

Touchstone Energy Home

DSM Program Changes Explanation

Touchstone Energy Home

Background

The Touchstone Energy Home (“TSE Home”) Program is designed to make sure that new homes built on owner-member cooperative services are constructed with energy efficiency in mind. New homes served by EKPC owner-members in rural Kentucky have been built to be safe and structurally sound, but not necessarily to lower energy consumption. . The 2009 IECC residential energy code is the construction standard required for new residential homes in Kentucky. Many, if not most, counties served by EKPC owner-members do not have residential new home code enforcement. Therefore, EKPC and its owner-members developed this program years ago to help home builders ensure that their member’s new home performed well from an energy standpoint.

Cost-effectiveness

The GDS Potential Study found that new home construction that is 15% more energy efficient than base construction and energy code is no longer cost-effective. (See Exhibit A, Appendix B – Residential Measure Details, Measure #10002 having a TRC of 0.97.) However, a home that is constructed with a 30% improvement in energy use is cost-effective. (See Exhibit A, Appendix B – Residential Measure Details, Measure #10004 having a TRC of 1.59.) Please find the following pages – TSE Home assumption sheet and summary results. The refined TRC in the summary results is 1.37 based on EKPC and owner-members’ costs.

Tariff Changes

EKPC and the owner-members changed the tariff to offer only one rebate/incentive because of measure cost-effectiveness. Simplifying this program to one incentive was also desired. Therefore, the tariff is changed to provide one incentive of \$750 for a home that is 30% more energy efficient than a typical home built in rural Kentucky. The typical home built in rural Kentucky scores a 105 on the HERS rating. The HERS testing and rating system is the industry accepted standard for evaluating the energy efficiency of a new home. Therefore, EKPC and the owner-members will provide the incentive for a home that either scores a HERS of 75 or better for the Performance Path identified in the tariff or completes a Prescriptive Path check list of energy saving measure that assures the home performs equivalently to a 75 HERS tested home.

Please find the TSE Home strike-through and clean copies. Please note that EKPC will provide a transfer payment of \$1,450 that includes the \$750 incentive reimbursing the owner-members, \$200 administration fee to the owner-member, and \$500 lost revenue payment to the owner-member. EKPC provides a lost revenue payment to offset the owner-member’s net revenue loss. EKPC’s consultant, John Farley, calculates the net lost revenues for the owner-member when one of their members participates in this program. The net lost revenue calculation is a net present value of the net lost revenues (owner-member average lost revenues minus avoided energy purchases and avoided demand charges from EKPC.)

For 2019 Tariff Filing

Touchstone Energy Home

Year 1 is 2018

Encourages new homes to be built to higher standards for thermal integrity and equipment efficiency and high efficient heat pump systems. Measures include air sealing and insulation equivalent to 2009 IECC standards, with specific focus on completing the Thermal Bypass Checklist. **HERS <=75 (30% savings)**

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 10,574 kWh, 8.69 kW (coincident with winter system peak), 2.35 kW (summer) Savings = 3,172 kWh After Participant 7,402 kWh, 6.08 kW (coincident with winter system peak), 1.64 kW (summer)	Typical practice heat pump: SEER 13, HSPF 7.7, 1700 square foot home, built to 2006 IECC standards. Standard electric hot water heater (2007 update to kWh). Efficient air source heat pump: SEER 14.5, HSPF 8.2, 1700 square foot home, built to Touchstone Energy Home standards, with continuous insulation, R-38 in attic, air barrier, sealed duct work, and completed thermal bypass checklist. Efficient electric hot water heater Savings come from GDS 2018 Potential study
Lifetime of savings Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices Participant Costs \$1,522	20 Years PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018 Includes (1) costs associated with bringing standard built Kentucky home to enhanced Touchstone Energy standards (2009 IECC); (2) savings from equipment resizing (1/2 ton reduction); (3) incremental cost of an efficient water heater. KY tax credit no longer applied because of inability for builders to claim given legal structure (per Josh, Sept 2011). Costs come from GDS 2018 Potential study.
Administrative Cost EK \$35,000 fixed annual 2% esc Co-op \$ 430 per new participant	Includes direct program administration only. No promotional costs Costs of rating and inspection. Based on typical hours and labor rates
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 2018-2022: 476, 485, 470, 470, 470. 5% Free Riders	Based on 2019 budget . 5 years included in load forecast. Free riders based on Frontier Assoc study for LG&E/KU
Rebates Co-op to Participant \$ 750 EK to Co-op \$ 1,450	recommended incentive according to tariff. Customer also receives free Energy Star rating (\$500 value). Reimburse for rebate, 50% of admin costs, plus compensation for net lost revenues.

Touchstone Energy Home program for 2019 Tariff Filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 6,811,570	Revenue Declines	(\$8,128,433)
Rebates From EK	\$3,133,012	Administrative Costs	(\$929,100)
		Rebates Paid To Consumers	(\$1,620,524)
Total Benefits	\$9,944,582	Total Costs	(\$10,678,057)
Benefit / Cost Ratio: 0.93			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$5,237,502	Up Front Investment	(\$2,974,642)
Rebates From Distribution System	\$ 1,465,822		
Reductions in O&M costs	\$0		
Total Benefits	\$6,703,324	Total Costs	(\$2,974,642)
Benefit / Cost Ratio: 2.25			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$3,338,490	Up Front Customer Investment	(\$3,124,154)
Avoided Gen Capacity Costs	\$1,549,894	Distribution System Admin. Costs	(\$929,100)
Avoided Transmission Expense	\$885,316	EK Administrative Costs	(\$159,391)
Reduced Customer O&M costs	\$0		
Total Benefits	\$5,773,700	Total Costs	(\$4,212,645)
Benefit / Cost Ratio: 1.37			

EK Benefits		EK Costs	
Avoided Energy Costs	\$3,338,490	Decrease In Revenue	(\$6,811,570)
Avoided Gen Capacity Costs	\$1,549,894	Rebates Paid	(\$3,133,012)
Avoided Transmission Expense	\$885,316	Administrative Costs	(\$159,391)
Total Benefits	\$5,773,700	Total Costs	(\$10,103,973)
Benefit / Cost Ratio: 0.57			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$4,105,536	Up Front Customer Investment	(\$3,238,914)
Avoided Gen Capacity Costs	\$1,941,483	Utility Admin Costs	(\$1,128,511)
Avoided Transmission Expense	\$1,074,184		
Environmental Externalities	\$0		
Total Benefits	\$7,121,203	Total Costs	(\$4,367,425)
Benefit / Cost Ratio: 1.63			

Combined RIM:			
Benefits:	\$5,773,700	Costs:	(\$10,837,448)
Benefit / Cost Ratio: 0.53			

**Direct Load Control Program
(Residential)**

DSM Program Changes Explanation

Direct Load Control Program - Residential

Background

The Direct Load Control (“DLC”) Program is designed to shift loads during peak time to off peak times to reduce EKPC’s capacity payments to PJM. The DLC program has been in place for over a decade, with over 33,000 DLC switches installed on water heaters and air conditioners. EKPC performs a measurement and verification study annually to determine the kW load shift capability of the switches. At 98 degrees, the switches shift 24.8 MWs of load from peak to off peak. This shift lowers EKPC’s capacity obligations and payments to PJM. EKPC’s peak load contributions and resulting capacity obligations and payments to PJM is determined by the top five load hours for PJM during the summer months. EKPC controls the switches during those hours each year to shift water heater and air conditioner load during PJM peaks.

Cost-effectiveness

The GDS Potential Study identified that new switch installations on water heaters are no longer cost-effective per the TRC. (See Exhibit A, Table 7-2 – Residential DLC Water Heaters having a TRC of 0.68.) However, installing a new switch on an air conditioner or heat pump is still cost-effective. (See Exhibit A, Table 7-2 – Residential DLC AC (Switch) having a TRC of 2.02.) EKPC also evaluated a thermostat based DLC program including a “Bring Your Own Thermostat” (“BYOT”) as an option for controlling air conditioner loads. (See Exhibit A, Table 7-2, Residential DLC AC (Thermostat) having a TRC of 1.21) Please find the following pages – DLC assumption sheet and summary results. The refined TRC in the summary results for DLC AC (Switch) is 1.60, and for DLC AC (Thermostat) is 1.96, all based on EKPC and owner-members’ projected costs.

Tariff Changes

EKPC and the owner-members changed the tariff to discontinue offering to install a new DLC switch on water heaters because that measure is no longer cost-effective. EKPC and the owner-members will continue to operate and provide annual compensation for the existing water heater switches installed. Several pages of the tariff were changed to accommodate this. The other significant change to the program is the BYOT offering noted as Alternative Three under Program Incentive for Air Conditioners and Heat Pumps. BYOT allows for members to utilize their existing or newly installed Wi-Fi-enabled thermostats to participate in the DLC program. Several areas of the tariff were adjusted to accommodate the BYOT option. EKPC included an incentive to offset the member paying their HVAC contractor for the thermostat installation. This is cost-effective because the incentive is equal to EKPC’s labor cost to install a switch. Installation costs are included in the TRC cost-effectiveness evaluations.

Additional tariff changes:

- Changed paying the \$20 annual incentive for air conditioners or heat pumps from four monthly payments of \$5 during the summer to one annual payment of \$20 to be paid at the end of the summer season. This will lessen the program administration burden.
- Added flexibility to pay the annual incentives via a bill credit or other methods.
- Added language to accommodate new communication technologies that EKPC and the owner-members could utilize to control air conditioners or heat pumps. Wi-Fi communication has become common and is a cost-effective method to communicate to thermostats. Other communication technologies have developed to a lesser extent, but are still viable. The tariff was adjusted on several pages to accommodate this change.
- Removed pool pumps as an eligible load. EKPC and the owner-members have no pool pump participants. Most importantly, this is an electrical issue. We had a few members with pool pumps a few years ago that requested participation. We found that the electrical service to the pool was not current with the National Electric Code (“NEC”). Per NEC, placing a DLC switch on the pool pump circuit is a change to the circuit. Any circuit changes requires it to be current with respect to NEC. This required significant investment by the member. This situation seems to be very common and EKPC and the owner-members decided to not offer this incentive. The tariff was adjusted on several pages to accommodate this change.

For 2019 Tariff Filing
5 years of participation Year 1 is 2018

Discount rate is 7%.

Direct Load Control Program - Residential: Bring your own thermostat (BYOT)

Reduce cooling peak demand and energy usage through smart thermostat pre-cool and tstat temperature settings

<u>Assumption</u>	<u>Source</u>
Load Impacts	
Air Conditioner savings 5 kWh, 0.00 kW (coincident with winter system peak), 0.95 kW (summer)	Based on M&V data for existing residential DLC program. Temperature of 98 degrees.
Lifetime of savings 15 Years.	Effective life given program history of the need for changeouts.
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Participant Costs \$ 0	the participant will have already purchased and installed their thermostat
Administrative Cost EA \$25k one time setup fee to each new vendor that joins the program, plus \$10k one time integration costs per new vendor; plus \$20 per thermostat per year as an annual maintenance fee to the vendor, plus \$30k per year fixed annual EKPC admin. escalates at 2% per year. Co-op \$0 per new participant	Vendor costs are based on the NEST Pilot. Integration costs based on previous project. EKPC fixed annual administrative costs include advertising, enrollment, other marketing, customer service, program oversight, and M&V. The assumption is that one new vendor joins the program in 2018, three new vendors will join the program in 2019, followed by 1 additional new vendor in 2020.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
New Participation - 2019: 500 new per year, 2018-2022.	based on 2018 budget forecast from Scott Drake.
Rebates Co-op to Participant: annual incentive of \$25 per thermostat, 2% escalation rate EKPC to Co-op: annual incentive of \$25 per thermostat, 2% escalation rate	Program as currently designed. Based on 2018 DSM Budget forecast. Program as currently designed. Based on 2018 DSM Budget forecast.

For 2019 Tariff Filing

Direct Load Control Program -Residential Air Conditioner switches

5 years of participation Year 1 is 2018

Reduce peak demand and energy usage through the installation of load control devices on air conditioners.

<u>Assumption</u>	<u>Source</u>
<p>Load Impacts</p> <p>Air Conditioner savings 5 kWh, 0.00 kW (coincident with winter system peak), 0.95 kW (summer)</p>	<p>Based on M&V data for the program. Temperature of 98 degrees.</p>
<p>Lifetime of savings 15 Years.</p>	<p>Effective life given program history of the need for changeouts.</p>
<p>Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices</p>	<p>PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018</p>
<p>Participant Costs \$ 0</p>	
<p>Administrative Cost</p> <p>EK \$350 per new switch installed (AC or WH); plus \$300k fixed annual admin.; plus \$0 legacy rebate payments per year; escalates at 1.5% per year.</p> <p>Co-op \$0 per new participant</p>	<p>Includes device costs, installation, transportation, scheduling, enrollment, recruitment, and servicing; also marketing, communications, IT, customer service, management contract fee, general admin, M&V. No legacy rebates included because legacy savings are not included</p>
<p>Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18, Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.</p>	<p>Current rates in effect as of August, 2017 Current rates in effect as of August, 2017</p>
<p>New Participation - five years (2018-2022) - 4,000; 500; 1,000; 1,000; 1,000 new per year.</p>	<p>based on 5 year workplan</p>
<p>Rebates Co-op to Participant \$20 per AC switch per year; 1.5% escalation rate EK to Co-op \$20 per AC switch per year; 1.5% escalation rate</p>	<p>Program as filed Program as filed</p>

Direct Load Control Program-Residential: Bring your own Thermostat - for 2019 Tariff Filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 699,796	Revenue Declines	(\$66,950)
Rebates From EK	\$623,959	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$623,959)
Total Benefits	\$1,323,755	Total Costs	(\$690,909)
Benefit / Cost Ratio: 1.92			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$44,497	Up Front Investment	\$0
Rebates From Distribution System	\$ 414,875		
Reductions in O&M costs	\$0		
Total Benefits	\$459,372	Total Costs	\$0
Benefit / Cost Ratio: N/A			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$27,073	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$1,777,875	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$254,856	EK Administrative Costs	(\$1,049,456)
Reduced Customer O&M costs	\$0		
Total Benefits	\$2,059,805	Total Costs	(\$1,049,456)
Benefit / Cost Ratio: 1.96			

EK Benefits		EK Costs	
Avoided Energy Costs	\$27,073	Decrease In Revenue	(\$699,796)
Avoided Gen Capacity Costs	\$1,777,875	Rebates Paid	(\$623,959)
Avoided Transmission Expense	\$254,856	Administrative Costs	(\$1,049,456)
Total Benefits	\$2,059,805	Total Costs	(\$2,373,211)
Benefit / Cost Ratio: 0.87			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$31,692	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$2,136,389	Utility Admin Costs	(\$1,197,500)
Avoided Transmission Expense	\$297,895		
Environmental Externalities	\$0		
Total Benefits	\$2,465,976	Total Costs	(\$1,197,500)
Benefit / Cost Ratio: 2.06			

Combined RIM:
 Benefits: \$2,059,805 Costs: (\$1,740,365)

Benefit / Cost Ratio: 1.18

Direct Load Control Program - Residential AC switches -2019 Tariff Filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 2,176,948	Revenue Declines	(\$208,269)
Rebates From EK	\$1,497,408	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$1,497,408)
Total Benefits	\$3,674,356	Total Costs	(\$1,705,677)
Benefit / Cost Ratio: 2.15			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$144,290	Up Front Investment	\$0
Rebates From Distribution System	\$ 1,042,732		
Reductions in O&M costs	\$0		
Total Benefits	\$1,187,021	Total Costs	\$0
Benefit / Cost Ratio: N/A			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$83,883	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$5,239,213	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$790,407	EK Administrative Costs	(\$3,816,620)
Reduced Customer O&M costs	\$0		
Total Benefits	\$6,113,504	Total Costs	(\$3,816,620)
Benefit / Cost Ratio: 1.60			

EK Benefits		EK Costs	
Avoided Energy Costs	\$83,883	Decrease In Revenue	(\$2,176,948)
Avoided Gen Capacity Costs	\$5,239,213	Rebates Paid	(\$1,497,408)
Avoided Transmission Expense	\$790,407	Administrative Costs	(\$3,816,620)
Total Benefits	\$6,113,504	Total Costs	(\$7,490,976)
Benefit / Cost Ratio: 0.82			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$96,696	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$6,224,983	Utility Admin Costs	(\$3,921,269)
Avoided Transmission Expense	\$911,019		
Environmental Externalities	\$0		
Total Benefits	\$7,232,698	Total Costs	(\$3,921,269)
Benefit / Cost Ratio: 1.84			

Combined RIM:
 Benefits: \$6,113,504 Costs: (\$5,522,297)

Benefit / Cost Ratio: 1.11

**Direct Load Control Program
(Commercial)**

DSM Program Changes Explanation

Direct Load Control Program - Commercial

Background

The Direct Load Control (“DLC”) Program is designed to shift loads during peak time to off peak times to reduce EKPC’s capacity payments to PJM. This applies to both DLC residential and DLC commercial programs. Although the DLC commercial program participation level is significantly lower than the residential program, it has the same load shift effect as the residential program. Therefore, EKPC and the owner-members decided to adjust the DLC commercial program to match the new changes to the DLC residential program.

Cost-effectiveness

Installing a new switch on an air conditioner or heat pump is still cost-effective. (See Exhibit A, Table 7-2 – Commercial DLC AC (Switch) having a TRC of 2.04.) EKPC also evaluated a thermostat based DLC program including a “Bring Your Own Thermostat” (“BYOT”) as an option for controlling air conditioner loads. (See Exhibit A, Table 7-2, Commercial DLC AC (Thermostat) having a TRC of 2.80)

Tariff Changes

EKPC and the owner-members changed the DLC Commercial tariff to match the residential program offerings. This reduces confusion between the programs. The following changes were made to the DLC Commercial program to match the DLC residential program:

- Discontinued new water heater switch installations.
- Continued maintaining, controlling, and providing annual incentive for existing water heater switches.
- Added a BYOT option.
- Adjusted annual incentive payment frequency to match the DLC residential program.
- Added Wi-Fi and other communication technologies as options for communicating with control devices.

For 2019 Tariff Filing
5 years of participation Year 1 is 2018

Discount rate is 7%.

Assumption

Source

Load Impacts

Air Conditioner savings
50 kWh, 0.00 kW (coincident with winter system peak), 1.6 kW (summer)

Direct Load Control Program Commercial: Bring your own thermostat (BYOT)
 Reduce cooling peak demand and energy usage through smart thermostat pre-cool and tstat temperature settings

Based on GDS sources, as well as results from New York and Illinois that show BYOT programs save as much as or more than switch programs with 100% cycling. Higher opt-out rates for BYOT programs bring overall savings in line with switch programs.

Lifetime of savings 15 Years.

Effective life given program history of the need for changeouts.

Generation Capacity Cost -PJM Market,
 100% summer **\$29.20** per kW-year in 2018
Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices

PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer
 based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore **Scenario 1, 0.540 esc in 2018**

Participant Costs \$ 0

the participant will have already purchased and installed their thermostat

Administrative Cost

EK \$25k one time setup fee to each new vendor that joins the program, plus \$10k one time integration costs per new vendor; plus \$20 per thermostat per year as an annual maintenance fee to the vendor, plus \$20k per year fixed annual EKPC admin. escalates at 2% per year.

Vendor costs are based on the NEST Pilot. Integration costs based on previous project. EKPC fixed annual administrative costs include advertising, enrollment, other marketing, customer service, program oversight, and M&V. Assumes lower enrollment and customer service costs than the residential program; comparable marketing and program oversight costs, and higher M&V costs. Vendors are additional to the residential program. Assumes that one new vendor joins the program in 2019, and a second new vendor joins in 2020.

Co-op \$0 per new participant

Rate Schedule - Retail
 Average Residential Rate for Co-ops
 Cust chrg **\$14.18**, Energy Rate **\$.08968**
Rate Schedule - Wholesale
 East Kentucky E-2 rate.

Current rates in effect as of August, 2017

Current rates in effect as of August, 2017

New Participation - 2019: 100 new per year, 2018-2022.

enrolls 5% of eligible market (small commercial customers with central AC and smart thermostat) by 2022

Rebates

Co-op to Participant: **annual incentive of \$20 per thermostat, 1.5% escalation rate**
 EKPC to Co-op: **annual incentive of \$20 per thermostat, 1.5% escalation rate**

Program as currently designed. Based on 2018 DSM Budget forecast.

Program as currently designed. Based on 2018 DSM Budget forecast.

For 2019 Tariff Filing

Direct Load Control Program - Commercial Air Conditioner switches

5 years of participation Year 1 is 2018

Reduce peak demand through the installation of load control devices on small commercial air conditioners.

<u>Assumption</u>	<u>Source</u>
Load Impacts Air Conditioner savings 50 kWh, 0.00 kW (coincident with winter system peak), 1.6 kW (summer)	Based on GDS sources . 5 ton unit.
Lifetime of savings 15 Years.	Effective life given program history of the need for changeouts.
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Participant Costs \$ 0	
Administrative Cost EK \$350 per new switch installed ; plus \$20k fixed annual admin. escalates at 1.5% per year. Co-op \$0 per new participant	Per-switch cost includes device costs, installation, transportation, scheduling, enrollment, recruitment, and servicing. fixed annual admin costs are the incremental costs of operating the commercial program: marketing, program management, and M&V.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18, Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
New Participation - five years (2018-2022) - 200 new per year.	enrolls 3% of the eligible market (small commercial customers with central AC) by 2022
Rebates Co-op to Participant \$20 per AC switch per year; 1.5% escalation rate EK to Co-op \$20 per AC switch per year; 1.5% escalation rate	Program as filed (5 ton unit) Program as filed

Direct Load Control Program-Commercial: Bring your own Thermostat - for 2019 Tariff Filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 235,719	Revenue Declines	(\$22,551)
Rebates From EK	\$96,000	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$96,000)
Total Benefits	\$331,719	Total Costs	(\$118,550)
Benefit / Cost Ratio: 2.80			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$14,988	Up Front Investment	\$0
Rebates From Distribution System	\$ 64,164		
Reductions in O&M costs	\$0		
Total Benefits	\$79,152	Total Costs	\$0
Benefit / Cost Ratio: N/A			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$9,119	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$598,863	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$85,846	EK Administrative Costs	(\$407,023)
Reduced Customer O&M costs	\$0		
Total Benefits	\$693,829	Total Costs	(\$407,023)
Benefit / Cost Ratio: 1.70			

EK Benefits		EK Costs	
Avoided Energy Costs	\$9,119	Decrease In Revenue	(\$235,719)
Avoided Gen Capacity Costs	\$598,863	Rebates Paid	(\$96,000)
Avoided Transmission Expense	\$85,846	Administrative Costs	(\$407,023)
Total Benefits	\$693,829	Total Costs	(\$738,742)
Benefit / Cost Ratio: 0.94			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$10,675	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$719,626	Utility Admin Costs	(\$463,341)
Avoided Transmission Expense	\$100,344		
Environmental Externalities	\$0		
Total Benefits	\$830,644	Total Costs	(\$463,341)
Benefit / Cost Ratio: 1.79			

Combined RIM:
 Benefits: \$693,829 Costs: (\$525,573)

Benefit / Cost Ratio: 1.32

Direct Load Control Program - Commercial AC switches -2019 Tariff Filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 471,439	Revenue Declines	(\$45,101)
Rebates From EK	\$191,999	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$191,999)
Total Benefits	\$663,438	Total Costs	(\$237,101)
Benefit / Cost Ratio: 2.80			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$29,976	Up Front Investment	\$0
Rebates From Distribution System	\$ 128,328		
Reductions in O&M costs	\$0		
Total Benefits	\$158,303	Total Costs	\$0
Benefit / Cost Ratio: N/A			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$18,239	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$1,197,727	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$171,693	EK Administrative Costs	(\$406,056)
Reduced Customer O&M costs	\$0		
Total Benefits	\$1,387,658	Total Costs	(\$406,056)
Benefit / Cost Ratio: 3.42			

EK Benefits		EK Costs	
Avoided Energy Costs	\$18,239	Decrease In Revenue	(\$471,439)
Avoided Gen Capacity Costs	\$1,197,727	Rebates Paid	(\$191,999)
Avoided Transmission Expense	\$171,693	Administrative Costs	(\$406,056)
Total Benefits	\$1,387,658	Total Costs	(\$1,069,494)
Benefit / Cost Ratio: 1.30			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$21,350	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$1,439,251	Utility Admin Costs	(\$420,983)
Avoided Transmission Expense	\$200,687		
Environmental Externalities	\$0		
Total Benefits	\$1,661,289	Total Costs	(\$420,983)
Benefit / Cost Ratio: 3.95			

Combined RIM:
 Benefits: \$1,387,658 Costs: (\$643,156)

Benefit / Cost Ratio: 2.16

Button-Up Weatherization

DSM Program Changes Explanation

Button-up Weatherization Program

Background

The Button-up Weatherization (“Button-up”) Program is designed to incentivize members with poor energy-performing homes to improve the energy efficiency of the home’s shell. Improvements typically include more insulation in the attic or floor, and air-sealing the shell. More insulation increases the resistance (“R”) value of the attic or floor causing the shell to hold heat better. Air-sealing actions reduce air infiltration by sealing air leaks in the shell walls, floors or ceiling. Electrical and plumbing protrusions as well as window and door seals are typical places where air leaks cause the home to lose heat in the winter. The existing program pays an incentive for multiple improvements to the insulation of a home including but not limited to installing new energy efficient doors and windows. The incentive is paid based on heat loss reduction measured in British Thermal Units per hour (“BTUH”). Heat losses are reduced by increasing insulation R-values, improving window or door performance, and /or lowering air leakage via improved air-sealing. The Button-up program is an important program to assist members with high bills caused by excessive heat losses. Air-sealing and improved ceiling insulation are the most cost-effective measure to improve home energy performance.

Cost-effectiveness

The GDS Potential Study identified that all residential shell improvements were not cost-effective except air-sealing measures and significant ceiling insulation improvements. Tier 1 air sealing is cost-effective for electric heat customers as a whole. Tier 2 air sealing is cost-effective for electric furnace homes only. (See Exhibit A, Appendix B – Residential Measure Details, Measures #s 7021, 7022, 7033, and 7034 having TRCs above 1.0 for air-sealing.) Only two of the six ceiling insulation measures were cost-effective. (See Exhibit A, Appendix B – Residential Measure Details, Measures # 7013-7015 and 7025-7027. Only 7013 and 7025 have a TRC above 1.0.) However, when combining ceiling insulation with an air-seal of the home, the resulting TRC is 1.01. Please find the following pages – Button-up assumption sheet and summary results. The refined TRC in the summary results is 1.01 based on EKPC and owner-members’ costs.

Tariff Changes

EKPC and the owner-members changed the Button-up tariff to offer only rebates/incentives that are cost-effective per the TRC evaluations. The Button-up tariff is being changed to provide an incentive for air-sealing or for ceiling insulation improvement along with an air-seal improvement. Improvement in ceiling insulation alone without an air-seal will not qualify for a rebate. The previous multiple level approach is now just one level of incentive.

The transfer payment rates from EKPC to the owner-member remains unchanged and includes \$40/1000 BTUH reduced incentive, a net lost revenue amount of \$30/1000 BTUH reduced, and a \$230 administration fee.

DSM for 2019 Tariff filing

Button-Up Weatherization Program

5 years of participation Year 1 is 2018

The Button-Up Weatherization Program offers an incentive for reducing the heat loss of a home. Only **ceiling insulation and air sealing** based on GDS measure TRCs

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 10,500 kWh, 8.12 kW (coinc. with winter system peak), 2.47 kW (summer)	Mix of Furnace/Central AC and air source heat pump weighted according to saturation in existing single family homes. 70% heat pump, 30% furnace/CAC.
Savings: 3,987 kWh After Participant 6,513 kWh, 5.56 kW (winter peak), 1.82 (summer peak)	GDS savings for ceiling insulation and air sealing, weighted across heat pump and furnace/CAC
Lifetime of savings	15 Years
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer
Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Participant Costs \$2,107	GDS costs weighted across heat pump and furnace/CAC
Administrative Cost EK \$5,000 per year (2018-2022), 2% escalation Co-op \$316 p per new participant	Program admin estimate of \$4,300 provided by EKPC Marketing/Communications, October 2010 updated to 2018. Also includes \$0 advertising budget. Labor costs are \$116. (2 hours times \$58 per hour). Plus \$200 for pre and post blower door test.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$0.08968	Current rates in effect as of August, 2017
Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017
Participation - 2018-2022: 345, 222, 67, 67, 67 10% free riders	Based on DSM 5 year workpla. 2018 value weighted avg. Free riders based on Frontier Assoc study for LG&E/KU
Rebates Co-op to Participant \$ 750 EK to Co-op \$ 1,545	Cap for program Full incentive according to the tariff. Reimburse for rebate, 50% of admin costs, plus compensation for net lost revenues.

Button Up Weatherization Program for 2019 Tariff Filing.

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 2,147,719	Revenue Declines	(\$2,709,422)
Rebates From EK	\$1,129,206	Administrative Costs	(\$230,957)
		Rebates Paid To Consumers	(\$548,158)
Total Benefits	\$3,276,925	Total Costs	(\$3,488,538)
Benefit / Cost Ratio: 0.94			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$2,102,850	Up Front Investment	(\$1,461,702)
Rebates From Distribution System	\$ 520,302		
Reductions in O&M costs	\$0		
Total Benefits	\$2,623,152	Total Costs	(\$1,461,702)
Benefit / Cost Ratio: 1.79			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$1,033,889	Up Front Customer Investment	(\$1,385,963)
Avoided Gen Capacity Costs	\$394,305	Distribution System Admin. Costs	(\$230,957)
Avoided Transmission Expense	\$233,483	EK Administrative Costs	(\$22,770)
Reduced Customer O&M costs	\$0		
Total Benefits	\$1,661,678	Total Costs	(\$1,639,691)
Benefit / Cost Ratio: 1.01			

EK Benefits		EK Costs	
Avoided Energy Costs	\$1,033,889	Decrease In Revenue	(\$2,147,719)
Avoided Gen Capacity Costs	\$394,305	Rebates Paid	(\$1,129,206)
Avoided Transmission Expense	\$233,483	Administrative Costs	(\$22,770)
Total Benefits	\$1,661,678	Total Costs	(\$3,299,696)
Benefit / Cost Ratio: 0.50			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$1,187,457	Up Front Customer Investment	(\$1,412,682)
Avoided Gen Capacity Costs	\$466,959	Utility Admin Costs	(\$259,021)
Avoided Transmission Expense	\$268,255		
Environmental Externalities	\$0		
Total Benefits	\$1,922,671	Total Costs	(\$1,671,704)
Benefit / Cost Ratio: 1.15			

Combined RIM:

Benefits: \$1,661,678 Costs: (\$3,511,308)

Benefit / Cost Ratio: 0.47

Heat Pump Retrofit Program

DSM Program Changes Explanation

Heat Pump Retrofit Program

Background

The Heat Pump Retrofit (“Heat Pump”) Program is designed to incentivize members to convert their primary heat source from electrical resistive heat (electric furnace, ceiling cable heat, baseboard heat, or electric thermal storage) to a more efficient electric heat pump. Most high bill complaints are from members with homes that are heated with electric resistive heat instead of a heat pump. Installing an electric heat pump lowers electric bills significantly for those members.

EKPC and the owner-members have seen a sizable increase in ducted and especially ductless mini-split heat pump systems. This heat pump technology is highly efficient and new to the US market. The existing tariff is silent to this product as it has gained popularity after this existing program and tariff were approved by the Commission.

Since the previous tariff was filed and implemented, the Federal Department of Energy (“DOE”) has raised the minimum efficiencies of air source heat pumps. The change in standards has eliminated the production of 13 SEER level heat pumps. With the elimination of this level of heat pump, the owner-members have expressed a desire to rebate only 2 levels for centrally-ducted systems.

Cost-effectiveness

The GDS Potential Study identified that replacing electric furnaces (resistive heat) with a minimum standard heat pump is still a cost-effective measure. (See Exhibit A, Appendix B – Residential Measure Details, Measures # 8011-8013 all having a TRC above 1.0.). Please find the following pages – Heat Pump Retrofit assumption sheets and summary results. The refined TRC in the summary results is 1.46 for a DOE minimum standard heat pump, 1.39 for an ENERGY STAR rated heat pump, and a 1.04 for an ENERGY STAR rated mini-split heat pump based on EKPC and owner-members’ costs.

Tariff Changes

EKPC and the owner-members changed the Heat Pump tariff to offer only two rebate/incentive levels for centrally-ducted systems (DOE minimum standard 14 SEER and ENERGY STAR rated 15 SEER). Language is changed in the tariff noting these two levels based on the appropriate agency standards. By doing so, members can continue to participate in the program even after one of these agencies change their equipment standards thus forgoing the need to change the tariff to include updated efficiency standards.

Language and rebates were added to accommodate the new mini-split heat pump technology. These installations must be ENERGY STAR rated. The rebate will be paid per indoor head unit up to a maximum of 3 rebates. Language was added to limit the number of rebates per heat pump type and per account.

Similar to the existing tariff, EKPC will pay a transfer payment to the owner-member that includes the appropriate rebate plus a lost revenue, and a \$90 administration fee..

For 2019 Tariff Filing

Heat Pump Retrofit Program: Ductless Mini-Split

5 years of participation Year 1 is 2018

This program encourages residential members to convert their primary heat source from electric resistance heat to a ductless mini-split system

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 14,843 kWh, 8.12 kW (coinc. with winter system peak), 2.25 kW (summer) Savings = 9,060 kWh per participant After Participant 5,783 kWh, 8.12 kW (coinc. with winter system peak), 1.74 kW (summer)	Electric Furnace and Central A.C. 3-head mini-split based on GDS savings %: SEER 16, HSPF 9.0
Lifetime of savings	20 Years
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMORE Scenario 1, 0.540 esc in 2018
Participant Costs \$4,768. 2% esc.	GDS measure cost for Ductless Mini-split measure
Administrative Cost EK \$5,000 fixed annual (2018-2022). 2% esc Co-op \$177 per new participant. 2% esc.	Program admin based on estimates provided by EKPC Marketing/Communications, October 2010. No advertising Cost information provided by various coops in September 2011 survey of hours and rates.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$0.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 0,51,93,93,93: 2018-2022. 0% Free Riders	based on 5 year DSM workplan. 1,2, and 3-head participants combined , scaled to 3-head as weighted by kWh savings
Rebates Co-op to Participant \$ 750 , 2% esc EK to Co-op \$2,143 , 2% esc	three tiers: 1-head is \$250, 2-head is \$500, 3-head is \$750. modeling 3-head Planned transfer payment for 5 year marketing plan. Reimburse for rebate, 50% of admin costs, plus compensation for a share of net lost revenues.

For 2019 Tariff Filing

Heat Pump Retrofit Program - SEER 14

5 years of participation Year 1 is 2018

This program encourages residential members to convert their primary heat source from electric resistance heat to an efficient air source heat pump

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 14,843 kWh, 8.12 kW (coinc. with winter system peak), 2.25 kW (summer) Savings = 7,533 per participant After Participant 7,310 kWh, 8.12 kW (coinc. with winter system peak), 1.93 kW (summer)	Electric Furnace and Central A.C. ENERGY STAR efficiency new heat pump: SEER 14, HSPF 8.0
Lifetime of savings	20 Years
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Participant Costs \$2,648. 2% esc.	GDS cost for SEER 16, scaled back to SEER 14 using Indiana TRM, version 2.2
Administrative Cost EK \$5,000 fixed annual (2018-2022). 2% esc Co-op \$177 per new participant. 2% esc.	Program admin based on 5 year workplan; no advertising Cost information provided by various coops in September 2011 survey of hours and rates.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 2018-2022: 525, 300, 300, 300, 300. 0% Free Riders	based on DSM 5 year workplan
Rebates Co-op to Participant \$ 500 , 2% esc EK to Co-op \$1,695 , 2% esc	two tiers: SEER 14 is \$500, SEER 15+ is \$750. modeling SEER 14 Planned transfer payment for 5 year marketing plan. Reimburse for rebate, 50% of admin costs, plus compensation for a share of net lost revenues.

For 2019 Tariff Filing

Heat Pump Retrofit Program - SEER 15

5 years of participation Year 1 is 2018

This program encourages residential members to convert their primary heat source from electric resistance heat to an efficient air source heat pump

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 14,843 kWh, 8.12 kW (coinc. with winter system peak), 2.25 kW (summer) Savings: 7,978 kWh per participant After Participant 6,865 kWh, 8.12 kW (coinc. with winter system peak), 1.80 kW (summer)	Electric Furnace and Central A.C. ENERGY STAR efficiency new heat pump: SEER 15, HSPF 8.0
Lifetime of savings	20 Years
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Participant Costs \$3,059. 2% esc.	GDS cost for SEER 16, scaled back to SEER 15 using Indiana TRM, version 2.2
Administrative Cost EK \$5,000 fixed annual (2018-2022). 2% esc Co-op \$177 per new participant. 2% esc.	Program admin based on 5 year workplan. No advertising Cost information provided by various coops in September 2011 survey of hours and rates.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18, Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 2018-2022: 400, 400, 300, 300, 300. 0% Free Riders	based on 5 year workplan
Rebates Co-op to Participant \$ 750 , 2% esc EK to Co-op \$1,991, 2% esc	two tiers: SEER 14 is \$500, SEER 15+ is \$750. modeling SEER 15 Planned transfer payment for 5 year marketing plan. Reimburse for rebate, 50% of admin costs, plus compensation for a share of net lost revenues.

Heat Pump Retrofit Program: Ductless Mini-Split for 2019 Tariff Filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 2,300,209	Revenue Declines	(\$3,278,408)
Rebates From EK	\$622,517	Administrative Costs	(\$51,416)
		Rebates Paid To Consumers	(\$217,866)
Total Benefits	\$2,922,726	Total Costs	(\$3,547,691)
Benefit / Cost Ratio: 0.82			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$1,921,923	Up Front Investment	(\$1,201,296)
Rebates From Distribution System	\$ 188,962		
Reductions in O&M costs	\$0		
Total Benefits	\$2,110,885	Total Costs	(\$1,201,296)
Benefit / Cost Ratio: 1.76			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$1,354,580	Up Front Customer Investment	(\$1,385,049)
Avoided Gen Capacity Costs	\$164,118	Distribution System Admin. Costs	(\$51,416)
Avoided Transmission Expense	\$0	EK Administrative Costs	(\$17,770)
Reduced Customer O&M costs	\$0		
Total Benefits	\$1,518,698	Total Costs	(\$1,454,235)
Benefit / Cost Ratio: 1.04			

EK Benefits		EK Costs	
Avoided Energy Costs	\$1,354,580	Decrease In Revenue	(\$2,300,209)
Avoided Gen Capacity Costs	\$164,118	Rebates Paid	(\$622,517)
Avoided Transmission Expense	\$0	Administrative Costs	(\$17,770)
Total Benefits	\$1,518,698	Total Costs	(\$2,940,496)
Benefit / Cost Ratio: 0.52			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$1,693,290	Up Front Customer Investment	(\$1,456,037)
Avoided Gen Capacity Costs	\$207,584	Utility Admin Costs	(\$72,663)
Avoided Transmission Expense	\$0		
Environmental Externalities	\$0		
Total Benefits	\$1,900,874	Total Costs	(\$1,528,701)
Benefit / Cost Ratio: 1.24			

Combined RIM:
 Benefits: \$1,518,698 Costs: (\$3,565,461)

Benefit / Cost Ratio: 0.43

Heat Pump Retrofit Program: SEER 14 for 2019 Tariff filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 10,397,960	Revenue Declines	(\$14,961,035)
Rebates From EK	\$2,697,105	Administrative Costs	(\$281,645)
		Rebates Paid To Consumers	(\$795,606)
Total Benefits	\$13,095,065	Total Costs	(\$16,038,286)
Benefit / Cost Ratio: 0.82			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$9,293,095	Up Front Investment	(\$3,866,176)
Rebates From Distribution System	\$ 730,018		
Reductions in O&M costs	\$0		
Total Benefits	\$10,023,113	Total Costs	(\$3,866,176)
Benefit / Cost Ratio: 2.59			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$6,048,580	Up Front Customer Investment	(\$4,213,530)
Avoided Gen Capacity Costs	\$534,074	Distribution System Admin. Costs	(\$281,645)
Avoided Transmission Expense	\$0	EK Administrative Costs	(\$22,770)
Reduced Customer O&M costs	\$0		
Total Benefits	\$6,582,655	Total Costs	(\$4,517,945)
Benefit / Cost Ratio: 1.46			

EK Benefits		EK Costs	
Avoided Energy Costs	\$6,048,580	Decrease In Revenue	(\$10,397,960)
Avoided Gen Capacity Costs	\$534,074	Rebates Paid	(\$2,697,105)
Avoided Transmission Expense	\$0	Administrative Costs	(\$22,770)
Total Benefits	\$6,582,655	Total Costs	(\$13,117,835)
Benefit / Cost Ratio: 0.50			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$7,395,687	Up Front Customer Investment	(\$4,347,221)
Avoided Gen Capacity Costs	\$666,695	Utility Admin Costs	(\$314,193)
Avoided Transmission Expense	\$0		
Environmental Externalities	\$0		
Total Benefits	\$8,062,383	Total Costs	(\$4,661,414)
Benefit / Cost Ratio: 1.73			

Combined RIM:
 Benefits: \$6,582,655 Costs: (\$16,061,056)

Benefit / Cost Ratio: 0.41

Heat Pump Retrofit Program: SEER 15 for 2019 Tariff Filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 10,889,110	Revenue Declines	(\$15,553,267)
Rebates From EK	\$3,109,025	Administrative Costs	(\$276,392)
		Rebates Paid To Consumers	(\$1,171,155)
Total Benefits	\$13,998,135	Total Costs	(\$17,000,814)
Benefit / Cost Ratio: 0.82			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$9,609,729	Up Front Investment	(\$4,359,998)
Rebates From Distribution System	\$ 1,068,976		
Reductions in O&M costs	\$0		
Total Benefits	\$10,678,706	Total Costs	(\$4,359,998)
Benefit / Cost Ratio: 2.45			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$6,296,764	Up Front Customer Investment	(\$4,776,749)
Avoided Gen Capacity Costs	\$740,724	Distribution System Admin. Costs	(\$276,392)
Avoided Transmission Expense	\$0	EK Administrative Costs	(\$22,770)
Reduced Customer O&M costs	\$0		
Total Benefits	\$7,037,488	Total Costs	(\$5,075,912)
Benefit / Cost Ratio: 1.39			

EK Benefits		EK Costs	
Avoided Energy Costs	\$6,296,764	Decrease In Revenue	(\$10,889,110)
Avoided Gen Capacity Costs	\$740,724	Rebates Paid	(\$3,109,025)
Avoided Transmission Expense	\$0	Administrative Costs	(\$22,770)
Total Benefits	\$7,037,488	Total Costs	(\$14,020,905)
Benefit / Cost Ratio: 0.50			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$7,714,264	Up Front Customer Investment	(\$4,936,745)
Avoided Gen Capacity Costs	\$925,733	Utility Admin Costs	(\$309,262)
Avoided Transmission Expense	\$0		
Environmental Externalities	\$0		
Total Benefits	\$8,639,997	Total Costs	(\$5,246,007)
Benefit / Cost Ratio: 1.65			

Combined RIM:
 Benefits: \$7,037,488 Costs: (\$17,023,584)

Benefit / Cost Ratio: 0.41

HVAC Duct Seal Program

DSM Program Changes Explanation

HVAC Duct Seal Program

Background

The HVAC Duct Seal Program (“Duct Seal”) is designed to incentivize members to seal up the ducts that deliver heat or cooling from the heating or cooling equipment to individual rooms in the home. For older homes, an average of 30% of the heating or cooling energy is lost via leaky ducts. Sealing ducts is a laborious task, and many HVAC contractors aren’t interested in offering this service. Even with the incentive offered by the Duct Seal program, owner-members have struggled over many years to convince HVAC contractors to provide this service. Most of the owner-members offer this program.

Cost-effectiveness

The GDS Potential Study identified HVAC duct sealing as no longer cost-effective. (See Exhibit A, Appendix B – Residential Measure Details, Measures #s 7023 and 7035.) Please find the following pages – HVAC Duct Seal assumption sheet and summary results. The refined TRC in the summary results is 1.30 based on EKPC and owner-members’ costs.

Tariff Changes

Even though the refined TRC is cost-effective, due to the difficulty in implementation, EKPC and the owner-members request to discontinue the Duct Seal program.

For 2019 Tariff filing

Lead: HVAC Duct Seal Program
Sealing ductwork. Reductions in duct losses are measured using a blower door test.

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 8,650 kWh, 8.12 kW (coincident with winter system peak), 2.47 kW (summer) Savings= 1,308 kWh After Participant 7,612 kWh, 7.15 kW (coincident with winter system peak), 2.17 kW (summer)	HVAC loads for a typical heat pump in typical residence: mix of SEER 10 and SEER 12 HVAC loads for a typical heat pump home reduced by 12% savings. 12 % savings derived from ACEEE report and site specific blower door results.
Lifetime of savings	12 Years
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Participant Costs \$ 330.00	Average payment to contractors for performing the measures in the program. Source: EKPC Marketing Department - based on Jackson program
Administrative Cost EK \$6,000 per year fixed (2018-2022) Co-op \$ 100 per customer	All cost estimates provided by EKPC Marketing/Communications, October 2010. Based on EKPC 5 year plan
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18, Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 200 per year, 2018-2022. 20% free riders	Based on 2018 DSM 5 year workplan. Free riders % based on Frontier Assoc study for LG&E/KU and CPUC DEER update.
Rebates Co-op to Participant \$280 EK to Co-op \$530	Average payment to contractors is \$330; participating member pays \$50. Marketing transfer payment adjusted for increased coop rebate

HVAC Duct Seal Program for 2019 Tariff Filing.

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 561,592	Revenue Declines	(\$664,106)
Rebates From EK	\$482,728	Administrative Costs	(\$91,081)
		Rebates Paid To Consumers	(\$255,026)
Total Benefits	\$1,044,321	Total Costs	(\$1,010,214)
Benefit / Cost Ratio: 1.03			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$583,501	Up Front Investment	(\$271,708)
Rebates From Distribution System	\$ 230,540		
Reductions in O&M costs	\$0		
Total Benefits	\$814,041	Total Costs	(\$271,708)
Benefit / Cost Ratio: 3.00			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$250,353	Up Front Customer Investment	(\$240,453)
Avoided Gen Capacity Costs	\$139,658	Distribution System Admin. Costs	(\$91,081)
Avoided Transmission Expense	\$76,788	EK Administrative Costs	(\$27,324)
Reduced Customer O&M costs	\$0		
Total Benefits	\$466,798	Total Costs	(\$358,858)
Benefit / Cost Ratio: 1.30			

EK Benefits		EK Costs	
Avoided Energy Costs	\$250,353	Decrease In Revenue	(\$561,592)
Avoided Gen Capacity Costs	\$139,658	Rebates Paid	(\$482,728)
Avoided Transmission Expense	\$76,788	Administrative Costs	(\$27,324)
Total Benefits	\$466,798	Total Costs	(\$1,071,645)
Benefit / Cost Ratio: 0.44			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$285,324	Up Front Customer Investment	(\$249,339)
Avoided Gen Capacity Costs	\$163,144	Utility Admin Costs	(\$122,781)
Avoided Transmission Expense	\$87,643		
Environmental Externalities	\$0		
Total Benefits	\$536,111	Total Costs	(\$372,120)
Benefit / Cost Ratio: 1.44			

Combined RIM:
 Benefits: \$466,798 Costs: (\$1,037,538)

Benefit / Cost Ratio: 0.45

Commercial and Industrial Advanced Lighting Program

DSM Program Changes Explanation

Commercial and Industrial Advanced Lighting Program

Background

The Commercial and Industrial Advanced Lighting Program (“C&I Lighting”) is designed to incentivize members to install or retrofit lighting lamps and/or fixture systems that are more energy-efficient than the Department of Energy (“DOE”) minimum standards. The C&I lighting program pays an incentive on the amount of kilowatts (“kW”) reduced compared to the existing lighting. Many companies are changing or already have changed their lighting systems to more-efficient options. When changing to more-efficient lighting, companies have the option to move to Halogen, Florescent or the most efficient LED. EKPC and the owner-members are seeing more and more companies choosing to move to the most efficient LED lights because lamp costs have decreased significantly. The lower LED lamp costs are causing companies to move to the more-efficient lighting options without the need for a utility rebate. Once the majority of members choose LED regardless of rebates, then LEDs become the new baseline for lighting. Once the market is transformed, continuing to provide incentives will result in significant free-riders, and significant unnecessary utility expense. Most of the owner-members offer this program.

Cost-effectiveness

The GDS Potential Study identified that most of the C&I lighting upgrades are still cost-effective. (See Exhibit A, Appendix C – Commercial Measure Details, Measures #s 1-23 and Exhibit A, Appendix D – Industrial Measures Details, Measures #s 51-67.) However, the most widely utilized measures by the largest members are measures #s 65 & 66. These measures are no longer cost-effective. Please find the following pages – C&I Lighting assumption sheet and summary results. The refined TRC in the summary results is 1.29 based on EKPC and owner-members’ costs.

Tariff Changes

Even though the refined TRC is cost-effective, due to LEDs already becoming the baseline light of choice, EKPC and the owner-members request to discontinue the C&I Lighting program.

For 2019 Tariff Filing

Commercial and Industrial Advanced Lighting Program

This program offers incentives to commercial and industrial customers to install high efficiency lamps and ballasts in their facilities.

<u>Assumption</u>	<u>Source</u>
<p>Load Impacts Before Participant <i>14,185 kWh, 1.51 kW (coincident with winter system peak), 2.83 kW (summer)</i></p> <p><i>Savings per project = 53,333 kWh</i> After Participant <i>9,933 kWh, 1.06 kW (coincident with winter system peak), 1.98 kW (summer)</i></p>	<p>Lighting load for typical 2,365 square foot commercial building. Equates to 1 kW connected load savings which is unit for program. EUI of 6 kWh per square foot (sources: EPRI Market Profiles, Duke Power end use metering study).</p> <p>Note: savings and costs rescaled to typical project size</p> <p>Lighting load for 2,365 square foot building with 30% savings applied. Based on achievable potential reported by several sources: EPA, utility impact evaluations. With T5, controls, LED exit signs</p>
<p>Lifetime of savings</p>	<p>10 Years (source: DEEM database)</p>
<p>Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018</p> <p>Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices Discount Rate: 7%</p>	<p>PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer</p> <p>based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018</p>
<p>Participant Costs \$ 16,500 per project</p>	<p>Based on updated EKPC cost of capital Midrange of reported values from several programs in NY, CA, MA, Northeast, and national. Used \$0.31 per annual saved kWh (NEEP 2004, adjusted to \$2009, premium for advanced). (based on typical facility of 3,500 square feet).</p>
<p>Administrative Cost EK \$ 41600 fixed annual, \$0 per new participant</p> <p>Co-op \$ 0 per new participant</p>	<p>Based on program tracking. Consistent with survey of utility programs - includes setup, marketing, contractor relations, monitoring & eval, customer field work.</p> <p>EKPC manages rebates, QC and marketing</p>
<p>Rate Schedule - Retail South Kentucky B rate : customer charge \$23.79 Energy charge \$0.09718 per kWh</p> <p>Rate Schedule - Wholesale East Kentucky E-2 rate.</p>	<p>Current rates in effect.</p> <p>Current rates in effect.</p>
<p>Participation - 281 per year, 2018-2022. 20% free ridership</p>	<p>Based on 2018 DSM 5 year workplan. Unit is a project. Conversion factor is 100000 divided by 53333. Free rider based on updated study done by CA PUC DEER. Free rider is a participant who would have installed the measure anyway in the absence of the program.</p>
<p>Rebates Co-op to Participant \$213 per kW saved EK to Co-op \$ 533 per kW saved</p>	<p>Marketing rebate Marketing transfer payment.</p>

Commercial and Industrial Advanced Lighting Program for 2019 Tariff filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 28,077,670	Revenue Declines	(\$45,000,402)
Rebates From EK	\$15,356,226	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$5,067,554)
Total Benefits	\$43,433,895	Total Costs	(\$50,067,956)
Benefit / Cost Ratio: 0.87			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$41,168,629	Up Front Investment	(\$19,087,483)
Rebates From Distribution System	\$ 4,580,996		
Reductions in O&M costs	\$0		
Total Benefits	\$45,749,625	Total Costs	(\$19,087,483)
Benefit / Cost Ratio: 2.40			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$14,872,235	Up Front Customer Investment	(\$16,891,848)
Avoided Gen Capacity Costs	\$5,680,572	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$1,478,633	EK Administrative Costs	(\$189,448)
Reduced Customer O&M costs	\$0		
Total Benefits	\$22,031,440	Total Costs	(\$17,081,296)
Benefit / Cost Ratio: 1.29			

EK Benefits		EK Costs	
Avoided Energy Costs	\$14,872,235	Decrease In Revenue	(\$28,077,670)
Avoided Gen Capacity Costs	\$5,680,572	Rebates Paid	(\$15,356,226)
Avoided Transmission Expense	\$1,478,633	Administrative Costs	(\$189,448)
Total Benefits	\$22,031,440	Total Costs	(\$43,623,344)
Benefit / Cost Ratio: 0.51			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$16,660,099	Up Front Customer Investment	(\$17,516,078)
Avoided Gen Capacity Costs	\$6,502,910	Utility Admin Costs	(\$196,449)
Avoided Transmission Expense	\$1,660,160		
Environmental Externalities	\$0		
Total Benefits	\$24,823,169	Total Costs	(\$17,712,527)
Benefit / Cost Ratio: 1.40			

Combined RIM:
 Benefits: \$22,031,440 Costs: (\$50,257,405)

Benefit / Cost Ratio: 0.44

Industrial Compressed Air Program

DSM Program Changes Explanation

Industrial Compressed-air Program

Background

The Industrial Compressed-air Program (“Compressed-air”) is designed to incentivize members to reduce leaks in the compressed-air delivery system in their factory. The industrial member obtains a leakage report from a 3rd party that identifies locations for air leaks within the compressed-air delivery system. Once the industrial member has repaired most of the leaks and a new leakage survey and report confirms the repairs, the member receives a rebate to offset the leak survey costs. Very few industrial members each year participate in this program. In some years, no industrial member participated in this program.

Cost-effectiveness

The GDS Potential Study identified that the compressed-air audit and leak repair measure is cost-effective. (See Exhibit A, Appendix D – Industrial Measure Details, Measures #s105.) Please find the following pages – Compressed-air assumption sheet and summary results. The refined TRC in the summary results is 0.68 based on EKPC and owner-members’ costs.

Tariff Changes

Due to the refined TRC results below 1.0 and very little program participation, EKPC and the owner-members request to discontinue the Compressed-air program.

For 2019 Tariff Filing

Industrial Compressed Air Program

Reduces electricity consumption through a comprehensive approach to efficient production and delivery of compressed air in industrial facilities. The program includes, assessment, training, and financial incentives for capital intensive improvements.

<u>Assumption</u>	<u>Source</u>
<p>Load Impacts Before Participant 25,320 kWh, 2.00 kW (coincident with winter system peak), 4.99 (summer)</p> <p>Savings: 3,800 kWh per partic After Participant 21,520 kWh, 1.70 kW (coincident with winter system peak), 4.24 (summer)</p>	<p>Compressed air load for industrial corresponding to 1 kW of connected load savings</p> <p>Compressed air load after program. 15% savings. Source: US DOE Industrial Technologies Program.</p>
<p>Lifetime of savings 7 years</p>	<p>Source: BPA and Pacific Northwest planning numbers. Mix of O&M and capital measures</p>
<p>Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018</p> <p>Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices</p>	<p>PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018</p>
<p>Discount Rate: 7%</p> <p>Participant Costs \$ 820 per unit (1 kw savings)</p>	<p>Based on updated EKPC cost of capital</p> <p>Typical cost of \$0.20 per annual kWh savings from set of case studies provided by US DOE</p>
<p>Administrative Cost EK \$10,000 fixed annual, \$0 per new participant</p> <p>Co-op \$80 per new 1 kW savings</p>	<p>Tracking, Processing,Cust Svc. Includes efforts to promote formal training and distribution of Compressed Air Challenge manual. Estimated to be 30% of prior cost</p> <p>Audit/assessment costs.</p>
<p>Rate Schedule - Retail Owen Schedule II</p>	<p>Current rates in effect Cust chrg \$21.31 , Demand charge \$6.13 per kW,Energy Rate \$.06498 per kWh</p>
<p>Rate Schedule - Wholesale East Kentucky E-2 rate.</p>	<p>Current rates in effect</p>
<p>Participation - 18 per year, 2018-2022. 10% Free riders</p>	<p>Based on 2016 actual. Converted participants to units using factor of 17.89. Units are 1 kW of connected load saved.</p>
<p>Rebates Co-op to Participant \$ 0</p> <p>EK to Co-op \$ 230 per unit.</p>	<p>Audit reimbursement treated as admin cost above. Marketing transfer payment. Units are 1 kW of connected load saved. \$150 per kW for lost revenues and \$80 per kW to reimburse audit/assessment costs.</p>

Industrial Compressed Air Program for 2019 Tariff filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 104,706	Revenue Declines	(\$134,103)
Rebates From EK	\$18,854	Administrative Costs	(\$6,558)
		Rebates Paid To Consumers	(\$0)
Total Benefits	\$123,559	Total Costs	(\$140,661)
Benefit / Cost Ratio: 0.88			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$116,446	Up Front Investment	(\$60,764)
Rebates From Distribution System	\$ 0		
Reductions in O&M costs	\$0		
Total Benefits	\$116,446	Total Costs	(\$60,764)
Benefit / Cost Ratio: 1.92			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$53,142	Up Front Customer Investment	(\$60,496)
Avoided Gen Capacity Costs	\$18,405	Distribution System Admin. Costs	(\$6,558)
Avoided Transmission Expense	\$5,019	EK Administrative Costs	(\$45,540)
Reduced Customer O&M costs	\$0		
Total Benefits	\$76,566	Total Costs	(\$112,594)
Benefit / Cost Ratio: 0.68			

EK Benefits		EK Costs	
Avoided Energy Costs	\$53,142	Decrease In Revenue	(\$104,706)
Avoided Gen Capacity Costs	\$18,405	Rebates Paid	(\$18,854)
Avoided Transmission Expense	\$5,019	Administrative Costs	(\$45,540)
Total Benefits	\$76,566	Total Costs	(\$169,100)
Benefit / Cost Ratio: 0.45			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$58,043	Up Front Customer Investment	(\$62,731)
Avoided Gen Capacity Costs	\$20,396	Utility Admin Costs	(\$54,023)
Avoided Transmission Expense	\$5,493		
Environmental Externalities	\$0		
Total Benefits	\$83,933	Total Costs	(\$116,755)
Benefit / Cost Ratio: 0.72			

Combined RIM:
 Benefits: \$76,566 Costs: (\$186,202)

Benefit / Cost Ratio: 0.41

**ENERGY STAR[®] Manufactured
Home Program**

DSM Program Changes Explanation

ENERGY STAR® Manufactured Home Program

Background

The ENERGY STAR® Manufactured Home (“ESMH”) Program is designed to incentivize members to purchase an ENERGY STAR® certified manufactured home instead of a Housing and Urban Development (“HUD”) minimum standard home. For the existing tariff, EKPC pays the incentive to the Systems Building Research Alliance (“SBRA”) instead of the owner-member or their member. SBRA is the only organization designated by the ENERGY STAR® program to verify and certify ESMHs. Utilizing EKPC’s incentive, SBRA pays the manufacturing plant for upgrading the shell of the home to ENERGY STAR® standards and pays the manufactured home retailer for installing a heat pump. The program is designed to have the plant upgrade the home shell at no charge to the home retailer and to reimburse the retailer for the heat pump. Therefore, the cost of the home upgrade is not included in the purchase price the member pays for their new home. The incentive EKPC pays to SBRA covers the cost to upgrade the home to ENERGY STAR® certification.

After four years of utilizing the model described above, the multiple step process proved to be cumbersome. Therefore, the owner-members indicated that they would prefer the incentive be paid to the member purchasing the ENERGY STAR® manufactured home.

In February 2018, EPA changed the ENERGY STAR® requirements for ENERGY STAR® manufactured homes. Effectively, EPA lessened the efficiency requirements for the home’s shell. The changes allow the manufacturers to achieve ENERGY STAR® certification while spending less on improving the home’s shell. Therefore, EKPC is lowering the incentive to a more appropriate level to offset the new costs.

Cost-effectiveness

Please find attached the refined ESMH assumption and summary results sheets. The TRC based on the new incentives and savings is 1.49.

Tariff Changes

EKPC and the owner-members changed the ESMH program tariff to pay the incentive to the member instead of SBRA. The incentive is lowered to \$1,150 to reflect the new lower cost of implementing ENERGY STAR® manufactured home upgrades.

Please note that the owner-members are filing the ESMH tariff as a new tariff filing. The existing ESMH tariff pays the incentive to the manufacturers and retailer through SBRA. No money is exchanged between the owner-member and their member. Therefore, they implemented the ESMH tariff based on EKPC’s approved tariff and direct payments to SBRA. The new tariff changes will have EKPC reimbursing the owner-member for the incentive

payments to their participating member. As a result, the owner-members are filing new tariffs to identify the incentive amount being paid by them to their member.

Similar to the existing tariff, EKPC will pay a transfer payment to the owner-member that includes the rebate to their member plus a lost revenue payment, and a \$90 administrative fee.

For 2019 Tariff Filing

ENERGY STAR® Manufactured Home Program

5 years of participation Year 1 is 2018

All Electric manufactured home built to Energy Star standards with a SEER 14 ASHP

Assumption

Source

Load Impacts

Before Participant

17,194 kWh, 9.58 kW (coincident with winter system peak), 3.06 kW (summer)

Heating & cooling electricity loads for a standard efficiency manufactured home with an electric furnace

Savings= 4,060 kWh per participant

After Participant

13,134 kWh, 8.65 kW (coincident with winter system peak), 2.59 kW (summer)

Heating & Cooling loads for a Manufactured home built to ENERGY STAR® standards with a SEER 14 ASHP . kWh and kW savings based on GDS assumptions as adjusted for Josh model run

Lifetime of savings

15 Years - TVA assumption

Generation Capacity Cost -PJM Market,

100% summer **\$29.20** per kW-year in 2018

PJM market forecast in **BlueGrass transmission econ analysis** (1/2018). **Updated escalators to match.** 100% allocation to summer

Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices

based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore **Scenario 1, 0.540 esc in 2018**

Participant Costs \$ 1,150

Price premium for ENERGY STAR® Manufactured Home upgrades. \$750 for heat pump and \$400 for building shell upgrades.

Administrative Cost

EK **\$10,000** fixed annual, plus **\$150** per home

Fixed annual allocated administrative costs (\$3,000) plus M&V (\$7,000).

Co-op **\$50** per new participant

\$50 for rebate processing and tracking

Rate Schedule - Retail

Average Residential Rate for Co-ops
Cust chrg **\$14.18**, Energy Rate **\$0.8968**

Current rates in effect as of August, 2017

Rate Schedule - Wholesale

East Kentucky E-2 rate.

Current rates in effect as of August, 2017

Participation -30, 175, 150, 150, 150 (2018-2022). 0% Free Riders projected because of nature of program

Based on 5 year workplan

Rebates

Co-op to Participant **\$1,150** per home

Incentive to owner-member who purchases the home.

EK to Co-op **\$ 2,050**

Reimbursement for incentive, 100% of coop admin, plus 10 years estimated net lost revenue (adjusted for lower savings estimate).

ENERGY STAR® Manufactured Home Program for 2019 Tariff filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 1,711,175	Revenue Declines	(\$2,457,449)
Rebates From EK	\$1,203,223	Administrative Costs	(\$29,347)
		Rebates Paid To Consumers	(\$674,979)
Total Benefits	\$2,914,398	Total Costs	(\$3,161,774)
Benefit / Cost Ratio: 0.92			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$1,600,509	Up Front Investment	(\$598,097)
Rebates From Distribution System	\$ 598,097		
Reductions in O&M costs	\$0		
Total Benefits	\$2,198,606	Total Costs	(\$598,097)
Benefit / Cost Ratio: 3.68			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$942,984	Up Front Customer Investment	(\$674,979)
Avoided Gen Capacity Costs	\$232,282	Distribution System Admin. Costs	(\$29,347)
Avoided Transmission Expense	\$75,965	EK Administrative Costs	(\$133,581)
Reduced Customer O&M costs	\$0		
Total Benefits	\$1,251,231	Total Costs	(\$837,907)
Benefit / Cost Ratio: 1.49			

EK Benefits		EK Costs	
Avoided Energy Costs	\$942,984	Decrease In Revenue	(\$1,711,175)
Avoided Gen Capacity Costs	\$232,282	Rebates Paid	(\$1,203,223)
Avoided Transmission Expense	\$75,965	Administrative Costs	(\$133,581)
Total Benefits	\$1,251,231	Total Costs	(\$3,047,979)
Benefit / Cost Ratio: 0.41			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$1,111,734	Up Front Customer Investment	(\$704,531)
Avoided Gen Capacity Costs	\$280,489	Utility Admin Costs	(\$169,750)
Avoided Transmission Expense	\$89,375		
Environmental Externalities	\$0		
Total Benefits	\$1,481,599	Total Costs	(\$874,281)
Benefit / Cost Ratio: 1.69			

Combined RIM:
 Benefits: \$1,251,231 Costs: (\$3,295,356)

Benefit / Cost Ratio: 0.38

Appliance Recycling Program

DSM Program Changes Explanation

Appliance Recycling Program

Background

The Appliance Program (“ARP”) is designed to incentivize members to discard older, less energy-efficient refrigerators or freezers in an environmentally sensitive manner. These appliances are not the home’s primary refrigerator or freezer. The member realizes lower energy bills. EKPC and the owner-members realize lower energy and capacity demands. EKPC developed the ARP back in 2014. All 16 owner-members have participated in the program. The program is implemented utilizing a contract with America Recycling Centers of America (“ARCA”). ARCA also implemented the LG&E-KU and Kentucky Power ARP utilizing the same staff, trucks and recycling center in Louisville.

Cost-effectiveness

The GDS Potential Study identified that second refrigerator or freezer pickups are cost-effective. (See Exhibit A, Appendix B – Residential Measure Details, Measures #s 1007, 1008, 1015, and 1016.) However, after the ARPs at LG&E-KU and Kentucky Power were ended, efficiency in service were lost by ARCA. The new cost to pick-up second appliances more than doubled, making the program no longer cost-effective. Please find the following pages – Appliance Recycling assumption sheet and summary results. The refined TRC in the summary results is 0.59 based on the new EKPC and owner-members’ costs.

Tariff Changes

EKPC and the owner-members request to discontinue the ARP because the program is no longer cost-effective.

For 2019 Tariff Filing

Appliance Recycling Program

This program provides collection and disposal of old, inefficient freezers. Members are paid a bounty for each freezer turned in and taken off of the grid. The freezer will be turned over to a licensed recycler.

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 696 kWh, 0.07 kW (coincident with winter peak), 0.10 kW (summer) Savings: 696 kWh After Participant 0 kWh, 0.00 kW (coincident with winter system peak), 0.00 kW (summer)	Weighted average usage for a pre-2000 appliance (refrigerator or freezer), where weights are expected levels of participation for refrigerators (783 kWh) and freezers (525 kWh) The appliance is removed from the grid.
Lifetime of savings	7 Years based on Xcel and Vermont reports
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Discount Rate: 7% Participant Costs \$ 0	Based on updated EKPC cost of capital No out of pocket expense is incurred by the participant
Administrative Cost EK \$42,500 per year admin (2018-2022); plus \$170 per participant Co-op \$0 per new participant	EK fixed costs are \$30,000. Contractor annual admin fee is \$12,500. Per appliance cost is fee paid to contractor for promotion, enrollment, pickup, recycling and program admin costs. Modeling 1 appliance per participant. EKPC pays all costs for this program directly
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 1,100 per year, 2018-2022. 36% free riders.	Based on 5 year DSM plan. Free rider estimate based on ADM study for CA and Fort Collins study
Rebates Co-op to Participant \$ 50 EK to Co-op \$ 140	Bounty fee. Based on KU program 100% of Rebate plus 5 years net lost revenues

Appliance Recycling Program for 2019 Tariff filing

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 838,292	Revenue Declines	(\$1,273,666)
Rebates From EK	\$701,322	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$250,472)
Total Benefits	\$1,539,615	Total Costs	(\$1,524,138)
Benefit / Cost Ratio: 1.01			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$1,555,261	Up Front Investment	\$0
Rebates From Distribution System	\$ 226,423		
Reductions in O&M costs	\$0		
Total Benefits	\$1,781,685	Total Costs	\$0
Benefit / Cost Ratio: N/A			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$469,631	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$106,734	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$35,340	EK Administrative Costs	(\$1,045,152)
Reduced Customer O&M costs	\$0		
Total Benefits	\$611,705	Total Costs	(\$1,045,152)
Benefit / Cost Ratio: 0.59			

EK Benefits		EK Costs	
Avoided Energy Costs	\$469,631	Decrease In Revenue	(\$838,292)
Avoided Gen Capacity Costs	\$106,734	Rebates Paid	(\$701,322)
Avoided Transmission Expense	\$35,340	Administrative Costs	(\$1,045,152)
Total Benefits	\$611,705	Total Costs	(\$2,584,767)
Benefit / Cost Ratio: 0.24			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$512,941	Up Front Customer Investment	\$0
Avoided Gen Capacity Costs	\$118,281	Utility Admin Costs	(\$1,083,775)
Avoided Transmission Expense	\$38,681		
Environmental Externalities	\$0		
Total Benefits	\$669,903	Total Costs	(\$1,083,775)
Benefit / Cost Ratio: 0.62			

Combined RIM:
 Benefits: \$611,705 Costs: (\$2,569,291)

Benefit / Cost Ratio: 0.24

**ENERGY STAR[®] Appliances
Program**

DSM Program Changes Explanation

ENERGY STAR® Appliances Program

Background

The ENERGY STAR® Appliance Program (“ESAP”) is designed to incentivize members to purchase appliances that are more efficient than minimum standard. The Environmental Protection Agency (“EPA”) developed and maintains the ENERGY STAR® (“ES”) program. The EPA sets the ES performance standards for many types of equipment including the seven appliances that currently qualify for the EKPC ESAP. The energy performance standard for an ES appliance is usually 20% more efficient than the Department of Energy (“DOE”) minimum equipment energy performance. EKPC developed the ESAP in 2014. All 16 owner-members have participated in the program.

Cost-effectiveness

The GDS Potential Study identified that all residential ES appliance upgrades are no longer cost-effective except clothes washers. (See Exhibit A, Appendix B – Residential Measure Details, Measures #s 1001-1006 and 1009-1014 for refrigerators and freezers, 4001-4020 for clothes washers and dryers, 5001-5008 for dish washers, 8002 and 8006 for air conditioners and heat pumps, and 12006 -12008 for heat pump water heaters.) Only the clothes washers remain cost-effective. However, when combining all appliances into one program for cost-effectiveness evaluation, the ESAP TRC for the program as a whole is below 1.0. Please find the following pages – ESAP assumption sheet and summary results. The refined TRC in the summary results for the program as a whole is 0.85 based on EKPC and owner-members’ costs.

Tariff Changes

EKPC and the owner-members request to discontinue the EASP because the program is no longer cost-effective.

For 2019 Tariff Filing

ENERGY STAR® Residential Central Air Conditioning program

<u>Assumption</u>	<u>Source</u>
<p>Load Impacts Before Participant 2,092 kWh, 2.07 kW (coinc. with summer system peak)</p> <p>Savings = 529 kWh After Participant 1,563 kWh, 1.55 kW (coinc. with summer system peak).</p>	<p>Standard efficiency new Central air conditioner (SEER 13)</p> <p>High efficiency new Central Air Conditioner (SEER 15), proper sizing and installation. Savings from SEER 15 are 279 kWh. Savings from proper sizing/installation are 250 kWh.</p>
<p>Lifetime of savings</p>	<p>15 Years</p>
<p>Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018</p> <p>Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices</p>	<p>PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer</p> <p>based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018</p>
<p>Discount Rate: 7%</p>	<p>Based on updated EKPC cost of capital</p>
<p>Participant Costs \$ \$550.</p>	<p>Difference in installed cost (\$550) between SEER 13 Central AC and SEER 15 CAC - based on ENERGY STAR® .</p>
<p>Administrative Cost</p> <p>EK \$7,000 fixed annual (2018-2022), \$17.34 per new participant</p> <p>Co-op \$0</p>	<p>Fixed annual cost includes fixed EKPC costs (\$5,000 per year), plus fixed contractor costs (\$2,000 per year). Per unit fee of \$17.34 is paid to contractor for servicing the rebate application. Contractor fees are pro-rated evenly across all the appliances in the ENERGY STAR® Appliance Rebate program.</p> <p>Co-op is not responsible for providing services to administer this program.</p>
<p>Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18, Energy Rate \$.08968</p> <p>Rate Schedule - Wholesale East Kentucky E-2 rate.</p>	<p>Current rates in effect as of August, 2017</p> <p>Current rates in effect as of August, 2017</p>
<p>Participation - 300 per year,2018-2022. 10% free riders</p>	<p>Based on 5 year workplan.. Free Riders from Xcel DSM plan (2009).</p>
<p>Rebates</p> <p>Co-op to Participant \$300 EK to Co-op \$400</p>	<p>\$300 to match KU rebate (\$100 plus \$100 per 1 SEER improvement), (see tariff, DSM Adjustment Clause).</p> <p>100% reimbursement of rebate plus 7 years net lost revenues.</p>

For 2019 Tariff Filing

ENERGY STAR® Clothes Washer Rebate Program

<u>Assumption</u>	<u>Source</u>
<p>Load Impacts Before Participant 3,400 kWh, 0.73 kW (coincident with winter system peak), 0.31 kW (summer)</p> <p>Savings = 350 kWh After Participant 3,050 kWh, 0.66 kW (coincident with winter system peak), 0.28 kW (summer)</p>	<p>Typical electric water heater with typical electric dryer. Electricity savings from ENERGY STAR® Clothes washers come from lower water heating and clothes drying energy.</p> <p>ENERGY STAR® clothes washers save on average 250 kWh on water heating and 100 kWh on clothes drying each year.</p>
<p>Lifetime of savings 12 years</p>	<p>Source: Northeast Energy Efficiency Partnership (NEEP) planning document (Sept 2004).</p>
<p>Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018</p> <p>Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices</p>	<p>PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018</p>
<p>Participant Costs \$260 one time; \$-20 per year O&M cost (savings)</p>	<p>Difference between retail price of an ENERGY STAR® clothes washer and a new standard efficiency washer. Source: NEEP (2004), ENERGY STAR® (2011). The negative \$20 per year O&M cost represents <u>savings</u> in water and sewer costs by using less water.. Verified with more recent reports.</p>
<p>Administrative Cost</p> <p>EK \$7,000 fixed annual (2018-2022), \$17.34 per new participant</p> <p>Co-op \$0</p>	<p>Fixed annual cost includes fixed EKPC costs (\$5,000 per year), plus fixed contractor costs (\$2,000 per year). Per unit fee of \$17.34 is paid to contractor for servicing the rebate application. Contractor fees are pro-rated evenly across all the appliances in the ENERGY STAR® Appliance Program</p> <p>Co-op is not responsible for providing services to administer this program.</p>
<p>Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18, Energy Rate \$0.08968</p> <p>Rate Schedule - Wholesale East Kentucky E-2 rate.</p>	<p>Current rates in effect as of August, 2017</p> <p>Current rates in effect as of August, 2017</p>
<p>Participation - 1,750, 2018-2022. 10% Free Riders</p>	<p>Based on 5 year workplan. Free Riders based on LG&E/KU.</p>
<p>Rebates Co-op to Participant \$75 EK to Co-op \$130</p>	<p>To match the LG&E/KU rebate (see tariff, DSM Adjustment Clause) 100% of Rebate plus 6 years net lost revenues</p>

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 343 kWh, 0.06 kW (coincident with winter system peak), 0.0.03 kW (summer) Savings = 79 After Participant 264 kWh, 0.05 kW (coincident with winter system peak), 0.02 kW (summer)	Typical electricity consumption for dishwasher and electric water heating for dish washing. Electricity savings from ENERGY STAR® Dishwashers come from lower water heating and dish washing energy. ENERGY STAR® dishwashers save on average 44 kWh on water heating and 35 kWh on dish washing each year.
Lifetime of savings 10 years	Source: ENERGY STAR®
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Participant Costs \$ 10 one time; \$0 per year O&M cost (savings)	Difference between retail price of an ENERGY STAR® dishwasher and a new standard efficiency washer. Source: ENERGY STAR®. O&M cost savings from lower water and sewer costs not included
Administrative Cost EK \$7,000 fixed annual (2018-2022), \$17.34 per new participant Co-op \$0	Fixed annual cost includes fixed EKPC costs (\$5,000 per year), plus fixed contractor costs (\$2,000 per year). Per unit fee of \$17.34 is paid to contractor for servicing the rebate application. Contractor fees are pro-rated evenly across all the appliances in the ENERGY STAR® Appliance Rebate program. Co-op is not responsible for providing services to administer this program.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$0.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 2,000 per year, 2018 - 2022 . 10% Free Riders	based on 5 year workplan
Rebates Co-op to Participant \$50 EK to Co-op \$60	To match the LG&E/KU rebate (see tariff, DSM Adjustment Clause) 100% of Rebate plus 5 years net lost revenues

For 2019 Tariff Filing

ENERGY STAR® Freezer Rebate Program

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 673 kWh, 0.055 kW (coincident with winter system peak), 0.109 kW (summer)	New upright automatic defrost freezer meeting current Federal standards for efficiency. Source: ENERGY STAR®
Savings = 67 kWh After Participant 606 kWh, 0.049 kW (coincident with winter system peak), 0.098 kW (summer)	
Lifetime of savings 12 years	Source: ENERGY STAR®
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices Discount Rate: 7%	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Participant Costs \$ 33 one time;	Based on updated EKPC cost of capital Incremental cost for the more efficient ENERGY STAR® model. Source: ENERGY STAR®
Administrative Cost EK \$7,000 fixed annual (2018-2022), \$17.34 per new participant Co-op \$0	Fixed annual cost includes fixed EKPC costs (\$5,000 per year), plus fixed contractor costs (\$2,000 per year). Per unit fee of \$17.34 is paid to contractor for servicing the rebate application. Contractor fees are pro-rated evenly across all the appliances in the ENERGY STAR® Appliance Rebate program. Co-op is not responsible for providing services to administer this program.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 300 per year, 2018-2022. 10% Free Riders	Based on 5 year workplan. Free rider estimate is from California PUC Energy Efficiency Policy Manual.
Rebates Co-op to Participant \$50 EK to Co-op \$60	To match the LG&E/KU rebate (see tariff, DSM Adjustment Clause) 100% of Rebate plus 6 years net lost revenues

For 2019 Tariff Filing

ASHP **standard replacement** to SEER 15 ENERGY STAR®

Encourages customers to upgrade their replacement air source heat pump from standard SEER 13 to high efficient SEER 15 heat pumps

<u>Assumption</u>	<u>Source</u>
Load Impacts Before Participant 7,669 kWh, 8.1 kW (coincident with winter peak), 2.1 kW (summer) Savings: 804 kWh After Participant 6,865 kWh, 8.1 kW (coincident with winter system peak), 1.8 kW (summer)	Standard efficiency heat pump: SEER 13, HSPF 7.7 1,700 square foot home, 3 ton unit High efficiency heat pump: SEER 15, HSPF 8.5. 1,700 square foot home, 3 ton unit
Lifetime of savings	20 years
Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018 Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices	PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018
Discount Rate: 7% Participant Costs \$ 1,000 per participant	Based on updated EKPC cost of capital Cost premium (\$1,000) associated with SEER 15 heat pump over and above the installed cost of a SEER 13 heat pump. Cost premium based on ENERGY STAR® data.
Administrative Cost EK \$7,000 fixed annual (2018-2022), \$17.34 per new participant Co-op \$0	Fixed annual cost includes fixed EKPC costs (\$5,000 per year), plus fixed contractor costs (\$2,000 per year) . Per unit fee of \$17.34 is paid to contractor for servicing the rebate application. Contractor fees are pro-rated evenly across all the appliances in the ENERGY STAR® Appliance Rebate program. Co-op is not responsible for providing services to administer this program.
Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18 , Energy Rate \$.08968 Rate Schedule - Wholesale East Kentucky E-2 rate.	Current rates in effect as of August, 2017 Current rates in effect as of August, 2017
Participation - 1,100 new per year, 2018-2022. 0% free riders.	based on 2018 5 year DSM workplan
Rebates Co-op to Participant \$ 300 EK to Co-op \$ 675	To match the LG&E/KU rebate (see tariff, DSM Adjustment Clause). \$100 plus \$100 more per 1 SEER improvement above the Federal standard Covers 100% of coop admin cost, rebate, plus 5 years estimated net lost revenues.

For 2019 Tariff Filing

Heat Pump Water Heater ENERGY STAR®

Heat pump water heaters use a vapor compression refrigeration cycle to concentrate ambient heat instead of generating heat directly. Therefore, they can be two to three times more energy efficient than conventional electric resistance water heaters.

<u>Assumption</u>	<u>Source</u>
<p>Load Impacts Before Participant 3,600 kWh, 0.84 kW (coincident with winter peak), 0.32 kW (summer)</p> <p>Savings = 2,200 kWh After Participant 1,400 kWh, 0.33 kW (coincident with winter system peak), 0.12 kW (summer)</p>	<p>Typical efficiency (EF=0.90) new electric hot water heater, 50 or more gallons</p> <p>ENERGY STAR® rated integrated heat pump water heater (EF=2.35), tank size of at least 50 gallons</p>
<p>Lifetime of savings</p>	<p>13 Years (Lawrence Berkeley Lab, ACEEE)</p>
<p>Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018</p> <p>Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices</p>	<p>PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer</p> <p>based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018</p>
<p>Discount Rate: 7% Participant Costs \$ 1,405 .</p>	<p>Based on updated EKPC cost of capital Cost premium associated with the installed cost of the heat pump water heater over and above the installed cost of a new conventional electric water heater. Total installed cost for HPWH is \$2,000. Installed cost of conventional electric water heater is \$595. .</p>
<p>Administrative Cost</p> <p>EK \$7,000 fixed annual (2018-2022), \$17.34 per new participant</p> <p>Co-op \$0</p>	<p>Fixed annual cost includes fixed EKPC costs (\$5,000 per year), plus fixed contractor costs (\$2,000 per year). Per unit fee of \$17.34 is paid to contractor for servicing the rebate application. Contractor fees are pro-rated evenly across all the appliances in the ENERGY STAR® Appliance Rebate program.</p> <p>Co-op is not responsible for providing services to administer this program.</p>
<p>Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18, Energy Rate \$.08968</p> <p>Rate Schedule - Wholesale East Kentucky E-2 rate.</p>	<p>Current rates in effect as of August, 2017</p> <p>Current rates in effect as of August, 2017</p>
<p>Participation - 150 new per year, 2018-2022. 0% free riders.</p>	<p>Based on 2018 DSM 5 year workplan</p>
<p>Rebates Co-op to Participant \$ 300 EK to Co-op \$ 685</p>	<p>To match the LG&E/KU rebate (see tariff, DSM Adjustment Clause) Covers 100% of coop admin cost, rebate, plus 7 years estimated net lost revenues.</p>

ENERGY STAR® Refrigerator Rebate Program

<u>Assumption</u>	<u>Source</u>
<p>Load Impacts Before Participant 600 kWh, 0.057 kW (coincident with winter system peak), 0.087 kW (summer)</p> <p>Savings = 100 kWh After Participant 500 kWh, 0.047 kW (coincident with winter system peak), 0.072 kW (summer)</p>	<p>New refrigerator meeting current Federal standards for efficiency</p> <p>New ENERGY STAR® Refrigerator. Source: ENERGY STAR®</p>
<p>Lifetime of savings 12 years</p>	<p>Source: ENERGY STAR®</p>
<p>Generation Capacity Cost -PJM Market, 100% summer \$29.20 per kW-year in 2018</p> <p>Avoided Electricity Energy Costs - PJM Market Medium DSMore scenario 1 scaled to ACES forward prices</p>	<p>PJM market forecast in BlueGrass transmission econ analysis (1/2018). Updated escalators to match. 100% allocation to summer based on Feb 13, 2018 ACES Forward prices for AEP_Dayton hub. DSMore Scenario 1, 0.540 esc in 2018</p>
<p>Participant Costs \$ 40 one time;</p>	<p>Incremental cost for the more efficient ENERGY STAR® model. Source: ENERGY STAR®</p>
<p>Administrative Cost</p> <p>EK \$7,000 fixed annual (2018-2022), \$17.34 per new participant</p> <p>Co-op \$0</p>	<p>Fixed annual cost includes fixed EKPC costs (\$5,000 per year), plus fixed contractor costs (\$2,000 per year). Per unit fee of \$17.34 is paid to contractor for servicing the rebate application. Contractor fees are pro-rated evenly across all the appliances in the ENERGY STAR® Appliance Rebate program.</p> <p>Co-op is not responsible for providing services to administer this program.</p>
<p>Rate Schedule - Retail Average Residential Rate for Co-ops Cust chrg \$14.18, Energy Rate \$.08968</p> <p>Rate Schedule - Wholesale East Kentucky E-2 rate.</p>	<p>Current rates in effect as of August, 2017</p> <p>Current rates in effect as of August, 2017</p>
<p>Participation - 2,500 per year, 2018-2022. 10% Free Riders</p>	<p>5 year worksheet</p>
<p>Rebates Co-op to Participant \$100 EK to Co-op \$115</p>	<p>To match the LG&E/KU rebate (see tariff, DSM Adjustment Clause) 100% of Admin and Rebate plus 6 years net lost revenues</p>

ENERGY STAR® Appliances Program for 2019 Tariff filing

<u>Distribution System Benefits</u>		<u>Distribution System Costs</u>	
Power Bill Declines	\$ 8,368,896	Revenue Declines	(\$11,691,982)
Rebates From EK	\$7,358,361	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$4,374,543)
Total Benefits	\$15,727,257	Total Costs	(\$16,066,524)
Benefit / Cost Ratio: 0.98			

<u>Participant Benefits</u>		<u>Participant Costs</u>	
Electric Bill Declines	\$8,142,678	Up Front Investment	(\$8,483,257)
Rebates From Distribution System	\$ 3,945,977		
Reductions in O&M costs	\$979,586		
Total Benefits	\$13,068,242	Total Costs	(\$8,483,257)
Benefit / Cost Ratio: 1.54			

<u>Total Resource Benefits</u>		<u>Total Resource Costs</u>	
Avoided Energy Costs	\$4,522,733	Up Front Customer Investment	(\$9,046,458)
Avoided Gen Capacity Costs	\$2,402,124	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$564,433	EK Administrative Costs	(\$860,371)
Reduced Customer O&M costs	\$877,310		
Total Benefits	\$8,366,600	Total Costs	(\$9,906,829)
Benefit / Cost Ratio: 0.85			

<u>EK Benefits</u>		<u>EK Costs</u>	
Avoided Energy Costs	\$4,522,733	Decrease In Revenue	(\$8,368,896)
Avoided Gen Capacity Costs	\$2,402,124	Rebates Paid	(\$7,358,361)
Avoided Transmission Expense	\$564,433	Administrative Costs	(\$860,371)
Total Benefits	\$7,489,291	Total Costs	(\$16,587,628)
Benefit / Cost Ratio: 0.45			

<u>Societal Benefits</u>		<u>Societal Costs</u>	
Avoided Energy Costs	\$5,332,200	Up Front Customer Investment	(\$9,376,948)
Avoided Gen Capacity Costs	\$2,942,150	Utility Admin Costs	(\$890,676)
Avoided Transmission Expense	\$667,612		
Environmental Externalities	\$0		
Total Benefits	\$8,941,962	Total Costs	(\$10,267,623)
Benefit / Cost Ratio: 0.87			

Combined RIM:
 Benefits: \$7,489,291 Costs: (\$16,926,895)

Benefit / Cost Ratio: 0.44