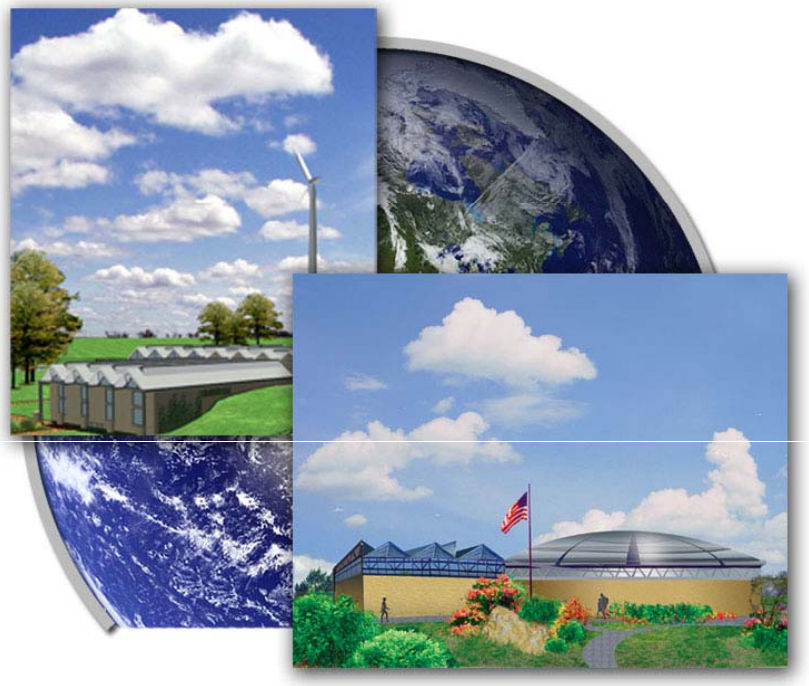
Education - Information & the Grid of the Future

Dan Boyt



CROWDER COLLEGE

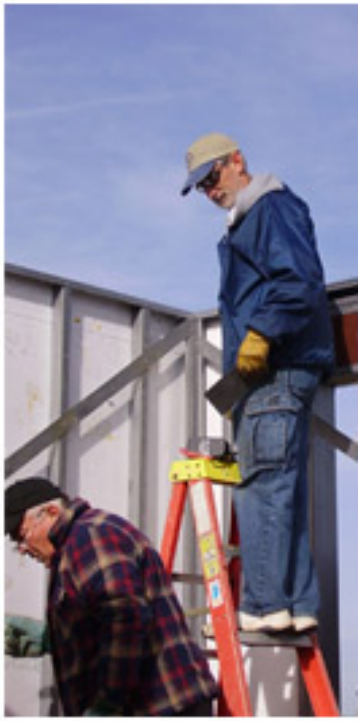
MARET Center

Missouri Alternative & Renewable Energy Technology

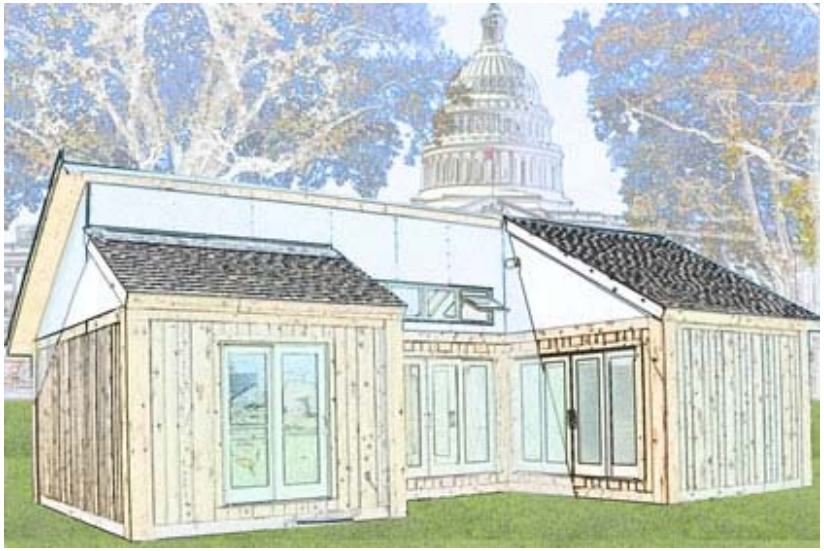
MARET Center

- Academic programs
  - Wind Turbine Technology
  - Solar PV & Solar Thermal
  - Biofuels
  - Green Building

MARET Missouri Alternative and Renewable Energy Technology Center



APPLIED RESEARCH



Community Involvement

Workshops

- Renewable Energy
- Energy Efficiency for the Homes

The 5th Annual E3 Conference

will be held September 24-25, 2010 at the Crowder College campus in Neosho, MO

This year's theme is "Sustainability & You"

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Information + Education =

Empowered Consumers

Empowered Consumers: Who wins?

- Utilities
  - Public & Customer Relations
  - Improved Customer Service
- Environment
  - NOX, SOX, CO2, Mining operations
- Missouri's Economy
  - Fuel Imports
  - Risk of carbon legislation
  - Commercial competitiveness
- The Customer
  - Better decisions, planning & control

- I am on a fixed income. I have had no raise since I retired 15 years ago. I am on social security. Everything is going up except my salary. How much is enough?
- This is an investor owned company. Go to the investors for a while and quit breaking the backs of the customers. It is ridiculous to destroy the finances of electric users, who have no choice, in the name of "a fair return for investors". I would like to know why my eletric bill has gone up 100.00 dollars a month nothing has changed in the thermostat settings.In this day and time of this economy.
- I find this to be a bunch of BS. I wish somebody would vote me in a raise in my wages so i could cover the offset of price gouging electric bills.It scares the hell out of me just to think about turning on the airconditioning this summer or even the lights to see my way in my home.
- The average income in my neighborhood is $30,000 with 8% unemployment. With this and all the other utility increases, how are we going to afford it? No wonder retail sales are down, we have no money. Can't they do anything else besides raise rates? If shareholders make 7%, why can't they make 5% or 6%> They are still better off than I am.

- Another increase, have they bought enought politicians to get this done, sure. Another example of a rip off by a greedy utility. Why should these CEO's make this kind of money?

Rate * Consumption = Cost

The Past The Transition The Future

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Information

Easy to understand?

Useful?

Timely?

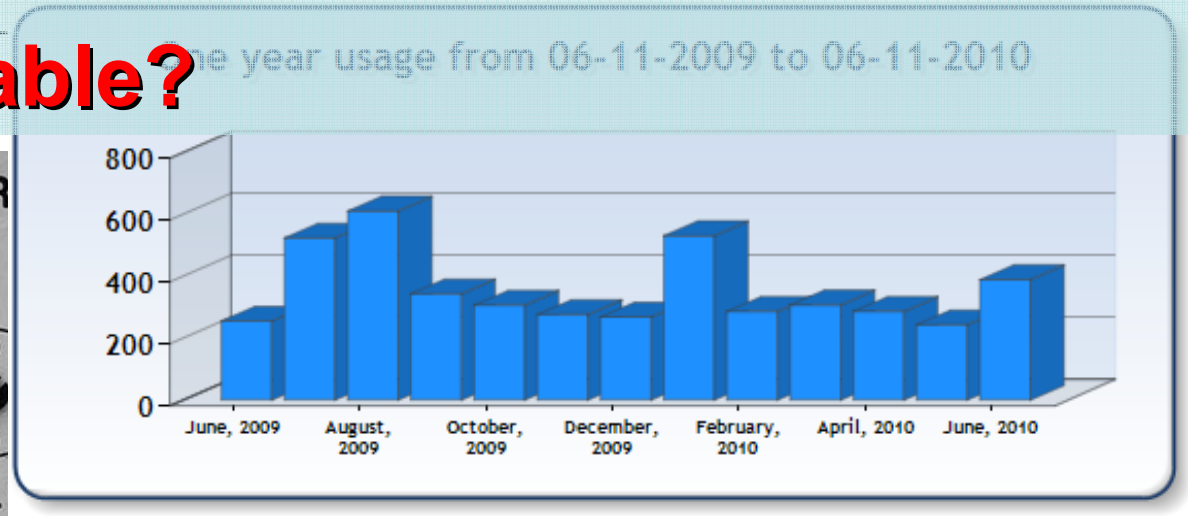
Actionable?

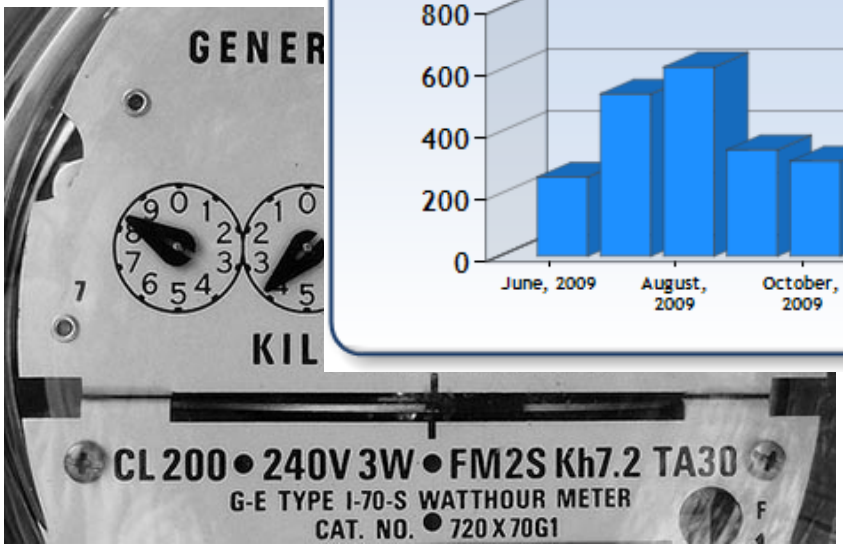
Electric 97822-07-464 For Service at 214 N Valley Street, Neosho, MO 64850-1338 Rate: RG-Residential

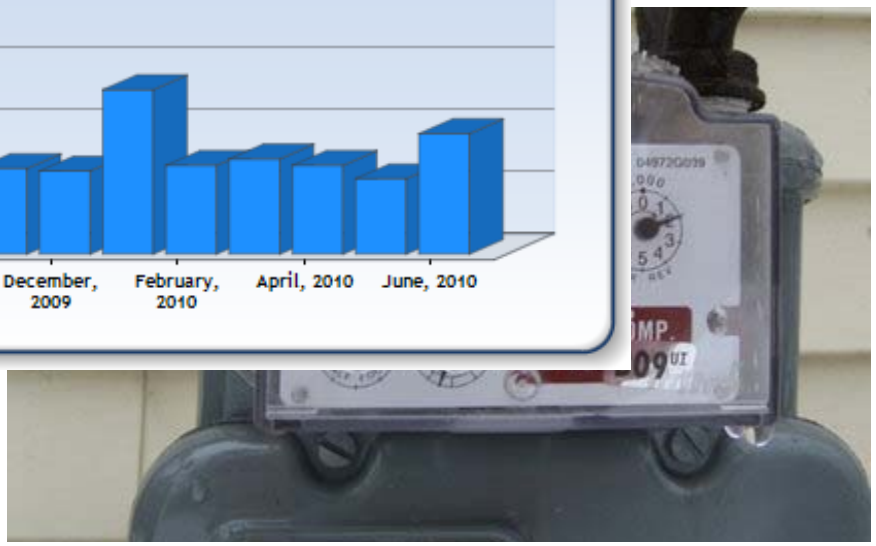
Read for: 38703216 From 04/12/10 to 05/11/10 (29 Days), Curr Read - 79548 Prev Read - 79304, Totaling 244 KwH

5/14/10	Customer Charge	1 x 11.04	$11.04
5/14	Usage Charge	244KWH x .0947	$23.11
5/14	Fuel Charge		$0.10 CR
		244KWH x .0004	
5/14/10	Franchise Fee	$34.05 x .04	$1.36
5/14/10	Newton County Tax	$34.05 x .00875	$0.30
5/14/10	Neosho City Tax	$34.05 x .01	$0.34
		Current Months Charges:	$36.05

$36.05







Information: A better way

REAL TIME!

Current Consumption: kW & $ per hr

Based on actual rate tariff

Current Rate (Peak, seasonal, tier)

Projected Consumption: kWh, $$

Alarm

Data-Logging


RYOBI


EXTECH
A FLIR COMPANY
Consumption
ID
Total
$
cost1
$
cost2
MEM
79%
1.256 kW/h
7.025
2.125
MODE
MAX
MIN
EnergyLogger™
EM100


ELECTRIC
GAS
OIL
WATER
Energy Now 223 KWatt
Cost DAY £3.10p
Down £0.17
Yesterday
Last 30 Days
87.40p
Night Day Eve
Cubic Metres
KWHr
Low Price
16:00
START TIME
APPLIANCE
18°C
TEMP
SHASPA
SHASPA


TED


Real-Time Use
$ 0.19 per Hour
1.718 kilowatts
October 01 10:48 AM
TED
The Energy Detective
htc
Sprint

TED 1000

- **Current energy consumption in kilowatts (kW).**
- **Current energy cost in dollars and cents per hour ($/hr).**
- **Energy consumed so far today in kilowatt-hours (kWh).**
- **Energy cost so far today in dollars and cents ($).**
- **Energy consumed so far this billing cycle in kWh.**
- **Energy cost so far this billing cycle in $.**
- **Projected energy use for current billing cycle in kWh.**
- **Projected energy cost for current billing cycle in $.**
- Peak electrical demand so far this billing cycle in kW.
- Peak use so far this billing cycle in $/hr
- Current voltage in Volts (V)
- Minimum voltage this billing cycle in Volts (V)
- Maximum voltage this billing cycle in Volts (V)
- **Current Energy Rate (Tariff) in dollars and cents per kilowatt hour $/kWh**
- Current Date & Time
- **Timer**
- **Alarms**
- **Historical Data for 13 months**

File Export Setup Help

TED The Energy Detective

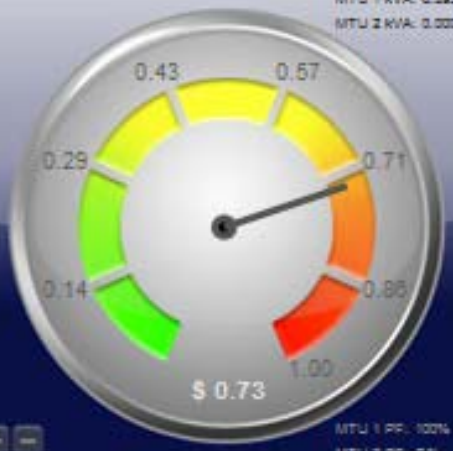
LIVE DASHBOARD | HISTORICAL GRAPH

PRESENT READINGS

May 25 2009 1:49 PM

Days Left In Billing Cycle: 23
Current Rate In Effect: $0.11000
Plan Type: Tiered
Tier: 1

PRESENT SPENDING PER HOUR



RECORDINGS

Peak kW Today: 9.294 kW @ 11:05 AM
Peak $ Spent Today: $1.06 @ 12:01 AM
Low Voltage Today: 118.9 V @ 11:03 AM
High Voltage Today: 121.8 V @ 12:01 AM

Peak KW MTD: 14.805 kW on May 20
Peak $ Spent MTD: $1.68 on May 20
Low Voltage MTD: 114.0 V on May 18
High Voltage MTD: 122.4 V on May 23

MONEY SPENT SINCE MIDNIGHT

$ 1.64

MONEY SPENT THIS MONTH

$ 35.32

PROJECTED BILL

$ 150.99

PRESENT VOLTAGE

119.8 volts

AVERAGE DAILY SPENDING

$ 3.53

WEATHER

Charleston, SC

79°

Partly Cloudy

10-Day Forecast

Wind: ESE 9mph
Sunrise: 6:15 AM
Sunset: 8:19 PM

File Export Setup Help

TED The Energy Detective

LIVE DASHBOARD | HISTORICAL GRAPH

PRESENT READINGS

May 25 2009 1:50 PM

Days Left In Billing Cycle: 23
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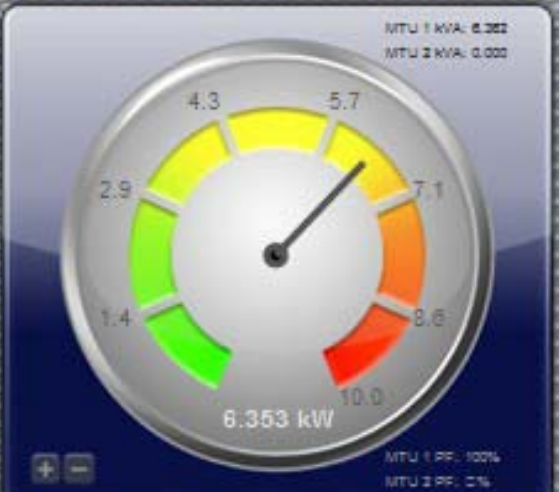
Tier: 1

REAL-TIME KW USAGE



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KWH USED SINCE MIDNIGHT

14.6 kWh

KWH USED THIS MONTH

258.5 kWh

PROJECTED KWH USAGE

1104.8 kWh

PRESENT VOLTAGE

119.7 volts

AVERAGE DAILY KWH USAGE

25.8 kWh

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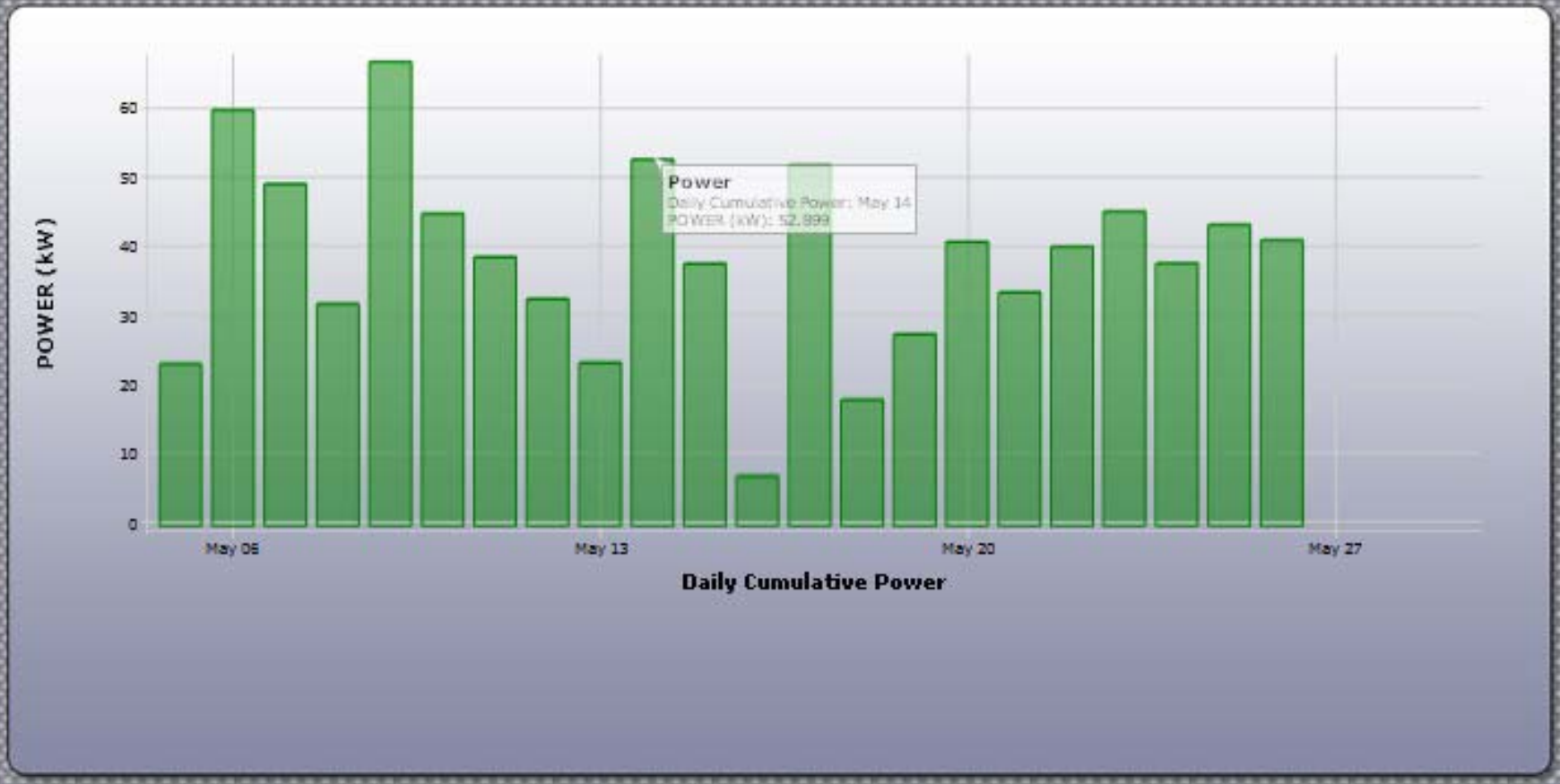

HISTORY REPORT SELECTION

Select View Type: Day History

Select Resolution: kWh

DATE SELECTION

Start Date: May 1, 2009

End Date: May 26, 2009

(Max Range is 90 days)

INSTRUCTIONS

To change the date range, use the date box located to the left

The mouse scroll wheel will control zoom. If zoomed in, you can right click and drag the mouse to move the view around.

File Export Setup Help

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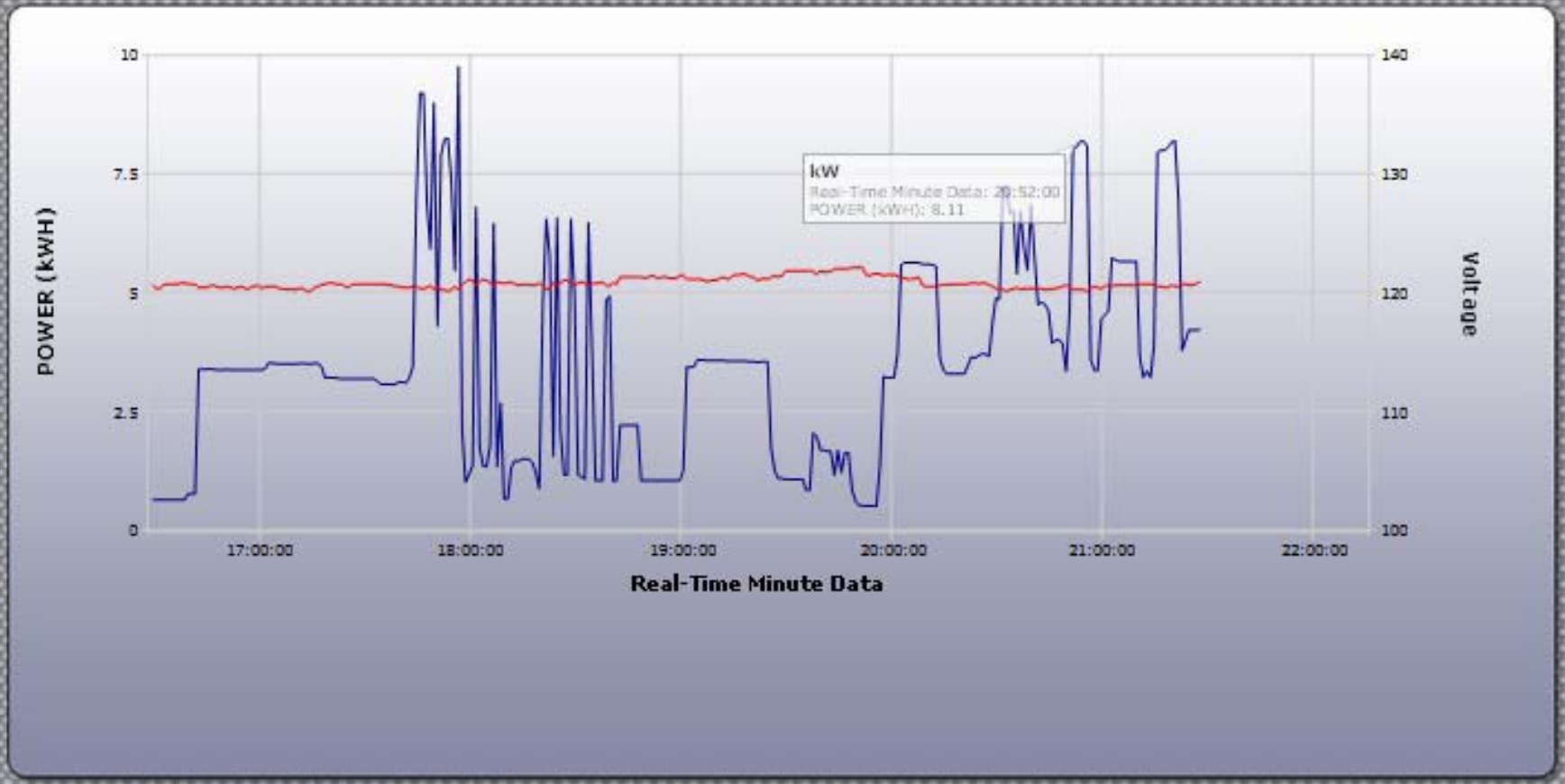
LIVE DASHBOARD | HISTORICAL GRAPH



HISTORY REPORT SELECTION

Select View Type: Minute Live View

Select Sample Size: 300 Minutes

P3 Industries

Kill-A-Watt

Single circuit

V, A, PF, kW, kWh, $, time

Battery backup

~$25

(TED) The Energy Detective

1001

House (200A)

PC interface (footprints)

~$120-$165 (w/software)

EXTECH

EM-100

Similar to above

Adds data-logging

~$90

(TED) The Energy Detective

5000-G

House (200A)

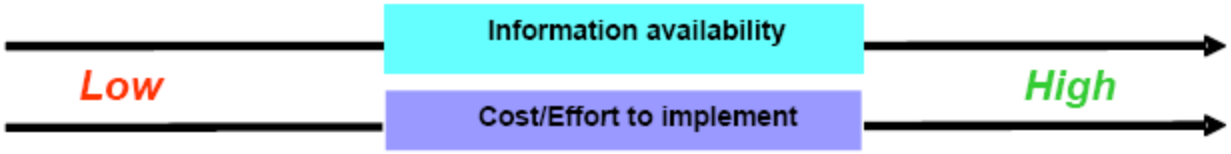
PC interface, wireless receiver, google powermeter (free)

~$200-$240 (w/wireless)

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Residential Electricity Use Feedback: A Research Synthesis and Economic Framework

1	2	3	4	5	6
Standard Billing Monthly invoice (actual or estimated usage)	Enhanced Billing Tips on how to save	Estimated Feedback Tailor audits and advice	Daily/Weekly Feedback Periodic reports on actual usage	Real time Feedback Readily available usage data	Real-time Plus Real – tie data plus controls
"Indirect" Feedback (provided after consumption occurs)				"Direct" Feedback (provided real-time)	

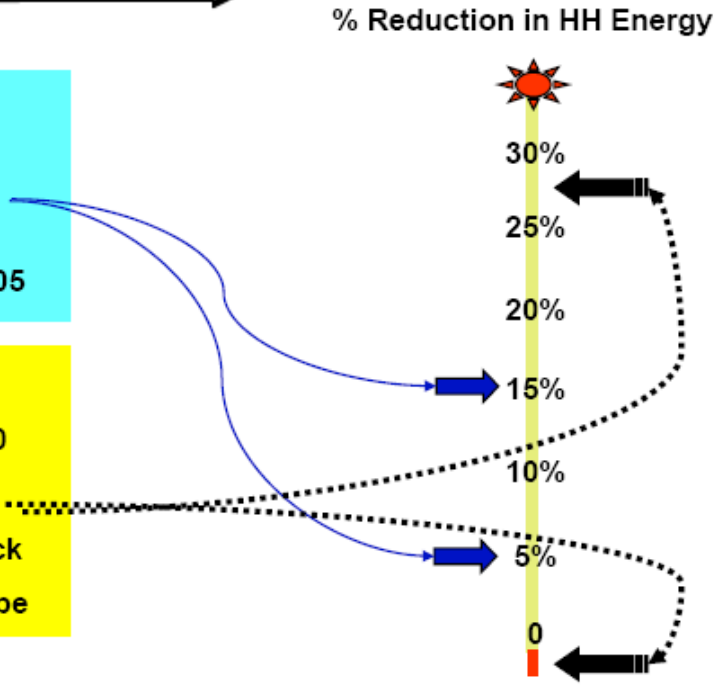


Metastudies

- Darby 2001, 2006
- Fischer 2007
- Abrahamse, *et al.*, 2005

Pilots

- Before and after 2000
- Direct vs. indirect
- Slow vs. fast feedback
- North America, Europe



EPRI Study

EXECUTIVE SUMMARY

Research findings suggest that residential electricity use feedback can be an effective tool in encouraging conservation. EPRI reviewed several past studies and found overall conservation effects that ranged from being negative (in one case, although on-peak reduction did occur) to 18%. This wide range suggests that there is more to be understood about feedback before its impacts are widely accepted. Research areas requiring additional focus relate to study participation levels, the persistence of feedback effects, the relative value of different types of feedback, dynamic pricing interactions, and distinguishing the effects of feedback among different demographic groups. Current utility research activity will address many of these areas, but it is difficult for any one utility to address all of them. A proposal is outlined to develop a widespread research collaborative to fully characterize how feedback affects residential electricity consumption.

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Information + Education =

Empowered Consumers

File Export Setup Help

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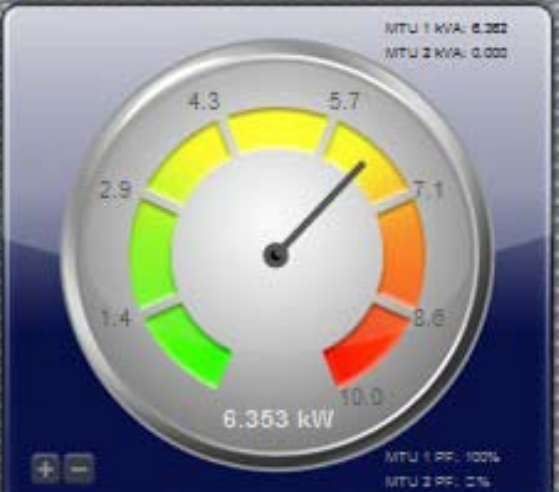

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Consumer Education

- What should it include?
- How much should be available?
- How should it be disseminated?
- Who should provide it?

What should it include?

- What power and energy are. Volts, Amps, Watts, kWh, BTU, efficiency, Cost & Value
- How to read you meter and bill
- Phantom loads
- Behavior, controls & equipment
- How to use your real-time energy meter effectively
- Energy Star labels
- State / Fed / Utility incentives
- Energy Audits
- *Energy myths*
- *Bogus products*
- *Additional Resources*

Dissemination

- How?
  - TV, radio, news paper, billboard
  - Billing inserts
  - Web
  - ***Workshops / Workbooks / Live Resource***
- Who?
  - The Utility
  - The Government
  - ***University & College outreach***

Proposed Pilot project

- Deploy *real-time* metering systems to residential customers

- *Provide community 4 to 6 hour workshops*
  - *Pre/Post Test, Vendors, Workbooks*

- Report results
  - Satisfaction, Savings, Equipment & Habit changes, Demographics

Funding

- Pilot Project:
  - Call me!
- Large Scale Deployment
  - $250 / customer (est.)
  - Utility funded?
  - Customer funded?
  - Combination ($125 utility, $125 amortized)?

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Information + Education =

Empowered Consumers

- Empowered customers in all stakeholder's interest
- Information from real-time metering; Education from 3rd party
- Studies show energy savings through information but overlook educational component
- Pilot study needed to determine effectiveness

Education - Information & the Grid of the Future

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