers and usage in each segment based on GMO's billing data and all reported residential energy sales in 2015.[1]

Table 1: GMO Residential Sector Control Totals

Segment	Households	Electricity Sales (GWh)	Avg. Use / Household (kWh)	Summer Peak Demand (MW)	Winter Peak Demand (MW)
GMO-MPS - Single Family	138,198	1,942	14,053	613	465
GMO-MPS - Multifamily	14,845	95	6,420	23	27
GMO-MPS - Single Family LI	43,406	493	11,359	155	121
GMO-MPS - Multifamily LI	24,607	135	5,480	32	40
GMO-SJLP - Single Family	30,475	442	14,505	131	111
GMO-SJLP - Multifamily	6,946	64	9,284	13	19
GMO-SJLP - Single Family LI	14,802	162	10,916	52	39
GMO-SJLP - Multifamily LI	5,461	38	7,019	8	11

The commercial and industrial sectors were developed for Great Plains Energy's (GPE) entire service territory, including KCP&L, KCP&L-KS, and GMO. With fewer survey completions than the residential sector and less anticipated heterogeneity among customers, AEG modeled the non-residential customers as a whole and made territory-specific calculations using pro-rata shares.

[1] Low income customers were identified through our market research surveys as those respondents with an annual household income of $30,000 or less. This is based on the eligibility for KCP&L's current Income-Eligible Weatherization Program, which is about 200% of the Federal Poverty Income Guideline for a family of two.

Table 2: Commercial Control Totals (KCP&L-Total)

Segment	Electricity Sales (GWh)	% of Total Usage	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Small Office	778	8.9%	102	143
Large Office	488	5.6%	64	76
Restaurant	576	6.6%	80	81
Retail	638	7.3%	105	96
Grocery	470	5.4%	60	49
School	842	9.6%	297	92
College	646	7.4%	116	110
Healthcare	1,138	13.0%	132	239
Lodging	298	3.4%	30	36
Data Center	1,103	12.6%	160	152
Warehouse	529	6.0%	216	73
Miscellaneous	1,253	14.3%	218	238

Table 3: Industrial Control Totals (KCP&L-Total)

Segment	Electricity Sales (GWh)	% of Total Usage	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Food Production	894	17%	128	146
Chemicals & Pharmaceuticals	755	14%	106	122
Transportation Equipment	498	10%	120	70
Electronic Equipment	484	9%	120	73
Stone, clay, glass	428	8%	57	70
Primary Metals	405	8%	48	68
Rubber & Plastics	262	5%	41	42
Other Industrial	1,482	28%	318	231

1.1.2 DECISION-MAKER COVERAGE

1. All significant decision-makers, including at least those who choose building design features and thermal integrity levels, equipment and appliance efficiency levels, and utilization levels of the energy-using capital stock; and —

GMO staff meets regularly with customer groups, architects, engineers, trade representatives, contractors, distributors, public agency staff and others to discuss energy usage issues, discuss energy efficiency and demand response programs, and elicit feedback and suggestions. Additionally, KCP&L promotes demand side

programs through awareness marketing in local trade publications, online channels and community events.

AEG provided a broad range of stakeholders opportunities to review and comment on the potential study methodologies, survey instruments and findings. The stakeholders included the Missouri Public Service Commission, Missouri Office of Public Counsel, Missouri Division of Energy, National Resources Defense Council, and Renew Missouri.

1.1.3 MAJOR END USES COVERAGE

2. All major end uses, including at least the end uses which are to be considered in the utility's load analysis as listed in 4 CSR 240-22.030(4)(A)1.; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG developed a comprehensive list of conventional and emerging technologies considering all customer sectors and end uses. The major end uses by sector include:

- Residential: cooling, heating, water heating, interior lighting, exterior lighting, appliances, electronics and miscellaneous
- Commercial: cooling, heating, ventilation, water heating, interior lighting, exterior lighting, refrigeration, food preparation, office equipment and miscellaneous
- Industrial: cooling, heating, ventilation, interior lighting, exterior lighting, motors, process, and miscellaneous

1.2 DESIGNING EFFECTIVE POTENTIAL DEMAND-SIDE PROGRAMS

(C) To fulfill the goal of achieving all cost effective demand-side savings, the utility shall design highly effective potential demand-side programs consistent with subsection (1)(A) that broadly cover the full spectrum of cost-effective end-use measures for all customer market segments; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG developed DSM programs by grouping market segments and end-use measures into programs.

Table 4: Summary of Residential DSM Programs

Residential Programs	High-Level Description
Home Lighting Rebate	Instant incentives at qualifying retailers for standard and specialty LEDs.
Home Energy Report	Behavioral program utilizing customized energy reports with peer comparisons sent periodically to households to encourage energy efficient behaviors.
Income-Eligible Home Energy Report	Behavioral program utilizing customized energy reports with peer comparisons sent periodically to households to encourage energy efficient behaviors. Targets low-income customer segment.
Online Home Energy Audit	Online energy audit tool.
Whole House Efficiency	A holistic program that aims at increasing efficiency across multiple systems in a customer's home, with measures that affect all end uses and building shell.
Income-Eligible Multi-Family	The program aims to provide direct install measures in housing units and common area measures to multi-family buildings, targeting low-income customers.
Income-Eligible Weatherization	The program leverages the Missouri Weatherization Assistance Program to provide qualifying customers with approved energy efficiency measures and equipment. Targets low-income customers and provides fully subsidized measures.
Residential Smart Thermostat with DLC	Direct load control program that modifies heating and cooling temperature settings and curtails HVAC equipment by way of a smart, communicating thermostat. Targets peak demand reductions during DR events, but also has energy savings from occupancy sensors and schedules with learning algorithms.
Central Air Conditioner DLC Switch	Direct load control program that cycles and curtails central air conditioners by way of a remote-controlled switch to provide peak demand reductions during DR events.
Water Heating DLC Switch	Direct load control program that cycles and curtails electric water heaters by way of a remote-controlled switch to provide peak demand reductions during DR events.

Table 5: Summary of Business DSM Programs

Business Programs	High-Level Description and Notes
Business Energy Efficiency Rebate - Standard	Customers receive incentives by installing efficient measures from a pre-qualified list of options.
Business Energy Efficiency Rebates - Custom	Customers receive incentives for installing efficient measures not explicitly identified in the Standard program. The measures are pre-approved by the implementer through an application and review process prior to installation. Incentives are paid based on a dollar per unit of energy saved basis.
Strategic Energy Management	Provide energy education, technical assistance, and coaching for commercial and industrial customers in order to drive behavioral change and transformation of the company culture.
Retrocommissioning	Initial or ongoing monitoring of building energy systems and operations to optimize energy use, focusing at least initially on low-cost or no-cost measures and actions.
Block Bidding	The utility purchases large blocks of electricity savings by issuing an RFP to eligible customers and third-party suppliers, representing reduced electric usage from non-conventional projects that may not be eligible or appropriately incentivized to participate in other programs.
Online Business Energy Audit	Online energy audit tool.
Small Business Targeted	Small business customers that typically do not have the staffing or financial resources to engage in energy efficiency receive targeted marketing and incentives up to 70% of the installed equipment cost for qualifying measures.
Business Smart Thermostat with DLC	Direct load control program that modifies heating and cooling temperature settings and curtails HVAC equipment by way of a smart, communicating thermostat. Targets peak demand reductions during DR events, but also has energy savings from occupancy sensors and schedules with learning algorithms.
Demand Response Incentive	Interruptible tariff program for customers that can reduce load by at least 25 kW during times of system peak congestion.

The following tables include detailed program descriptions (see also AEG's *Kansas City Power & Light 2016 DSM Potential Study* report).

Table 6: Home Lighting Rebate

Description	The program incentivizes the purchase and installation of efficient lighting utilizing an upstream strategy to provide customers incentives on qualifying LED light bulbs at participating retailers. Customers receive an instant incentive at the point-of-purchase. The incentives vary depending upon the type of light bulb, manufacturer and associated retail cost.
Objectives	Increase the penetration of efficient lighting in customer homes by incentivizing the purchase of ENERGY STAR® qualified LEDs.
Target Market	Residential customers as well as lighting manufacturers and local retailers.
Implementation Strategy	GMO will engage a third-party implementation contractor to efficiently obtain the energy savings goals while adhering to the budget. The implementation contractor will: • Establish relationships with lighting manufacturers and retailers throughout GMO's service territory. • Provide in-store promotional materials and retail sales staff training. • Track program performance, including tracking sales data, reviewing sales data for accuracy and payment to retailers. • Periodically report progress towards program goals and opportunities for improvement. GMO will work with the implementation contractor to market the program to customers and educate retailer sales staff. Marketing efforts to increase customer awareness may include, but not be limited to bill inserts, newspaper advertisements, internet placement, and Point-of-Purchase materials (hang tags, posters). The Home Lighting Rebate Program will be cross-marketed with GMO's other Residential DSM programs and be used to increase awareness of GMO DSM rebates.
Risk Management	Upstream programs simplify the participation process for residential customers, eliminating the need to complete and submit a rebate application. However, upstream programs typically have higher free ridership and leakage outside of the service territory. A number of steps will be taken to reduce free ridership and leakage while increasing spillover, including: • GMO will work with the implementation contractor to select retailers located well within the service territory to reduce leakage outside of the service territory. • The program will be cross-marketed with GMO's other Residential DSM programs (e.g. bill inserts will promote multiple programs). • Incentives will be modified as needed to respond to the market price of qualifying light bulbs, with a goal of the incentive being no higher than 50% of the incremental cost. • GMO will work with the implementation contractor and third party evaluator to understand any market transformation elements that arise from this upstream program. Another potential risk management issue is the onset of the federal lighting standard starting January 1, 2020, which will raise the minimum efficacy requirements of general service screw-in lamps from approximately 17 lumens per watt to 45 lumens per watt. This will change savings per lamp and change program cost-effectiveness. AEG and GMO have included projections that account for these changes, appropriately adjust incentives, and maintain cost effectiveness, but program staff will monitor market data and make adjustments as appropriate.
Measures	The measures may be modified to reflect market conditions. Eligible measures include standard LEDs and specialty LEDs.

Table 7: Home Energy Report

Description	The program provides individualized energy use information to customers while simultaneously offering recommendations on how to save energy and money by making small changes to energy consuming behaviors. Energy reports are sent periodically to customer households to give them self-awareness and a peer comparison of their energy usage. Customers are also provided access to an online tool to track energy consumption and receive tips to reduce usage. Social competitiveness increases behavior to reduce energy consumption.
Objectives	Reduce consumption via socially- and information-driven behavioral change and raise general awareness of energy efficiency and GMO's DSM programs.
Target Market	Residential single family homes.
Implementation Strategy	GMO will select an implementation contractor that specializes in developing and issuing residential energy reports. The implementation contractor will utilize experimental design to select report recipients and a control group, design the reports and develop customized energy reduction tips with input from GMO. The program will cross-promote and market the GMO DSM portfolio.
Risk Management	Potential issues/risks to be aware of: • The program may undergo a meaningful change in customer responsiveness and evaluation paradigms in the coming years. • Research is being conducted on the persistence of savings after the program has ended. The program has been assumed to have a one year measure life and therefore has a relatively high-cost of energy savings on a lifetime or levelized cost basis. • Customer attrition may reduce the potential achievable program savings. The implementation contractor may account for customer attrition by adding new customers each year during designated periods. The program provides a significant opportunity to promote GMO's Residential DSM programs via the customer reports and online tool, thereby resulting in increased program spillover. However, the spillover impact will need to be carefully determined through an impact evaluation.
Measures	Customers receive personalized energy reports, but there is no monetary incentive.

Table 8: Income Eligible Home Energy Report

Description	The program provides individualized energy use information to income-eligible customers while simultaneously offering recommendations on how to save energy and money by making small changes to energy consuming behaviors. Energy reports are sent periodically to customer households to give them self-awareness and a peer comparison of their energy usage. Customers are also provided access to an online tool to track energy consumption and offer tips to reduce usage. Social competitiveness increases behavior to reduce energy consumption.
Objectives	Reduce consumption via socially- and information-driven behavioral change and raise general awareness of energy efficiency and GMO's DSM programs.
Target Market	Income-eligible residential homeowners and renters that are below 200% of the Federal poverty level.
Implementation Strategy	GMO will select an implementation contractor that specializes in developing and issuing residential energy reports. The implementation contractor will utilize experimental design to select report recipients and a control group, design the reports and develop customized energy reduction tips with input from GMO. The program will cross-promote and market the GMO DSM portfolio.
Risk Management	Potential issues/risks to be aware of: • The program may undergo a meaningful change in customer responsiveness and evaluation paradigms in the coming years. • Research is being conducted on the persistence of savings after the program has ended. The program has been assumed to have a one year measure life and therefore has a relatively high-cost of energy savings on a lifetime or levelized cost basis. • Customer attrition may reduce the potential achievable program savings. The implementation contractor may account for customer attrition by adding new customers each year during designated periods. The program provides a significant opportunity to promote GMO's Residential DSM programs via the customer reports and online tool, thereby resulting in increased program spillover. However, the spillover impact will need to be carefully determined through an impact evaluation.
Measures	Customers receive personalized energy reports, but there is no monetary incentive.

Table 9: Online Home Energy Audit

Description	The program provides customers access to a free online tool to analyze the energy efficiency of their home, educational materials regarding energy efficiency and conservation, and information on GMO DSM programs.
Objectives	Encourage energy education and conservation, as well as further engagement in the broader portfolio of DSM programs. The program goals include: • Increase awareness of household energy consumption. • Educate residential customers about the benefits of energy efficiency and the opportunities to reduce energy consumption. • Increase awareness of and participation in other GMO DSM programs.
Target Market	Residential customers.
Implementation Strategy	GMO will engage a third-party contractor to develop and maintain the online tool(s).
Risk Management	The Online Home Energy Audit Program is an educational program that informs customers of household energy consumption and methods to reduce energy usage. GMO will strategize ways to highlight the audit tool on the GMO website and increase customer engagement.
Measures	There are no monetary incentives.

Table 10: Whole House Efficiency

<table>
<tr><td>Description</td><td>The program is a holistic program that aims at increasing efficiency across multiple systems in a customer's home, with measures that affect all end uses and building shell. It consists of 3 optional tiers:
Home Energy Assessment. The customer receives an in-home energy assessment and direct installation of low-cost measures. The assessment will identify potential efficiency improvements. The low-cost measures to be installed include: low-flow faucet aerator, low-flow showerhead, advanced power strip, water heater tank wrap, hot water pipe insulation, furnace filter whistle and LEDs.
Weatherization. Customers are eligible to receive incentives for the purchase and installation of air sealing, duct repair and sealing, and insulation (ceiling, wall, radiant barrier).
Equipment Rebates. Customers are eligible to receive incentives for qualifying HVAC equipment installed by a participating contractor. Qualifying measures include heat pump water heaters, heat pump ductless mini splits, central air conditioners and heat pumps. Early retirement incentives are provided for central air conditioners and/or heat pumps in operable condition and at least 5 years of age.
Customers that install items from multiple tiers will be provided a bonus incentive per the chart.
<table>
<tr><th>Requirements</th><th>Bonus Incentive</th></tr>
<tr><td>Weatherization & Equipment measure</td><td>$225</td></tr>
<tr><td>Assessment + Weatherization measure + Equipment measure</td><td>$300</td></tr>
</table>
Residential customers that rent a residence must receive the written approval of the homeowner/landlord to participate in the program.</td></tr>
<tr><td>Objectives</td><td>Encourage whole-house improvements to existing homes by promoting home energy assessments and comprehensive retrofit services. This includes:
Encourage energy saving behavior and whole house improvements.
Help residential customers reduce their electricity bills.
Educate customers about the benefits of installing high efficiency equipment.
Develop partnerships with contractors to bring efficient systems to market.</td></tr>
<tr><td>Target Market</td><td>Residential customers that own/rent a residence or are building a new residence as well as HVAC contractors for trade ally participation.</td></tr>
<tr><td>Implementation Strategy</td><td>GMO will engage a third-party implementation contractor to efficiently obtain the savings goals while adhering to the budget. The implementation contractor will:
Hire/sub-contract local staff to perform home assessments and direct measure installation.
Engage customers and schedule home assessment appointments.
Provide customer service and trade ally support.
Establish relationships with local contractors to work with the program installing energy efficient equipment and infiltration measures.
Process rebate applications, including review and verification of applications and payment of customer rebates.
Track program performance, including customer and contractor participation as well as quality assurance/quality control (QA/QC).
Periodically report progress towards program goals.
GMO will work with the implementation contractor to market the program to residential customers and contractors utilizing the following approaches:
Direct outreach to customers, including bill inserts, newspaper advertisements, email blasts, direct mail, bill messaging, and community events.</td></tr>
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<table>
<tr><td></td><td>

Engage contractors to promote the program and use rebates to help sell qualifying equipment.
Cross-market with GMO's other Residential DSM programs.

</td></tr>
<tr><td>Risk Management</td><td>
It is important that the measures are properly installed and customer satisfaction is high. Therefore, it is crucial to engage experienced contractors. It is recommended that contractors provide GMO with proof of insurance on an annual basis. GMO and/or the implementation contractor should conduct QA/QC of a random group of completed projects by project type and contractor. The QA/QC process should include verification of the equipment installed and customer satisfaction with the contractor and the program. GMO and/or the implementation contractor should work with the contractors to correct any QA/QC findings. If QA/QC issues persist, the contractor may be removed from the program.
A number of steps will be taken to reduce free ridership and increase spillover, including:

Incentives will be modified as needed to respond to the market price of qualifying measures, with a goal of the incentive being no higher than 50% of the incremental cost.
GMO will work with the implementation contractor to properly set the rebate levels to ensure customers have adequate buy-in to the program.
Cross-market the program with GMO's other Residential DSM programs.
Encourage customers to participate in all three tiers.

</td></tr>
<tr><td>Measures</td><td>
The measures may be modified to reflect market conditions.
<table>
<tr><th>Kit Measures</th></tr>
<tr><td>Low-flow faucet aerator</td></tr>
<tr><td>Low-flow showerhead</td></tr>
<tr><td>Advanced power strip</td></tr>
<tr><td>Water heater tank wrap</td></tr>
<tr><td>Hot water pipe insulation</td></tr>
<tr><td>LED lamps</td></tr>
<tr><td>Furnace filter whistle</td></tr>
</table>
<table>
<tr><th>Weatherization Measures</th></tr>
<tr><td>Air Sealing</td></tr>
<tr><td>Ceiling Insulation, R-38</td></tr>
<tr><td>Wall Insulation, R-5</td></tr>
<tr><td>Radiant Barrier Insulation</td></tr>
<tr><td>Duct Repair and Sealing</td></tr>
</table>
<table>
<tr><th>Equipment Rebate Measures</th><th>Replace/ New</th><th>Early Retirement Option</th><th>Distinct option for Replacing Electric Resistance Heat</th></tr>
<tr><td>Heat Pump Water Heater</td><td>X</td><td>n/a</td><td>n/a</td></tr>
<tr><td>Heat Pump Ductless Mini-Split</td><td>X</td><td>n/a</td><td>n/a</td></tr>
<tr><td>SEER ≥15 Central Air Conditioner</td><td>X</td><td>X</td><td>n/a</td></tr>
<tr><td>SEER ≥16 Central Air Conditioner</td><td>X</td><td>X</td><td>n/a</td></tr>
<tr><td>SEER ≥17 Central Air Conditioner</td><td>X</td><td>X</td><td>n/a</td></tr>
<tr><td>SEER ≥15, HSPF ≥8.5 Heat Pump</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>SEER ≥16, HSPF ≥8.5 Heat Pump</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>SEER ≥17, HSPF ≥8.6 Heat Pump</td><td>X</td><td>X</td><td>X</td></tr>
</table>
</td></tr>
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Table 11: Income-Eligible Multi-Family

Description	The program aims to provide direct install measures in housing units and common area measures to multi-family buildings. This includes the following characteristics: ***Multi-Family Kits.*** Direct installation of low-cost measures for income-eligible homeowners and renters in multi-family housing, at no cost to the participant. The low-cost measures to be installed include: low-flow faucet aerator, low-flow showerhead, advanced power strip, water heater tank wrap, hot water pipe insulation and LEDs. ***Multi-Family Common Areas.*** Installation of prescriptive lighting measures in multi-family common areas, at no cost to the participating building owner, and custom measure rebates at $/kWh saved.
Objectives	Deliver long-term energy savings and bill reductions to income-eligible customers in multi-family housing and multi-family common area energy savings.
Target Market	Income-eligible residential homeowners and renters that are below 200% of the Federal poverty level and reside in multi-family housing as well as multi-family buildings with income-eligible residents.
Implementation Strategy	GMO will engage a third-party implementation contractor to: • Identify and establish relationships with multi-family building owners that have a number of income-eligible residents. • Engage customers and schedule appointments. • Track program performance. • Periodically report progress towards program goals. GMO will work with the implementation contractor to market the program to income-eligible customers and multi-family building owners utilizing the following approaches: • Direct outreach to customers, including bill inserts, direct mail, bill messaging, community events and community organizations. • Engage building owners to promote awareness of and use of the program. The implementation contractor framework could include providing owners of multi-family buildings with a single point of contact or Coordinator for in-unit and common area/building system measures. The Coordinator's duties could include: • Determining eligibility and ensuring eligible customers are aware of the available incentives from all utilities. • Assisting in the application process for the residential and business improvements. In addition, where other utilities are participating, assisting with those applications. • Providing a seamless point of contact for navigating the various incentive offers provided by the Company and other utilities. • Maintaining a relationship with the existing business trade ally network and providing information and guidance to assist them with the bid process for installation work. • Understanding and maintaining a network of assistance agencies and making referrals for financing and repairs, seeking to remove barriers to participation. • Providing case studies and education, and working with business development teams to ensure proper outreach is occurring. • Coordinating marketing materials to provide an easy to understand process for participation. • Maintaining working relationships with and providing outreach and education to stakeholders such as lenders, government agencies, and other identified parties. The program targets an underserved market that may not participate in other DSM programs due to a lack of funds or awareness. The program will encourage building managers and owners to continue improving building energy efficiency via the Business DSM Programs.

Risk Management	The program focuses on providing energy efficiency services to income-eligible residents to ensure reduced consumption. There is little risk associated with this product.
Measures	The multi-family unit kits and common area lighting measures are installed free of charge. The kits include: low-flow faucet aerator, low-flow showerhead, advanced power strip, water heater tank wrap, hot water pipe insulation and LEDs. Custom common area incentives at a $/kWh saved.

Table 12: Income-Eligible Weatherization

Description	The program leverages the Weatherization Assistance Program to provide qualifying customers with approved energy efficiency measures and equipment.
Objectives	Deliver long-term energy savings and bill reductions to income-eligible customers.
Target Market	Income-eligible residential homeowners and renters that are below 200% of the Federal poverty level.
Implementation Strategy	GMO will work with local Weatherization Assistance Program agencies to implement the program. The agencies will utilize the GMO funding to provide weatherization to additional homes and will be responsible for the following activities: • Market the program and engage customers. • Schedule appointments. • Install measures. • Track program performance. • Periodically report progress towards program goals. The program targets an underserved market that may not participate in other DSM programs due a lack of funds.
Risk Management	The program focuses on providing energy efficiency services to income-eligible residents to ensure reduced consumption. There is little risk associated with this product.
Measures	Measures include those that are approved through the Weatherization Assistance Program, including, but not limited to:

Eligible Measures
LED Bulbs
Ceiling Insulation
Duct Insulation
Wall Insulation
Duct Repair and Sealing
Foundation Insulation
Air Sealing
Water Heater Pipe Insulation
Heat Pump Maintenance and Tune-Up
SEER ≥15, HSPF ≥8.5 Heat Pump
SEER ≥15, HSPF ≥8.5 Heat Pump Early Retirement

Table 13: Residential Smart Thermostat with Direct Load Control

Description	The program pays an incentive to participants to reduce peak demand by controlling their cooling equipment during periods of system peak demand and when there may be delivery constraints within certain load zones. This is done by way of a remotely communicating, programmable thermostat. During a program event, the program operations center sends a signal to the thermostat to adjust its set-point by a few degrees such that the system will consume less energy and run less frequently throughout the max 4-hour event duration. One method of participation will be for customers to receive the thermostat and professional installation for free upon qualification and enrollment in the program. Smart thermostats also achieve energy savings by using occupancy sensors and setback schedules with learning algorithms.
Objectives	Primarily decrease peak demand usage to provide system and grid relief during particularly high-load, high-congestion peak hours. Also provide annual energy savings.
Target Market	Individually metered residential customers. Target primarily single family homeowners, expanding into multi-family as the single family market opportunities begin to saturate.
Implementation Strategy	GMO will engage a third-party implementation contractor to: • Hire/sub-contract local staff to install the programmable thermostats. • Engage customers, schedule installation appointments and process customer incentives. • Provide customer service support. • Track program performance and event data. • Periodically report progress towards program goals and opportunities for improvement. Events will typically occur between June 1 and September 30, Monday to Friday. Event duration is max 4 hours per day for a maximum of 15 events per year. Customers may opt out of any event. The program will be marketed through direct contact with consumers using bill inserts, newsletters, website, broadcast and print media, and direct mail. The program will be cross marketed with GMO's Residential DSM programs. In particular, it will be marketed and positioned to customers as a seamless bundle with other demand response programs that are similar in delivery mechanism and nature.
Risk Management	The primary benefit of demand response programs is to mitigate the risks and costs associated with system peak loads. From a planning perspective, using demand response resources in the most valuable way would imply that system planners would include the peak impacts in the load forecast nominated to the RTO (regional transmission organization), thereby reducing the utility system peak, required capacity, and the reserve requirements. This also implies that events would primarily be called when the day-ahead forecast projects a load in excess of that nominated peak, rather than using another event trigger mechanism, such as energy market prices above a certain threshold or weather above a certain temperature. Having the thermostats available as a resource year-round is potentially of value to system operations in the event of plant maintenance or other grid events. Curtailment in participating homes with electric heat could provide additional risk management capabilities during winter months in the future. Providing the opportunity for customers to opt-out or override a limited number of events provides choice and control to the customer, minimizing the risk of attrition and lost participants.
Measures	Customers receive a free communicating, programmable thermostat with installation as well as a modest, annual incentive payments in future years to retain their engagement and participation.

Table 14: Residential Central Air Conditioner Direct Load Control Switch

Description	The program pays an incentive to participants to reduce peak demand by controlling their cooling equipment during periods of system peak demand and when there may be delivery constraints within certain load zones. This is done by way of a remotely communicating switch installed on the exterior, condensing unit of the central air conditioner. During a program event, the program operations center sends a radio frequency signal to the switch to cycle the central air conditioner such that the system will consume less energy and run less frequently throughout the event duration. The compressor in the condensing unit is shut down up to 50% of the time in distinct cycles during an event while the operation of the fan unit is not impacted. This allows cool air to be circulated throughout the home while the compressor is disabled. The operation of the switch is usually controlled through a digital paging network.
Objectives	Decrease peak demand usage to provide system and grid relief during particularly high-load, high-congestion peak hours.
Target Market	Individually metered residential customers. Target primarily single family homeowners, expanding into multi-family as the single family market opportunities begin to saturate.
Implementation Strategy	GMO will engage a third-party implementation contractor to: • Hire/sub-contract local staff to install the switches. • Engage customers, schedule installation appointments and process customer incentives. • Provide customer service support. • Track program performance and event data. • Periodically report progress towards program goals and opportunities for improvement. Events will typically occur between June 1 and September 30, Monday to Friday. Event duration is max 4 hours per day for a maximum of 15 events per year. Customers may opt out of any event. The program will be marketed through direct contact with consumers using bill inserts, newsletters, website, broadcast and print media, and direct mail. The program will be cross marketed with GMO's Residential DSM programs. In particular, it will be marketed and positioned to customers as a seamless bundle with other demand response programs that are similar in delivery mechanism and nature.
Risk Management	The primary benefit of demand response programs is to mitigate the risks and costs associated with system peak loads. From a planning perspective, using demand response resources in the most valuable way would imply that system planners would include the peak impacts in the load forecast nominated to the RTO (regional transmission organization), thereby reducing the utility system peak, required capacity, and the reserve requirements. This also implies that events would primarily be called when the day-ahead forecast projects a load in excess of that nominated peak, rather than using another event trigger mechanism, such as energy market prices above a certain threshold or weather above a certain temperature. Providing the opportunity for customers to opt-out or override a limited number of events provides choice and control to the customer, minimizing the risk of attrition and lost participants. Keeping track of switch equipment is an issue to consider and track closely since the switch can be either removed or left in place if a customer moves or is no longer enrolled in the product. If renters requested to participate, they are required to get landlord approval beforehand to prevent any installation conflicts over property and access.
Measures	A direct load control switch is installed on the condensing unit of the customer's central air conditioner.

Table 15: Residential Water Heating Direct Load Control Switch

Description	Participants receive an incentive to reduce peak demand by controlling their electric water heating equipment during periods of system peak demand and when there may be delivery constraints within certain load zones. This is done by way of a remotely communicating switch installed on the water heater. During a program event, the program operations center sends a radio frequency signal to the switch to cycle the water heater such that the system will consume less energy and run less frequently throughout the event duration.
Objectives	Decrease peak demand usage to provide system and grid relief during particularly high-load, high-congestion peak hours.
Target Market	Individually metered residential customers with electric water heat. Target primarily single family homeowners, expanding into multi-family as single family market opportunities begin to saturate.
Implementation Strategy	GMO will engage a third-party implementation contractor to: • Hire/sub-contract local staff to install the switches. • Engage customers, schedule installation appointments and process customer incentives. • Provide customer service support. • Track program performance and event data. • Periodically report progress towards program goals and opportunities for improvement. Events are essentially undetectable to participants if cycling time is provided to allow alternating homes in the program portfolio to recharge or reheat their hot water storage tanks. Individual tank recovery time is typically 1 to 2 hours. These traits allow events to occur any day of the year at any time. Events will typically be driven by and coincide with the summer system peak events targeted by GMO's other demand response programs, occurring for 4 hour blocks between June 1 and September 30, Monday to Friday; but other hours and schedules can be utilized if deemed valuable. Customers may opt-out twice a year. The program will be marketed through direct contact with consumers using bill inserts, newsletters, website, broadcast and print media, and direct mail. The program will be cross marketed with GMO's Residential DSM programs. In particular, it will be marketed and positioned to customers as a seamless bundle with other demand response programs that are similar in delivery mechanism and nature.
Risk Management	The primary benefit of demand response programs is to mitigate the risks and costs associated with system peak loads. From a planning perspective, using demand response resources in the most valuable way would imply that system planners would include the peak impacts in the load forecast nominated to the RTO (regional transmission organization), thereby reducing the utility system peak, required capacity, and the reserve requirements. This also implies that events would primarily be called when the day-ahead forecast projects a load in excess of that nominated peak, rather than using another event trigger mechanism, such as energy market prices above a certain threshold or weather above a certain temperature. Providing the opportunity for customers to opt-out or override a limited number of events provides customer choice and control, minimizing the risk of attrition and lost participants. Keeping track of switch equipment is an issue to consider and track closely since the switch can be either removed or left if a customer moves or is no longer enrolled in the program. If renters requested to participate, they are required to get landlord approval beforehand to prevent any installation conflicts over property and access. Additionally, installation cost and complexity is higher with water heating DLC since the installer must access the interior of the home and coordinate schedules with the participant. This is in contrast to the air conditioning DLC switch, which can be installed on the exterior condensing unit of the air conditioner without requiring home access.
Measures	A direct load control switch is installed on the customer's water heater.

Table 16: Business Energy Efficiency Rebate - Standard

Description	The program is a pre-qualified list of measures designed to help commercial and industrial customers save energy through a broad range of energy efficiency options that address all major end uses and processes. The program will offer standard rebates as well as mid-stream incentives. The measures incentivized, including lighting, HVAC equipment and motors, are proven technologies that are readily available with known performance characteristics. ***Standard Rebates:*** participants select energy efficient equipment from a pre-qualified list. Rebates are issued to participants upon completion of the project and submission of the rebate application. ***Mid-Stream Incentives:*** Trade Allies receive incentives for increasing the sale of qualifying measures. Measures that are incentivized mid-stream will not be offered as a standard rebate. Standard participant rebates per program year are limited to the annual cap outlined in the tariff and on the company website and applications.
Objectives	Encourage the purchase and installation of energy efficient equipment.
Target Market	All commercial and industrial customers as well as Trade Allies.
Implementation Strategy	GMO will engage a third-party implementation contractor to: • Process customer applications, verify eligibility and process customer rebates. • Conduct QA/QC to verify equipment installation. • Provide customer service and trade ally support. • Track program performance. • Periodically report progress towards program goals and opportunities for improvement. Key pillars of the marketing strategy will include Trade Allies and direct customer marketing, including direct mail, newspaper advertisements, email blasts, bill inserts and HVAC trade publications. Additional marketing tactics will include: • Education. Train and educate Trade Allies on the programs and how to effectively sell the program to customers. • Incentives. Provide incentives to Trade Allies that successfully increase the sale of qualifying measures to customers within the GMO service territory. • Trade Associations. Businesses rely on trade associations to represent industry's best interests in lobbying, growth, and identification of business opportunities. GMO will coordinate with specific associations to highlight suitable program offerings. • Highlight successfully completed projects. GMO will select projects to display the process and benefits of the program. This type of marketing will spur the customer's competitors to improve building performance and increase business process efficiency. The program will be cross marketed with GMO's Business DSM programs, particularly the Business Energy Efficiency Rebate – Custom Program.
Risk Management	The key barriers are return on investment, decision timing and customer internal funding and approval processes. Many customers have internal return on investment hurdles that are quite aggressive, sometimes as short as a one year payback. Another barrier is ensuring that enough vendors are properly educated to allow them to actively engage customers by explaining the myriad benefits of efficiency improvements. Measure savings are expected to be updated annually. Potential changes to measure savings, costs, and other key assumptions could affect the measure's ability to pass cost-effectiveness tests. Therefore, the mix of measures offered could change from year to year to reflect changes made to the original measure attributes. Incentives will be modified as needed to respond to market prices, with a goal of the incentive being no higher than 50% of the incremental cost. Proper incentives can reduce free ridership while still encouraging customers to participate in the program.

Measures

The consolidated measure list below is set for planning purposes and may be modified to reflect market conditions. Additional measures included in the Company TRM may also be offered.

Measure	
Heat Pump Water Heater	High Efficiency Reach-In Refrigerator/Freezer
Low Flow Faucet Aerator	ECM Motors Walk-In Coolers & Freezers
Pipe Wrap/Insulation	Advanced RTU Controls >2,000 annual hour occupancy
Pre-Rinse Spray Valves	Programmable Thermostat Controls
High Efficiency Pool Pump	High Bay Fluorescent Fixture (HP T8)
Pool Pump VSD	High Bay Fluorescent Fixture w/ HE Electronic Ballast (T5)
VSD Pumps/Fan	LED High & Low-Bay Fixture
Smart Power Strip	LED Linear Replacement Lamp replace a T8, T12, or T5
Compressed Air	LED Retrofit Kit replace T8, T12 or T5/T5HO
Variable Speed Drive Compressor	LED Troffer/ Linear Ambient replace T8, T12 or T5/T5HO
Variable Speed ECM Pump	LED Downlight or Retrofit Kit
ENERGY STAR Beverage Machine	28W - 4 ft fluorescent T8 lamp
Strip Curtains	25W - 4 ft fluorescent T8 lamp
High Efficiency PTAC/PTHP	LED Refrigerated/Freezer Case Lights
Air Source Heat Pump <135 kBtuh	Parking Garage T5, T5HP, or T8 replacing HID
Air Sourced Air Conditioner	Parking Garage LED replacing HID
High Volume Low Speed Fans	Exterior LED replacing HID
Directional LED Bulb	Networked Fixture Controls
Omnidirectional LED Bulb	Photocell Occupancy Sensor
Lighting Optimization	Wall-Mount Occupancy Sensor
LED Flood Light	LED Exit Sign
LED Recessed Fixture	Low Wattage T8 Lamp

Table 17: Business Energy Efficiency Rebate - Custom

Description	The program is designed to provide customers incentives for installing energy efficient measures not explicitly identified in the Standard program. It helps commercial and industrial customers save energy through a broad range of energy efficiency options that address all major end uses and processes. Applications must be pre-approved by GMO before equipment is purchased and installed and must have a Total Resource Cost Test benefit-cost ratio of at least 1.0. Incentives, up to 50% of the project cost, were included as a $ per first-year-kWh saved. Participant rebates per program year are limited to the annual cap outlined in the tariff on the company website and applications. Multiple rebate applications for different measures may be submitted. Rebates will be issued upon completion of the project. As a targeted sub-segment, GMO and the implementation contractor will work with customers interested in Enhanced Operations for Data Centers to determine project costs, cost-effectiveness, tax credits, and financing options.
Objectives	Encourage the purchase and installation of energy efficient equipment by providing incentives to lower the cost of purchasing efficient equipment for commercial and industrial facilities.
Target Market	All commercial and industrial customers.
Implementation Strategy	GMO will engage a third-party implementation contractor to: • Process customer applications, verify eligibility, review pre-approval applications, and process customer rebates. • Conduct QA/QC to verify equipment installation. Randomly inspect 10% of projects and all projects over a threshold determined by GMO (e.g., $10,000). • Provide customer service and trade ally support. • Track program performance. • Periodically report progress towards program goals and opportunities for improvement. Key pillars of the marketing strategy will include Trade Allies and direct customer marketing such as direct mail, newspaper advertisements, email blasts, bill inserts and HVAC trade publications. Additional marketing tactics will include: • Education. Train and educate Trade Allies on the programs and how to effectively sell the program to customers. • Trade Associations. Businesses rely on trade associations to represent industry's best interests in lobbying, growth, and identification of business opportunities. GMO will coordinate with specific associations to highlight suitable program offerings. • Highlight successfully completed projects. GMO will select projects to display the process and benefits of the program. This type of marketing will spur the customer's competitors to improve building performance and increase business process efficiency. The program will be cross marketed with GMO's Business DSM programs, particularly the Business Energy Efficiency Rebate – Standard Program.
Risk Management	The key barriers are return on investment, decision timing, and customer internal funding and approval processes. Many customers have internal return on investment hurdles that are quite aggressive, sometimes as short as a one year payback. Another barrier is ensuring that enough vendors are properly educated to allow them to actively engage customers by explaining the myriad benefits of efficiency improvements.
Measures	Incentives were set for planning purposes and may be modified to reflect market conditions. Incentives, up to a certain percentage of the project cost and up to a maximum annual cap, are paid on a $ per first-year kWh saved basis for all incentives.

Table 18: Strategic Energy Management

Description	The program is a systematic approach to delivering persistent energy savings to organizations by integrating energy management into regular business practices. The program involves appointment of an energy liaison(s) and a team within participating organizations who regularly correspond with program representatives. The program includes two program tracks that use different delivery mechanisms: ***One-on-One Consultative Strategic Energy Management (Consultative SEM)*** provides the customer with access to an energy expert who works intensively with them to integrate energy management into the organization's business practices by helping the customer set up an energy management process and implement improvements. The participant receives frequent and personalized attention throughout the implementation period. Touch points and milestones are agreed upon between the two parties. ***Strategic Energy Management Cohort (SEM Cohort)*** places companies into groups that work alongside each other for one year or longer, coming together in periodic workshops, approximately quarterly, and working on their own between the sessions. The group setting enhances participant action as they strive to perform in front of their peers. Structured groups are composed of 5 to 12 participants that are often located in the same geographical area, sharing best practices and learning together. The group is typically filled with participants from non-competing industries; however, if mutual agreement is established, competitors may participate in the same group. A methodology is developed early in the engagement to forecast each participant's baseline energy consumption, from which savings goals are created and measured. To isolate energy savings attributable to SEM efforts, any savings from equipment measures installed under other programs in the portfolio can be netted out of these savings. SEM has been shown to produce larger and longer lasting energy savings when compared to other energy management offerings. Few customers, however, have the internal resources to pursue and sustain these initiatives on their own, without the support of a utility program.
Objectives	Provide energy education, technical assistance, and company-wide coaching to large commercial and industrial customers to drive behavioral change and transformation of company culture with respect to energy use and management.
Target Market	Customers with high energy use and operational sophistication. The best candidates are likely to have the following attributes: • Large manufacturing companies or commercial facilities with >300 kW peak demand. • Companies and institutional customers with multiple sites (i.e. operations/offices in another state or country). • Customers with commitment to sustainability and environmental stewardship. • Customers in regulated industries. • Companies that have well established management systems like quality/safety or those using continuous improvement practices. • Companies in a stable or rapid growth mode.
Implementation Strategy	The design relies on a Program Administrator and Energy Management Providers. ***Program Administrator:*** GMO staff and a third-party implementation contractor to deliver the program and manage administrative functions, such as marketing, customer recruitment, and results tracking. ***Energy Management Providers:*** firms and personnel with specific knowledge and expertise who work with customers to achieve savings. The Energy Management Provider must have a combination of the following: • Experience in customer consulting and change management. • Experience with continuous improvement methodologies. • Experience engaging customer personnel at all levels, particularly executives.

	• Experience using and deploying management systems such as quality, environmental impact, and safety. • Technical expertise for understanding production process and operations to identify energy savings opportunities. • Established track record deploying utility-based SEM programs, driving energy savings along with customer change and customer satisfaction. Program delivery will be integrated with other programs. Customers that have already completed or are currently participating in the Business Energy Efficiency Rebate Programs can achieve additional efficiency gains. If capital measures are identified during the course of participation in SEM, they can be submitted for incentives under the appropriate Business Energy Efficiency Rebate Program. The Program Administrator recruits customers through one-on-one contacts. To achieve goals, the program will likely need to target two- to three-times the participation goal. The recruitment process will build an SEM pipeline, wherein potential participants can be monitored as their priorities and business situations change over time. One-on-one recruiting builds familiarity and trust, providing the basis for successful engagements. *Recruit Customers*. Recruiting requires a two-prong approach at both the facility management and executive levels. GMO should leverage relationships with large customers and peer relationships that GMO executives have with customer executives. *Screen Customers*. Potential participants will be screened on the size of their connected load and on factors including history of implementing energy efficiency projects, experience with other continuous improvement programs, general responsiveness of plant personnel, etc. Screening will take place through discussions with account managers and preliminary conversations with prospective participants. *Gain Customer Commitment*. As part of the screening process, participating customers will commit to an on-site executive-level sponsor, dedicated program budget, access to key human resources, inclusion of an energy continuous improvement statement within existing corporate goals, and a training program for new and existing personnel. An Energy Management Provider will be assigned to each participant and have primary responsibility for implementing the program and working with the participant. The provider will have three roles: *Project Manager*. Coordinate customer communication and meetings, develop reports. *Organizational Facilitator(s)*. Conduct initial Energy Management Assessment, provide ongoing customer coaching, maintain customer satisfaction, and provide input to energy maps and savings models. Identify and cultivate an energy champion or team leader. *Savings Modeler*. Develop energy maps and savings models. Provide technical assistance to participating customers to understand current energy use, identify opportunities to reduce energy use, and to set energy-use reduction goals. The key marketing message should be that GMO is supporting customers to more strategically manage energy and to invest in their future by building an organizational foundation for energy management, providing consultative resources and incentives. Marketing will rely heavily upon presentations and letters, supported by brochures, case studies and success stories. It is important for the marketing materials to: • Provide a basic understanding of the concept of SEM and the program. • Outline the compelling business case (benefits and costs) of participation. • Connect the SEM offering to the existing DSM portfolio.
Risk Management	The most challenging aspect of SEM is maintaining long-term customer commitment, because it directly affects savings persistence. To ensure commitment, the customer must clearly understand the following: • The level of staff time, management review, and other resources they are committing. • The services, such as consulting and training, they will receive. • The benefits, such as a more systematic and proactive approach to managing energy.

	Successful efforts involve setting rigorous expectations through ongoing meetings with the participant, Energy Management Providers, Program Administrator and GMO staff. *Participating Customer and Program Administrator*. To ensure the customer maintains momentum and arrives at an agreed upon success point, a Stage-gate approach is recommended. This includes clearly defined stages based on progress indicators, such as the existence of an energy goal, consistent meetings of an energy team, and the engagement of employees in energy awareness. *Program Administrator, Energy Management Provider(s) and GMO*. A periodic review meeting on a quarterly basis brings together GMO staff, the Program Administrator, and the Energy Management Provider(s) to discuss each participant with respect to successes, challenges, and overall progress. If it is determined that a customer's progress is lagging, they will agree to next steps, including increased engagement scope and discussions with the customer to ensure that they understand program support may be withdrawn if they do not improve performance. Working with customers' energy and production data is vital to the tracking of progress in this program. The data are frequently proprietary and competition-sensitive, so steps must be taken to establish a secure mechanism and procedure for sharing and storage of data.
Measures	Behavioral and operational energy savings, as measured relative to the participant's personal baseline consumption, are paid incentives on a $ per first-year-kWh saved. These levels were set for planning purposes and may be modified to reflect market conditions. Separately, capital measures that are adopted due to participation in the Strategic Energy Management Program, and which are eligible for incentives under other programs such as the Business Standard and Custom initiatives, are routed through them and receive the applicable incentives as if they were regular projects. These savings are netted out of the SEM savings and recorded under the Standard or Custom Programs. In this way, SEM also becomes a lead generator for other programs and further drives portfolio success.

Table 19: Retrocommissioning

Description	Participants receive a study to optimize building energy systems and facility operations. Heavy focus is placed on tuning of energy management systems and automation, but maintenance, operations, and other manual adjustments are also important. Eligible customers receive one of the following fully-funded studies depending upon their building size: ***RCx Lite:*** Buildings with 50,000 and 150,000 square feet and 150 < 500 kW peak demand. A program affiliated dealer completes a targeted assessment and recommend improvements. Customers agree to spend a minimum of $5,000 towards improvements with ≤18 month payback identified through the study. ***RCx Standard:*** Facilities larger than 150,000 square feet and with ≥500 kW peak demand receives a comprehensive study and a verification report with pre- and post-results. Customers agree to spend a minimum of $15,000 towards improvements with ≤18 month payback identified through the study.
Objectives	Encourage commercial and industrial customers to optimize their facility systems and reduce energy consumption.
Target Market	All commercial and industrial customers, as well as qualifying contractors to perform the RCx studies and implement the findings.
Implementation Strategy	GMO should engage a third-party implementation contractor to: • Process customer applications, verify customer eligibility and process rebates. • Establish relationships with local certified retrocommissioning contractors and maintain a list of qualified or authorized contractors and trade allies. • Track program performance, including customer and dealer participation as well as verification of reported savings and measure installation. • Develop QA/QC procedures and conduct random inspections of projects. • Provide customer service and trade ally support. • Periodically report progress towards program goals and opportunities for improvement. • Provide documented validation of reported savings. Ability to track measures associated with reported savings. • Conduct inspections as required and/or recommended to validate savings. • Market program to customers, trade organizations, etc. as required to meet project participation and savings targets. Develop and maintain comprehensive program marketing plan with focused outreach to target markets. Key pillars of the marketing strategy include trade allies and direct customer marketing such as direct mail, email blasts, GMO key account representatives and HVAC trade publications. Additional marketing tactics may include: • Trade Associations. Businesses rely on trade associations to represent industry's best interests in lobbying, growth, and identification of business opportunities. GMO should coordinate with specific associations to highlight suitable program offerings. • Highlight successful projects. GMO should select projects to display the process and benefits of the program. This type of marketing typically spurs the customer's competitors to improve building performance and increase business process efficiency.
Risk Management	The key barriers are return on investment, decision timing and customer internal funding and approval processes. Many customers have internal return on investment hurdles that are quite aggressive, sometimes as short as a one year payback. Another barrier is ensuring that enough service providers are properly educated to allow them to actively engage customers by explaining the myriad benefits of efficiency improvements.
Measures	Behavioral and operational energy savings, as measured relative to the participant's personal baseline consumption, are paid incentives on a $ per first-year-kWh saved. These levels may be modified to reflect market conditions.

Table 20: Block Bidding

Description	The program seeks to purchase blocks of electric savings by issuing a Request For Proposal (RFP) to eligible customers and third-party suppliers. The RFP details the proposal requirements as well as the electric savings that must be achieved. Customers and/or third parties submit proposals to deliver the requested block of cost-effective electric savings. The electric savings may be achieved in a variety of ways (e.g., one customer facility installing energy efficiency equipment or a bundle of projects across multiple sites and/or customers). Bidder proposals are reviewed to: • Verify customer eligibility. • Ensure completeness and accuracy of proposed energy savings. • Screen the proposed measures for cost-effectiveness. All projects must have a Total Resource Cost Test benefit-cost ratio of greater than 1.0. Qualifying and cost-effective bidder proposals are ranked based upon the proposed cost per kWh saved ($/kWh). Program funds are awarded to bidders starting with the lowest $/kWh saved until the funding is depleted. GMO enters into contracts with the selected bidders. All projects must receive pre- and post-implementation inspections to verify the existing and upgraded equipment. The acquired savings may differ from the expected savings stated in the contract based upon actual performance and the post-implementation inspection.
Objectives	Encourage high-volume energy savings projects from customers and third-party suppliers working on behalf of customers at lower cost than traditional programs. This program provides an opportunity to organize and procure non-conventional projects that may not be eligible or appropriately incentivized to participate in other programs.
Target Market	Any commercial, industrial or municipal customer as well as third-party suppliers, such as energy service companies, trade allies and performance contractors.
Implementation Strategy	GMO staff will administer the Block Bidding Program with assistance from a third-party implementation contractor. Implementation contractor activities include: • Assist with outreach and education to potential bidders. • Review bidder proposals and recommend the bids to be funded. • Perform pre- and post-implementation inspections. • Provide customer service and trade ally support. • Track program performance. • Periodically report progress towards program goals and opportunities for improvement. Marketing will be targeted to third-party suppliers and customers. Tactics will include: • Training sessions to educate third-party suppliers and customers on the program, proposal requirements and any associated paperwork requirements. • Direct outreach via GMO key account representatives, news releases, announcements, telephone calls and email. • Highlight successfully completed projects to display the benefits of the program. • Third-party suppliers will promote the program directly to eligible customers.
Risk Management	The most challenging aspect is bidder engagement and the ability to achieve the required blocks of savings. The implementation contractor and GMO staff must work closely to ensure potential bidders understand the program requirements and work to correct any issues or concerns that arise in bidder proposals. Customers must be made aware of the ability to bundle projects and/or work with a third-party supplier to achieve the required blocks of electric savings. The implementation contractor and GMO staff must work closely with the contracted bidders to ensure projects are being completed in a timely fashion and issues are addressed in a timely fashion.

Measures	Incentives on a dollar per first-year-kWh saved were assumed for planning purposes, but the actual incentive payments will be a result of the individual project bids received during the RFP process. Program management can choose the threshold cost below which they are willing to pay based on the condition of budgets and energy and peak demand savings goals at the time the bids are received.

Table 21: Online Business Energy Audit

Description	The program provides customers access to a free online tool to analyze the energy efficiency of their businesses, educational materials regarding energy efficiency and conservation, and information on GMO DSM Programs.
Objectives	Encourage energy education and conservation, as well as further engagement in the broader portfolio of DSM programs.
Target Market	Non-residential customers.
Implementation Strategy	GMO will engage a third-party contractor to develop and maintain the online tool(s).
Risk Management	The Online Business Energy Audit Program is an educational program that informs customers of business energy consumption and methods to reduce energy usage. GMO will strategize ways to highlight the audit tool on the GMO website and increase customer engagement.
Measures	There are no measures.

Table 22: Small Business Targeted

Description	The program offers customers an energy assessment that includes information on potential energy savings and anticipated payback as well as incentives that cover up to 70% percent of the equipment and installation costs. GMO will select a third-party implementation contractor that will provide the lighting audit and information on lighting incentives. Incentives will be assigned directly to the contractor, so that the value of utility incentives is reduced directly from the project cost. The program is part of a long-term strategy to raise awareness of energy savings opportunities among business customers and to help them take action using incentives offered by GMO.
Objectives	Provide targeted, highly cost-effective measures to small business customers in a quickly deployable program delivery mechanism.
Target Market	Small business customers with an average electric demand of less than 100 kW per year. This group of customers is important and typically underserved by DSM programs since they typically do not have the staffing or financial resources to engage in energy efficiency cost-benefit analysis and project planning.
Implementation Strategy	The implementation strategy will incorporate the following components: *Walk-Through Audits.* Trained auditors complete a walk-through examination of the business using standard audit software, identifying specific energy saving opportunities. The auditor will review the anticipated costs and savings of the measures, along with information on financial resources available to help defray costs. Customers will be provided with a report and check list of recommendations from the audit. *Installation of Measures.* Upon customer approval of a job scope, the implementation contractor will install pertinent lighting measures identified. *Customer Education.* Customers will be educated on energy efficient equipment and GMO's full suite of DSM programs. Particular attention will be paid to the areas identified in the audit. GMO will hire an implementation contractor to: • Hire qualified, local individuals to conduct energy audits and install efficient lighting equipment. Provide training, ongoing as needed, to auditors. • Ensure that auditors are familiar with all GMO DSM programs available to customers. • Assist with program marketing and outreach. • Provide customer service and trade ally support. • Track program performance, including audit requests, audit activities and customer actions. • Periodically report progress towards program goals and opportunities for improvement. The marketing and outreach strategies will include direct customer marketing such as bill inserts, newsletters, email, and on-bill messaging. The auditors will market the program directly to customers. GMO will highlight successfully completed projects to display the benefits of the program. This program targets a very specific market that may have limited access to capital. However, the program will encourage customers to participate in other GMO DSM programs.
Risk Management	Small business customers are typically a hard-to-reach market, without the time available to become educated on energy efficient equipment and the money available to upgrade to efficient equipment. One potential risk is a limited supply of qualified individuals with the skills to conduct audits and market energy efficiency improvements. A solution is the development of a local network of qualified professionals to provide audit and installation services and to promote the program to customers. The implementation contractor will: • Offer technical training to auditors, including classroom and field sessions.

<table>
<tr><td></td><td>• Offer sales and business process training to help contractors succeed in selling and delivering energy efficiency services.</td></tr>
<tr><td>Measures</td><td>The consolidated measure list below represents a set of measures used for planning purposes, but may be modified to reflect market conditions and/or particular customers. Additional custom measures or those included in the Company TRM may also be offered.
<table>
<tr><th>Measure</th><th></th></tr>
<tr><td>Low Flow Faucet Aerator</td><td>High Bay Fluorescent Fixture (HP T8)</td></tr>
<tr><td>Screw In - LEDs</td><td>High Bay Fluorescent Fixture w/ HE Electronic Ballast (T5)</td></tr>
<tr><td>Directional LED Bulb</td><td>LED High & Low-Bay Fixture</td></tr>
<tr><td>Omnidirectional LED Bulb</td><td>LED Linear Replacement Lamp replace a T8, T12, or T5</td></tr>
<tr><td>LED Recessed Fixture</td><td>LED Retrofit Kit replace T8, T12 or T5/T5HO</td></tr>
<tr><td>Lighting Optimization</td><td>LED Troffer/ Linear Ambient replace T8, T12 or T5/T5HO</td></tr>
<tr><td>Low Wattage T8 Lamp</td><td>LED Downlight or Retrofit Kit</td></tr>
<tr><td>Networked Fixture Controls</td><td>28W - 4 ft fluorescent T8 lamp</td></tr>
<tr><td>Photocell Occupancy Sensor</td><td>25W - 4 ft fluorescent T8 lamp</td></tr>
<tr><td>Wall-Mount Occupancy Sensor</td><td>LED Refrigerated/Freezer Case Lights</td></tr>
<tr><td>LED Exit Sign</td><td>Parking Garage T5, T5HP, or T8 replacing HID</td></tr>
<tr><td>Exterior LED replacing HID</td><td>Parking Garage LED replacing HID</td></tr>
<tr><td>Smart Power Strip</td><td></td></tr>
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Table 23: Business Smart Thermostat with Direct Load Control

Description	The program pays an incentive to participants to reduce peak demand by controlling their cooling equipment during periods of system peak demand and when there may be delivery constraints within certain load zones. This is done by way of a remotely communicating, programmable thermostat. During a program event, the program operations center sends a signal to the thermostat to adjust its set-point by a few degrees such that the system will consume less energy and run less frequently throughout the max 4-hour event duration. One method of participation will be for customers to receive the thermostat and professional installation for free upon qualification and enrollment in the program. Smart thermostats also achieve energy savings by using occupancy sensors and setback schedules with learning algorithms.
Objectives	Primarily decrease peak demand usage to provide system and grid relief during particularly high-load, high-congestion peak hours. Also provide annual energy savings.
Target Market	Small & medium Commercial customers who control their heating and cooling with traditional wall-mounted thermostats.
Implementation Strategy	GMO will engage a third-party implementation contractor to: • Hire/sub-contract local staff to install the programmable thermostats. • Engage customers, schedule installation appointments and process customer incentives. • Provide customer service support. • Track program performance and event data. • Periodically report progress towards program goals and opportunities for improvement. Events will typically occur between June 1 and September 30, Monday to Friday. Event duration is max 4 hours per day for a maximum of 15 events per year. Customers may opt out of any event. The program will be marketed through direct contact with consumers using newsletters, website, broadcast and print media, and direct mail. The program will be cross marketed with GMO's Business DSM programs.
Risk Management	The primary benefit of demand response programs is to mitigate the risks and costs associated with system peak loads. From a planning perspective, using demand response resources in the most valuable way would imply that system planners would include the peak impacts in the load forecast nominated to the RTO (regional transmission organization), thereby reducing the utility system peak, required capacity, and the reserve requirements. This also implies that events would primarily be called when the day-ahead forecast projects a load in excess of that nominated peak, rather than using another event trigger mechanism, such as energy market prices above a certain threshold or weather above a certain temperature. Having the thermostats available as a resource year-round is potentially of value to system operations in the event of plant maintenance or other grid events. Curtailment in participating homes with electric heat could provide additional risk management capabilities during winter months in the future. Providing the opportunity for customers to opt-out or override a limited number of events provides choice and control to the customer, minimizing the risk of attrition and lost participants.
Measures	Customers receive a free communicating, programmable thermostat with installation as well as a modest, annual incentive payments in future years to retain their engagement and participation.

Table 24: Demand Response Incentive

Description	The program provides firm contractual arrangements with customers to pay them an incentive for periodic curtailments at times of system peak demand. Customers enter into a contract for a one-, three- or five-year term and receive a payment/bill credit based upon the curtailable load, the contract term and number of consecutive years under contract. Participants receive notification of an event at least 4 hours prior to the start time.
Objectives	Decrease peak demand usage to provide system and grid relief during particularly high-load, high-congestion peak hours.
Target Market	Large commercial and industrial customers with load curtailment capability of at least 25 kW.
Implementation Strategy	Curtailment events may occur between June 1 through September 30, Monday through Friday between the hours of 12 pm and 10 pm (holidays are excluded). Event duration is typically 3 to 6 hours per day for a maximum of 15 events per year. GMO energy consultants will be vital to coordinating with the largest customers and gaining their participation and collaboration. The program will also be marketed through direct customer outreach as well as newsletters and direct mail. The program will promote GMO's Business DSM programs to participating customers.
Risk Management	The primary benefit of demand response programs is to mitigate the risks and costs associated with system peak loads. From a planning perspective, using demand response resources in the most valuable way would imply that system planners would include the peak impacts in the load forecast nominated to the RTO, thereby reducing the utility system peak, required capacity, and the reserve requirements. This also implies that events would primarily be called when the day-ahead forecast projects a load in excess of that nominated peak, rather than using another event trigger mechanism, such as energy market prices above a certain threshold or weather above a certain temperature. Providing the opportunity for customers to opt-out or override a limited number of events provides choice and control to the customer, minimizing the risk of attrition and lost participants.
Measures	Customers receive a fixed, capacity-reserve payment in terms of $/kW, based on the number of curtailable kW, the contract term, and number of consecutive years under contract. The fixed payment is supplemented by a performance payment on a $/kWh basis, calculated from the customer's actual load curtailment relative to their baseline load, as calculated by program management.

1.3 DEMAND-SIDE RATES

(E) To include demand-side rates for all customer market segments; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG worked with The Brattle Group (Brattle) to identify demand-side rate based options that are designed to incentivize customers to reduce, shift, or modify their load. Brattle took a two-pronged approach:

- First, Brattle considered how different each alternative rate is from current GMO rates. Currently, GMO has rates that include customer charges, seasonality, demand charges and declining block rates. Brattle notes that changes in rate designs must be thought of as incremental and, therefore, rate designs that are too different or divergent from the current GMO rates may not be realizable because of political feasibility or customer blowback.

- Second, rate options were assessed and scored based on the following Bonbright criteria:[2] 1) economic efficiency, 2) equity, 3) revenue stability, 4) bill stability, and 5) customer satisfaction.

Out of these discussions, following ten rate options were identified for initial, qualitative analysis and consideration:

- Critical Peak Pricing (CPP)
- Demand Charges
- Electric Vehicle (EV) Rates
- Inclining Block Rates (IBR)
- Peak Time Rebate (PTR)
- Prepaid Rebates
- Real Time Pricing
- Seasonal Rates
- Time of Use (TOU)
- Variable Peak Pricings (VPP)

To further select rate options for quantitative analysis, AEG, Brattle, and GMO then met with Stakeholders, gathered their input, considered the degree of departure from GMO's current rates, weighed the strategic pros and cons with respect to the Bonbright criteria,

[2] A set of utility rate design principles developed by James Cumming Bonbright that look to aid in rate development. James C. Bonbright, *Principles of Public Utility Rates* (New York: Columbia University Press, 1961).

and considered the analysis schedule and budget. The demand side rates included in the analysis are shown in the table below.

Table 25: List of Demand Side Rate Options

Program Option	Eligible Customer Segments	Mechanism
Demand Rates	Residential	Opt-in rate that includes a billing component based on a customer's peak demand in a given month. This rate structure has traditionally been reserved for C&I customers, but better reflects the grid's evolving underlying cost structure and is being considered for residential application. Opt-in and opt-out options correspond to RAP and MAP respectively. We also investigate the effects of this rate on customers with electric vehicles, who would in effect have an "enabling technology" in the form of their EV that would enable them to shift large amounts of usage and demand by charging their EV during off-peak hours.
Time-of-use Rates	Residential, Small C&I, Large C&I	Higher rate for a particular block of hours that occurs every day. Requires interval meters. Opt-in and opt-out options correspond to RAP and MAP respectively. Similar to the demand rate, we also investigated TOU rates for customer with electric vehicles.
Real-time Pricing	Small C&I, Large C&I	Dynamic rate that fluctuates throughout the day based on energy market prices. Requires interval meters. This is modeled with an opt-in roll-out, which is the only typical implementation that has been observed in the industry. Low and high opt-in participation levels are assumed for RAP and MAP respectively.
Inclining Block Rates	Residential	Higher per-unit price for incremental blocks of monthly energy usage. This is modeled with a mandatory roll-out, which is the only typical implementation that has been observed in the industry. We investigate two cases here, one where the fixed charge remains the same, and another where the fixed charge increases in a manner that is often done in these implementations to preserve revenue stability.

1.4 MULTIPLE DESIGNS

(F) To consider and assess multiple designs for demand-side programs and demand-side rates, selecting the optimal designs for implementation, and modifying them as necessary to enhance their performance; and —

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG considered multiple design scenarios including the program-level realistic achievable potential (RAP) and maximum achievable potential (MAP) as well as two additional scenarios extrapolated based on those program-level RAP and MAP portfolios in order to provide GMO with a more diverse set of planning cases.

- Program RAP-: Alternative portfolio designed to represent approximately 75% of RAP participation levels.

- Program RAP: The measure-level RAP candidates from the DSM Potential Study that GMO proposes passing to the integration phase. This portfolio reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions.

- Program RAP+: Alternative portfolio designed to represent approximately the average of RAP and MAP participation levels.

- Program MAP: The measure-level MAP candidates from the DSM Potential Study that GMO proposes passing into the integration phase. This portfolio reflects expected program participation given ideal market implementation and few barriers to customer adoption. Incentives represent a substantial portion of the incremental cost combined with high administrative and marketing costs.

1.5 EFFECTS OF IMPROVED TECHNOLOGIES

(G)To include the effects of improved technologies expected over the planning horizon to —

1.5.1 REDUCE OR MANAGE ENERGY USE

***1. Reduce or manage energy use;* or —**

GMO engaged AEG to conduct a 2016 DSM Potential Study, which included the effects of improved technologies expected over the 20-year planning horizon. As a part of the scope of work, AEG selected potential demand-side resources to fulfill the goal of achieving all cost-effective demand-side savings by designing highly effective potential demand-side programs. AEG included the effects of improved technologies expected over the planning horizon to reduce or manage energy use and incorporate combined heat and power (CHP) as a resource.

A comprehensive list of energy efficiency and demand response measures was developed for each customer sector, drawing upon GMO's current programs, AEG's measure database, and measure lists developed from previous studies. The list of measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption. Special focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups all over the nation. This includes recent evolutions in LED lighting, heat pump technologies, smart thermostats, behavioral research, and smart control systems; all of which are included in this study.

1.5.2 IMPROVE THE DELIVERY OF PROGRAMS

2. Improve the delivery of demand-side programs or demand-side rates. —

GMO engaged AEG to conduct a 2016 DSM Potential Study. As a part of the scope of work, AEG selected potential demand-side resources to fulfill the goal of achieving all cost-effective demand-side savings by designing highly effective potential demand-side programs. AEG used program design, incentive structures, marketing approaches, budgets, and levels of staffing from field experience to refine delivery assumptions and participation rates to a level that can be accomplished given GMO's current DSM programs; and also to reflect the ramp-up time necessary for new initiatives. Incentive amounts and administrative budgets are associated with continuing GMO's current program momentum as well as launching new initiatives into the marketplace. We developed these assumptions based on discussions with GMO staff, review of existing program data, and AEG program benchmarking research.

The proposed DSM programs deliver an effective and balanced portfolio of energy savings opportunities across all customer segments. Program eligibility has been defined broadly to make programs as inclusive as possible. In general, participation guidelines are designed to include all customer sectors and end uses. Each program was designed to leverage the optimal mix of best-practice measures, delivery strategies, and target markets in order to most effectively deliver programs and measures to GMO customers.

GMO's program portfolio uses a combination of education and customer incentives to advance energy efficiency. Customer incentives are the primary mechanism for program delivery. Customers receive rebates to purchase energy efficient equipment and services through existing market actors, including equipment dealers and retailers. To achieve the portfolio's long-term savings goals, it will be necessary for GMO to continue to engage customers, retailers, trade allies, and state and local agencies. Targeting retailers / trade allies and leveraging GMO's relationship with its stakeholders will increase program awareness among consumers and promote the market adoption of high efficiency equipment. Creative and sustained marketing is important to a successful and robust energy efficiency program portfolio.

GMO's programs have been aligned to offer customers consistent programs and incentives across all four service territories. This will allow GMO to streamline implementation and marketing activities and provide equitable programs to all of their customers within the GMO service territory.

SECTION 2: DEMAND-SIDE RESEARCH

(2) The utility shall conduct, describe, and document market research studies, customer surveys, pilot demand-side programs, pilot demand-side rates, test marketing programs, and other activities as necessary to estimate the maximum achievable potential, technical potential, and realistic achievable potential of potential demand-side resource options for the utility and to develop the information necessary to design and implement cost-effective demand-side programs and demand-side rates. These research activities shall be designed to provide a solid foundation of information applicable to the utility about how and by whom energy-related decisions are made and about the most appropriate and cost-effective methods of influencing these decisions in favor of greater long-run energy efficiency and energy management impacts. The utility may compile existing data or adopt data developed by other entities, including government agencies and other utilities, as long as the utility verifies the applicability of the adopted data to its service territory. The utility shall provide copies of completed market research studies, pilot programs, pilot rates, test marketing programs, and other studies as required by this rule and descriptions of those studies that are planned or in progress and the scheduled completion dates. —

2.1 DSM POTENTIAL STUDY

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG conducted primary market research for the residential and non-residential sectors, including end-use equipment saturation data, customer demographics and firmographics.

The residential market research was structured to represent all households served by GMO, with a household defined as a single energy-using customer at a unique, contiguous location. Households were assumed to include single-family homes, manufactured homes, or units in multi-family dwellings, as long as those units are billed directly for some unique electricity use. Customers were mailed survey packages to solicit the completion of questionnaires via paper or online. The survey included questions on home characteristics, demographics, heating / cooling systems, water heating equipment,

lighting, etc. Of the total of 3,897 questionnaires that were completed, 21.1% were filled out online, while 78.9% were filled out on paper and returned by mail.

The non-residential market research was structured to represent all of the business establishments served by one of the Great Plains Energy operating companies. For the purposes of this research a “business establishment” was defined as including all of the energy used by a given business at a single contiguous location. The research design involved the use of both onsite interviews and telephone surveys. Respondents were also offered a ‘thank you’ payment of $10 for completing the survey. The survey included questions about the business, end uses, operating hours, equipment and energy efficiency actions. A total of 752 surveys were completed and 40 on-site interviews.

AEG used its Load Management Analysis and Planning tool (LoadMAP™) version 4.0 to develop the baseline projection and potential estimates. AEG developed LoadMAP in 2007 and has enhanced it over time, using it for more than 50 studies in the past five years. Built in Microsoft Excel®, the LoadMAP framework is both accessible and transparent.

Our highest priority data sources for the potential study were those that were specific to GMO. In general, data was adapted to local conditions, for example, by using local sources for measure data and local weather for building simulations. Data sources are broken out into four categories:

KCP&L Greater Missouri Operations (GMO) Data

- 2015 residential customer count and usage data as well as nonresidential billing data. The nonresidential billing data was (1) utilized to develop customer counts and energy use for the commercial and industrial segments and (2) SIC and NAICS information was analyzed to assist in development of the market segmentation.

- Most recent load and peak forecasts as well as an economic growth forecast by sector and electric load forecast by sector.

- Forecast of avoided costs, forecast of retail electricity rates by sector, discount rate, and line loss factor.

- Information about past and current DSM programs, including program descriptions, goals, and achievements to date.

Energy Efficiency Measure Data

Several sources of data were used to characterize the energy efficiency measures. AEG used the following national and well-vetted regional data sources and supplemented with AEG's data sources to fill in any gaps.

- Appliance and Equipment Standards: U.S. Department of Energy, Energy Star and the Consortium for Energy Efficiency.

- Illinois Technical Reference Manual. Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 5.0, effective June 1, 2016.

- Northwest Power and Conservation Council workbooks.

AEG Data

AEG maintains several databases and modeling tools for forecasting and potential studies. Relevant data from these tools has been incorporated into the analysis and deliverables for this study.

- AEG Energy Market Profiles: For more than 10 years, AEG staff has maintained profiles of end-use consumption for the residential, commercial and industrial sectors. These profiles include market size, fuel shares, unit consumption estimates, and annual energy use, customer segment and end use for 10 regions in the United States. The Energy Information Administration surveys (RECS, CBECS and MECS) as well as state-level statistics and local customer research provide the foundation for these regional profiles.

- Building Energy Simulation Tool (BEST). AEG's BEST is a derivative of the DOE 2.2 building simulation model, used to estimate base-year UECs and EUIs, as well as measure savings for the HVAC-related measures.

- AEG's EnergyShape™. This database of load shapes includes the following:

    - Residential electric load shapes for ten regions, three housing types, 13 end uses

    - Nonresidential electric load shapes for nine regions, 54 building types, ten end uses

- AEG's Database of Energy Efficiency Measures (DEEM). AEG maintains an extensive database of existing and emerging measures for our studies. Our database draws upon reliable sources including the California Database for Energy Efficient Resources (DEER), the EIA Technology Forecast Updates – Residential and Nonresidential Building Technologies – Reference Case, RS Means cost data, and Grainger Catalog Cost data.

- Recent studies. AEG has conducted numerous potential studies in the last five years. We checked our input assumptions and analysis results against the results from these other studies, which include Ameren Illinois, Indianapolis Power & Light, NIPSCO, Indiana Michigan Power, PacifiCorp, and Vectren Energy. In addition, we used the information about impacts of building codes and appliance standards from recent reports for the Edison Electric Institute.

Other Secondary Data

The main sources of secondary data are identified below.

- Annual Energy Outlook (AEO), conducted each year by the U.S. Energy Information Administration (EIA), presents yearly projections and analysis of energy topics. For this study, we used data from the 2015 AEO.

- US Census American Community Survey is an ongoing survey that provides data every year on household characteristics.

- Weather from NOAA's National Climatic Data Center for Kansas City was used as the basis for building simulations.

- EPRI End-Use Models (REEPS and COMMEND). These models provide the energy-use elasticities we apply to electricity prices, household income, home size and heating and cooling.

- Other relevant regional sources, including reports from the Consortium for Energy Efficiency, the EPA, and the American Council for an Energy-Efficient Economy.

2.2 KCP&L SMARTGRID DEMONSTRATION PROJECT

The 2009 American Recovery and Reinvestment Act provided the United States Department of Energy with $600 million to fund Smart Grid Demonstration Projects. The KCP&L SmartGrid Demonstration Project (SGDP) was awarded a contract in August 2010. The operational testing and data collection phase of the SGDP concluded September 31, 2014. The analysis of these operational demonstrations was published in the 'KCP&L Green Impact Zone SmartGrid Demonstration Project Final Technical Report, version 2.0, dated May 22, 2015. This report was attached to the 2016 Annual Update as Appendix C.

2.3 ELECTRIC POWER RESEARCH INSTITUTE

GMO financially supports research conducted by the Electric Power Research Institute (EPRI). GMO has access to the EPRI library of energy efficiency and demand response research and data that is available to program participants.

More information about the EPRI energy efficiency and demand response program research can be found on their website, www.epri.com. Additional specific EPRI energy efficiency and demand response programs recently and/or currently supported by GMO are summarized below.

2.3.1 EPRI PROGRAM 170: ENERGY EFFICIENCY AND DEMAND RESPONSE

GMO continues its participation in this EPRI research program. This program is focused on the assessment, testing, demonstration, and deployment of energy efficient and smart end-use technologies to accelerate their adoption into utility programs. The program also develops analytical frameworks essential to utility application of energy efficiency and demand response, including assessment of resource potential, characterization of end-use load profiles, calculation of environmental impacts, and integration into utility resource planning. This program was more fully described in the Company's 2015 Triennial IRP filing.

2.3.2 EPRI PROGRAM 170 SUPPLEMENTAL: EVALUATING SMART THERMOSTATS' IMPACT ON ENERGY EFFICIENCY AND DEMAND RESPONSE

GMO continues its participation in this EPRI supplemental research project. Given that smart thermostats may offer better customer usability due to their remote programming capability, the objective of this program is to evaluate their energy and demand savings impacts, as well as how customers perceive and use them. This supplemental project was more fully described in the Company's 2015 Triennial IRP filing. The EPRI analysis of the KCP&L hosted project is expected later this year.

2.3.3 EPRI PROGRAM 182: UNDERSTANDING ELECTRIC UTILITY CUSTOMERS

GMO continues its participation in this EPRI research program. Electric utilities increasingly realize that they need to better understand and engage with customers. This program employs two parallel and coordinated initiatives—original research and utilizing the research of others—to fill important knowledge gaps about how consumers and businesses use and value electricity. This program was more fully described in the Company's 2015 Triennial IRP filing.

2.3.4 EPRI PROGRAM 182 SUPPLEMENTAL: MATCHING ELECTRIC SERVICE PLANS TO UTILITY STRATEGIC GOALS

This EPRI supplemental research project has concluded. GMO collaborated with EPRI to evaluate alternative Electric Service Plan (ESP) offerings in light of fundamental

changes in its electricity supply costs and the desire to diversify its (ESP) offerings to provide customers more pricing options and engage the in managing their energy consumption. This supplemental project was more fully described in the Company's 2015 Triennial IRP filing. The results of the EPRI's analysis and ESP screening are being incorporated into the rate studies currently underway at GMO.

2.3.5 EPRI PROGRAM 182 SUPPLEMENTAL: CHARACTERIZING RESIDENTIAL CUSTOMER PREFERENCES FOR ELECTRIC SERVICE PLANS

This EPRI supplemental research project has concluded. This supplemental project results provide initial insight into customer ESP preferences, and produce research tools that can be employed by utilities, on their own or collaboratively, to improve their understanding of customers' preferences for how they buy electricity. This project was more fully described in the Company's 2015 Triennial IRP filing. The project results are being incorporated into the rate studies currently underway at GMO.

2.3.6 EPRI PROGRAM 161: INFORMATION & COMMUNICATION TECHNOLOGY

GMO continues its participation in this EPRI research program. This program provides information and tools that provide members with immediate value while conducting longer-term R&D to help guide the industry towards a highly connected and interoperable future by advance interoperability standards for advanced metering systems, distributed energy resources, demand response and enterprise system integration. This program was more fully described in the Company's 2015 Triennial IRP filing.

2.3.7 EPRI PROGRAM 161 SUPPLEMENTAL: AUTOMATED DEMAND RESPONSE AND ANCILLARY SERVICES DEMONSTRATION

This EPRI supplemental research project has concluded. The program will performed research associated with emerging energy price and product messaging-protocol standards to take advantage of ubiquitous low-cost communication infrastructures that may be able to reliably perform automated demand response (DR) and ancillary services or fast DR functions. This supplemental assisted the industry and KCP&L in the development of the OpenADR 2.0 communications specification that KCP&L

demonstrated in its SmartGrid Demonstration Project. This project was more fully described in the Company's 2015 Triennial IRP filing.

2.3.8 EPRI PROGRAM D_SG: SMART GRID DEMONSTRATION

This EPRI research program has concluded. The Smart Grid Demonstration Initiative was a multi-year collaborative research effort between 17 host utilities to design, deploy, and evaluate how to integrate DER, both customer and grid connected, into utility grid operations. GMO participated as a project host utility in conjunction with the KCP&L SmartGrid Demonstration Project. The results of this research project are publically available on the EPRI website at http://smartgrid.epri.com/Demo.aspx.

2.4 MEEIA CYCLE 2 RESEARCH & PILOT INITIATIVES

KCP&L will be embarking with a handful or more of research and pilot initiatives as part of the approved funding associated with the KCP&L and GMO MEEIA Cycle 2 demand side management programs. As of April 2017, we are conducting research projects into Business Communications Marketing tools as well as the Water and Energy nexus. The outcomes of these initiatives should provide us insight into how best communicate through technology in our person to person sales meetings as well as learn what programs might be possible to help influence reduced water usage as a result of reduced energy usage.

SECTION 3: DEVELOPMENT OF POTENTIAL DEMAND-SIDE PROGRAMS

(3) The utility shall develop potential demand-side programs that are designed to deliver an appropriate selection of end-use measures to each market segment. The utility shall describe and document its potential demand-side program planning and design process which shall include at least the following activities and elements: —

GMO engaged AEG to conduct a 2016 DSM Potential Study. The energy efficiency potential estimates represent net savings[3] developed into several levels of potential. The potential study calculated four types of potential:

- Technical Potential: Theoretical upper limit of energy efficiency potential, assuming that customers adopt all feasible measures regardless of cost or customer preference. At the time of existing equipment failure, customers replace their equipment with the most efficient option available. In new construction, customers and developers also choose the most efficient equipment option.

- Economic Potential: Represents the adoption of all cost-effective energy efficiency measures, as measured by the total resource cost (TRC) test. Customers are assumed to purchase the most cost-effective option applicable to them at any decision juncture. Economic potential is still a hypothetical upper-boundary of savings potential as it represents only measures that are economic, but does not yet consider customer acceptance and other factors.

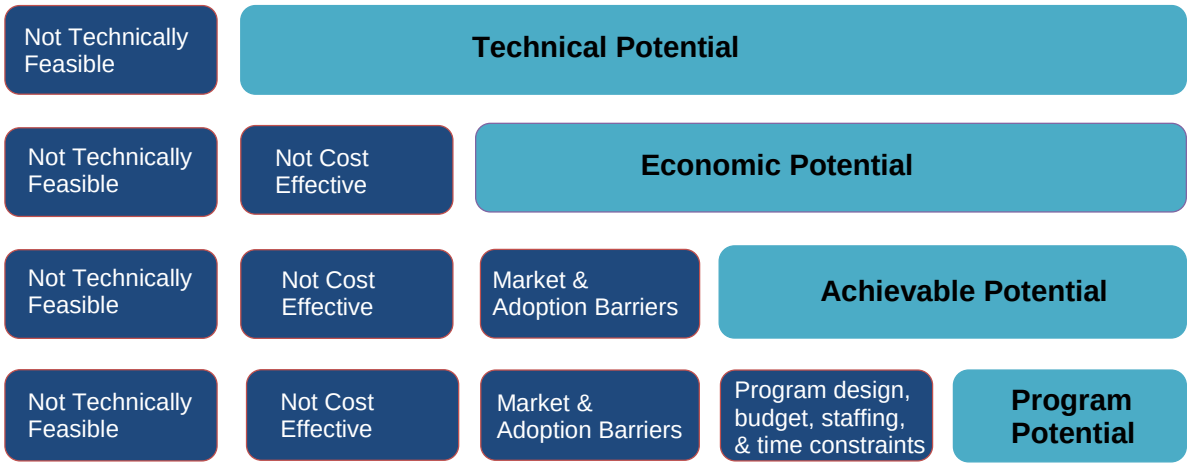
- Maximum Achievable Potential (MAP): Estimates customer adoption of economic measures when delivered through DSM programs under ideal market, implementation, and customer preference conditions and an appropriate regulatory framework. Information channels are assumed to be well established and efficient for marketing, educating consumers, and coordinating with trade allies

[3] "Net" savings mean that the baseline forecast includes naturally occurring efficiency. In other words, the baseline assumes that energy efficiency levels reflect that some customers are already purchasing the more efficient option.

and delivery partners. MAP establishes a maximum target for the savings that an administrator can hope to achieve through its DSM programs and involves incentives that represent a substantial portion of measure costs combined with high administrative and marketing costs.

- Realistic Achievable Potential (RAP): Reflects expected program participation given DSM programs under more typical market conditions and barriers to customer acceptance, non-ideal implementation channels, and constrained program budgets. The delivery environment in this analysis projects the current state of the DSM market in GMO's service territory and projects typical levels of expansion and increased awareness over time.

A graphical depiction of the various levels of potential from the EPA's National Action Plan for Energy Efficiency.[4]



A number of analytical steps were taken to produce the potential estimates.[5]

Step 1. Market Characterization

In order to estimate the savings potential from energy-efficient measures, it is necessary to understand how much energy is used today and what equipment is currently being

[4] Per Missouri requirements, two levels of achievable potential are estimated: maximum and realistic. Size of Boxes not necessarily indicative of size of associated resources.
Source: National Action Plan for Energy Efficiency, "Guide to Resource Planning with Energy Efficiency." Figure 2-1.
https://www.epa.gov/sites/production/files/2015-08/documents/resource_planning.pdf
[5] See the Kansas City Power & Light 2016 DSM Potential Study for the full report.

used. The characterization begins with a segmentation of GMO's electricity footprint to quantify energy use by sector, segment, end-use application, and the current set of technologies used. Table 26 illustrates GMO's electricity footprint segmentation.

Table 26: Overview of GMO Analysis Segmentation Scheme

Dimension	Segmentation Variables	Description
1	Sector	Residential, Commercial, and Industrial
2	Segment	*Residential*: Single Family and Multifamily, further separated by service territory and Low Income/Regular Income *Commercial*: Small Office, Large Office, Restaurant, Retail, Grocery, College, School, Healthcare, Lodging, Warehouse, Data Center, Miscellaneous *Industrial*: Food Production, Chemicals & Pharmaceuticals, Transportation Equipment, Electronic Equipment, Stone-clay-and-glass, Primary Metals, Rubber & Plastics, Other Industrial
3	Vintage	Existing and New Construction
4	End uses	Cooling, Heating, Lighting, Water heat, motors, etc. (as appropriate by sector)
5	Appliances/technologies	Lamp type, air conditioning equipment, motors by application, etc.
6	Equipment efficiency levels for new purchases	Baseline and higher-efficiency options as appropriate for each technology

With the segmentation scheme defined, AEG then performed a high-level market characterization of electricity sales in the base year (2015) to allocate sales to each customer segment. We used GMO billing and customer data, residential and non-residential customer surveys, and secondary sources to allocate energy use and customers to the various sectors and segments such that the total customer count, energy consumption, and peak demand matched the GMO system totals from the 2015 billing data. This information provided control totals at a sector level for calibrating the LoadMAP model to known data for the base year.

Step 2. Develop Baseline Projection

AEG developed a baseline projection of annual electricity use, summer peak demand, and winter peak demand for 2015 through 2037 by customer segment and end use without new utility programs. The end-use projection includes the relatively certain impacts of known and adopted legislation, as well as codes and standards that will unfold over the study timeframe. All legislation and mandates that were finalized as of January

31, 2016 are included in the baseline. The baseline projection is the foundation for the analysis and is the metric against which potential savings are measured.

Inputs to the baseline projection include:

- Current economic growth forecasts (i.e., customer growth, income growth)
- Electricity price forecasts
- Trends in fuel shares and equipment saturations
- Existing and approved changes to building codes and equipment standards
- Known and adopted legislation
- Naturally occurring efficiency improvements, which include purchases of high-efficiency equipment options by early adopters.

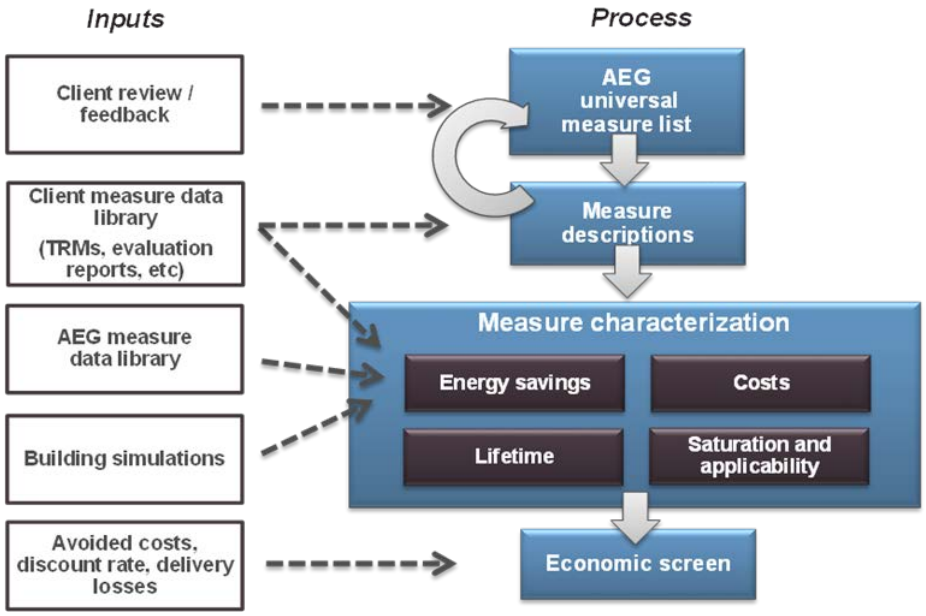
Step 3. Define and Characterize Energy Efficiency Resources

A comprehensive list of energy efficiency and demand response measures was developed for each customer sector, drawing upon GMO's current programs, AEG's measure database, and measure lists developed from previous studies. The list of measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption. Special focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups all over the nation. This includes recent evolutions in LED lighting, heat pump technologies, smart thermostats, behavioral research, and smart control systems; all of which are included in this study.

Each measure was characterized with energy and demand savings, incremental cost, effective useful life, and other performance factors, drawing upon data from AEG's DEEM measure database and well-vetted national and regional sources. An economic screening of each measure was performed, which serves as the basis for developing the economic

and achievable potential, utilizing the measure information along with GMO's avoided cost data. Figure 1 represents AEG's energy efficiency measure assessment process.

Figure 1: Approach for Energy Efficiency Measure Assessment



Step 4. Estimate Measure-Level Potential

The energy efficiency potential estimates represent net savings[6] developed into several levels of potential. At the measure-level, four levels of potential were analyzed: technical, economic, maximum achievable, and realistic achievable potential. Technical and economic potential are both theoretical limits to efficiency savings and would not be realizable in actual programs. Achievable potential embodies a set of assumptions about the decisions consumers make regarding the efficiency of the equipment they purchase, the maintenance activities they undertake, the controls they use for energy-consuming equipment, and the elements of building construction.

[6] "Net" savings mean that the baseline forecast includes naturally occurring efficiency. In other words, the baseline assumes that energy efficiency levels reflect that some customers are already purchasing the more efficient option.

Table 27: GMO-MPS Measure-Level Energy Efficiency Summary

GMO-MPS	2019	2020	2021	2030	2037
Baseline Projection (GWh)	6,127	6,125	6,124	6,404	6,784
Cumulative Net Savings (GWh)					
Realistic Achievable Potential	61	92	123	392	610
Maximum Achievable Potential	82	129	174	545	832
Economic Potential	158	251	339	940	1,359
Technical Potential	206	347	479	1,430	2,040
Cumulative as % of Baseline					
Realistic Achievable Potential	1.0%	1.5%	2.0%	6.1%	9.0%
Maximum Achievable Potential	1.3%	2.1%	2.8%	8.5%	12.3%
Economic Potential	2.6%	4.1%	5.5%	14.7%	20.0%
Technical Potential	3.4%	5.7%	7.8%	22.3%	30.1%

Table 28: GMO-SJLP Measure-Level Energy Efficiency Summary

GMO-SJLP	2019	2020	2021	2030	2037
Baseline Projection (GWh)	2,092	2,087	2,083	2,145	2,248
Cumulative Net Savings (GWh)					
Realistic Achievable Potential	18	28	39	132	206
Maximum Achievable Potential	25	41	56	186	285
Economic Potential	47	78	107	319	465
Technical Potential	63	108	150	465	661
Cumulative as % of Baseline					
Realistic Achievable Potential	0.9%	1.4%	1.9%	6.1%	9.2%
Maximum Achievable Potential	1.2%	1.9%	2.7%	8.7%	12.7%
Economic Potential	2.3%	3.7%	5.1%	14.9%	20.7%
Technical Potential	3.0%	5.2%	7.2%	21.7%	29.4%

AEG developed the following sensitivity analyses:

- Investigate the impact of higher avoided costs of generation that could be caused by implementation of provisions of the Clean Power Plan or other similar legislation.

- Maximum customer opt-out scenario. All C&I customers with a peak demand of 2.5 MW or greater were assumed to opt-out of the programs.

- Estimate the impact of naturally occurring energy efficiency in the market.

AEG also conducted (1) a demand response and demand side rate potential analysis to understand the peak demand savings that could be achieved from peak-focused resources, and (2) an analysis of the potential for CHP to understand the energy and peak demand savings that could be achieved from CHP.

Step 5. Estimate Program-Level Potential

The program-level potential takes was developed by considering and bundling the measure-level analysis – energy efficiency, demand response, demand side rates, and combined heat and power – in an integrated and holistic manner to ascertain the total potential savings, costs, and delivery structure of an actual and realizable portfolio of DSM resources. Program potential is defined as the portion of the potential that might be reasonably achieved given the realities of implementation and the constraints of program resources. It is a subset of measure-level achievable potential that is aligned with recent program accomplishments, available future budget, and long-term strategic goals.

AEG used program design, incentive structures, marketing approaches, budgets, and levels of staffing from field experience to refine delivery assumptions and participation rates to a level that can be accomplished given GMO's current DSM programs; and also to reflect the ramp-up time necessary for new initiatives. Incentive amounts and administrative budgets are associated with continuing GMO's current program momentum as well as launching new initiatives into the marketplace. We developed these assumptions based on discussions with GMO staff, review of existing program data, and AEG program benchmarking research.

Specifically, when translating from the measure-level potential to program-level potential, AEG applied the following adjustments:

- Allocated measures to one or more programs, considering measure bundling.
- Assigned incentive and administrative program costs consistent with bundles and delivery mechanisms

- Reviewed marginally cost-effective measures (TRC benefit-to-cost ratio close to 1.0). Some non-cost-effective measures may remain in a program for market continuity purposes and to provide a robust portfolio, while other measures may be removed to improve program and portfolio cost-effectiveness.

- Excluded measures with small potential or that are challenging to implement (e.g., residential electronic equipment).

- As appropriate, considered multiple efficiency levels for technologies that may not have been part of measure-level results. For example, measure-level potential selects one SEER level of residential central air conditioners to maximize absolute energy savings, but the program potential includes several SEER levels to provide a more customer-friendly set of choices and options.

- Evaluated program cost-effectiveness incorporating delivery, administration and EM&V costs. The program-level potential relied primarily on the TRC test to determine cost-effectiveness.

3.1 PREVIOUSLY IMPLEMENTED DEMAND-SIDE PROGRAMS FROM OTHER UTILITIES

***(A) Review demand-side programs that have been implemented by other utilities with similar characteristics and identify programs that would be applicable for the utility*; —**

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG conducted a benchmarking assessment of input assumptions and analysis results to ensure the potential estimates developed were reasonable and appropriate.

The assessment included a review of the following studies: Ameren Illinois, Indianapolis Power & Light, NIPSCO, Indiana Michigan Power, PacifiCorp, and Vectren Energy. In

addition, we used the information about impacts of building codes and appliance standards from recent reports for the Edison Electric Institute.[7]

3.2 MARKET SEGMENT IDENTIFICATION

(B) Identify, describe, and document market segments that are numerous and diverse enough to provide relatively complete coverage of the major classes and decision-makers identified in subsection (1)(A) and that are specifically defined to reflect the primary market imperfections that are common to the members of the market segment; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG identified the market segments by categorizing billing and customer data, residential and non-residential customer surveys, and secondary sources to allocate energy use and customers to the various sectors and segments such that the total customer count, energy consumption, and peak demand matched the system totals from the 2015 billing data. The market segments included:

- Residential: Single Family, Single Family Low-Income, Multi-family, Multi-family Low-Income
- Commercial: Small Office, Large Office, Restaurant, Retail, Grocery, College, School, Healthcare, Lodging, Warehouse, Data Center, Miscellaneous
- Industrial: Food Production, Chemicals & Pharmaceuticals, Transportation Equipment, Electronic Equipment, Stone-clay-and-glass, Primary Metals, Rubber & Plastics, Other Industrial

The total number of households and residential electricity sales for the service territory were obtained from GMO's customer database. AEG adjusted the number of customers

[7] AEG staff has prepared three white papers on the topic of factors that affect U.S. electricity consumption, including appliance standards and building codes. Links to all three white papers are provided:
http://www.edisonfoundation.net/IEE/Documents/IEE_RohmundApplianceStandardsEfficiencyCodes1209.pdf
http://www.edisonfoundation.net/iee/Documents/IEE_CodesandStandardsAssessment_2010-2025_UPDATE.pdf.
http://www.edisonfoundation.net/iee/Documents/IEE_FactorsAffectingUSElecConsumption_Final.pdf

and usage in each segment based on GMO's billing data and all reported residential energy sales in 2015.

Table 29: GMO Residential Sector Control Totals

Segment	Households	Electricity Sales (GWh)	Avg. Use / Household (kWh)	Summer Peak Demand (MW)	Winter Peak Demand (MW)
GMO-MPS - Single Family	138,198	1,942	14,053	613	465
GMO-MPS - Multifamily	14,845	95	6,420	23	27
GMO-MPS - Single Family LI	43,406	493	11,359	155	121
GMO-MPS - Multifamily LI	24,607	135	5,480	32	40
GMO-SJLP - Single Family	30,475	442	14,505	131	111
GMO-SJLP - Multifamily	6,946	64	9,284	13	19
GMO-SJLP - Single Family LI	14,802	162	10,916	52	39
GMO-SJLP - Multifamily LI	5,461	38	7,019	8	11

The commercial and industrial sectors were developed for GPE's entire service territory, including GMO, KCP&L-MO, and KCP&L-KS. With fewer survey completions than the residential sector and less anticipated heterogeneity among customers, AEG modeled the non-residential customers as a whole and made territory-specific calculations using pro-rata shares.

Table 30: Commercial Control Totals (GPE)

Segment	Electricity Sales (GWh)	% of Total Usage	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Small Office	778	8.9%	102	143
Large Office	488	5.6%	64	76
Restaurant	576	6.6%	80	81
Retail	638	7.3%	105	96
Grocery	470	5.4%	60	49
School	842	9.6%	297	92
College	646	7.4%	116	110
Healthcare	1,138	13.0%	132	239
Lodging	298	3.4%	30	36
Data Center	1,103	12.6%	160	152
Warehouse	529	6.0%	216	73
Miscellaneous	1,253	14.3%	218	238

Table 31: Industrial Control Totals (GPE)

Segment	Electricity Sales (GWh)	% of Total Usage	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Food Production	894	17%	128	146
Chemicals & Pharmaceuticals	755	14%	106	122
Transportation Equipment	498	10%	120	70
Electronic Equipment	484	9%	120	73
Stone, clay, glass	428	8%	57	70
Primary Metals	405	8%	48	68
Rubber & Plastics	262	5%	41	42
Other Industrial	1,482	28%	318	231

3.3 DEVELOPMENT OF END USE MEASURES

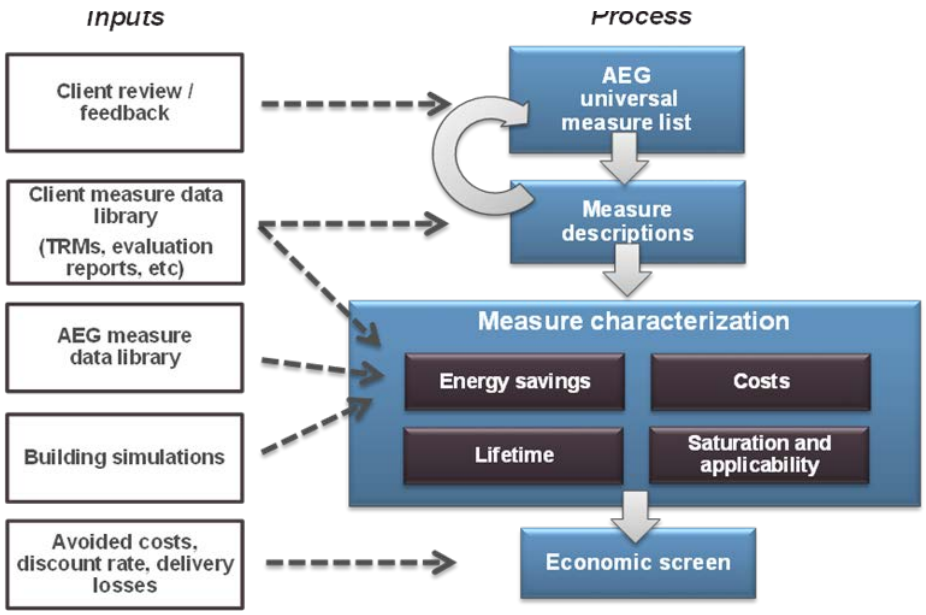
(C) Identify a comprehensive list of end-use measures and demand-side programs considered by the utility and develop menus of end-use measures for each demand-side program. The demand-side programs shall be appropriate to the shared characteristics of each market segment. The end-use measures shall reflect technological changes in end-uses that may be reasonably anticipated to occur during the planning horizon; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. A comprehensive list of energy efficiency and demand response measures was developed for each customer sector, drawing upon GMO's current programs, AEG's measure database, and measure lists developed from previous studies. The list of measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption. Special focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups all over the nation. This includes recent evolutions in LED lighting, heat pump technologies, smart thermostats, behavioral research, and smart control systems; all of which are included in this study.

Each measure was characterized with energy and demand savings, incremental cost, effective useful life, and other performance factors, drawing upon data from AEG's DEEM measure database and well-vetted national and regional sources. An economic screening

was performed for each measure, which serves as the basis for developing the economic and achievable potential, utilizing the measure information along with GMO's avoided cost data. Figure 2 represents AEG's energy efficiency measure assessment process.

Figure 2: Approach for Energy Efficiency Measure Assessment



3.4 ADVANCED METERING AND DISTRIBUTION ASSESSMENT

(D) Assess how advancements in metering and distribution technologies that may be reasonably anticipated to occur during the planning horizon affect the ability to implement or deliver potential demand-side programs; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. Advanced Metering Infrastructure (AMI) is actively rolling out in GMO's service territory, with approximately 500,000 meters in the metro area already, and should be completed soon. For the potential study, AEG assumed that AMI is fully available in all years of interest (2019-2037). Therefore, measures or programs relying on AMI meters will have no limitations with regards to metering infrastructure for the study period.

3.5 END-USE MEASURES MARKETING PLAN

(E) Design a marketing plan and delivery process to present the menu of end-use measures to the members of each market segment and to persuade decision-makers to implement as many of these measures as may be appropriate to their situation. When appropriate, consider multiple approaches such as rebates, financing, and direct installations for the same menu of end-use measures; —

The marketing plan and delivery process will be designed to inform customers of the DSM programs, the benefits of each program and how they can participate in a program. The plan will include a combination of strategies to reach all market segments and decision-makers. The GMO website content and functionality will be a crucial component of the marketing plan, as the website directs customers to information about the DSM programs.

A strategy will be developed to move customers along the marketing funnel from awareness to education to conversion to engagement. Key points of the strategy and ensuing marketing campaigns will be to:

1. Develop a set of campaigns driven by seasonal timeliness and opportunities during and immediately after customers' engagement with each product to generate leads for the portfolio, especially the priority programs.

2. Drive customers from awareness to conversion by matching campaign elements to customers' informational needs at various points within the marketing funnel. Continue supporting customers through the engagement portion of the funnel via cross-promotion.

3. Ensure planned campaigns remain flexible and responsive to shifts in program strategy based on current unknowns becoming clearer, the need to balance costs versus participation through the year, and other unanticipated variables.

4. Craft malleable and creative approaches for planned campaigns, preserving our ability to complement and roll up to new creative strategy that will be developed for the general awareness advertising campaign.

5. Engage GMO employees through communications campaigns that will increase employee awareness of products so they can help tell our story to customers, and encourage participation among eligible employees.

Tactics that can help move customers to participation include the following:

- GMO website content providing program information resources, contact information, and links to other relevant service and information resources.
- Digital channels (like Pandora, Hulu and Youtube)
- Search engine marketing
- Program brochures that describe the benefits and features of the program.
- Bill inserts, on-bill messages and targeted email messages.
- Print and radio advertisements.
- Direct customer outreach (e.g., GMO customer representatives and/or an implementation contractor).
- Presence at conferences and public events used to increase general awareness of the program and distribute promotional materials.
- Partnerships with local contractors/businesses.
- Customized newsletters.

3.6 STATEWIDE MARKETING AND OUTREACH PROGRAM EVALUATION

***(F) Evaluate, describe, and document the feasibility, cost-reduction potential, and potential benefits of statewide marketing and outreach programs, joint programs with natural gas utilities, upstream market transformation programs, and other activities. In the event that statewide marketing and outreach programs are preferred, the utilities shall develop joint programs in consultation with the stakeholder group*; —**

Challenges definitely exist with an overall statewide marketing plan considering the variety of program offerings across the state and within service territories. GMO saw this in the degree of effort and diligence in MEEIA Cycle 1 needed to properly educate customers and promote programs in the KCP&L-Missouri territory vs. the GMO territory based on slightly different vintages of the programs. That being said, we continue to engage with peer utilities across the state at least once per year to identify opportunities with programs that are similar to evaluate the effectiveness in delivery.

GMO is embarking on a demand side program co-delivery model with MGE/Laclede for two of the MEEIA Cycle 2 programs, Whole House Efficiency and Income Eligible Multi-family. Both GMO and MGE/Laclede expect to see a reduced overall cost of administration of the programs by joint delivery. The resulting program is also planned to provide some additional boost to participation by allowing for multiple marketing channels and enhanced total rebate available.

An additional area of cooperation includes efforts GMO has undertaken to market programs jointly run with outside organizations, such as non-profit organizations and state agencies involved with the Income Eligible Weatherization Program.

KCP&L also currently has engaged in upstream energy efficiency programming in both the residential lighting sector as well as for a couple commercial standard measures, pumps and nozzles. In the residential sector, midstream lighting (i.e. instant discount at retailer) has been effective for many years in driving customer demand for efficient lighting products. KCP&L is early in the deployment of commercial midstream measures, but

hope that with time and market adoption those measures can be successfully integrated and become a strong contributor to the demand side management program portfolio.

3.7 COST-EFFECTIVENESS

(G)Estimate the characteristics needed for the twenty (20)-year planning horizon to assess the cost effectiveness of each potential demand-side program, including: —

3.7.1 STAND-ALONE DEMAND AND ENERGY REDUCTION IMPACTS

1. An assessment of the demand and energy reduction impacts of each stand-alone end-use measure contained in each potential demand-side program; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. A comprehensive list of energy efficiency and demand response measures was developed for each customer sector, drawing upon GMO's current programs, AEG's measure database, and measure lists developed from previous studies. The list of measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption. Special focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups all over the nation. This includes recent evolutions in LED lighting, heat pump technologies, smart thermostats, behavioral research, and smart control systems; all of which are included in this study.

Each measure was characterized with energy and demand savings, incremental cost, effective useful life, and other performance factors, drawing upon data from AEG's DEEM measure database and well-vetted national and regional sources. AEG performed an economic screening of each measure, which serves as the basis for developing the economic and achievable potential, utilizing the measure information along with GMO's avoided cost data.

Table 32 below details the energy-efficiency measure inputs and identifies the key sources.

Table 32: Data Sources for Measure Characterization

Model Inputs	Description	Key Sources
Energy Impacts	The annual reduction in consumption attributable to each specific measure. Savings were developed as a percentage of the energy end use that the measure affects.	BEST AEG's DEEM AEO 2015 Other secondary sources
Peak Demand Impacts	Savings during the peak demand periods are specified for each electric measure. These impacts relate to the energy savings and depend on the extent to which each measure is coincident with the system peak.	BEST AEG's DEEM AEG EnergyShape
Costs	Equipment Measures: Includes the full cost of purchasing and installing the equipment on a per-unit basis. Non-equipment measures: Existing buildings – full installed cost. New Construction - the costs may be either the full cost of the measure, or as appropriate, it may be the incremental cost of upgrading from a standard level to a higher efficiency level.	AEG's DEEM AEO 2015 RS Means Other secondary sources
Measure Lifetimes	Estimates derived from the technical data and secondary data sources that support the measure demand and energy savings analysis.	AEG's DEEM AEO 2015 Other secondary sources
Applicability	Estimate of the percentage of dwellings in the residential sector, square feet in the commercial sector or employees in the industrial sector where the measure is applicable and where it is technically feasible to implement.	AEG's DEEM Other secondary sources
On Market and Off Market Availability	Expressed as years for equipment measures to reflect when the equipment technology is available or no longer available in the market.	AEG appliance standards and building codes analysis

3.7.2 IMPACT OF BUNDLING END-USE MEASURES

2. An assessment of how the interactions between end-use measures, when bundled with other end-use measures in the potential demand-side program, would affect the stand-alone end-use measure impact estimates; —

AEG screened the end-use measures for cost-effectiveness on a stand-alone basis. Measures that were cost-effective on a stand-alone basis were bundled into programs and re-screened for cost-effectiveness. Except for the low-income programs, the DSM programs were designed to be cost-effective. Measures were bundled based on end-use and implementation. For example, space cooling and heating end-use measures benefit from being installed by an experienced HVAC contractor.

3.7.3 CHANGE IN PARTICIPANTS AND INSTALLATIONS

3. An estimate of the incremental and cumulative number of program participants and end-use measure installations due to the potential demand-side program; —

An estimate of the potential DSM Program incremental and cumulative end-use measure installations and participants can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

3.7.4 DEMAND REDUCTION AND ENERGY SAVINGS

4. For each year of the planning horizon, an estimate of the incremental and cumulative demand reduction and energy savings due to the potential demand-side program; **and —**

Table 33 below presents the incremental annual program potential demand savings by year for each of the program design scenarios as presented in the 2016 DSM Potential Study.

Table 33: GMO Incremental Demand Savings (MW)

Year	RAP-	RAP	RAP+	MAP
2019	72.9	96.9	99.8	102.7
2020	83.6	111.2	117.7	124.1
2021	94.5	125.7	135.6	145.5
2022	104.8	139.5	152.8	166.0
2023	110.5	147.1	163.9	180.7
2024	115.4	153.7	171.5	189.2
2025	120.5	160.4	179.1	197.9
2026	125.5	167.1	186.9	206.6
2027	130.7	174.0	195.6	217.1
2028	135.9	180.9	203.5	226.1
2029	134.8	179.5	202.0	224.4
2030	132.7	176.7	198.4	220.1
2031	127.6	169.9	190.3	210.7
2032	123.1	163.9	183.1	202.3
2033	123.4	164.4	183.4	202.3
2034	124.8	166.2	185.5	204.7
2035	126.2	168.0	187.5	206.8
2036	127.6	169.9	189.7	209.3
2037	127.9	170.3	190.4	210.4

Table 34 below presents the cumulative annual program potential demand savings by year for each of the program design scenarios as presented in the 2016 DSM Potential Study.

Table 34: GMO Cumulative Demand Savings (MW)

Year	RAP-	RAP	RAP+	MAP
2019	72.9	96.9	99.8	102.7
2020	89.6	119.0	126.6	134.0
2021	105.8	140.3	152.3	164.1
2022	120.9	160.2	176.4	192.4
2023	131.4	174.0	194.6	214.9
2024	141.2	186.8	209.2	231.4
2025	150.9	199.6	223.7	247.7
2026	160.8	212.5	238.5	264.2
2027	170.7	225.5	254.1	282.5
2028	180.8	238.7	269.6	300.2
2029	183.2	241.8	273.7	305.1
2030	184.5	243.7	275.9	307.7
2031	183.0	241.7	273.8	305.4
2032	182.3	240.8	272.7	304.3
2033	186.8	246.7	279.7	312.3
2034	191.3	252.8	287.1	321.1
2035	197.1	260.5	296.4	331.9
2036	203.5	268.9	306.6	343.8
2037	208.0	275.0	314.4	353.3

Table 35 below presents the incremental annual program potential energy savings by year for each of the program design scenarios as presented in the 2016 DSM Potential Study.

Table 35: GMO Incremental Energy Savings (MWh)

Year	RAP-	RAP	RAP+	MAP
2019	52,390	68,546	78,615	88,528
2020	45,080	58,778	67,404	75,860
2021	46,058	60,090	68,985	77,697
2022	46,072	60,112	69,030	77,766
2023	45,330	59,086	67,717	76,163
2024	46,343	60,420	68,986	77,371
2025	46,687	60,878	69,512	77,942
2026	47,452	61,925	70,710	79,294
2027	48,453	63,283	75,127	86,796
2028	49,547	64,754	76,837	88,765
2029	51,890	67,876	80,626	93,197
2030	54,537	71,387	84,816	98,042
2031	56,525	74,026	87,943	101,718
2032	58,580	76,793	91,288	105,636
2033	60,908	79,889	94,994	109,941
2034	64,094	84,096	100,072	115,879
2035	66,907	87,867	104,552	121,068
2036	69,990	91,988	109,508	126,910
2037	69,990	91,988	109,508	126,910

Table 36 below presents the cumulative annual program potential energy savings by year for each of the program design scenarios as presented in the 2016 DSM Potential Study.

Table 36: GMO Cumulative Energy Savings (MWh)

Year	RAP-	RAP	RAP+	MAP
2019	52,390	68,546	78,615	88,528
2020	82,542	107,421	123,129	138,513
2021	113,657	147,586	169,200	190,307
2022	142,136	184,237	211,221	237,545
2023	169,873	219,862	251,927	283,180
2024	198,528	256,696	293,760	329,860
2025	226,776	292,988	334,962	375,809
2026	255,782	330,316	377,352	423,101
2027	284,771	367,679	422,636	476,187
2028	314,485	406,022	468,069	528,614
2029	336,883	435,874	504,264	571,040
2030	359,809	466,421	541,201	614,218
2031	380,893	494,507	575,320	654,299
2032	402,380	523,131	610,138	695,252
2033	426,824	555,693	649,692	741,734
2034	439,611	572,696	671,816	768,944
2035	462,601	603,349	709,741	814,118
2036	487,938	637,130	751,433	863,741
2037	510,556	667,299	788,505	907,780

An estimate of the 2016 DSM Potential Study incremental and cumulative demand reduction and energy savings by program can be found in the work paper “GMO 2017 IRP Exhibits.xlsx.”

The IRP process takes the annual program potential and spreads the incremental savings across each year (i.e., not all new participants or installations are immediately providing savings on January 1st). The installations are spread equally throughout the year. The delayed installations lower the expected first year savings of any given installation/program participant, but the total savings are still achieved over the life of the measures. The tables showing the savings spread across the year can be found in the “8760_IRP Inputs” work papers.

3.7.5 COST ESTIMATES

5. For each year of the planning horizon, an estimate of the costs, including: —

Table 37 below presents the total portfolio budget by year for each of the program design scenarios.

Table 37: GMO Program Costs (Real 2015 Dollars, 000$)

Year	RAP-	RAP	RAP+	MAP
2019	$ 9,948	$14,190	$18,086	$22,583
2020	$10,942	$15,655	$19,660	$24,597
2021	$12,132	$17,320	$21,682	$27,003
2022	$12,237	$17,543	$22,051	$27,575
2023	$10,870	$15,786	$20,080	$25,405
2024	$10,784	$15,715	$19,967	$25,332
2025	$11,043	$16,111	$20,470	$26,038
2026	$11,320	$16,592	$21,125	$26,856
2027	$11,761	$17,105	$22,409	$29,236
2028	$12,144	$17,835	$23,321	$30,357
2029	$12,672	$18,520	$24,326	$31,720
2030	$13,028	$19,058	$25,063	$32,759
2031	$13,332	$19,677	$25,770	$33,715
2032	$13,723	$20,184	$26,519	$34,822
2033	$14,288	$21,134	$27,804	$36,422
2034	$15,188	$22,341	$29,502	$38,717
2035	$15,947	$23,627	$31,257	$41,072
2036	$16,913	$25,069	$33,212	$43,738
2037	$16,916	$25,073	$33,238	$43,791

The breakdown of total costs by program, incremental costs, incentive costs, costs to the customer, and the utilities costs to administer the programs are located in the work paper "GMO 2017 IRP Exhibits.xlsx."

A. The incremental cost of each stand-alone end-use measure; —

The incremental cost of each stand-alone energy use measure are located in the work paper "GMO 2017 IRP Exhibits.xlsx."

B. The cost of incentives paid by the utility to customers or utility financing to encourage participation in the potential demand-side program. The utility shall consider multiple levels of incentives paid by the utility for each end-use measure within a potential demand-side program, with corresponding adjustments to the maximum achievable potential and the realistic achievable potential of that potential demand-side program; —

AEG considered multiple levels of incentives in the development of the program design scenarios.

- RAP- scenario incentives are approximately 75% of the RAP scenario incentives.
- RAP scenario incentives are approximately 50% of the incremental cost.
- RAP+ scenario incentives are approximately 125% of the RAP scenario incentives.
- MAP scenario incentives are approximately 150% of the RAP scenario incentives.

Customer incentives can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

C. ***The cost of incentives to customers to participate in the potential demand-side program paid by the entities other than the utility; —***

No assumption was made that any incentives would be paid by entities other than the utility.

D. The cost to the customer and to the utility of technology to implement a potential demand–side program; —

The cost to the customer and the utility to implement the potential DSM programs can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

E. ***The utility's cost to administer the potential demand-side program; and —***

The utility's cost to administer the potential DSM programs can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

***F. Other costs identified by the utility*; —**

AEG did not identify other utility costs.

3.8 TABULATION OF PARTICIPANTS, IMPACT, & COSTS

(H) A tabulation of the incremental and cumulative number of participants, load impacts, utility costs, and program participant costs in each year of the planning horizon for each potential demand-side program; and —

The incremental and cumulative participations, load impacts, utility costs and program participant costs in each year for the potential DSM programs can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

3.9 SOURCES AND QUALITY OF INFORMATION

(I) The utility shall describe and document how it performed the assessments and developed the estimates pursuant to subsection (3)(G) and shall provide documentation of its sources and quality of information. —

GMO engaged AEG to conduct a 2016 DSM Potential Study. A comprehensive list of energy efficiency and demand response measures was developed for each customer sector, drawing upon GMO's current programs, AEG's measure database, and measure lists developed from previous studies. The list of measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption. Special focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups all over the nation. This includes recent evolutions in LED lighting, heat pump technologies, smart thermostats, behavioral research, and smart control systems; all of which are included in this study.

Each measure was characterized with energy and demand savings, incremental cost, effective useful life, and other performance factors, drawing upon data from AEG's DEEM

Figure 3: Approach for Energy Efficiency Measure Assessment

measure database and well-vetted national and regional sources. We performed an economic screening of each measure, which serves as the basis for developing the economic and achievable potential, utilizing the measure information along with GMO's avoided cost data.

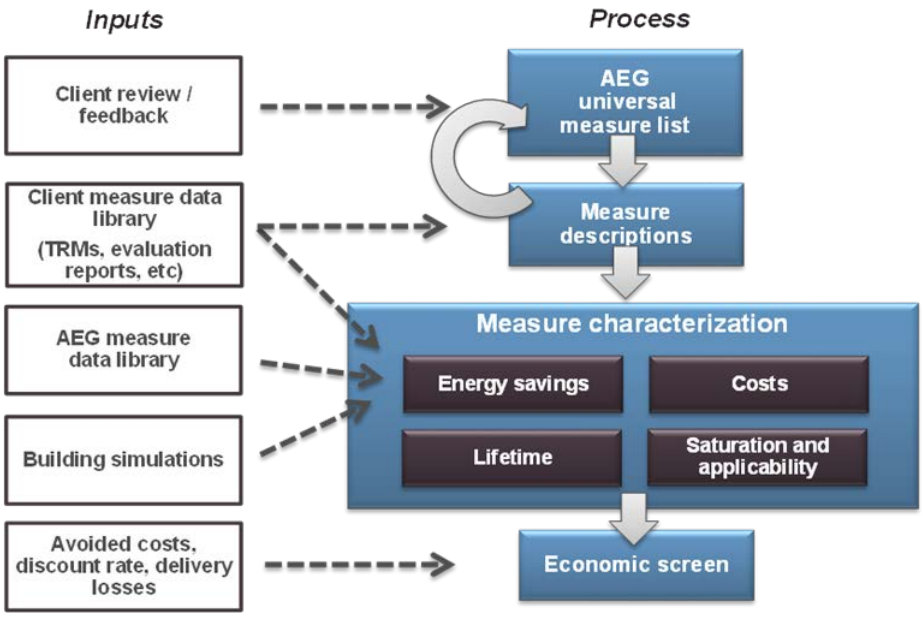


Table 38 below details the energy-efficiency measure inputs and identifies the key sources.

Table 38: Data Needs for Measure Characterization

Model Inputs	Description	Key Sources
Energy Impacts	The annual reduction in consumption attributable to each specific measure. Savings were developed as a percentage of the energy end use that the measure affects.	BEST AEG's DEEM AEO 2015 Other secondary sources
Peak Demand Impacts	Savings during the peak demand periods are specified for each electric measure. These impacts relate to the energy savings and depend on the extent to which each measure is coincident with the system peak.	BEST AEG's DEEM AEG EnergyShape
Costs	Equipment Measures: Includes the full cost of purchasing and installing the equipment on a per-unit basis. Non-equipment measures: Existing buildings – full installed cost. New Construction - the costs may be either the full cost of the measure, or as appropriate, it may be the incremental cost of upgrading from a standard level to a higher efficiency level.	AEG's DEEM AEO 2015 RS Means Other secondary sources
Measure Lifetimes	Estimates derived from the technical data and secondary data sources that support the measure demand and energy savings analysis.	AEG's DEEM AEO 2015 Other secondary sources
Applicability	Estimate of the percentage of dwellings in the residential sector, square feet in the commercial sector or employees in the industrial sector where the measure is applicable and where it is technically feasible to implement.	AEG's DEEM Other secondary sources
On Market and Off Market Availability	Expressed as years for equipment measures to reflect when the equipment technology is available or no longer available in the market.	AEG appliance standards and building codes analysis

SECTION 4: DEMAND-SIDE RATE DEVELOPMENT

(4) The utility shall develop potential demand-side rates designed for each market segment to reduce the net consumption of electricity or modify the timing of its use. The utility shall describe and document its demand-side rate planning and design process and shall include at least the following activities and elements: —

4.1 DEMAND-SIDE RATE REVIEW

(A) Review demand-side rates that have been implemented by other utilities and identify whether similar demand-side rates would be applicable for the utility taking into account factors such as similarity in electric prices and customer makeup; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG engaged The Brattle Group (Brattle) to assist in the development of the demand-side rates. Brattle is a leading national expert on demand response and energy markets at the retail and wholesale level, as well as dynamic pricing and demand-side rates. Brattle maintains the largest database of pilot projects involving dynamic pricing and time-varying rate designs and also tracks full-scale deployment of inclining block rate designs. Brattle also has data from non-pilot studies that have been published for commercial and industrial customers. Building on this database, Brattle has developed a simulation model, PRISM, for simulating rate impacts. It has two sub-models. The GREEN PRISM simulates the impacts of inclining block rates and the BLUE PRISM simulates the impacts of dynamic pricing and time-of-use pricing rates.

Brattle looked at the universe of demand-side rate based options and identified options that are designed to incentivize customers to reduce, shift, or modify their load. Toward this end, AEG and Brattle first held a workshop with GMO staff to:

- Review current GMO rates
- Identify the universe of demand-side rate alternatives

- Identify strategic pros and cons
- Compare demand-side rates to GMO's current rates
- Recommend a set of rates for the potential analysis

To assess alternative rate options, Brattle took a two-pronged approach that first considered how different each alternative rate is from current GMO rates. Currently, GMO has rates that include customer charges, seasonality, demand charges and declining block rates. Brattle notes that changes in rate designs must be thought of as incremental and, therefore, rate designs that are too different or divergent from the current GMO rates may not be realizable because of political feasibility or customer blowback. Second, rate options were assessed and scored based on the following Bonbright criteria:[8] 1) economic efficiency, 2) equity 3) revenue stability 4) bill stability 5) customer satisfaction. Out of these discussions, we identified the following ten rate options for initial, qualitative analysis and consideration:

- Critical Peak Pricing (CPP)
- Demand Charges
- Electric Vehicle (EV) Rates
- Inclining Block Rates (IBR)
- Peak Time Rebate (PTR)
- Prepaid Rebates
- Real Time Pricing
- Seasonal Rates
- Time of Use (TOU)
- Variable Peak Pricings (VPP)

To further select DSR options for quantitative analysis, AEG, Brattle, and GMO then met with Stakeholders, gathered their input, considered the degree of departure from GMO's current rates, weighed the strategic pros and cons with respect to the Bonbright criteria, and considered the analysis schedule and budget.

Resources utilized included:

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- Federal Energy Regulatory Commission staff. “A National Assessment of Demand Response Potential.” June 2009. www.ferc.gov/legal/staff-reports/06-09-demand-response.pdf

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4.2 IDENTIFY DEMAND SIDE RATES

(B) Identify demand-side rates applicable to the major classes and decision-makers identified in subsection (1)(A). When appropriate, consider multiple demand-side rate designs for the same major classes; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. AEG worked with The Brattle Group (Brattle) to identify demand-side rate based options that are designed to incentivize customers to reduce, shift, or modify their load. Brattle took a two-pronged approach described above.

The following ten rate options were identified for initial, qualitative analysis and consideration:

- Critical Peak Pricing (CPP)
- Demand Charges
- Electric Vehicle (EV) Rates
- Inclining Block Rates (IBR)
- Peak Time Rebate (PTR)
- Prepaid Rebates
- Real Time Pricing
- Seasonal Rates
- Time of Use (TOU)
- Variable Peak Pricings (VPP)

To further select rate options for quantitative analysis, AEG, Brattle, and GMO then met with Stakeholders, gathered their input, considered the degree of departure from GMO's current rates, weighed the strategic pros and cons with respect to the Bonbright criteria, and considered the analysis schedule and budget. The demand side rates included in the analysis are shown in the table below.

- Residential TOU rates scored well because of the opportunity for energy and demand savings; they are relatively equitable for all customers; and they are a reasonable departure from the current rate design

- Similarly, demand charges scored well because of the opportunity for demand savings, and these rates are aligned with actual costs

Figure 4: Bonbright Weighting - Residential

Metric	Simple for Customers to Understand	Appealing to Some Customer Groups	Energy Savings	Demand Savings	Low Implementation Cost	Stability for Utility Business Case	Realizable Given KCP&L's Current Rates (Gradualism)	Equitable for All Customers	Total Score
Residential:									
Critical Peak Pricing (CPP)				++				+	3
Demand Charges				+++			+	+++	7
Electric Vehicle Rates		+	+	+			+		4
Inclining Block Rates (IBR)			++		+		--	--	-1
Peak Time Rebates (PTR)		+		++			+		4
Prepaid Rates		+	+			+	+		4
Real-Time Pricing	--		+	++	-		--		-2
Seasonal Rates	+				+		+		3
Time-of-Use (TOU)			+	++			+	++	6
Variable Peak Pricing (VPP)	-			++	-		-	+	0

- As with residential TOU, commercial TOU scored well because of the opportunity for energy and demand savings; they are relatively equitable for all customers; and they are a reasonable departure from the current rate design.

- RTP scored well because of the opportunity for energy and demand savings, and these rates align with actual costs. However, these rates would appeal most to sophisticated customers.

Figure 5: Bonbright Weighting - Commercial & Industrial

Metric	Simple for Customers to Understand	Appealing to Some Customer Groups	Energy Savings	Demand Savings	Low Implementation Cost	Stability for Utility Business Case	Realizable Given KCP&L's Current Rates (Gradualism)	Equitable for All Customers	Total Score
Commercial & Industrial:									
Critical Peak Pricing (CPP)				++			+	+	4
Inclining Block Rates (IBR)		--	+		+		--	--	-4
Peak Time Rebates (PTR)		+		++			+		4
Real-Time Pricing	--	+	++	++	-		+	+++	6
Seasonal Rates	+				+		+		3
Time-of-Use (TOU)			+	++			+	++	6
Variable Peak Pricing (VPP)	-			++	-		+	+	2

The demand side rates included in the analysis are shown in Table 39 below.

Table 39: List of Demand Side Rate Options[9]

Program Option	Eligible Customer Segments	Mechanism
Demand Rates	Residential	Opt-in rate that includes a billing component based on a customer's peak demand in a given month. This rate structure has traditionally been reserved for C&I customers, but better reflects the grid's evolving underlying cost structure and is being considered for residential application. Opt-in and opt-out options correspond to RAP and MAP respectively. We also investigate the effects of this rate on customers with electric vehicles, who would in effect have an "enabling technology" in the form of their EV that would enable them to shift large amounts of usage and demand by charging their EV during off-peak hours.
Time-of-use Rates	Residential, Small C&I, Large C&I	Higher rate for a particular block of hours that occurs every day. Requires interval meters. Opt-in and opt-out options correspond to RAP and MAP respectively. Similar to the demand rate, we also investigated TOU rates for customer with electric vehicles.
Real-time Pricing	Small C&I, Large C&I	Dynamic rate that fluctuates throughout the day based on energy market prices. Requires interval meters. This is modeled with an opt-in roll-out, which is the only typical implementation that has been observed in the industry. Low and high opt-in participation levels are assumed for RAP and MAP respectively.
Inclining Block Rates	Residential	Higher per-unit price for incremental blocks of monthly energy usage. This is modeled with a mandatory roll-out, which is the only typical implementation that has been observed in the industry. We investigate two cases here, one where the fixed charge remains the same, and another where the fixed charge increases in a manner that is often done in these implementations to preserve revenue stability.

4.3 ASSESS TECHNOLOGICAL ADVANCEMENTS

(C) Assess how technological advancements that may be reasonably anticipated to occur during the planning horizon, including advanced metering and distribution systems, affect the ability to implement demand-side rates; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. A comprehensive list of energy efficiency and demand response measures was developed for each customer sector, drawing upon GMO's current programs, AEG's measure database, and measure lists developed from previous studies. Special focus was given to including the latest

[9] AEG assumed that AMI is fully available in all years of interest (2019-2037). Therefore, measures or programs relying on AMI meters will have no limitations with regards to metering infrastructure for the study period.

available data on emerging technologies from AEG's in-depth research and participation in technical working groups all over the nation. This includes recent evolutions in LED lighting, heat pump technologies, smart thermostats, behavioral research, and smart control systems; all of which are included in this study.

Advanced Metering Infrastructure (AMI) is actively rolling out in GMO's service territory, with approximately 500,000 meters in the metro area already, and should be completed soon. For the potential study, AEG assumed that AMI is fully available in all years of interest (2019-2037). Therefore, measures or programs relying on AMI meters will have no limitations with regards to metering infrastructure for the study period.

Subsequent to the Navigant study, GMO developed a IT technology roadmap that includes the following elements;

- *AMI Metro (2014-2016)*. GMO initiated an upgrade of the legacy AMR meters with new AMI meters and technology in the entire Kansas City Metro service area.
- *MDM (2015)*. GMO will deploy an enterprise MDM system to manage all meter reading data.
- *CIS (2017)*. GMO has a project underway to deploy a new CIS that will upgrade and consolidate the existing KCP&L-MO and GMO systems. AMI deployments will be suspended in 2017 to facilitate the CIS implementation, migration and testing.
- *AMI Rural (2018-2020)*. While not yet approved, GMO projects that after the new CIS project, AMI meters will be deployed in all service territories outside of the Kansas City.

4.4 ESTIMATE INPUT DATA AND OTHER CHARACTERISTICS

(D) Estimate the input data and other characteristics needed for the twenty (20)-year planning horizon to assess the cost effectiveness of each potential demand-side rate, including: —

4.4.1 DEMAND AND ENERGY REDUCTION IMPACT

1. An assessment of the demand and energy reduction impacts of each potential demand-side rate; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. The potential demand savings are calculated by multiplying the per-customer load reduction at system peak by the total number of participating customers. Existing program impacts were sourced from GMO program experience and the 2016-2018 MEEIA and KEEIA plan filings, specifically for the program options DLC Smart Thermostat and Curtailment Agreements. The remaining program impacts were developed through secondary research. Program impacts are equivalent across service territories and between the RAP and MAP cases, except for TOU and Demand Rate where impacts vary between RAP and MAP to reflect the difference between the customer population in the opt-in scenario (RAP) and those in the opt-out scenario (MAP). A more engaged population with higher responsiveness is anticipated to volunteer for a program, while an opt-out program will have moderated responsiveness due to the enrollment of the entire eligible customer base. The assumptions used in the model for per-customer summer and winter peak savings are shown in Table 40 below.

Table 40: Per Unit DR and DSR Load Reduction Assumptions

Customer Class	Option	Unit	Summer Peak Impact	Winter Peak Impact
Residential	DLC Space Cooling	kW @meter	1.26	-
Residential	DLC Space Heating	kW @meter	-	1.65
Residential	DLC Water Heating	kW @meter	0.58	0.58
Residential	DLC Smart Thermostats	kW @meter	1.26	0.70
Residential	DLC Smart Appliances	kW @meter	0.14	0.14
Residential	DLC Room AC	kW @meter	0.47	-
Residential	Battery Energy Storage	kW @meter	2.00	2.00
Residential	DLC Elec Vehicle Charging	kW @meter	0.92	0.92
Residential	Time-Of-Use (opt-out)	% customer peak @meter	*6.7%*	*6.1%*
Residential	Time-Of-Use (opt-in)	% customer peak @meter	*10.9%*	*10.1%*
Residential	Time-Of-Us w EV	kW @meter	1.80	1.67
Residential	Demand Rate (opt-out)	% customer peak @meter	*6.7%*	*7.8%*
Residential	Demand Rate (opt-in)	% customer peak @meter	*11.1%*	*13.0%*
Residential	Demand Rate w EV	kW @meter	1.81	2.07
Residential	Inclining Block Rate	% customer peak @meter	1.3%	0.8%
Small C&I	DLC Space Cooling	kW @meter	1.51	-
Small C&I	DLC Space Heating	kW @meter	-	1.98
Small C&I	DLC Water Heating	kW @meter	0.70	0.70
Small C&I	DLC Smart Thermostats	kW @meter	1.51	0.78
Small C&I	Ice Energy Storage	kW @meter	5.00	0.00
Small C&I	Battery Energy Storage	kW @meter	2.00	2.00
Small C&I	Time-Of-Use	% customer peak @meter	0.4%	0.4%
Small C&I	Real Time Pricing	% customer peak @meter	0.7%	0.7%
Large C&I	Curtail Agreements	% customer peak @meter	21.0%	21.0%
Large C&I	Battery Energy Storage	kW @meter	15.00	15.00
Large C&I	Time-Of-Use	% customer peak @meter	4.4%	4.4%
Large C&I	Real Time Pricing	% customer peak @meter	9.5%	9.5%

4.4.2 INTERACTION OF MULTIPLE DEMAND-SIDE RATES

2. An assessment of how the interactions between multiple potential demand-side rates, if offered simultaneously, would affect the impact estimates; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. To avoid double counting of load reduction impacts, program-eligibility criteria were defined to ensure that customers do not participate in mutually exclusive programs at the same time. For example, small C&I customers cannot participate in the DLC Space Cooling program and the Ice Energy Storage program since both of them would target the same load from the same end use for curtailment on the same days.

With the hierarchy activated, each successive resource that is run in the model stack has a newly updated pool of eligible participants where customers enrolled in previously-stacked, competing resource options have been removed. The participation rate for that resource is then applied to the new pool of eligible participants, rather than the entire, original pool. The results of this analysis are shown in Table 41 below:

Table 41: Participation Hierarchy in DR and DSR Options by Customer Class

	Customer Class	Residential	Small C&I	Large C&I
Loaded First	DLC Space Cooling	x	x	
	DLC Space Heating	x	x	
	DLC Water Heating	x	x	
	DLC Smart Thermostats	x	x	
	DLC Smart Appliances	x		
	DLC Room AC	x		
	Ice Energy Storage		x	
	Curtail Agreements			x
	Battery Energy Storage	x	x	x
	DLC Elec Vehicle Charging	x		
Loaded Last	Rate structure:			
	Time-Of-Use with EV	x		
	Time-Of-Use	x	x	x
	Demand Rate with EV	x		
	Demand Rate	x		
	Real Time Pricing		x	x
	Inclining Block Rate	x		

AEG estimated several levels of potential as defined below:

- *Standalone DR/DSR potential.* Each DR and DSR option is assessed independently, without regard for the participation hierarchy and assuming maximum expected participation (equivalent to the MAP case for EE). This gives the maximum savings that could be attained for each option. It also allows us to

consider a first-level estimate of cost-effectiveness. Programs that have a benefit-cost ratio of 1.0 or greater pass into the estimation of achievable potential.[10]

- *Maximum achievable DR/DSR potential.* The case considers only those programs that pass the first-level cost-effectiveness screen and assumes the highest level of customer participation. We also apply the participation hierarchy to restrict customer participation to only one DR or DSR option. Savings and cost-effectiveness are reported after the resource stacking and integration occurs with the subset of cost-effective options.

- *Realistic achievable DR/DSR potential.* This case is the same as the above maximum achievable potential case except that more realistic customer participation rates are assumed. Again, only those options that are cost-effective are included in the savings estimates.

4.4.3 INTERACTION OF POTENTIAL DEMAND-SIDE RATES AND PROGRAMS

3. An assessment of how the interactions between potential demand-side rates and potential demand-side programs would affect the impact estimates of the potential demand side programs and potential demand-side rates; —

GMO engaged AEG to conduct a 2016 DSM Potential Study. The energy efficiency end-use measures identified were screened for cost-effectiveness on a stand-alone basis. Measures that were cost-effective on a stand-alone basis were bundled into programs and re-screened for cost-effectiveness. Except for the low-income programs, the DSM programs were designed to be cost-effective. Measures were bundled based on end-use and implementation.

To avoid double counting of demand side rates and demand response load reduction impacts, program-eligibility criteria were defined to ensure that customers do not participate in mutually exclusive programs at the same time. With the hierarchy activated,

[10] Technical and Economic Potential are not useful theoretical concepts for Demand Response analyses because these resources are inherently based on customer behaviors and program activity. Therefore, it is necessary to include an assumption about levels of customer adoption and participation, which does not appear in the definition of technical or economic potential.

each successive resource that is run in the model stack has a newly updated pool of eligible participants where customers enrolled in previously-stacked, competing resource options have been removed. The participation rate for that resource is then applied to the new pool of eligible participants, rather than the entire, original pool.

4.4.4 DEMAND AND REDUCTION ENERGY SAVINGS

4. For each year of the planning horizon, an estimate of the incremental and cumulative demand reduction and energy savings due to the potential demand-side rate; and —

The estimated incremental and cumulative demand and energy reduction savings due to the potential demand-side rates can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

4.4.5 COST OF DEMAND-SIDE RATES

5. For each year of the planning horizon, an estimate of the costs of each potential demand-side rate, including: —

A. The cost of incentives to customers to participate in the potential demand side rate paid by the utility. The utility shall consider multiple levels of incentives to achieve customer participation in each potential demand-side rate, with corresponding adjustments to the maximum achievable potential and the realistic achievable potentials of that potential demand-side rate; —

The cost of incentives to customers can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

B. The cost to the customer and to the utility of technology to implement the potential demand-side rate; —

There is no assumed cost to the customer. The cost to the utility to implement the potential demand-side rates can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

C. The utility's cost to administer the potential demand-side rate; and —

The utility's cost to administer the potential demand-side rates can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

D. Other costs identified by the utility; —

No other costs were identified.

4.5 TABULATION OF NUMBER OF PARTICIPANTS

(E) A tabulation of the incremental and cumulative number of participants, load impacts, utility costs, and program participant costs in each year of the planning horizon for each potential demand-side program; —

There is no assumed cost to the customer. The incremental and cumulative participants, load impacts, utility costs and program participant costs for each potential demand-side rate can be found in the work paper "GMO 2017 IRP Exhibits.xlsx."

4.6 SPP DR ELIGIBILITY

(F) Evaluate how each demand-side rate would be considered by the utility's Regional Transmission Organization (RTO) in resource adequacy determinations, eligibility to participate as a demand response resource in RTO markets for energy, capacity, and ancillary services; and —

On March 1, 2014, the Southwest Power Pool (SPP) launched its new Integrated Marketplace. Included in SPP's new market design is the enabling of demand response resources to compete with traditional generators in the energy market. To offer a Demand Response Resource (DRR) into the SPP market, market participants must register as either a Dispatchable Demand Response (DDR) Resource or a Block Demand Response (BDR) Resource. As a part of this registration, the Asset Owner must also identify a corresponding Demand Response Load Asset and the associated PNode or APNode at which the load will be reduced. The Demand Response Load Asset is used by SPP to

identify the actual load reduction to verify DDR and BDR compliance with Dispatch Instructions and Operating Reserve deployment instructions.

A DDR resource is a special type of resource created to model demand reduction associated with controllable load and/or a behind-the-meter generator that is dispatchable on a 5-minute basis and must have a corresponding Demand Response Load (DRL). DRL is a measurable load capable of being increased or reduced at the instruction of the SPP operator identified in the registration and must have telemetering installed. A DDR must submit the real-time value of the DRL to SPP via SCADA on a 10-second basis. A DDR resource has two alternatives for reporting its output; Submitted Resource Production Option or Calculated Production Option.

For DDR resources utilizing the Submitted Resource Option, the Market Participant must determine the real-time resource production and submit the value to SPP via SCADA on a 10-second basis. The meter agent will submit after-the-act integrated meter values directly to SPP.

For DDR resources utilizing the Calculated Resource Production Option, a baseline hourly load profile must be submitted for the DRL prior to the hour for which the DDR resource has been committed that represents the forecast consumption for the hour assuming no load reduction. SPP will take a snapshot of the demand MW at the start of the operating hour. The Real-Time Resource output is calculated as the difference between 1) the minimum of (hourly Load Profile of the DRL, Snapshot of the DRL SCADA interval prior to deployment) and 2) the Real-Time SCADA value for the DRL.

DDR resources must submit energy offer curves similar to generators. The offer curve represents how much the DDR resource can reduce load by in a given hour and at what price. DDR resources specify the maximum and minimum amount of demand reduction that can be achieved. DDR resources would also submit all associated costs no-load costs, start-up costs, etc. A DDR resource can also be compensated for some but not all ancillary services. DDR resources have the opportunity to be compensated for spinning and supplemental reserves but not for regulation up or regulation down.

A BDR is a special type of resource that is not dispatchable on a 5-minute basis but can be dispatched and committed in hourly blocks. A BDR resource must also have a corresponding DRL. The DRL must have telemetering installed and have the real-time load consumption sent to SPP SCADA via ICCP on a 10-second basis. A BDR resource is required to submit an hourly load profile prior to the hour for which the BDR resource has been committed which represents the forecast assuming no load reduction. SPP will take a snapshot of the demand MW at the start of the operating hour.

There are certain operational differences that apply to BDR resources. First, a BDR resource will only use two operating limits, minimum economic capacity operating limit and maximum economic capacity operating limit. The minimum economic operating limit represents the MW amount of demand reduction associated with the first price block identified in the energy price offer curve. The maximum economic capacity limit represents the maximum amount of demand reduction that can be achieved. Second, in the Real Time Balancing Market (RTBM), if the BDR is committed and dispatched in the Day-Ahead market or Reliability Unit Commitment (RUC), the BDR resource minimum economic capacity operating limit will be increased to match the dispatched amount.

A limiting factor for the use of DRRs in the SPP market are the metering requirements. SPPs requirements stipulate that the DRRs must be metered at the individual meter level. Therefore, the company cannot register a DR program as a whole, but would have to register each individual participating customer as a separate resource, because each customer has their own meter. This would greatly increase the amount of work required to manage the program and would also increase the cost, with unclear benefits.

Further, SPP does not have a capacity market and thus the DRRs only receive compensation for the energy and ancillary provided and do not receive capacity payments. This potentially reduces the value of the DRRs because the utility does not control the dispatch of the resource. DRRs are included in the must offer requirements of the SPP market, meaning that the company is required to offer all available resources into the market. The utility does retain some capability to self-commit the resource, but if

there are a limited number of times we can call on a particular DR program and SPP has already utilized all those times, then we will have nothing left to use.

Finally, SPP does not recognize demand response as a resource equal to a generator in the capacity margin requirements. If the DRR does not get dispatched, the utility does not realize a reduction in its peak demand and therefore does not avoid the capacity need. For the time being, it would appear that the company may have greater ability to control and manage its peak demand by self-dispatching its DRRs rather than submitting demand response offers into the SPP market. This will help to maximize the value of DRR by capturing the value of avoided capacity by reducing its overall system load from SPP's perspective. At the time of this writing, GMO is not aware of any registered DRRs in the SPP market. The company will continue to evaluate and monitor SPPs DR market options for the best way to maximize the value of DRRs.

4.7 DOCUMENT HOW ASSESMENTS WERE PERFORMED

(G)The utility shall describe and document how it performed the assessments and developed the estimates pursuant to subsection (4)(D) and shall document its sources and quality of information. —

GMO engaged AEG to conduct a 2016 DSM Potential Study. The study considered a comprehensive list of demand response programs available in the DSM marketplace today and projected into the 20-year study time horizon. These are controllable or dispatchable programmatic options where customers agree to reduce, shift, or modify their load during a limited number of event hours throughout the year. Table 42 represents the Demand Response Programs analyzed.

Table 42: List of Demand Response Program Options in the Analysis

Program Option	Eligible Customer Segments	Mechanism	Current Utility Offering?
DLC Space Cooling	Residential, Small C&I	Direct Load Control switch installed on customer's equipment and operated remotely, typically by RF.	
DLC Room AC			
DLC Water Heating			
DLC Space Heating			
DLC Smart Appliances	Residential, Small C&I	Internet-enabled control of operational cycles of white goods appliances.	
DLC Smart Thermostats	Residential, Small C&I	Internet-enabled control of thermostat set points.	Yes
Curtailment Agreements	Large C&I	Customers enact their customized, mandatory curtailment plan. May use stand-by generation. Penalties apply for non-performance. Various delivery mechanisms, contractual payment and penalty structures used – interruptible tariffs, third party aggregation, etc.	Yes
Ice Energy Storage	Small C&I	Peak shifting of primarily space cooling loads using stored ice.	
Battery Energy Storage	All	Peak shifting of loads using batteries on the customer side of the meter (stored electrochemical energy).	
Electric Vehicle DLC Smart Chargers	Residential	Smart, connected EV chargers that would automate vehicle charging such that it occurred preferentially during overnight, off-peak hours.	

AEG worked with The Brattle Group (Brattle) to identify demand-side rate based options that are designed to incentivize customers to reduce, shift, or modify their load. Brattle took a two-pronged approach:

- First, Brattle considered how different each alternative rate is from current GMO rates. Currently, GMO has rates that include customer charges, seasonality, demand charges and declining block rates. Brattle notes that changes in rate designs must be thought of as incremental and, therefore, rate designs that are too different or divergent from the current GMO rates may not be realizable because of political feasibility or customer blowback.

- Second, rate options were assessed and scored based on the following Bonbright criteria:[11] 1) economic efficiency, 2) equity, 3) revenue stability, 4) bill stability, and 5) customer satisfaction.

Out of these discussions, following ten rate options were identified for initial, qualitative analysis and consideration:

- Critical Peak Pricing (CPP)
- Demand Charges
- Electric Vehicle (EV) Rates
- Inclining Block Rates (IBR)
- Peak Time Rebate (PTR)
- Prepaid Rebates
- Real Time Pricing
- Seasonal Rates
- Time of Use (TOU)
- Variable Peak Pricings (VPP)

To further select rate options for quantitative analysis, AEG, Brattle, and GMO then met with Stakeholders, gathered their input, considered the degree of departure from GMO's current rates, weighed the strategic pros and cons with respect to the Bonbright criteria, and considered the analysis schedule and budget. The demand side rates included in the analysis are shown in the Table 43 below.

[11] A set of utility rate design principles developed by James Cumming Bonbright that look to aid in rate development. James C. Bonbright, *Principles of Public Utility Rates* (New York: Columbia University Press, 1961).

Table 43: List of Demand Side Rate Options

Program Option	Eligible Customer Segments	Mechanism
Demand Rates	Residential	Opt-in rate that includes a billing component based on a customer's peak demand in a given month. This rate structure has traditionally been reserved for C&I customers, but better reflects the grid's evolving underlying cost structure and is being considered for residential application. Opt-in and opt-out options correspond to RAP and MAP respectively. We also investigate the effects of this rate on customers with electric vehicles, who would in effect have an "enabling technology" in the form of their EV that would enable them to shift large amounts of usage and demand by charging their EV during off-peak hours.
Time-of-use Rates	Residential, Small C&I, Large C&I	Higher rate for a particular block of hours that occurs every day. Requires interval meters. Opt-in and opt-out options correspond to RAP and MAP respectively. Similar to the demand rate, we also investigated TOU rates for customer with electric vehicles.
Real-time Pricing	Small C&I, Large C&I	Dynamic rate that fluctuates throughout the day based on energy market prices. Requires interval meters. This is modeled with an opt-in roll-out, which is the only typical implementation that has been observed in the industry. Low and high opt-in participation levels are assumed for RAP and MAP respectively.
Inclining Block Rates	Residential	Higher per-unit price for incremental blocks of monthly energy usage. This is modeled with a mandatory roll-out, which is the only typical implementation that has been observed in the industry. We investigate two cases here, one where the fixed charge remains the same, and another where the fixed charge increases in a manner that is often done in these implementations to preserve revenue stability.

Program-eligibility criteria were defined to ensure that customers do not participate in mutually exclusive programs at the same time. For example, small C&I customers cannot participate in the DLC Space Cooling program and the Ice Energy Storage program since both of them would target the same load from the same end use for curtailment on the same days. With the hierarchy activated, each successive resource that is run in the model stack has a newly updated pool of eligible participants where customers enrolled in previously-stacked, competing resource options have been removed. The participation rate for that resource is then applied to the new pool of eligible participants, rather than the entire, original pool. The results of this analysis are shown in Table 44 below:

Table 44: Participation Hierarchy in DR and DSR Options by Customer Class

	Customer Class	Residential	Small C&I	Large C&I
Loaded First	DLC Space Cooling	x	x	
	DLC Space Heating	x	x	
	DLC Water Heating	x	x	
	DLC Smart Thermostats	x	x	
	DLC Smart Appliances	x		
	DLC Room AC	x		
	Ice Energy Storage		x	
	Curtail Agreements			x
	Battery Energy Storage	x	x	x
Loaded Last	DLC Elec Vehicle Charging	x		
	Rate structure:			
	Time-Of-Use with EV	x		
	Time-Of-Use	x	x	x
	Demand Rate with EV	x		
	Demand Rate	x		
	Real Time Pricing		x	x
	Inclining Block Rate	x		

Participation rate assumptions are defined as the percent of eligible customers who take part in a given program in a given year. The assumptions are provided in Table 45 below. Note that a customer is not considered eligible if they do not have the relevant equipment or are already participating in a mutually exclusive program. The existing programs (DLC Smart Thermostat and Curtailment Agreements) are calibrated in year 1 to current performance. The remaining programs were developed by researching DR programs at utilities similar to GMO in size and region, then normalizing for the KCP&L system and customer base.

In general, new DR and DSR programs need time to ramp up and reach a steady state. During ramp up, customer education, marketing and recruitment take place, as well as the physical implementation and installation of any hardware, software, telemetry, or other equipment required. For GMO, it is assumed that programs ramp up to steady state over five years, typical of industry experience. There are some exceptions to this general rule:

- Under the mandatory residential inclining block rate, 100% of relevant customers are enrolled automatically.

- Under an opt-out rate, which includes Time-Of-Use in the MAP case and Demand Rates in the MAP case, 100% of relevant customers are also enrolled automatically, but they may choose to leave the rate at any time.

All programs, except GMO's existing DLC Smart Thermostat and Curtailment agreement programs are assumed to begin ramping up in 2019.

Table 45: Participation Rates by Option and Customer Sector (percent of eligible customers)

			Steady State Participation Rate	
Option	Category	Program	RAP	MAP
Residential	DR	DLC Space Cooling	7.0%	8.0%
Residential	DR	DLC Space Heating	15.0%	22.5%
Residential	DR	DLC Water Heating	15.0%	22.5%
Residential	DR	DLC Smart Thermostats	18.0%	22.0%
Residential	DR	DLC Smart Appliances	5.0%	7.5%
Residential	DR	DLC Room AC	15.0%	22.5%
Residential	DR	Battery Energy Storage	1.0%	1.5%
Residential	DR	DLC Elec Vehicle Charging	20.0%	30.0%
Residential	DSR	Time-Of-Use	28.0%	85.0%
Residential	DSR	Time-Of-Use w EV	85.0%	100%
Residential	DSR	Demand Rate	28.0%	85.0%
Residential	DSR	Demand Rate w EV	84.0%	100.0%
Residential	DSR	Inclining Block Rate	100.0%	100.0%
Small C&I	DR	DLC Space Cooling	3.0%	4.5%
Small C&I	DR	DLC Space Heating	3.0%	30.0%
Small C&I	DR	DLC Water Heating	3.0%	4.5%
Small C&I	DR	DLC Smart Thermostats	5.0%	7.5%
Small C&I	DR	Ice Energy Storage	1.5%	2.3%
Small C&I	DR	Battery Energy Storage	1.0%	3.0%
Small C&I	DSR	Time-Of-Use	13.0%	74.0%
Small C&I	DSR	Real Time Pricing	18.0%	31.0%
Large C&I	DR	Curtail Agreements	45.9%	55.0%
Large C&I	DR	Battery Energy Storage	1.0%	3.0%
Large C&I	DSR	Time-Of-Use	13.0%	74.0%
Large C&I	DSR	Real Time Pricing	18.0%	31.0%

Program costs include fixed and variable cost elements for numerous aspects of program delivery: program development costs, annual program administration costs, marketing and recruitment costs, enabling technology costs for purchase and installation, annual O&M costs, and participant incentives. These assumptions are based on actual program costs from existing or past GMO programs. For new programs, assumptions are based on actual AEG program implementation experience, experience in developing program costs for other similar studies, and secondary research.

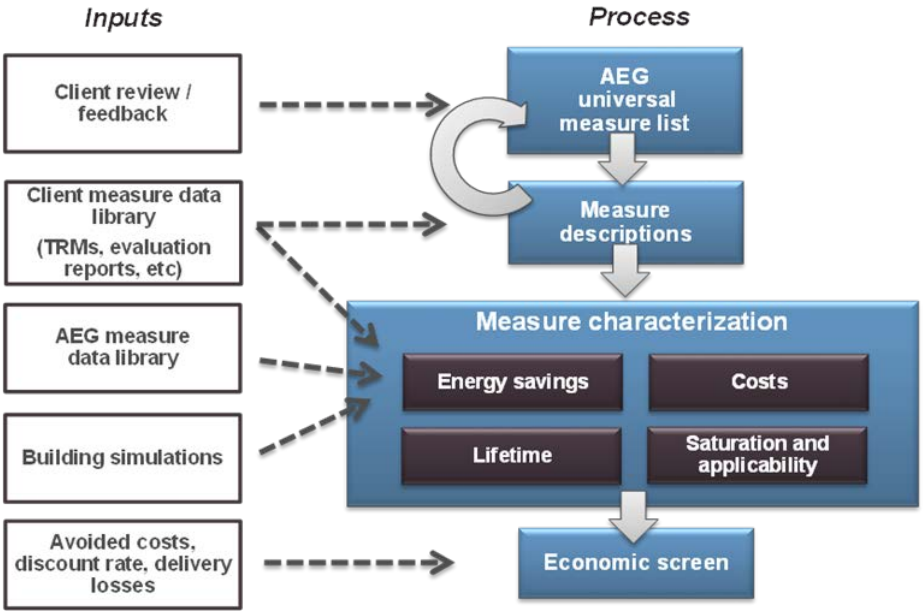
SECTION 5: DEMAND-SIDE PROGRAM COST EFFECTIVENESS

(5) The utility shall describe and document its evaluation of the cost effectiveness of each potential demand-side program developed pursuant to section (3) and each potential demand-side rate developed pursuant to section (4). All costs and benefits shall be expressed in nominal dollars. —

GMO engaged AEG to conduct a 2016 DSM Potential Study. A comprehensive list of energy efficiency and demand response measures was developed for each customer sector, drawing upon GMO's current programs, AEG's measure database, and measure lists developed from previous studies. The list of measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption. Special focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups all over the nation. This includes recent evolutions in LED lighting, heat pump technologies, smart thermostats, behavioral research, and smart control systems; all of which are included in this study.

Each measure was characterized with energy and demand savings, incremental cost, effective useful life, and other performance factors, drawing upon data from AEG's DEEM measure database and well-vetted national and regional sources. An economic screening was performed on each measure, which serves as the basis for developing the economic and achievable potential, utilizing the measure information along with GMO's avoided cost data.

Figure 6: Approach for Energy Efficiency Measure Assessment



AEG performed the industry standard cost-effectiveness tests to gauge the economic merits of the measures, programs and portfolio. Each test compares the benefits of a DSM program to its costs using its own unique perspectives and definitions. The definitions for the four standard tests most commonly used are described below.

- *Total Resource Cost Test (TRC)* measures the net costs and benefits of an energy efficiency program as a resource option based on the total costs of the measure, including both the participant's and the utility's costs. This test represents the combination of the effects of a program on both participating and non-participating customers.
- *Utility Cost Test (UCT)* measures the net costs of a measure as a resource option based on the costs incurred by the program administrator, excluding any net costs incurred by the participant.
- *Participant Cost Test (PCT)* quantifies the benefits and costs to the customer due to program participation.

- *Rate Impact Measure Test (RIM)* measures what happens to a customer's rates due to changes in utility revenues and operating costs.

Only measures that are cost-effective were included in economic and achievable measure-level potential. Measures were first screened for cost-effectiveness within LoadMAP for inclusion in the economic and achievable potential scenarios. LoadMAP utilized the TRC test for measure-level cost-effectiveness screening (i.e., a TRC benefit-cost ratio of at least 1.0). The LoadMAP model performs this screening dynamically, taking into account changing savings and cost data over time. Thus, some measures pass the economic screen for some — but not all — years in the projection.

The programs were developed by considering and bundling the measure-level analysis – energy efficiency, demand response, demand side rates, and combined heat and power – in an integrated and holistic manner to ascertain the total potential savings, costs, and delivery structure of an actual and realizable portfolio of DSM resources. Table 46 represents a summary of the residential DSM programs and Table 47 represents a summary of the Business DSM programs.

Specifically, when translating from the measure-level potential to program-level potential, AEG applied the following adjustments:

- Allocated measures to one or more programs, considering measure bundling.
- Assigned incentive and administrative program costs consistent with bundles and delivery mechanisms
- Reviewed marginally cost-effective measures (TRC benefit-to-cost ratio close to 1.0). Some non-cost-effective measures may remain in a program for market continuity purposes and to provide a robust portfolio, while other measures may be removed to improve program and portfolio cost-effectiveness.
- Excluded measures with small potential or that are challenging to implement (e.g., residential electronic equipment).

- As appropriate, considered multiple efficiency levels for technologies that may not have been part of measure-level results. For example, measure-level potential selects one SEER level of residential central air conditioners to maximize absolute energy savings, but the program potential includes several SEER levels to provide a more customer-friendly set of choices and options.

- Evaluated program cost-effectiveness incorporating delivery, administration and EM&V costs. The program-level potential relied primarily on the TRC test to determine cost-effectiveness.

Table 46: Summary of Residential DSM Programs

Residential Programs	High-Level Description
Home Lighting Rebate	Instant incentives at qualifying retailers for standard and specialty LEDs.
Home Energy Report	Behavioral program utilizing customized energy reports with peer comparisons sent periodically to households to encourage energy efficient behaviors.
Income-Eligible Home Energy Report	Behavioral program utilizing customized energy reports with peer comparisons sent periodically to households to encourage energy efficient behaviors. Targets low-income customer segment.
Online Home Energy Audit	Online energy audit tool.
Whole House Efficiency	A holistic program that aims at increasing efficiency across multiple systems in a customer's home, with measures that affect all end uses and building shell.
Income-Eligible Multi-Family	The program aims to provide direct install measures in housing units and common area measures to multi-family buildings, targeting low-income customers.
Income-Eligible Weatherization	The program leverages the Missouri Weatherization Assistance Program to provide qualifying customers with approved energy efficiency measures and equipment. Targets low-income customers and provides fully subsidized measures.
Residential Smart Thermostat with DLC	Direct load control program that modifies heating and cooling temperature settings and curtails HVAC equipment by way of a smart, communicating thermostat. Targets peak demand reductions during DR events, but also has energy savings from occupancy sensors and schedules with learning algorithms.
Central Air Conditioner DLC Switch	Direct load control program that cycles and curtails central air conditioners by way of a remote-controlled switch to provide peak demand reductions during DR events.
Water Heating DLC Switch	Direct load control program that cycles and curtails electric water heaters by way of a remote-controlled switch to provide peak demand reductions during DR events.

Table 47: Summary of Business DSM Programs

Business Programs	High-Level Description and Notes
Business Energy Efficiency Rebate - Standard	Customers receive incentives by installing efficient measures from a pre-qualified list of options.
Business Energy Efficiency Rebates - Custom	Customers receive incentives for installing efficient measures not explicitly identified in the Standard program. The measures are pre-approved by the implementer through an application and review process prior to installation. Incentives are paid based on a dollar per unit of energy saved basis.
Strategic Energy Management	Provide energy education, technical assistance, and coaching for commercial and industrial customers in order to drive behavioral change and transformation of the company culture.
Retrocommissioning	Initial or ongoing monitoring of building energy systems and operations to optimize energy use, focusing at least initially on low-cost or no-cost measures and actions.
Block Bidding	The utility purchases large blocks of electricity savings by issuing an RFP to eligible customers and third-party suppliers, representing reduced electric usage from non-conventional projects that may not be eligible or appropriately incentivized to participate in other programs.
Online Business Energy Audit	Online energy audit tool.
Small Business Targeted	Small business customers that typically do not have the staffing or financial resources to engage in energy efficiency receive targeted marketing and incentives up to 70% of the installed equipment cost for qualifying measures.
Business Smart Thermostat with DLC	Direct load control program that modifies heating and cooling temperature settings and curtails HVAC equipment by way of a smart, communicating thermostat. Targets peak demand reductions during DR events, but also has energy savings from occupancy sensors and schedules with learning algorithms.
Demand Response Incentive	Interruptible tariff program for customers that can reduce load by at least 25 kW during times of system peak congestion.

5.1 CUMULATIVE BENEFITS

(A) In each year of the planning horizon, the benefits of each potential demand-side program and each potential demand-side rate shall be calculated as the cumulative demand reduction multiplied by the avoided demand cost plus the cumulative energy savings multiplied by the avoided energy cost. These calculations shall be performed both with and without the avoided probable environmental costs. The utility shall describe and document the methods, data, and assumptions it used to develop the avoided costs. —

5.1.1 AVOIDED DEMAND COST

1. The utility avoided demand cost shall include the capacity cost of generation, transmission, and distribution facilities, adjusted to reflect reliability reserve margins and capacity losses on the transmission and distribution systems, or the corresponding market-based equivalents of those costs. The utility shall describe and document how it developed its avoided demand cost, and the capacity cost chosen shall be consistent throughout the triennial compliance filing. —

The technology costs were updated through discussion with engineering firms and outside parties in order to ensure the values represent current market conditions. Following is a brief discussion of these three components that make up the avoided cost:

1. **Capital cost** includes two components – the cost of the power plant construction and the cost of the transmission interconnection. A levelized fixed charge rate is applied to these capital costs to arrive at an annual cost for the plant and the related transmission interconnection. This levelized fixed charge rate accounts for the weighted cost of capital, capturing the cost of debt, equity, and preferred equity, as well as the impact of deferred taxes, depreciable lives, income taxes, and property taxes.

2. The **FOM cost** assumptions are provided by an outside vendor and, as such, are considered proprietary information available only to those under license. The FOM cost includes items such as operating labor for plant personnel, maintenance costs

for different sections of the plant, and overhead charges for administrative and support labor. An annual FOM cost is calculated and then divided by the size of the power plant to arrive at an annual FOM cost/kW-Yr.

3. The **cost of firm gas transportation** represents the cost of pipeline upgrades to ensure that natural gas supplies are available when needed at the power plant. These capital cost estimates are highly confidential cost projections provided by gas pipeline companies and can vary due to the proximity of existing feed lines. These estimates are converted to an annual cost/kW-Yr, similar to the FOM costs.

The sum of the levelized annual capital cost, the FOM, and the firm gas transportation cost are combined to arrive at a total avoided cost on a dollar per kilowatt-year basis.

The calculation of avoided demand cost for the 2016 DSM Potential Study was sourced from the 2016 IRP Annual Update is provided in the table below.

Table 48: Avoided Demand Cost Development (Real 2015 Dollars)
****Highly Confidential****

CT Value for Avoided Cost Calculations (2015 $)	GE 7FA (w Firm Gas Est)
Net Capacity (MW)	[redacted]
Capacity Factor	
Fixed O&M ($/kW-Yr)	
Var O&M ($/MWh)	
Technology Cost ($/kW)	
Technology Capital	
Levelized FCR for construction projects	
Annual Technology Carrying Cost	
Transmission Cost ($/kW)	
Transmission Capital	
Transmission FCR	
Annual Transmission Carrying Cost	
Total Annual Cost	
Total Fixed O&M	
Total Variable O&M	
Total Levelized Fixed Cost Per Year	
Installed Cost $/kW	

5.1.2 AVOIDED ENERGY COST

2. The utility avoided energy cost shall include the fuel costs, emission allowance costs, and other variable operation and maintenance costs of generation facilities, adjusted to reflect energy losses on the transmission and distribution systems, or the corresponding market-based equivalents of those costs. The utility shall describe and document how it developed its avoided energy cost, and the energy costs shall be consistent throughout the triennial compliance filing. —

The base case energy price forecast used for the DSM Potential Study was the Mid Gas, No CO_2 price curve from the 2016 IRP Annual Update. This is represented by endpoint #10 above, and is the scenario with the highest probability.

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For the 2016 IRP Annual Updates, there were a total of six different energy price curves used in the evaluation of each Alternative Resource Plan, which represented a high, mid and low gas price coupled with and without a CO_2 cost. In the IRP analysis, these six price curves are combined with high, mid and low load uncertainties to derive the 18 endpoint scenarios used to measure the expected value of revenue requirement for plan rankings.

Table 49: Eighteen Endpoint Scenarios from 2016 IRP Update

Endpoint	Load Growth	Natural Gas	CO_2	Endpoint Probability
1	High	High	Yes	2.5%
2	High	High	No	3.8%
3	High	Mid	Yes	5.0%
4	High	Mid	No	7.5%
5	High	Low	Yes	2.5%
6	High	Low	No	3.8%
7	Mid	High	Yes	5.0%
8	Mid	High	No	7.5%
9	Mid	Mid	Yes	10.0%
10	Mid	Mid	No	15.0%
11	Mid	Low	Yes	5.0%
12	Mid	Low	No	7.5%
13	Low	High	Yes	2.5%
14	Low	High	No	3.8%
15	Low	Mid	Yes	5.0%
16	Low	Mid	No	7.5%
17	Low	Low	Yes	2.5%
18	Low	Low	No	3.8%

The corresponding energy costs by year are provided in the table below (values in real 2015 dollars).

Table 50: Avoided Energy Costs by Year (Real 2015 Dollars)
****Highly Confidential****

Year	Avoided Energy Cost ($/MWh)
2019	
2020	
2021	
2022	
2023	
2024	
2025	
2026	
2027	
2028	
2029	
2030	
2031	
2032	
2033	
2034	
2035	
2036	
2037	

5.1.3 AVOIDED ENVIRONMENTAL COST

3. The avoided probable environmental costs include the effects of the probable environmental costs calculated pursuant to 4 CSR 240-22.040(2)(B) on the utility avoided demand cost and the utility avoided energy cost. The utility shall describe and document how it developed its avoided probable environmental cost. —

The probable environmental costs were developed as described in the response to 4 CSR 240-22.040(2)(B) in the 2015 Triennial IRP filing and are included in the calculation of avoided energy costs.

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5.2 TOTAL RESOURCE COST TEST (TRC)

(B) The total resource cost test shall be used to evaluate the cost effectiveness of the potential demand-side programs and potential demand-side rates. In each year of the planning horizon —

5.2.1 DEMAND-SIDE PROGRAM COSTS

1. The costs of each potential demand-side program shall be calculated as the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions) plus utility costs to administer, deliver, and evaluate each potential demand-side program; —

The TRC costs include the incremental participant cost and utility administrative costs associated with the program.

5.2.2 DEMAND-SIDE RATE COSTS

2. The costs of each potential demand-side rate shall be calculated as the sum of all incremental costs that are due to the rate (including both utility and participant contributions) plus utility costs to administer, deliver, and evaluate each potential demand-side rate; and —

The TRC costs include the incremental participant cost and the utility administrative costs associated with the program.

5.2.3 COSTS NOT TO INCLUDE

3. For purposes of this test, the costs of potential demand-side programs and potential demand-side rates shall not include lost revenues or utility incentive payments to customers. —

The TRC costs do not include lost revenues or incentive payments to customers.

5.3 UTILITY COST TEST (UCT)

(C) The utility cost test shall also be performed for purposes of comparison. In each year of the planning horizon —

5.3.1 TEST COSTS

1. The costs of each potential demand-side program and potential demand-side rate shall be calculated as the sum of all utility incentive payments plus utility costs to administer, deliver, and evaluate each potential demand-side program or potential demand-side rate; —

The UCT costs include the utility's incentive and administrative costs.

5.3.2 COSTS NOT TO INCLUDE

2. For purposes of this test, the costs of potential demand-side programs and potential demand-side rates shall not include lost revenues; and —

The UCT costs do not include lost revenues.

5.3.3 RATE OF RETURN OR INCENTIVE COSTS

3. The costs shall include, but separately identify, the costs of any rate of return or incentive included in the utility's recovery of demand-side program costs. —

The analysis did not assume a rate of return or utility incentive.

5.4 TRC MUST BE GREATER THAN ONE

(D) The present value of program benefits minus the present value of program costs over the planning horizon must be positive or the ratio of annualized benefits to annualized costs must be greater than one (1) for a potential demand-side program or potential demand-side rate to pass the utility cost test or the total resource cost test. The utility may relax this criterion for programs that are judged to have potential benefits that are not captured by the estimated load impacts or avoided costs, including programs required to comply with legal mandates. —

Except for the low-income programs, the DSM programs were designed to be cost-effective.

5.5 TRC AND UCT TEST RESULTS

(E) The utility shall provide results of the total resource cost test and the utility cost test for each potential demand-side program evaluated pursuant to subsection (5)(B) and for each potential demand–side rate evaluated pursuant to subsection (5)(C) of this rule, including a tabulation of the benefits (avoided costs), demand-side resource costs, and net benefits or costs. —

The TRC and UCT results for each potential DSM program and demand side rate are presented in the work paper “GMO 2017 IRP Exhibits.xlsx.”

5.6 OTHER COST BENEFIT TEST RESULTS

(F) If the utility calculates values for other tests to assist in the design of demand-side programs or demand-side rates, the utility shall describe and document the tests and provide the results of those tests. —

AEG also analyzed cost-effectiveness for the following two standard tests:

- *Participant Cost Test (PCT).* The benefits include lost utility revenues (i.e. the lifetime value of retail rate savings). The costs include the participant incremental measure costs minus the value of incentives.
- *Rate Impact Measure Test (RIM).* The test measures what happens to customer's rates due to changes in utility revenues and operating costs. Therefore, if the benefits are greater than the costs, rates will decrease on average and subsidies will be minimized or avoided. The benefits are the same as the TRC benefits and the costs include all utility costs associated with the program, including lost utility revenue as well as incentive and administrative costs.

The PCT and RIM results for each potential DSM program and demand side rate are presented in the work paper "GMO 2017 IRP Exhibits.xlsx."

5.7 DESCRIBE AND DOCUMENT COST EFFECTIVENESS TESTS

(G) The utility shall describe and document how it performed the cost effectiveness assessments pursuant to section (5) and shall describe and document its methods and its sources and quality of information. —

GMO engaged AEG to conduct a 2016 DSM Potential Study. A comprehensive list of energy efficiency and demand response measures was developed for each customer sector, drawing upon GMO's current programs, AEG's measure database, and measure lists developed from previous studies. The list of measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption. Special focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups all over the nation.

This includes recent evolutions in LED lighting, heat pump technologies, smart thermostats, behavioral research, and smart control systems; all of which are included in this study.

Each measure was characterized with energy and demand savings, incremental cost, effective useful life, and other performance factors, drawing upon data from AEG's DEEM measure database and well-vetted national and regional sources. We performed an economic screening of each measure, which serves as the basis for developing the economic and achievable potential, utilizing the measure information along with GMO's avoided cost data.

Figure 7: Approach for Energy Efficiency Measure Assessment

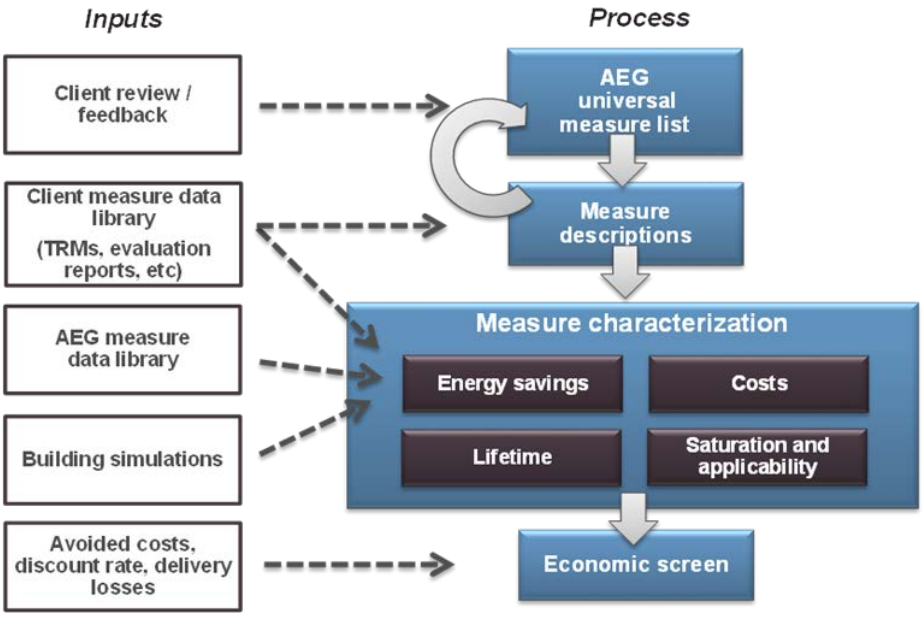

Table 51 below details the energy-efficiency measure inputs and identifies the key sources.

Table 51: Data Needs for Measure Characterization

Model Inputs	Description	Key Sources
Energy Impacts	The annual reduction in consumption attributable to each specific measure. Savings were developed as a percentage of the energy end use that the measure affects.	BEST AEG's DEEM AEO 2015 Other secondary sources
Peak Demand Impacts	Savings during the peak demand periods are specified for each electric measure. These impacts relate to the energy savings and depend on the extent to which each measure is coincident with the system peak.	BEST AEG's DEEM AEG EnergyShape
Costs	Equipment Measures: Includes the full cost of purchasing and installing the equipment on a per-unit basis. Non-equipment measures: Existing buildings – full installed cost. New Construction - the costs may be either the full cost of the measure, or as appropriate, it may be the incremental cost of upgrading from a standard level to a higher efficiency level.	AEG's DEEM AEO 2015 RS Means Other secondary sources
Measure Lifetimes	Estimates derived from the technical data and secondary data sources that support the measure demand and energy savings analysis.	AEG's DEEM AEO 2015 Other secondary sources
Applicability	Estimate of the percentage of dwellings in the residential sector, square feet in the commercial sector or employees in the industrial sector where the measure is applicable and where it is technically feasible to implement.	AEG's DEEM Other secondary sources
On Market and Off Market Availability	Expressed as years for equipment measures to reflect when the equipment technology is available or no longer available in the market.	AEG appliance standards and building codes analysis

Several sources of data were used to characterize the energy efficiency measures. AEG used the following national and well-vetted regional data sources and supplemented with AEG's data sources to fill in any gaps.

- Appliance and Equipment Standards: U.S. Department of Energy, Energy Star and the Consortium for Energy Efficiency.
- Illinois Technical Reference Manual. Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 5.0, effective June 1, 2016.

- Northwest Power and Conservation Council workbooks.

AEG performed the industry standard cost-effectiveness tests to gauge the economic merits of the measures, programs and portfolio. Each test compares the benefits of a DSM program to its costs using its own unique perspectives and definitions. The definitions for the four standard tests most commonly used are described below.

- *Total Resource Cost Test (TRC)* measures the net costs and benefits of an energy efficiency program as a resource option based on the total costs of the measure, including both the participant's and the utility's costs. This test represents the combination of the effects of a program on both participating and non-participating customers.
- *Utility Cost Test (UCT)* measures the net costs of a measure as a resource option based on the costs incurred by the program administrator, excluding any net costs incurred by the participant.
- *Participant Cost Test (PCT)* quantifies the benefits and costs to the customer due to program participation.
- *Rate Impact Measure Test (RIM)* measures what happens to a customer's rates due to changes in utility revenues and operating costs.

Measures were first screened for cost-effectiveness within LoadMAP for inclusion in the economic and achievable potential scenarios. LoadMAP utilized the TRC test for measure-level cost-effectiveness screening (i.e., a TRC benefit-cost ratio of at least 1.0). The LoadMAP model performs this screening dynamically, taking into account changing savings and cost data over time. Thus, some measures pass the economic screen for some — but not all — years in the projection.

Measures that were cost-effective on a stand-alone basis were bundled into programs and re-screened for cost-effectiveness. The programs were developed by considering and bundling the measure-level analysis – energy efficiency, demand response, demand side rates, and combined heat and power – in an integrated and holistic manner to

ascertain the total potential savings, costs, and delivery structure of an actual and realizable portfolio of DSM resources.

Specifically, when translating from the measure-level potential to program-level potential, AEG applied the following adjustments:

- Allocated measures to one or more programs, considering measure bundling.
- Assigned incentive and administrative program costs consistent with bundles and delivery mechanisms
- Reviewed marginally cost-effective measures (TRC benefit-to-cost ratio close to 1.0). Some non-cost-effective measures may remain in a program for market continuity purposes and to provide a robust portfolio, while other measures may be removed to improve program and portfolio cost-effectiveness.
- Excluded measures with small potential or that are challenging to implement (e.g., residential electronic equipment).
- As appropriate, considered multiple efficiency levels for technologies that may not have been part of measure-level results. For example, measure-level potential selects one SEER level of residential central air conditioners to maximize absolute energy savings, but the program potential includes several SEER levels to provide a more customer-friendly set of choices and options.
- Evaluated program cost-effectiveness incorporating delivery, administration and EM&V costs. The program-level potential relied primarily on the TRC test to determine cost-effectiveness.

AEG considered multiple design scenarios including the program realistic achievable potential (RAP) and program maximum achievable potential (MAP) as well as two additional scenarios extrapolated based on those program-level RAP and MAP portfolios in order to provide GMO with a more diverse set of planning cases.

- Program RAP-: Alternative portfolio designed to represent approximately 75% of RAP participation levels.

- Program RAP: The measure-level RAP candidates from the DSM Potential Study that GMO proposes passing to the integration phase. This portfolio reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions.

- Program RAP+: Alternative portfolio designed to represent approximately the average of RAP and MAP participation levels.

- Program MAP: The measure-level MAP candidates from the DSM Potential Study that GMO proposes passing into the integration phase. This portfolio reflects expected program participation given ideal market implementation and few barriers to customer adoption. Incentives represent a substantial portion of the incremental cost combined with high administrative and marketing costs.

SECTION 6: TOTAL RESOURCE COST TEST

(6) Potential demand-side programs and potential demand-side rates that pass the total resource cost test including probable environmental costs shall be considered as demand side candidate resource options and must be included in at least one (1) alternative resource plan developed pursuant to 4 CSR 240-22.060(3). —

Potential demand-side programs and demand-side rates that passed the total resource cost test (a benefit-cost ratio of at least 1.0) were considered as a demand-side candidate resource option.

6.1 BUNDLING OF PORTFOLIOS

(A) The utility may bundle demand-side candidate resource options into portfolios, as long as the requirements pursuant to section (1) are met and as long as multiple demand side candidate resource options and portfolios advance for consideration in the integrated resource analysis in 4 CSR 240-22.060. The utility shall describe and document how its demand-side candidate resource options and portfolios satisfy these requirements. —

GMO engaged AEG to conduct a 2016 DSM Potential Study. Measures that were cost-effective on a stand-alone basis were bundled into programs and re-screened for cost-effectiveness. The programs were developed by considering and bundling the measure-level analysis – energy efficiency, demand response, demand side rates, and combined heat and power – in an integrated and holistic manner to ascertain the total potential savings, costs, and delivery structure of an actual and realizable portfolio of DSM resources.

Specifically, when translating from the measure-level potential to program-level potential, AEG applied the following adjustments:

- Allocated measures to one or more programs, considering measure bundling.

- Assigned incentive and administrative program costs consistent with bundles and delivery mechanisms

- Reviewed marginally cost-effective measures (TRC benefit-to-cost ratio close to 1.0). Some non-cost-effective measures may remain in a program for market continuity purposes and to provide a robust portfolio, while other measures may be removed to improve program and portfolio cost-effectiveness.

- Excluded measures with small potential or that are challenging to implement (e.g., residential electronic equipment).

- As appropriate, considered multiple efficiency levels for technologies that may not have been part of measure-level results. For example, measure-level potential selects one SEER level of residential central air conditioners to maximize absolute energy savings, but the program potential includes several SEER levels to provide a more customer-friendly set of choices and options.

- Evaluated program cost-effectiveness incorporating delivery, administration and EM&V costs. The program-level potential relied primarily on the TRC test to determine cost-effectiveness.

AEG considered multiple design scenarios including the program realistic achievable potential (RAP) and program maximum achievable potential (MAP) as well as two additional scenarios extrapolated based on those program-level RAP and MAP portfolios in order to provide GMO with a more diverse set of planning cases.

- Program RAP-. Alternative portfolio designed to represent approximately 75% of RAP participation levels.

- Program RAP. The measure-level RAP candidates from the DSM Potential Study that GMO proposes passing to the integration phase. This portfolio reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions.

- Program RAP+. Alternative portfolio designed to represent approximately the average of RAP and MAP participation levels.

- Program MAP. The measure-level MAP candidates from the DSM Potential Study that GMO proposes passing into the integration phase. This portfolio reflects expected program participation given ideal market implementation and few barriers to customer adoption. Incentives represent a substantial portion of the incremental cost combined with high administrative and marketing costs.

6.2 LOAD IMPACT ESTIMATES

(B) For each demand-side candidate resource option or portfolio, the utility shall describe and document the time-differentiated load impact estimates over the planning horizon at the level of detail required by the supply system simulation model that is used in the integrated resource analysis, including a tabulation of the estimated annual change in energy usage and in diversified demand for each year in the planning horizon due to the implementation of the candidate demand-side resource option or portfolio. —

The time-differentiated load impacts for each demand-side candidate resource option are detailed in the 2016 DSM Potential study program design workbooks which are included as work papers.

6.3 UNCERTAINTY OF LOAD IMPACT ESTIMATES

(C) The utility shall describe and document its assessment of the potential uncertainty associated with the load impact estimates of the demand-side candidate resource options or portfolios. The utility shall estimate —

1. The impact of the uncertainty concerning the customer participation levels by estimating and comparing the maximum achievable potential and realistic achievable potential of each demand-side candidate resource option or portfolio; and —

The potential uncertainty associated with the load impact estimates of the demand-side candidate resource options was accounted for with the four scenarios developed by AEG.

- Program RAP-: Alternative portfolio designed to represent approximately 75% of RAP participation levels.
- Program RAP: The measure-level RAP candidates from the DSM Potential Study that GMO proposes passing to the integration phase. This portfolio reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions.
- Program RAP: Alternative portfolio designed to represent approximately the average of RAP and MAP participation levels.
- Program MAP: The measure-level MAP candidates from the DSM Potential Study that GMO proposes passing into the integration phase. This portfolio reflects expected program participation given ideal market implementation and few barriers to customer adoption. Incentives represent a substantial portion of the incremental cost combined with high administrative and marketing costs.

The annual incremental and cumulative energy and demand impacts and budgets for each scenario are presented in the work paper “GMO IRP Filing Tables.xlsx.”

2. The impact of uncertainty concerning the cost effectiveness by identifying uncertain factors affecting which end-use resources are cost effective. The utility shall identify how the menu of cost-effective end-use measures changes with these uncertain factors and shall estimate how these changes affect the load impact estimates associated with the demand-side candidate resource options. —

The potential uncertainty concerning cost-effectiveness was accounted for with the four scenarios developed by AEG.

- Program RAP-: Alternative portfolio designed to represent approximately 75% of RAP participation levels.

- Program RAP: The measure-level RAP candidates from the DSM Potential Study that GMO proposes passing to the integration phase. This portfolio reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions.

- Program RAP+: Alternative portfolio designed to represent approximately the average of RAP and MAP participation levels.

- Program MAP: The measure-level MAP candidates from the DSM Potential Study that GM proposes passing into the integration phase. This portfolio reflects expected program participation given ideal market implementation and few barriers to customer adoption. Incentives represent a substantial portion of the incremental cost combined with high administrative and marketing costs.

SECTION 7: DEVELOPMENT OF EVALUATION PLANS

(7) For each demand-side candidate resource option identified in section (6), the utility shall describe and document the general principles it will use to develop evaluation plans pursuant to 4 CSR 240-22.070(8). The utility shall verify that the evaluation costs in subsections (5)(B) and (5)(C) are appropriate and commensurate with these evaluation plans and principles. —

Program evaluation supports the need for public accountability, oversight, validation of program performance and cost-effective program improvements. The performance of DSM portfolios in regulated jurisdictions is almost universally evaluated by third-party independent contractors. GMO has designated approximately 5% of its portfolio budget for Evaluation, Measurement and Verification (EM&V) activities.

GMO will engage an EM&V contractor(s) to conduct process and impact evaluations of the DSM programs. The EM&V Contractor will meet with GMO program staff to discuss evaluation objectives, establish a schedule of deliverables and set up a communications protocol. The EM&V Contractor will develop a high level timeline of evaluation strategies and objectives.

Process Evaluations

Process evaluations ensure that a program is operating as intended and provides information that can enable improvements in both the program design and implementation. Process evaluations are typically conducted within six months to a year from a program's implementation.

A good process evaluation will:

- Assist KPC&L staff and implementation contractors structure programs to achieve cost-effective savings while maintaining high levels of customer satisfaction.
- Determine awareness levels to refine marketing strategies and reduce barriers to participation.

- Provide recommendations for changing the program's structure, management, administration, design, delivery, operations or targets.
- Determine if specific best practices should be incorporated.

Process evaluations assess customer understanding, attitudes about, and satisfaction with the program and other educational activities. The EM&V contractor will assess the effectiveness of the marketing and outreach, trade ally involvement, and whether implementation milestones are met adequately and on schedule. These evaluations will use sales and promotion data maintained by the tracking system as well as customer survey data.

Evaluation Plans

The EM&V Contractor will develop evaluation plans for each program, identifying the program objectives, key researchable issues, data collection requirements, sampling plan, budget and timeline. The sampling plan will describe the sample design, interview methodology and stratification. The interview methodology will range depending on the market actor being interviewed, from on-site interviews, in-depth interviews or telephone interviews. The EM&V Contractor will identify key market actors, such as GMO staff, third-party implementation contractors, participation trade allies, and participation customers. The sample size of each group will be calculated at a 90% confidence interval with an error margin of +/- 10%. GMO will review and approve the evaluation plans and subsequent data collection instruments.

Document Review

The EM&V Contractor will collect program materials, including, but not limited to, process flowcharts, third-party implementation contractor agreements (redacted as necessary), trade ally agreements, rebate applications, and marketing and outreach materials.

The EM&V Contractor will also evaluate the program tracking system(s), including initial data validation (application processing, measure and savings capture and validation, audit trail, and system location), security, and data granularity (types of data being

captured, QA/QC processes, data thresholds and back-up data capture, refresh rate and automated validations).

Market Actor Interviews

Interviews with key market actors will focus on understanding the program history and objectives as well as program implementation, including, but not limited to:

- Marketing and outreach activities
- Third-party implementation contractor responsibilities and management, if applicable
- Customer acquisition and participation process
- Trade Ally participation
- Rebate application processing
- Program tracking and reporting

Interview questions will be based on portfolio- and program-level activities and achievements to identify process improvements to improve program efficiency.

Customer Surveys

Participating customer surveys will seek to understand the customer experience with the program and awareness of the KPC&L portfolio. The surveys will identify barriers to participation, spillover, and areas of improvement.

Trade Ally Surveys/Interviews

Trade allies will be asked about clarity of program rules, support from KPC&L staff and/or third-party implementation contractor, marketing efforts, and rebate applications. The surveys/interviews will identify barriers to participation, free-ridership, spillover, and opportunities to improve program processes.

Non-Participating Customer and Trade Ally Interviews/Surveys

Where appropriate, interviews with non-participating customers and trade allies will be conducted to better understand the free ridership, spillover, barriers to participation and marketing messages.

Impact Evaluations

Impact evaluations estimate gross and net demand, energy savings and the cost-effectiveness of installed systems. They are used to verify measure installations, identify key energy assumptions and provide the research necessary to calculate defensible and accurate savings attributable to the program. Impact evaluations are typically conducted one year after the program is implemented because program results may not be accessible or apparent before then.

The EM&V Contractor will develop evaluation plans that ensure the appropriate measurement of savings in compliance with the appropriate International Performance Measurement and Verification Protocol as well as the State of Missouri EM&V protocols. The evaluation will verify measure installations and identify key assumptions for equipment life, incremental equipment cost, free ridership and spillover. The evaluation will also provide the necessary research to calculate defensible and accurate savings attributable to the program.

The EM&V Contractor will evaluate program cost-effectiveness using the standard tests including Total Resource Cost, Societal Cost Test, Participant Test, Utility Test and Rate Impact Measure Test.

SECTION 8: DEMAND-SIDE RESOURCES AND LOAD-BUILDING PROGRAMS

(8) Demand-side resources and load-building programs shall be separately designed and administered, and all costs shall be separately classified to permit a clear distinction between demand-side resource costs and the costs of load-building programs. The costs of demand-side resource development that also serve other functions shall be allocated between the functions served. —

GMO did not include load-building programs.