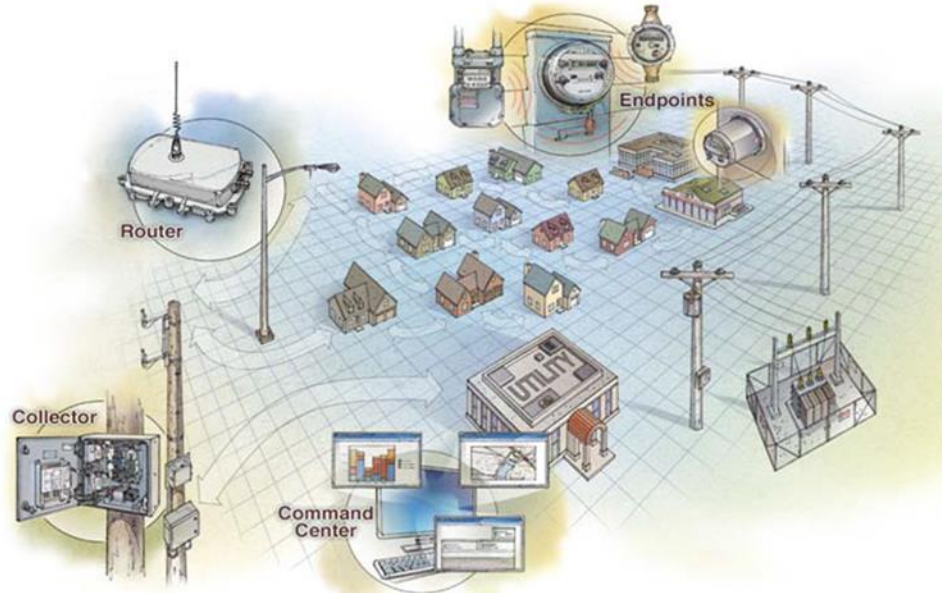


Delivering the Customer Value of Advanced Metering Infrastructure (AMI) Through Analytics



Ryan Ellen, PE
September 2016

For Discussion Purposes Only



Ameren Corporation

Customers (64,000 square mile territory):

- 2.4 million electric
- 900,000 gas

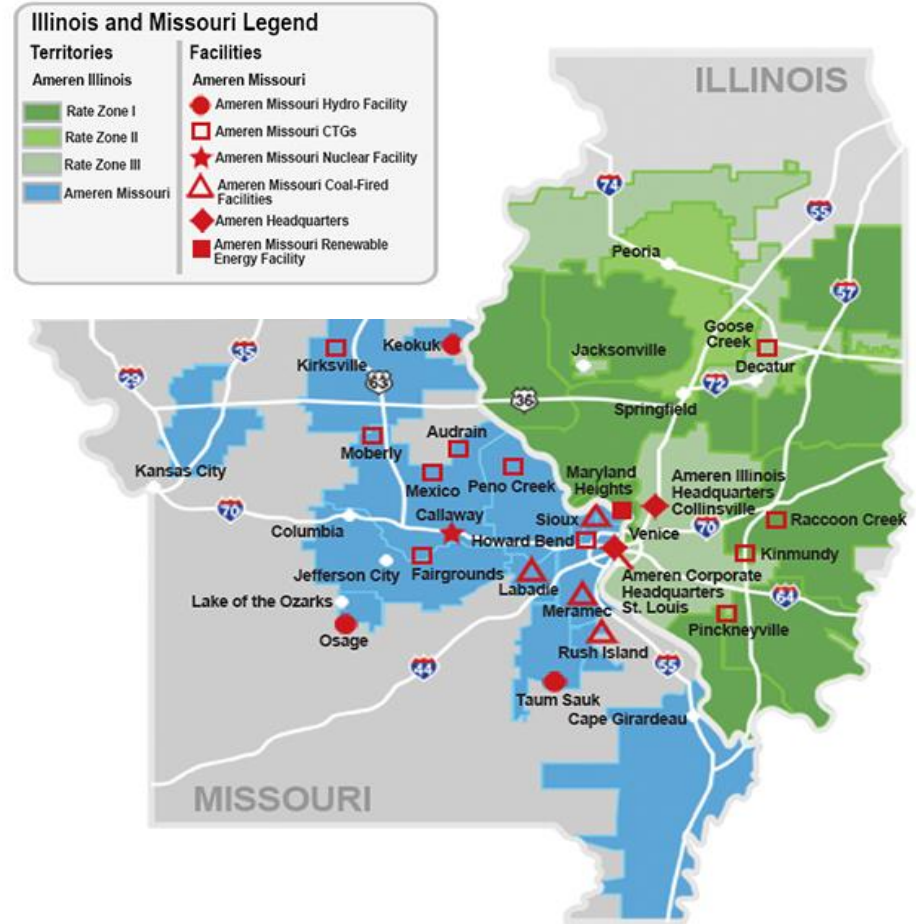
Regulatory Environments:

- Illinois – deregulated (transmission and distribution only)
- Missouri – fully integrated (generation, transmission, and distribution)

Generation Capacity: 10,300 MW

- Coal, Gas, Nuclear, Solar

Employees: 8,500+



Advanced Metering Infrastructure

Energy Infrastructure Modernization Act (220 ILCS 5/16-108)

- Ameren Illinois will deploy electric AMI to 62% of its customers (2014 - 2019)

Legislative Defined Meter Related Metrics

- 56% reduction in estimated reads
- 56% reduction in consumption on inactive meters
- \$3.5M reduction in uncollectible debt

Natural Gas Consumer Safety and Reliability Act (220 ILCS 5/9-220.3)

- Ameren Illinois will deploy gas AMI in geographic areas that receive electric AMI



AMI Meter Deployment Overview

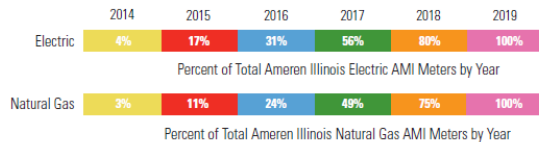


AMI deployment target expanded to 100% by Illinois Commerce Commission order on September 22nd

- 1.2M electric (100%)
- 830k gas (100%)

Deployment Schedule

- Complete 100% Electric AMI and Gas AMI by the end of 2019



2016 AMI Program Status (Meter/Modules/Network Installed Since Mid 2014)

Service	Installed to Date	2016 Target
Electric Meters	350,000	386,000
Gas Modules	180,000	199,000
Network Devices	7,800	8,055



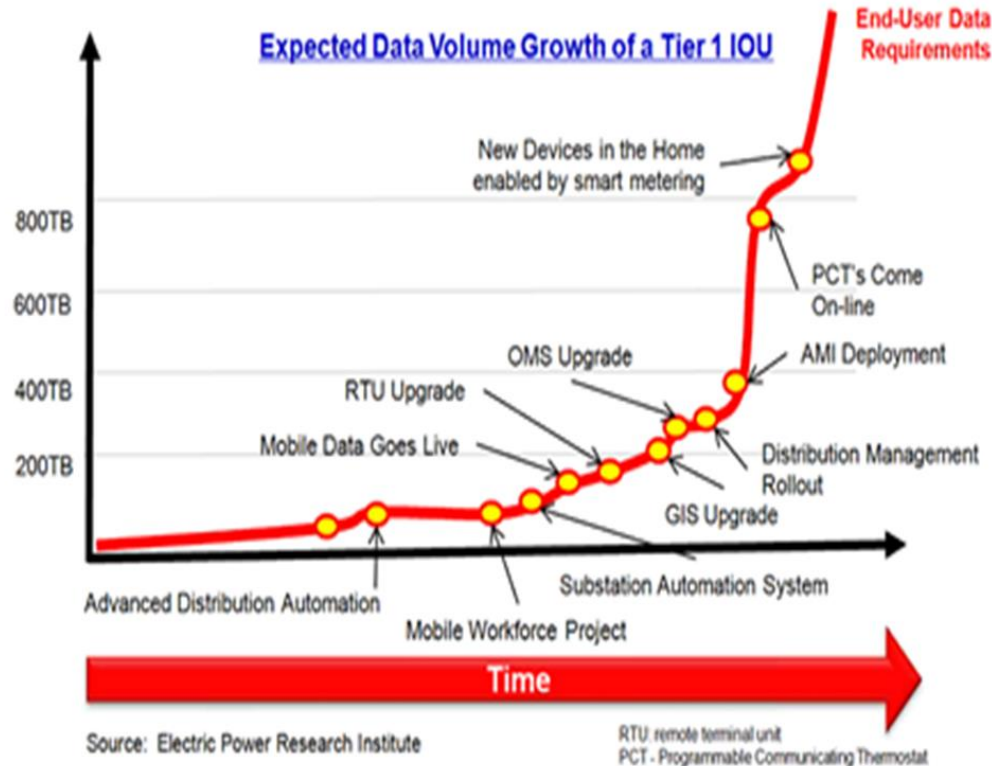
Advanced Metering Infrastructure (AMI) and Analytics



With the implementation of AMI, Ameren Illinois and our customers will have access to more data points on their energy usage over 13 hours than they previously had all year.



Explosion of Data Required to Deliver Value in Utilities

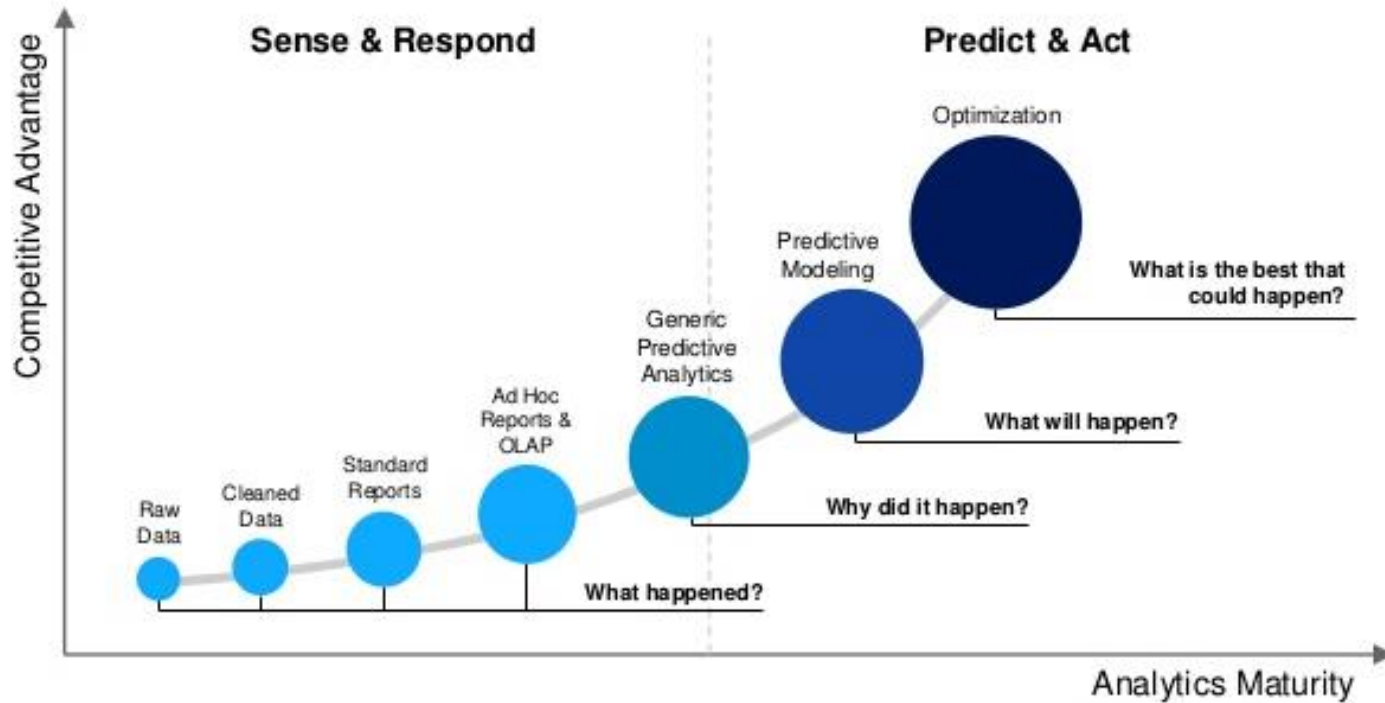


*“Ameren is not in the utility business...Ameren is in the **customer** business.”*

*Warner Baxter, CEO
Ameren Corporation*



Analytics Maturity Model



Credit: David Taylor in SAP for Utilities Blog



Five Vs of Big Data for Ameren Illinois' AMI Program



- Volume – Expanding data storage for customer information from 2.5 TB to 100 TB
- Velocity
 - Current state: daily/monthly
 - Future state: near real time (alarms, flags, events), every four hours for usage
- Variety
 - Current state: energy usage
 - Future state: usage, voltage, temperature, outage, more than 100 alarms, flags, and events
- Veracity – data validity needs investment
- Value – using the data to find actionable insights for deployment management, grid operations, and customer service





AMI Program Management Data Visualization

Executive Summary | Deployment Detail | Web Presentment | ICC / CUB | RCD | PTR | Revenue Protection | Smart Devices

AMI

Executive Summary | Deployment Detail | Web Presentment | ICC / CUB | RCD | PTR | Revenue Protection | Smart Devices

Operating Center: --Select Value--

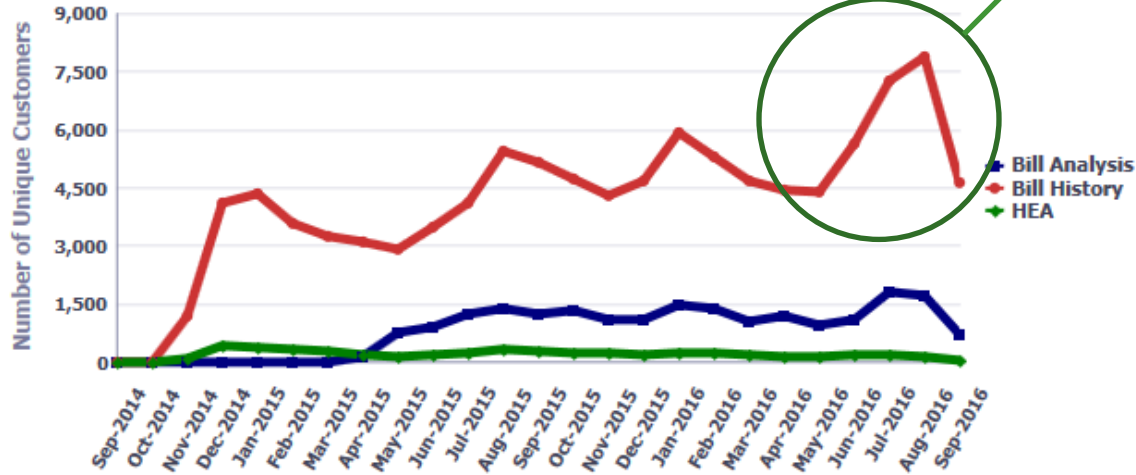
AMI Deployment Status

Year	2014	2015	2016	Total Installed	End of 2016 Total Installed Goal
Electric Meters Installed	46,972	161,567	133,039	341,578	386,539
Gas Modules Installed	25,797	70,054	78,301	174,152	199,359
Network Devices Installed	1,930	2,164	3,731	7,825	8,055

Number of NSM Accounts

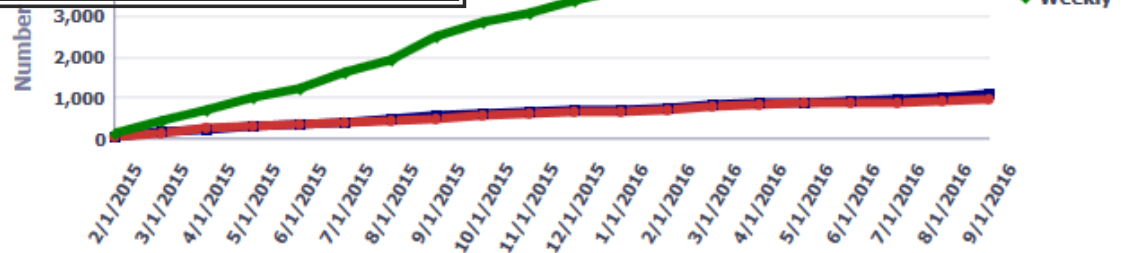


Web Access By Application



Significant spike in Web Access correlated with High Bill Calls this Summer

Subscribed to Billing/Usage Alerts



Dashboard Drill Down Capability – Remote Service Orders



Summary

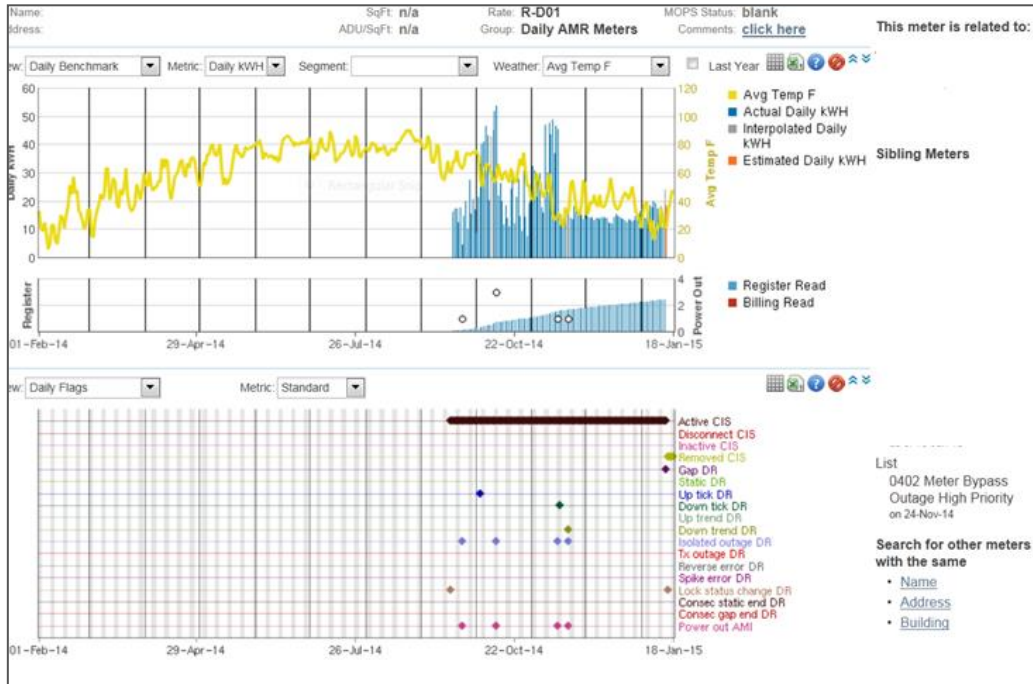


Detail

FO Scheduled Date	FO Scheduled Time	FO Completion Date	FO Completion Time	Next Available Time Slot	Field Order Number	Service Order Number	Premise Number	Meter Equipment Number
2015-11-02	10:01:58	2015-11-02	10:05:19	Yes	165053793	287139006	471902981	71907685
2015-11-02	12:00:00	2015-11-02	12:00:00		104964351	329478796	195303500	15379054
2015-11-02	12:00:00	2015-11-02	12:00:00		199056752	214133605	575097229	15688156
2015-11-02	12:00:00	2015-11-02	12:00:00		713783384	184350875	828075301	71822475
2015-11-02	08:11:26	2015-11-02	08:15:18		140286807	207831415	921271825	15693473
2015-11-02	09:18:32	2015-11-02	09:20:10	Yes	144810063	158937499	207053065	15693094
2015-11-02	10:07:03	2015-11-02	10:10:29	Yes	206008618	167284804	516309800	15379659
2015-11-02	10:08:28	2015-11-02	10:15:10		132629445	81455629	654332377	15689566
2015-11-02	11:06:26	2015-11-02	11:10:27		175886749	285934714	939390697	15691989



Metering Operations Analytics



- Deployed a cloud based analytics solution, Oracle Dataraker, which provides the data “crunching” service for the initial rollout of analytics
- Early analytics functionality that will drive AMI benefits:
 - Theft and diversion
 - Billing exception management
 - Route Cutover Support
- Analytics will evolve over time



Examples of Implemented Analytics from Cloud Analytics Solution

	Gas Stuck Meter Orders	Consumption on Cut for Non-Pay	Route Read Analysis
Issue	Many gas stuck meter service orders generated are invalid	Ameren misses potential theft on accounts cut for non-pay	Cutover route identification requires many inputs and reports
Value	<ul style="list-style-type: none"> Auto-void invalid stuck meter orders Issue follow up order to Billing for valid stuck meter orders 	<ul style="list-style-type: none"> Generate a list of theft leads for manual review and Revenue Protection service order issuance (<i>implemented June 2015</i>) Auto-issue Revenue Protection service orders for the Field to investigate Issue follow up order to Revenue Protection for valid orders 	Use DataRaker report to cut down on number of reports used to determine cutover eligibility
Status	Completed	Completed	Completed
Result	~80% of Ameren-generated stuck meter orders are voided, saving Billing review time and the Field unnecessary trips	Ameren finds and stops consumption on cut accounts weeks sooner, reducing the need for the Check Cut Follow Up field service order	Report helps troubleshoot meter / network problems on routes

Frequent Momentary Outage Check

Status	Meter or Connections	Findings	Point Id	Point Type Code
Invalid	Neither	No problems found (likely was actual outages)	268442677	EM
Valid	Connections	Sleeves burnt up; replaced	268788547	EM
Valid	Connections	Old A Base meter with frayed service wires//customer to replace, but may take time.	271974319	EM
Valid	Connections	Bad connections	273885884	EM
Valid	Connections	Bad connections at transformer	274198023	EM

- Dataraker looks for frequent momentary outages that are uncorrelated with known system outages to determine if there is an issue with a customer's electric service
- Suspected issues are put on a report that is reviewed by field operations prior to issuing a service order
- Ameren Illinois has found 35 valid issues with a customer's electric service since this check was implemented in March 2016 without the customer having to call into Ameren Illinois' call center.

Analytics Dataset

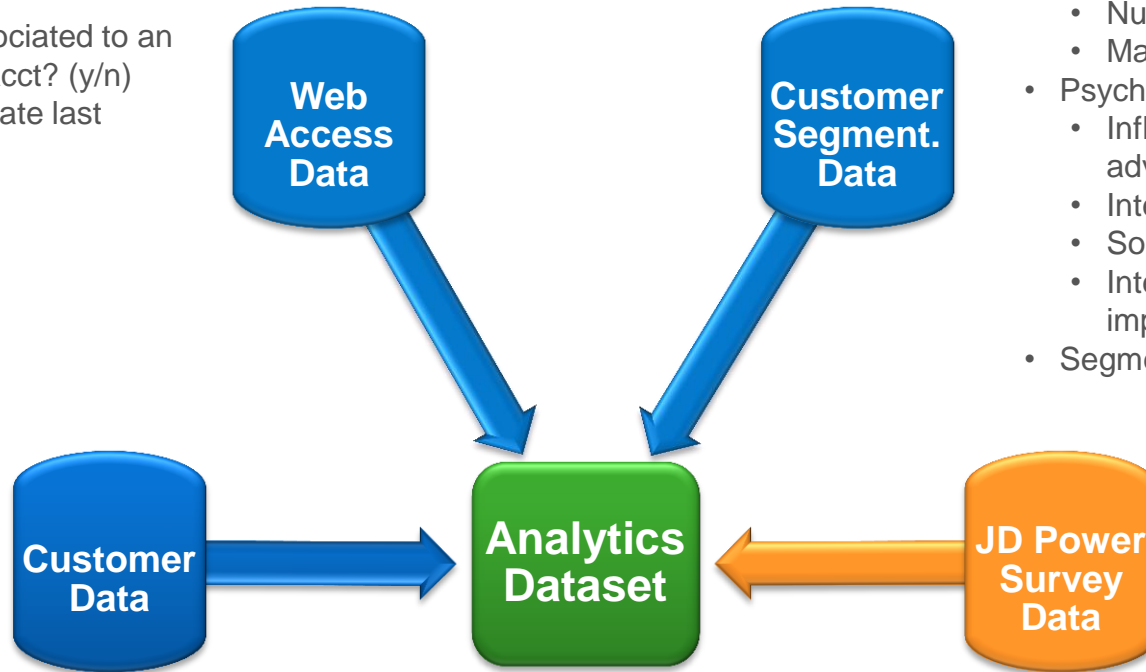
Confidential & Proprietary

eCustomer Data

- Account associated to an eCustomer Acct? (y/n)
- eCustomer date last accessed

Account Data

- <=2-years of kWh/Therms
- Electronic Bill?(y/n)
- Direct debit? (y/n)
- Premise Zip Code



Shelton/Axiom Data

- Demographic:
 - Home ownership
 - Number of children
 - Marital status
- Psychographic:
 - Influenced by Internet advertising
 - Internet purchasing
 - Social Media influencer
 - Interests: Home improvement Do-It-Yourself
- Segments

Survey Data

- 2-years of anonymized customer survey data

 Data associated to an Ameren customer

 Data cannot be associated to an Ameren customer

For Discussion Purposes Only



Customer Segmentation



Customize Messaging by Segment

- True Believers – Protect the environment, save natural resources
- Concerned Parents – Avoid waste; quality of life for future Generations
- Cautious Conservatives – Financial security/control; comfort
- Working Class Realists – Saving money



Customer Behaviors Correlated with Web Usage

High Potential Customer Behavior 1

1. Customers have E-Bill

High Potential Customer Behavior 2

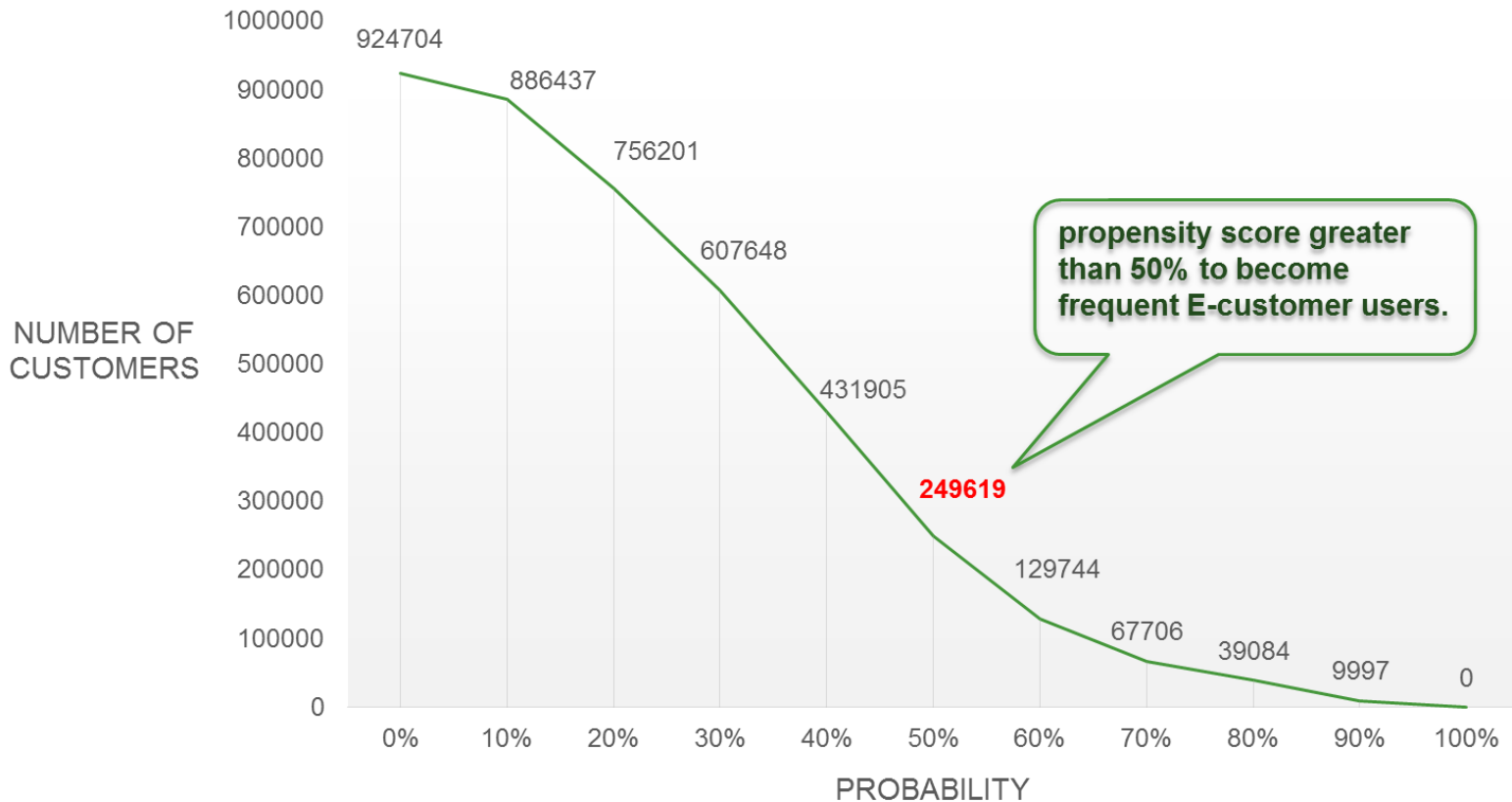
1. Customers do not have E-Bill
2. Ameren Illinois residential customer less than 10 years
3. Prefer cell phone as media channel
4. Favor shopping online
5. Customers do not have direct debit

Low Potential Customer Behavior

1. Customers do not have E-Bill
2. Ameren Illinois residential customer greater than 10 years



Probability of Potential Frequent Users



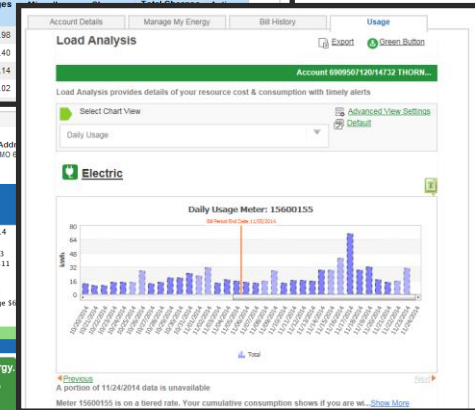
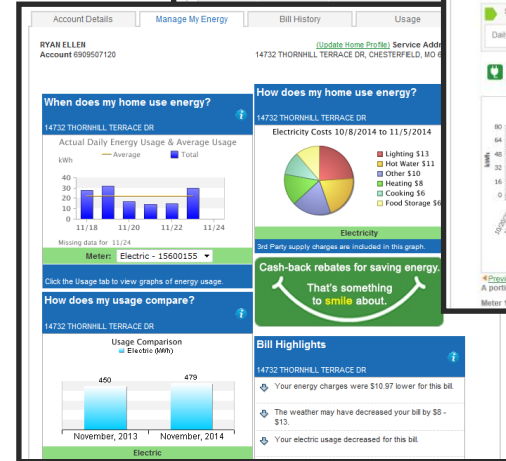
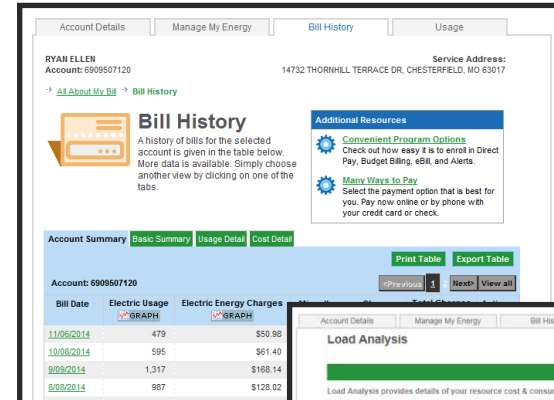
Ameren Illinois MyAccount Customer Portal

Our new enhanced MyAccount functionality (residential web presentment) will allow customers to:

- View their energy usage (gas and electric)
- See their bill history and bill analysis
- Provide tips on reducing their bill
- Present Ameren Illinois EE promotions
- Enable alerts for bill-to-date and thresholds.
- Access Green Button “Download” functionality
- Present Dynamic Pricing Event History (2016)

Web presentment will be enabled for all Ameren Illinois residential customers regardless of meter type (AMI, AMR, or Legacy)

- AMI – Hourly Data
- AMR – Daily Data
- Legacy – Monthly Data

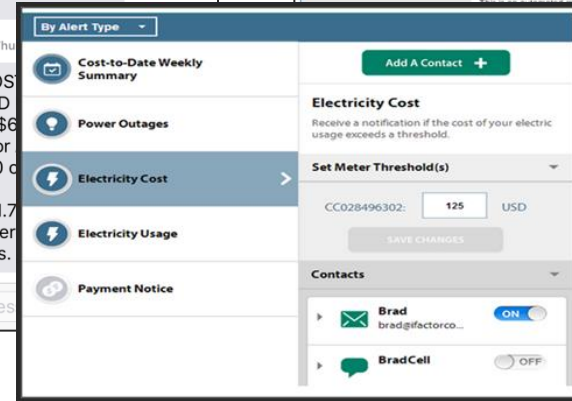
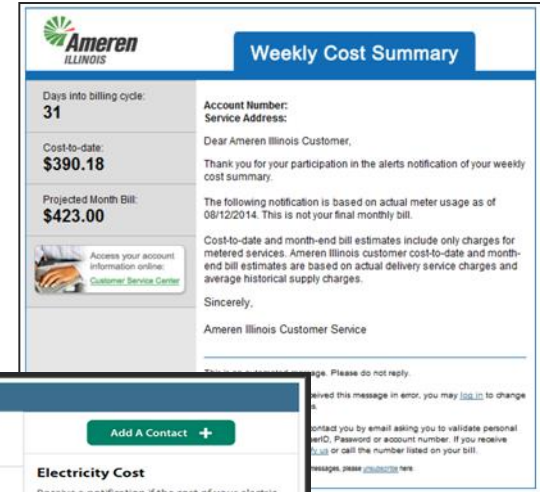
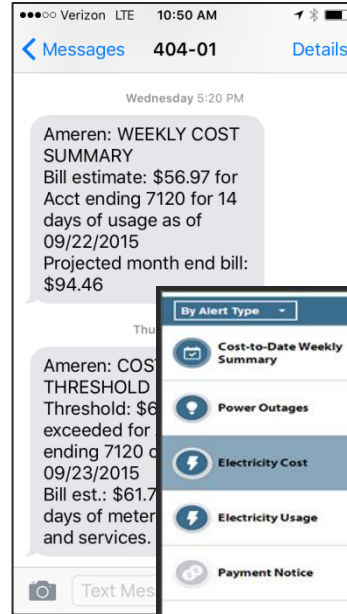


Customer Bill Summary and Threshold Alerts

Email

- Cost Threshold (by account)
- Weekly Bill Summary
- Usage Thresholds by service type (gas or electric)
- Sign up is by web, text, or call to Ameren's contact center

Text



Alerts Sign Up



Peak Time Rewards (PTR) Overview



What is PTR?

PTR is a demand response program that encourages customers to **reduce or shift their electricity consumption during peak demand times** to save customers money and reduce stress on Ameren Illinois' electricity delivery system.



Who is Eligible?

The customer must be on a **residential electric** account with an **AMI meter on a cutover route**. The customer *cannot* be on a customer generation contract (e.g., net metering or qualifying facility) and can only be enrolled in *one* demand response program at a time.



Why Should Customers Participate?

Participating customers who successfully reduce their usage below their individually calculated personal baseline will receive **a credit on their next bill, but won't be penalized if they decide not to reduce usage during the event.**



2016 Peak Time Rewards Events Summary

	8/11/2016	9/8/2016
Eligible Customers	10,380	10,376
Length Of Event	4 hours	2 hours
Total KWH Reduction	27,440 KWH	20,168 KWH
Total Credits Earned by Customers	\$41,435	\$30,455
Average Credit by Participant	\$5.63	\$3.52
Max Credit for Single Account	\$64	\$29
% of Eligible Accounts with Reduction	77%	83%



Turn up AC thermostat



Unplug unused electronics



Delay laundry

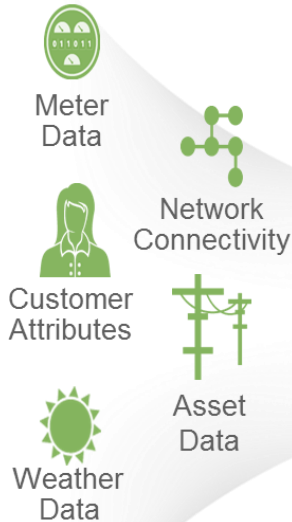


Delay cooking or using the oven

For Discussion Purposes Only

Actionable Insight Opportunities from Analytics

Data Sources*



Flexible Data Model With Preconfigured Apps

Customer Service & Engagement

Meter Operations and Billing Optimization

Efficiency & Demand Response

Revenue Assurance

Network Planning & Operations

Asset Optimization and Condition Monitoring

Sample Outputs

- Meter Malfunctions
- Customer Tampering Targets
- Overloaded Transformers
- Urgent Safety Risks
- Maintenance Priorities
- EE / DR Targets
- 100s more

Actionable Insights NOW



INCREASE

Operational Efficiency



IMPLEMENT

Preventative Maintenance Strategies

Future Possibilities



IMPROVE

Customer Engagement



PREVENT

Public Safety Hazards





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