COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

JOINT APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY FOR REVIEW, MODIFICATION, AND CONTINUATION OF EXISTING, AND ADDITION OF NEW, DEMAND-SIDE MANAGEMENT AND ENERGY-EFFICIENCY PROGRAMS	)	CASE NO. 2014-00003

ADVANCED METERING SYSTEMS 2016 ANNUAL REPORT

On November 14, 2014, the Commission issued an Order in Case No. 2014-00003[1] approving an Advanced Metering System Opt-In service offering ("AMS Opt-In") for up to 5,000 Louisville Gas and Electric Company ("LG&E") and up to 5,000 Kentucky Utilities Company ("KU") (collectively "the Companies") residential and small commercial customers. The goal is to provide customers who desire to have consumption data more frequently than once a month an opportunity to request and receive an advanced meter, which will present individual daily consumption through a website. Advanced meters are installed for customers who elect to participate. A participating customer's consumption is captured, communicated and stored. Customers are able to monitor their hourly usage through the web within two business days. The program does not include in-home devices.

The Commission ordered the Companies to prepare annual reports beginning on December 31, 2015, and due by January 31, 2016, and again annually through December 31, 2018, due by January 31, 2019. The Commission stated the reports should provide the number of participants by Company, measurable energy savings, the information learned, any problems and the resolution, and whether the information was accessible to the participants in a 24- to 48-hour period.[2]

Customer Experience – Enrollment

Since inception of the AMS Opt-In Program in 2015 through December 31, 2016 there are 4,181 active customer enrollments and 4,105 meters currently installed in the AMS Opt-In service (see Figure 1).

The Companies use customer-provided address information to plot customer locations in Google Earth to aid in network deployment planning.

[1] Case No. 2014-00003, Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for Review, Modification, and Continuation of New Demand-Side Management and Energy Efficiency Programs (Ky. PSC, Nov. 14, 2014).
[2] Id. at 32.

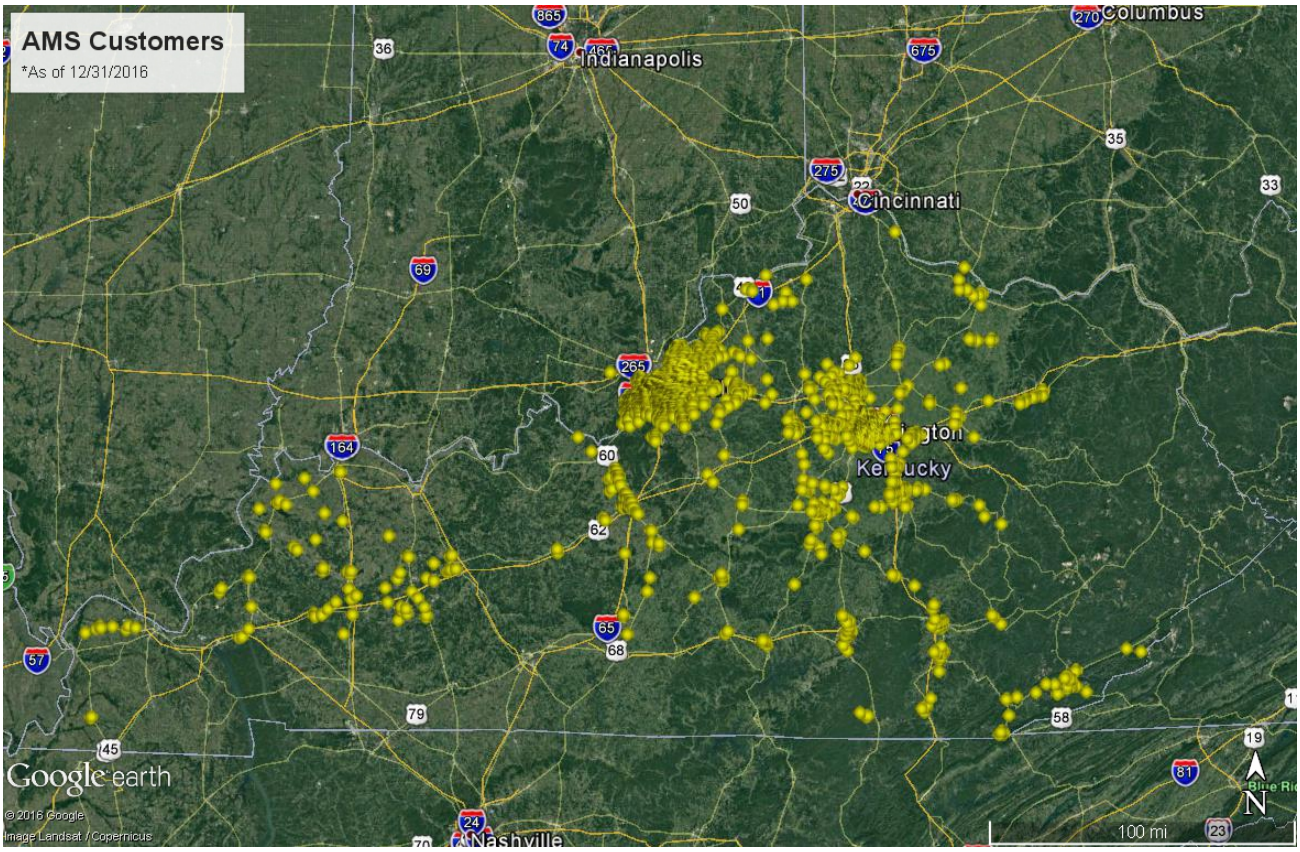


FIGURE 1 – ACTIVE CUSTOMER ENROLLMENTS IN AMS OPT-IN

Total customer enrollment between January 1 and December 31, 2016 are displayed in Figure 2 below. These counts represent total enrollments received in the month reported and are not net of any removals or cancelled requests.

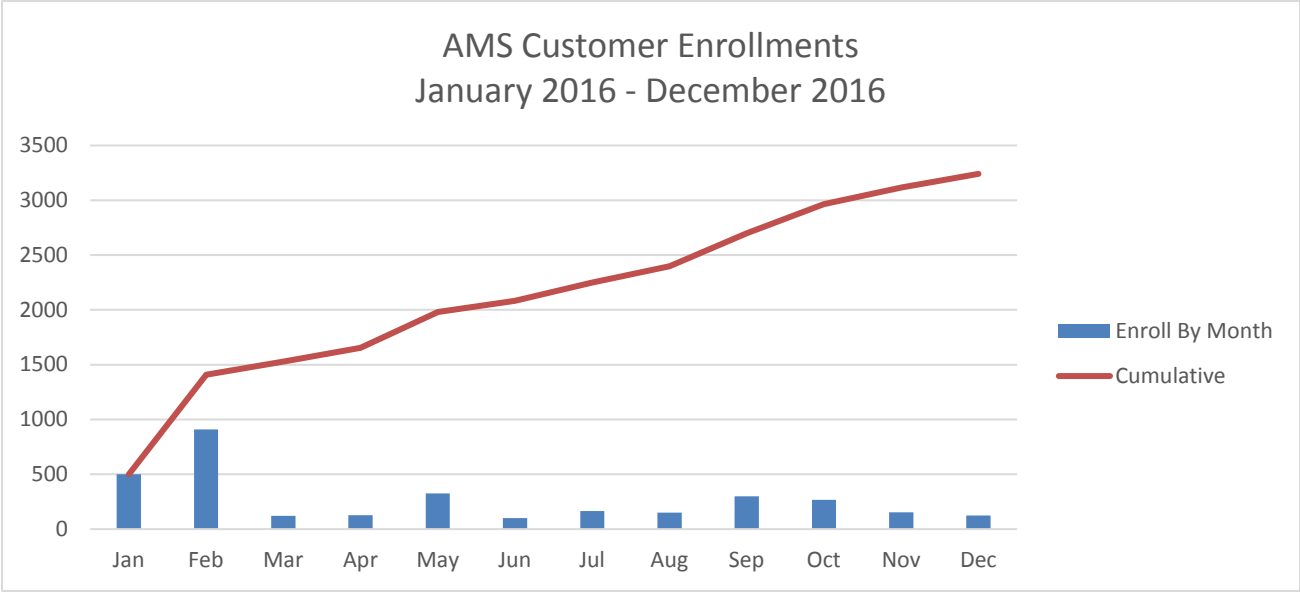


FIGURE 2 - CUSTOMER ENROLLMENTS IN AMS OPT-IN BY MONTH

Enrollments in AMS Opt-In is distributed by company as seen in Figure 3 below.

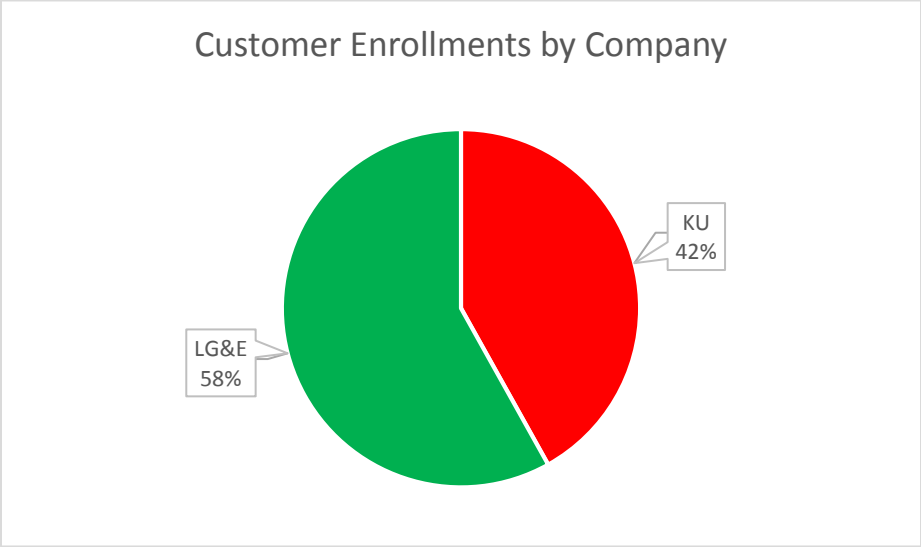


FIGURE 3 - AMS ENROLLMENT BY COMPANY

AMS Opt-In is available to customers in rate classes RS (Residential) and GS (Small Commercial), and the distribution by rate class is depicted in the Figure 4 below.

	Active Program Enrollments as of December 31, 2016	
Rate	**LG&E**	**KU**
Residential Electric Service	2,400	1,681
Residential Time-of-Day Energy	6	1
General Service Three Phase	10	29
General Service Single Phase	13	41
Grand Total	**2,429**	**1,752**

FIGURE 4 - ENROLLMENTS BY RATE

As stated previously, 4,105 AMS meters are actively installed as of December 31, 2016. These meters are associated with 4,072 customers[3]. 47% of the current meter deployment utilizes cellular communications, while 53% are mesh meters.

Through 2016, the Companies have closely managed the AMS Opt-In program delivering against the participation goals identified in Case No. 2014-00003:

	Cumulative (through 2016)		
	Participation Goal	Actuals Enrollments	Installed
LG&E	2,000	2,429	2,383
KU	2,000	1,752	1,689
Total	4,000	4,181	4,072

FIGURE 5 – AMS OPT-IN PARTICIPATION GOALS VS ACTUALS

[3] Some customers have more than one meter.

The participation numbers listed above are not inclusive of customers who move out (320 customers), resulting in an AMS meter removal if the move out occurs after the AMS meter was installed. Nor do they include customers (30 customers) who request AMS service and reside in areas with existing AMS-capable meters (*e.g.*, customers in Wilmore, KY and the Downtown Louisville Network have AMS-capable meters; however, they are not included in AMS Opt-In metrics). The participation numbers also do not include customers who request to cancel their enrollment before their meter gets installed (97 customers) or opt out of the AMS offering after their meter is installed (12 customers).

For a more reflective gauge of customer interest in AMS, the Companies point to the over 4,600 customer enrollments received since program launch. This volume demonstrates customer excitement around AMS; outpacing the Companies' participation goal by over 15%.

Customers' Engagement with MyMeter Web Portal

The following table (Figure 6) reflects the volume of customer interest in the websites the Companies have established to provide information on the Advanced Meter Service as well as educational materials on the MyMeter portal. Please note, Google Analytics defines "Pageviews" as the total number of pages viewed. Repeated views of a single page are counted. "Unique Pageviews" is the number of sessions during which the specified page was viewed at least once. A unique pageview is counted for each page URL + page Title combination.

Page	Description	Pageviews	Unique Pageviews	Avg. Time on Page
All page URLs begin: https://lge-ku.com/saving-energy-money/*		20,696	18,223	00:00:56
/advanced-meter-service/	General awareness page that explains the service and how to sign up for it.	18,334	16,181	00:01:22
/advanced-meter-service/ams	Welcome site for AMS customers featuring helpful tips and video tutorials about how to use the MyMeter dashboard.	2,125	1,821	00:01:13
/advanced-meter-service/ams/chart-view	Welcome site for AMS customers featuring helpful tips and video tutorials about how to use the MyMeter "Charts View".	59	56	00:00:13
/advanced-meter-service/ams/data-view	Welcome site for AMS customers featuring helpful tips and video tutorials about how to use the MyMeter "Data View".	50	47	00:00:33
/advanced-meter-service/ams/notifications	Welcome site for AMS customers featuring helpful tips and video tutorials about how to use the MyMeter "Notifications".	48	42	00:00:40
/advanced-meter-service/ams/profile	Welcome site for AMS customers featuring helpful tips and video tutorials about how to use the MyMeter "Profile".	44	41	00:00:54

/advanced-meter-service/ams/how-to-use-notifications	Welcome site for AMS customers featuring helpful tips and video tutorials about how to use the MyMeter "Notifications".	36	35	00:01:35

FIGURE 6 – GOOGLE ANALYTICS SNAPSHOT OF COMPANIES' AMS WEB TRAFFIC

The following table (Figure 7) depicts data on customer activity utilizing the MyMeter web portal as part of the AMS Opt-In service. For a brief definition of each metric please see Appendix 1.

MyMeter Analytics	2015[4]	2016
Accounts registered (enrollments)	908[5]	3,281
User Registrations (first time a user clicks into MyMeter)	514	2,484
Customer Energy Markers™	71	416
Customer Notification: Mobile phone notification set-up	34	73
System Notifications[6]	492	2,515
Customer Notification: Threshold alert set-up	54	173
Threshold notifications sent by system	653	12,663
Total Sessions within MyMeter Site	2,035	26,519
Sessions by new users	614	7,473
Sessions by returning users	1,421	19,046
Average session duration (minutes:seconds)	4:05	2:04
Page visits/session	2.96	1.8
Average Number of times MyMeter visited per month	508.8	2,209.92
Unique pageviews to MyMeter site	3,523	36,231
Total MyMeter site pageviews	6,027	47,742

FIGURE 7 – MYMETER WEB PORTAL ACTIVITY AND ANALYTICS

The chart below (Figure 8) illustrates the type of devices customers are using to access the MyMeter web portal.

[4] 2015 metrics are for September – December 31.
[5] The difference between "Accounts registered" and "Meters installed" is that some accounts have multiple meters.
[6] This metric label was "Customer Notification: E-mail address notification set-up" in the 2015 report and was updated for clarity. MyMeter updated their reporting structure in 2016 to include all system notifications rather than only customer generated email notifications so the values reported capture all system notifications generated.

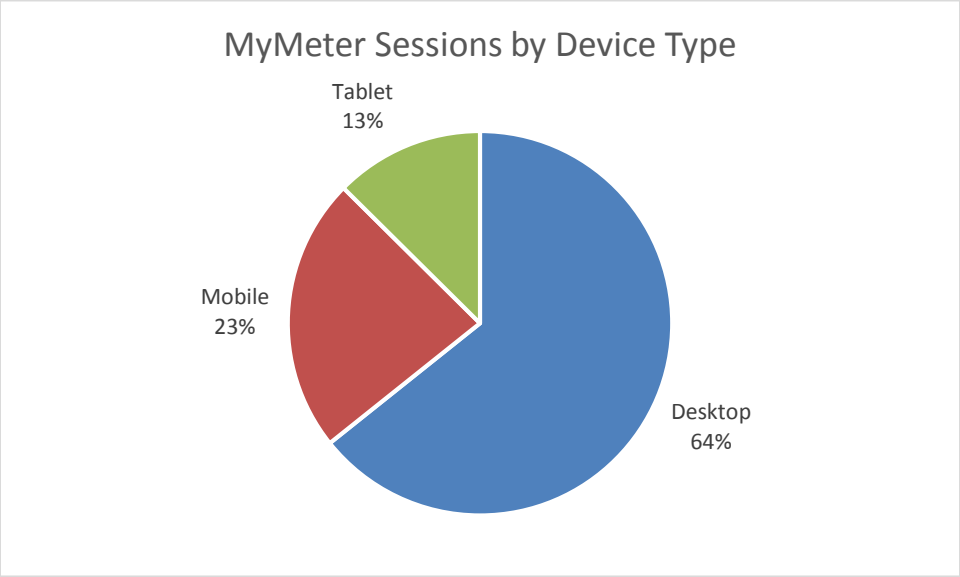


FIGURE 8 – MYMETER WEB PORTAL SESSIONS BY DEVICE TYPE. SOURCE: GOOGLE ANALYTICS

Customer Experience – Survey

In May 2016, the Company partnered with Bellomy Research to conduct a study to evaluate perceptions among the approximately 2,000 AMS Opt-In participants at that time. Specific objectives included understanding overall satisfaction with the AMS Opt-In offering, satisfaction with the MyMeter dashboard, interest in additional MyMeter dashboard features, and changes in behavior due to participation. 370 customer responses were received providing the following conclusions:

- Most customers currently participating are satisfied with the Advanced Meter Service (77%) and MyMeter Dashboard (75%).
- AMS Opt-In participants are very engaged when it comes to saving energy. Most have taken additional steps since joining the program by doing things such as upgrading to LED bulbs, programming thermostat settings and enrolling in utility energy efficiency programs.
- Although satisfaction with the Dashboard is high, some opportunities for improvement exist:
    - Customers who access the MyMeter Dashboard more frequently tend to be happier with the service. Continue to encourage customers to access the Dashboard.
    - There is an opportunity for continuous communication and education among participants since some who have never accessed the MyMeter Dashboard (16%) said they did not know about it or how to access it.
    - Ease of accessing the MyMeter Dashboard was the lowest rated attribute, suggesting an area for improvement. Possibly explore providing a mobile app, which was especially desirable among younger customers.
    - Few customers are using “energy markers” or schedule MyMeter notifications.
- 86% of customers were interested in having an option to review energy usage in terms of dollars and not just kWh
- Nearly two-thirds of participants surveyed are *Promoters* of the Advanced Meter Service and are likely to recommend the program to others.

System Design & Project Planning

The design process for the RF Mesh network infrastructure includes site surveys and field surveys of proposed substation, communication towers and distribution infrastructure locations. When suitable locations are finalized and approved, construction begins for the installation of communications equipment. There are 31 substation and communication tower locations, and over 300 distribution infrastructure locations included in the Companies' RF Mesh design. The installation of RF Mesh network has been completed in the Louisville area (Jefferson County) and is 70% complete in the Lexington area (Fayette County). The balance of the Lexington area RF Mesh network is expected to be completed in 2017.

Customer Education

The Company deployed a number of customer education materials in 2016 in an effort to raise awareness of the AMS Opt-In program. These materials[7] included:

- Digital and social media campaign
- October LG&E and KU *Power Source* customer newsletters
- Customer door hangers informing customers with hard to access meters to participate in AMS
- Flyers and rack cards
- Yard signs at Company sponsored events like Homearama
- Multiple email campaigns targeted in areas with RF Mesh coverage

In addition to the Company sponsored materials mentioned above, the AMS Opt-In program was also promoted in a number of media forums:

- February: Lexington Herald-Leader article
  - http://www.kentucky.com/news/business/article59016133.html)
- April: WFPL interview
  - http://wfpl.org/new-online-portal-helps-energy-obsessives-drill-electricity-usage/
- October: WHAS Great Day Live! Interview
  - http://www.whas11.com/entertainment/television/great-day-live/track-your-energy-use-down-to-the-minute/337478381

MyMeter Enhancements

The MyMeter web portal was updated in July 2016 and again subsequently in November to enable a number of system improvements, bug fixes, and feature requests either received from customers or recommended by MyMeter. Some of the key new functionality included:

- New usage feature that allows customers to view their consumption in terms of dollars or kilowatt-hours. Financial information displayed in the MyMeter dashboard reflects only the customer's estimated electric charges, which is their billed amount (rate) multiplied by their electric usage (kilowatt hours - kWh). This information is not their full billed amount, which reflects actual billing dates and additional electric charges that are itemized each month for their review.
- New dynamic help screens

[7] Samples of the various education materials may be found in Appendix 2.

- Advanced notification options
- Customizable date range filters for the chart and data views
- Bug fixes and improvements to the usage export functionality

Impact Assessment

In October the Company partnered with Tetra Tech to quantify what, if any, measurable energy savings existed among AMS Opt-In participants. Tetra Tech reviewed participant billing data to investigate whether AMS Opt-In participants recognized energy savings during the relatively short time the advanced meters have been installed and operating.

Tetra Tech's analysis was based on pre- and post-installation PRISM[2]-type models on households who had the advanced meter installed for at least 10 months during the post-installation period. A control group was developed for households who had only received their advanced meter in the last month of the study period. The PRISM approach develops two weather normalized energy consumption models for each building in the sample based on regression models. Differences between the weather normalized consumption between the pre- and post- periods show energy consumption increases or decreases, removing the effects of weather.

The PRISM analysis indicated average household energy savings of approximately six percent. While these result are encouraging, the Company agrees with Tetra Tech's caution in generalizing this finding to a larger population or in assuming that the analysis equates to a full evaluation of the AMS Opt-In Program. The analysis is a preliminary look at near-term changes in consumption and simply point to a possible direction in consumption changes.

Lessons Learned to Date

As Figure 1 displayed, customers across the Companies' service territories have indicated their interest in the AMS Opt-In offering. Customers have been actively providing feedback since approval was received in November 2014. Questions have ranged from how to use the features available within the presentment portal to requests for additional functionality such as support for customer purchased in-home devices.

Additionally in April the Companies identified its first, and only to date, case of meter tampering in which the meter was bypassed. This event was quickly mitigated thanks to the system alerts created by the meter and communicated to Company employees.

Problems & Resolutions

Experience gained from the early deployment in 2015 resulted in more robust business practices in 2016.

As reported last year, AMS Meter installation was delayed for some customers (eighty-one in 2015, ultimately growing to over 170) with electric service characteristics such as Advanced Meter Reading (AMR), in which the meter can be probed remotely from short proximities away, as well as customers with any rate that requires multiple meter usage channels like net metering customers and Time-of-Day customers. AMR meters are typically used when access to a meter is an issue (*e.g.*, meter access by field personnel is hindered by a locked door or gate, dogs, etc.). Replacing these types of meters with AMS meters had the potential to result in reverting to manually reading the meter because processes to provide

monthly meter reads from AMS for billing were not initially created. Reverting to manual meter reads results in inefficiencies for the Companies and an adjusted experience for the customer. To prevent this from occurring, the Companies developed interfaces from the advanced meter systems to allow for automated billing reads and further integration of the technology into Companies' operations. The interfaces were developed in the first quarter of 2016 and these meters were then installed beginning in March.

Additionally customers with multiple meter channels (time-of-day and net metering) were delayed temporarily while the web presentment portal was readied to facilitate presentation of such information. This update was completed in January 2016. Customers with net metering can now see both the energy delivered as well as received in the portal. Customers with time-of-day rates can also now view their usage but at this time the presentment portal has not yet implemented the additional benefit of shading during peak times to differentiate from off-peak times. This feature is aimed to facilitate a better understanding of when usage is occurring. At this time the Companies expect the portal to support this feature by March 2017.

The inventory delays with cellular meters reported last year continued to impact deployment of all meter types in areas of 4G/LTE cellular network coverage. To minimize customer impact, the Companies secured 3G meter inventory for RS customers; however, poly-phase or other less used meter forms were delayed temporarily until the meter manufacturer resolved issues with the 4G products in October.

Subsequent Updates and Operations

The next AMS Opt-In report will be in January 2018.

APPENDIX 1 – MYMETER METRIC DEFINITIONS

Accounts registered (Completed enrollments)
Number of unique customer accounts with AMS meters installed. Note, some accounts have more than one meter.

User Registrations (first time a user clicks into MyMeter)
The number of accounts registered. As noted, a user is considered registered after they first click into the MyMeter dashboard.

Customer Energy Markers™
The number of Energy Markers™ created in a given timeframe. Energy Markers™ are a feature within the MyMeter dashboard where a customer can add activities that they would like to track the correlating impact said activity has on their energy consumption. For example, if a customer were to replace an appliance with a new Energy Star appliance, they can add an Energy Marker™ on the date the new appliance was installed.

Customer Notification: Mobile phone notification set-up
The number of unique accounts registered (definition above) in a given timeframe that have added mobile phone numbers to their MyMeter accounts via the Communication Options page. Some accounts have elected to receive notifications on multiple mobile numbers but these are only counted once here.

Customer Notification: E-mail address notification set-up
The number of unique accounts registered (definition above) in a given timeframe that have added email addresses to their MyMeter accounts via the Communication Options page. Some accounts have elected to receive notifications on multiple addresses but these are only counted once here.

Customer Notification: Threshold alert set-up
The number of threshold notifications set up in a given timeframe.

Threshold notifications sent by system
The number of notifications actually sent in a given timeframe.

Total Sessions within MyMeter Site
Total number of Sessions within the date range. A session is the period time a user is actively engaged with the MyMeter portal. Total is equal to the sum of sessions by first-time visitors and repeat visitors. Source: Google Analytics

Sessions by new users
The number of first-time users during the selected date range. Source: Google Analytics

Sessions by returning users
The number of repeat users during the selected date range. Source: Google Analytics

Average session duration (minutes:seconds)
The average length of time a user spends on the MyMeter site. Source: Google Analytics

Page visits/session
The average number of pages viewed during a session. Repeated views of a single page are counted. Source: Google Analytics

Average Number of times MyMeter visited per month
The average number of sessions per month. A session is the period time a user is actively engaged with the MyMeter portal. Source: Google Analytics

Unique pageviews to MyMeter site
Unique Pageviews is the number of sessions during which the specified page was viewed at least once. A unique pageview is counted for each page URL + page Title combination. Source: Google Analytics

Total MyMeter site pageviews
Pageviews is the total number of pages viewed. Repeated views of a single page are counted. Source: Google Analytics

ADVANCED THINKING: MORE DETAILED INFO COULD MEAN MORE SAVINGS

Would you like to get access to more detail on your energy usage? If so, sign up today for KU's Advanced Meter Service, a voluntary service available at no additional cost to residential and small business customers.

Most meters record a running total of energy used. But an advanced meter can record energy usage data in 15-, 30- or 60-minute increments. Generally, once a day the meter will communicate this information to KU's data network system.

With an advanced meter, you are able to view usage information by logging in to a secure online energy usage portal. Electricity usage data is available within two business days, providing a closer look at when you are using energy. Armed with this information, you will have a better understanding of electricity usage in your home or business, giving you more opportunity to improve energy efficiency.

Sign in to your online account – or create one – at my.lge-ku.com to sign up to receive an advanced meter.

FIGURE 9 – OCTOBER 2016 POWER SOURCE NEWSLETTER (KU)

ADVANCED THINKING: MORE DETAILED INFO COULD MEAN MORE SAVINGS

Would you like to get access to more detail on your energy usage? If so, sign up today for LG&E's Advanced Meter Service, a voluntary service available at no additional cost to residential and small business customers.

Most meters record a running total of energy used. But an advanced meter can record energy usage data in 15-, 30- or 60-minute increments. Generally, once a day the meter will communicate this information to LG&E's data network system.

With an advanced meter, you are able to view usage information by logging in to a secure online energy usage portal. Electricity usage data is available within two business days, providing a closer look at when you are using energy. Armed with this information, you will have a better understanding of electricity usage in your home or business, giving you more opportunity to improve energy efficiency.

Sign in to your online account – or create one – at my.lge-ku.com to sign up to receive an advanced meter.

FIGURE 10 – OCTOBER 2016 POWERSOURCE NEWSLETTER (LG&E)

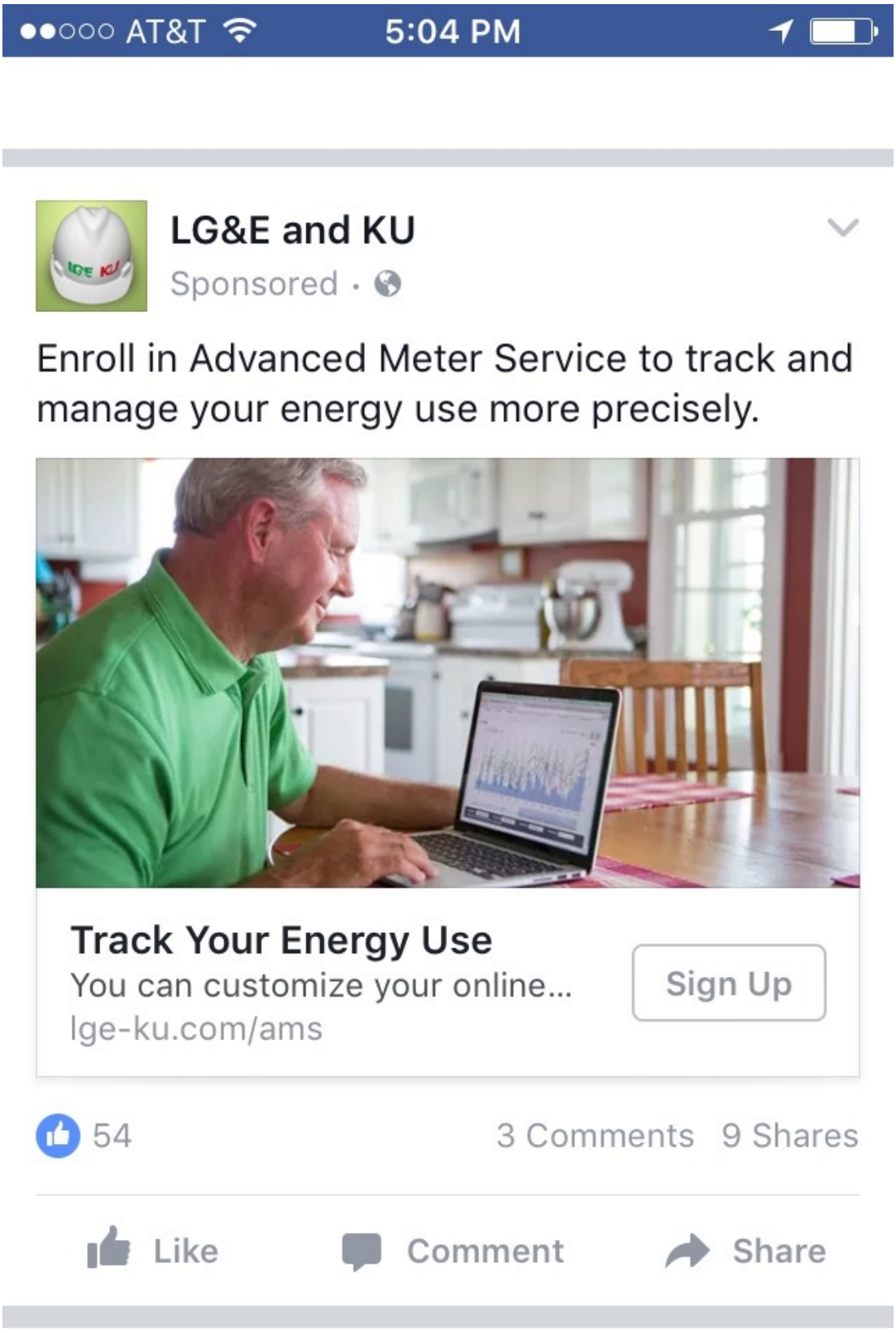
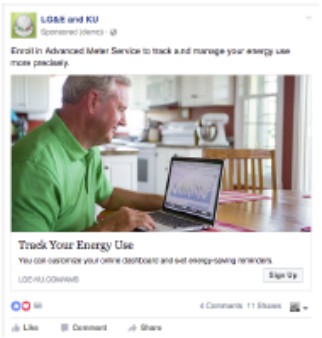


FIGURE 11 – FACEBOOK AD

The following summarizes performance of digital and social media ad campaigns for AMS Opt-In.

Facebook Performance – LG&E and KU

- The AMS clicks to website ads drove a total of 1,336 clicks to the landing page – a considerable amount of clicks for a campaign with such selective zip code targeting
- The AMS video ads exceeded benchmark for engagement rate – over 30% of impressions viewed the video for 3+ seconds or engaged with the ad. The desired rate is above 25%



	Impressions	Website Clicks	Website CTR	Engagement Rate	Avg. % of Video Viewed	Video Views to 100%
"Jerry" Desktop Display 9/26 – 10/3	109,478	496	0.45%	0.53%	N/A	N/A
"Jerry" KU Newsfeed Video 9/30 – 10/7	61,541	181	0.29%	35.21%	85.47%	3,227
"Matt" LG&E Newsfeed Video 9/30 – 10/7	139,185	505	0.36%	30.06%	89.24%	6,125
"Celebrating" Desktop Display 10/12 – 10/19	170,399	851	0.50%	0.59%	N/A	N/A
Total	480,603	2,033	0.42%	13.54%	87.95%	9,352

2

FIGURE 12 – FACEBOOK PERFORMANCE

Network Display Ads – KU

- The overall CTR greatly exceeds the 0.02% – 0.06% benchmark
- KU pre-roll video completion rates are over the 70% benchmark at 74.50%
- Rich media metrics and learnings from creative A/B testing to be provided at campaign completion

V1

V2

	Impressions	Website Clicks	Website CTR
KU Standard V1	216,004	228	0.11%
KU Standard V2	215,210	210	0.10%
KU Pre-Roll Video	44,248	29	0.07%
Total	**523,362**	**471**	**0.09%**

FIGURE 13 – ONLINE AD PERFORMANCE - KU

Network Display Ads – LG&E

- The overall CTR greatly exceeds the 0.02% – 0.06% benchmark
- LG&E pre-roll video completion rates are over the 70% benchmark at 77.45%
- Rich media metrics and learnings from creative A/B testing to be provided at campaign completion

V1

V2

	Impressions	Website Clicks	Website CTR
LG&E Standard V1	504,993	604	0.12%
LG&E Standard V2	504,385	658	0.13%
LG&E Pre-Roll Video	70,998	40	0.06%
Total	**1,184,418**	**1,315**	**0.11%**

FIGURE 14 – ONLINE AD PERFORMANCE – LG&E