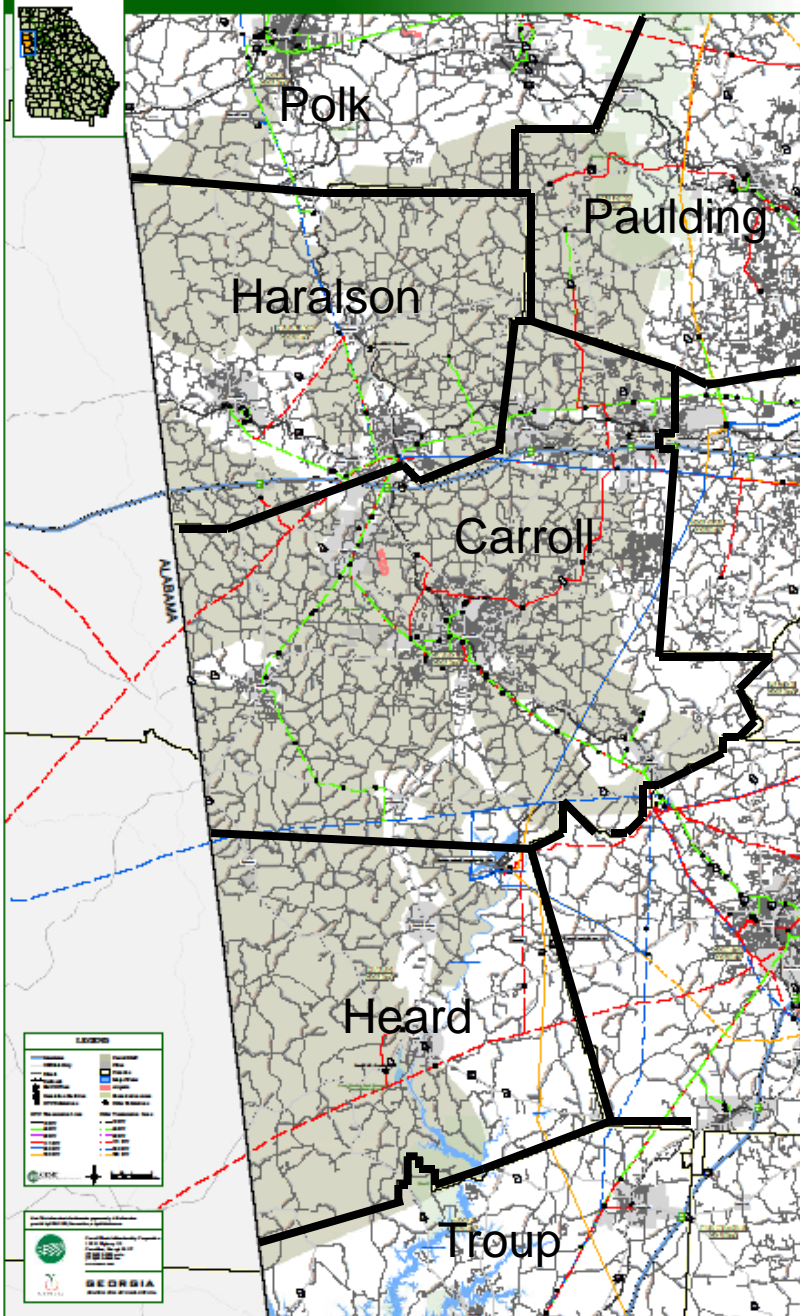


A row of smart meters is shown in a rack. The central meter is in sharp focus, revealing its internal components, including a display screen and various sensors. The other meters in the row are blurred, creating a sense of depth. The lighting is soft and even, highlighting the metallic and plastic surfaces of the devices.

Case Study: Smart Metering Implementation and Outcome

Tim Martin
Chief Operating Officer
Carroll EMC



Carroll EMC Background

- Electric Distribution Cooperative
- 52,616 meters
- 25 substations
- 5,313 miles of line (17.5% URD)
- Four Office Locations
- Headquarters in Carrollton, GA
- 132 employees
- 242 MW Peak Demand (2009)
- 1,024,538,088 kWh sold (2009)
 - 64% Residential
 - 12% Small Commercial
 - 24% Large Comm./Industrial



Carroll EMC
Carroll Electric Membership Corporation

Service Beyond the Meter



Smart Metering = AMR → AMI

A Case Study

- Cost – Benefit Analysis (01/2006 – 02/2006)
- AMI Company/Product Comparison (02/2006 – 03/2007)
- Pre-Implementation (04/2007 – 11/2007)
- Implementation (12/2007 – 11/2008)
- Benefits Today
- Challenges Today
- Expected Future Benefits

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Cost – Benefit Analysis

- Consultant used for analysis
- Calculated 10-year Net Present Value and Payback
- Costs Included
 - Capital (modules, meters, communications equipment, collars, servers, software, installation labor, etc.)
 - Financing
 - Training
 - Depreciation (30 year vs. 15 year)
 - Annual Maintenance (system operator, meter swaps, meter repair and troubleshooting, AMI support fees, etc.)
 - Project Management

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Cost – Benefit Analysis

- Savings Included
 - Meter Reading (personnel, equipment, trucks, expenses)
 - Meter Reading finance costs (carrying costs)
 - System losses (more accurate meters and less theft, other losses identified with Power Line Carrier system)
 - Move-in / Move-out readings
 - Fewer re-reads
 - Remote disconnect / reconnect
 - Normal meter retirements (redundancy)
- Other savings that were more difficult to quantify
 - Quicker outage restoration, better maps, ↑ customer satisfaction, employee safety, fewer delinquents, etc.)

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AMI Company / Product Comparison

- CEMC's estimated Payback was approximately 4.74 years with a 10 year NPV of \$3.9MM
- Formed AMI team
- Identified potential AMI companies to consider
- Listed features of AMI product/company (must have / desired to have / not required to have but potentially beneficial) – For CEMC, our must haves were:
 - On-demand meter reading
 - Remote disconnects
 - Interfaces with OMS/CIS software
 - Interval Hourly data
 - Supports prepaid system
 - Ability to “ping” for outages
 - Tamper / Theft detection
 - Supports GE/ Centron/ Landis&Gyr
 - Ease of installation / maintenance
 - Minimizes “no-reads”
 - Experienced and strong vendor
 - Excellent customer support

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AMI Company / Product Comparison

- AMI Team made site visits to different utilities
- Obtained quotes from vendors
- Ranked vendors based on ability to provide features (weighted based on need assessment)
- Selected AMI vendor (CEMC selected Aclara – TWACS)
- Estimated capital costs were \$7.82MM (Actual costs were \$7.74MM)

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Pre-Implementation period

- Hired consultant to negotiate with AMI company
 - Master Agreement and Software License Agreement
 - Bill of Materials – Who is providing what?
 - Scope of Work – Who is responsible for what?
 - Specification and System Acceptance Test plan
 - Equipment warranty (extended 3 years – failure rate)
- Formed AMI Implementation Team with “Champions” from each work area
 - Developed plan and installation schedule
 - Raised issues and offered solutions
 - Positively communicated plan to their work group

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Pre-Implementation period

- Ordered modules, collars and substation equipment to arrive based on installation schedule
- Coordinated with meter vendor
- Designed configuration for meters (what info to bring back)
- Started retiring services that have been idle for 2+ years
- Developed communication plan for member/customer
- Bonus Goal developed for full implementation by EOY 2008
- Kickoff meeting and then
- Executed the plan!

Service Beyond the Meter

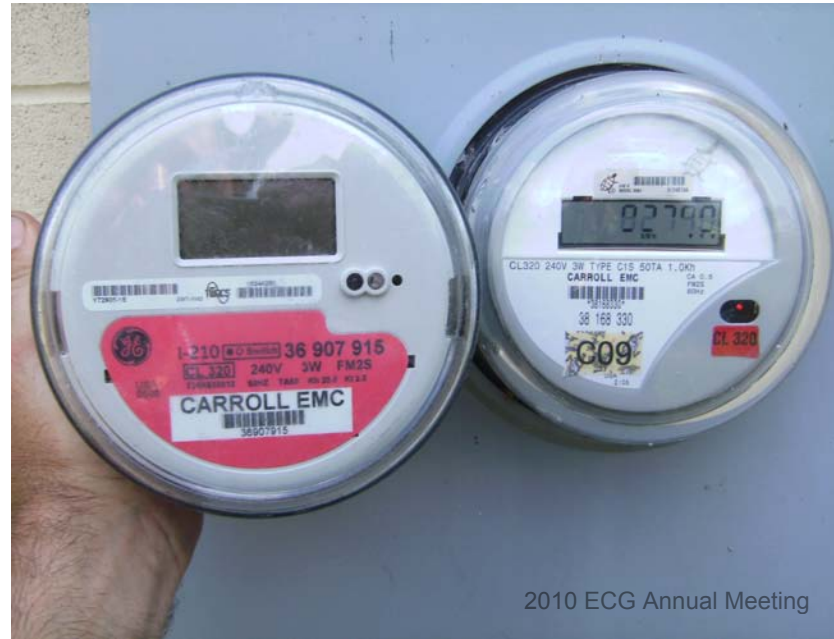


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Smart Metering = AMR → AMI Implementation!

- Communicated plan to members/customers
- Purchased solid-state meters with AMI modules installed
- Installed meters and substation equipment with existing employees (able to do so because of slow construction work)
- Substation installers stayed ahead of meter setters
- Replaced meters according to meter route
- Meter setters took pictures of old and new meter together
- Old residential meters sold for scrap



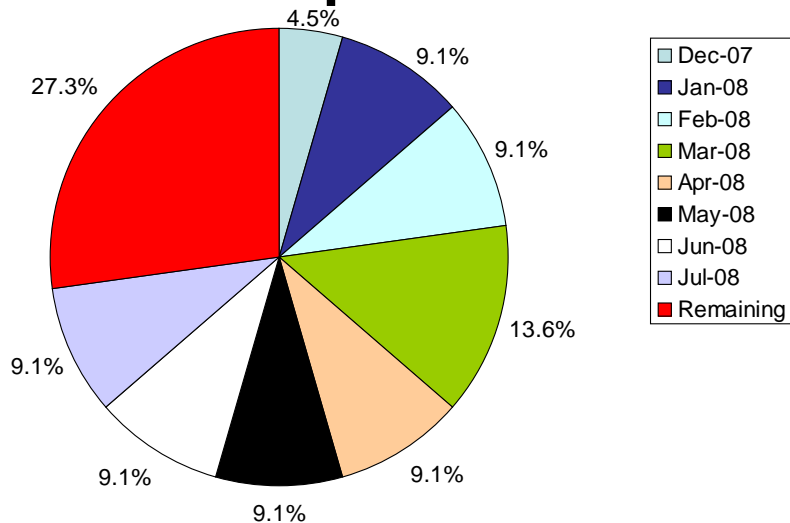
Service Beyond the Meter



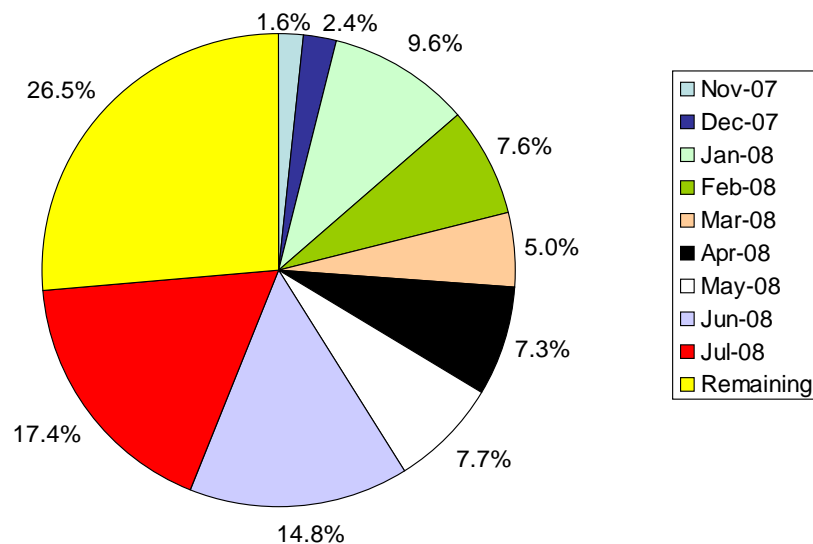
Smart Metering = AMR → AMI Implementation!

- August 2008 Update – Completed in November

Substations Complete



Meters Set



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Smart Metering = AMR → AMI Implementation!

- Hired electrician to correct meter base problems (\$46K)
- Needed additional staff in data processing for keying
- Used automated call-out system to notify customers of meter change (and brief outage) in their area
- 9 → 0 meter readers
- 5 → 3.5 service technicians
- Meter readers and service techs were absorbed through attrition
- Repurposed two staking technicians to new system inspector positions

Last 4 meter readers and supervisor



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Smart Metering = AMR → AMI

Benefits Today

- Daily read – can bill any meter on any date
- Hourly data collected every day – used for high bill complaints and could be used in future for Time-of-Use rates
- On-demand reads for verification and move-in / move-out
- Outage “pings” – OMS can ping single and device outages
- Remote disconnect/connect with collars (9% of meters with collars and about 30% of services disconnected remotely)
- Theft detection with Use On Inactive and Blink Reports
- Engineering analysis modeling with peak meter hourly data
- Prepay system with 2,274 members/customers

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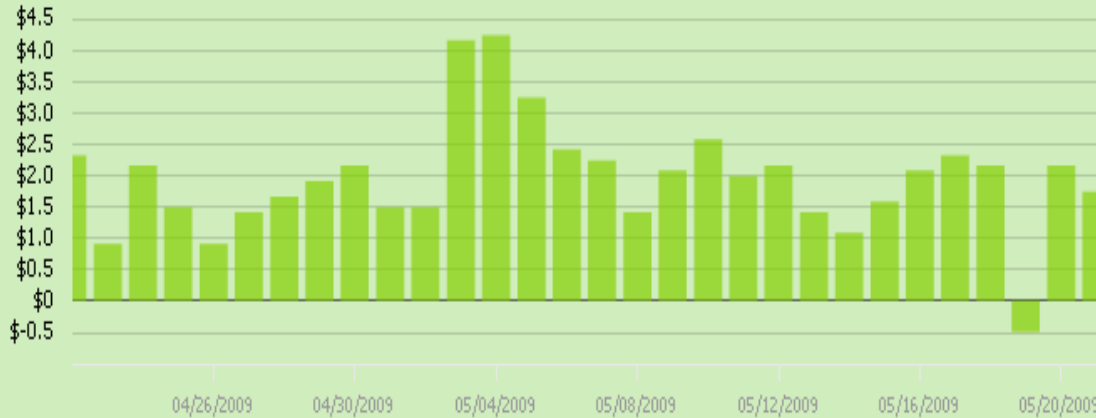
Benefits Today – Prepay!

- Program started in January 2009 to give customers more control over their power bill and reduce bad debt write-offs
- Optional for residential and small commercial customers
- On-demand reads for verification and “change of names”
- NO – deposit, late fees, reconnect fees or monthly bill
- Helps members understand their electric usage (10% lower usage on average)
- Improves customer satisfaction (according to survey)
- Balance calculated daily; notification sent when balance is low; balance below zero, service is disconnected; payment made which returns balance positive, service is automatically reconnected; average payment is \$39 every nine days

How does prepay benefit the member?

Daily energy charge chart for the last thirty days

MyUsage.com



Account Info

Current Balance
\$15.54

last updated on May 21

Last Energy Usage
21 KWh

rated at 08.30¢ per KWh

Last Payment
\$100.00

posted on April 21

Account #
108383702

DRUMMOND MICHELLE ANDREA

Avg Daily Energy Charge
\$1.92

Last Daily Energy Charge
\$1.74

Unpaid Balance

Meter Status
Active

Recent Alerts

- *Low Balance* Call to 7706846659 Sent 05/21/2009 09:13:16
- *Low Balance* Call to 7706846659 Sent 05/20/2009 09:12:50
- *Low Balance* Call to 7706846659 Sent 05/19/2009 09:12:21
- *Low Balance* Call to 7706846659 Sent 05/18/2009 09:13:32
- *Low Balance* Call to 7706846659 Sent 05/17/2009 09:13:21



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Challenges Today

- Dependent on FRAM relay for substation communications; limited redundancy
- Daily responsibilities to maintain AMI system; can't let get behind; reports are critical for theft detection
- Software updates occasionally "break" something (e.g. software interfaces)
- System operator is critical; need back-up for "Hit by a Bus" contingency
- Not certain that current organizational structure is most efficient

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Expected Future Benefits

- Phase correction on digital maps to be finished by May 2010
- End-of-line voltage monitoring
- Field monitoring of capacitors and regulators
- Improved OMS interface
- Demand Side Management – Load Control
- Ability to offer different rates (Time-of-Use, Critical Peak Pricing)
- Expanded use of MyUsage.com for energy efficiency
- Distribution Automation