

Demand-Side Management Technology Workshop: Advances in Water Heating

*Sponsored by
Tri-State Generation & Transmission
with Western Area Power Administration*



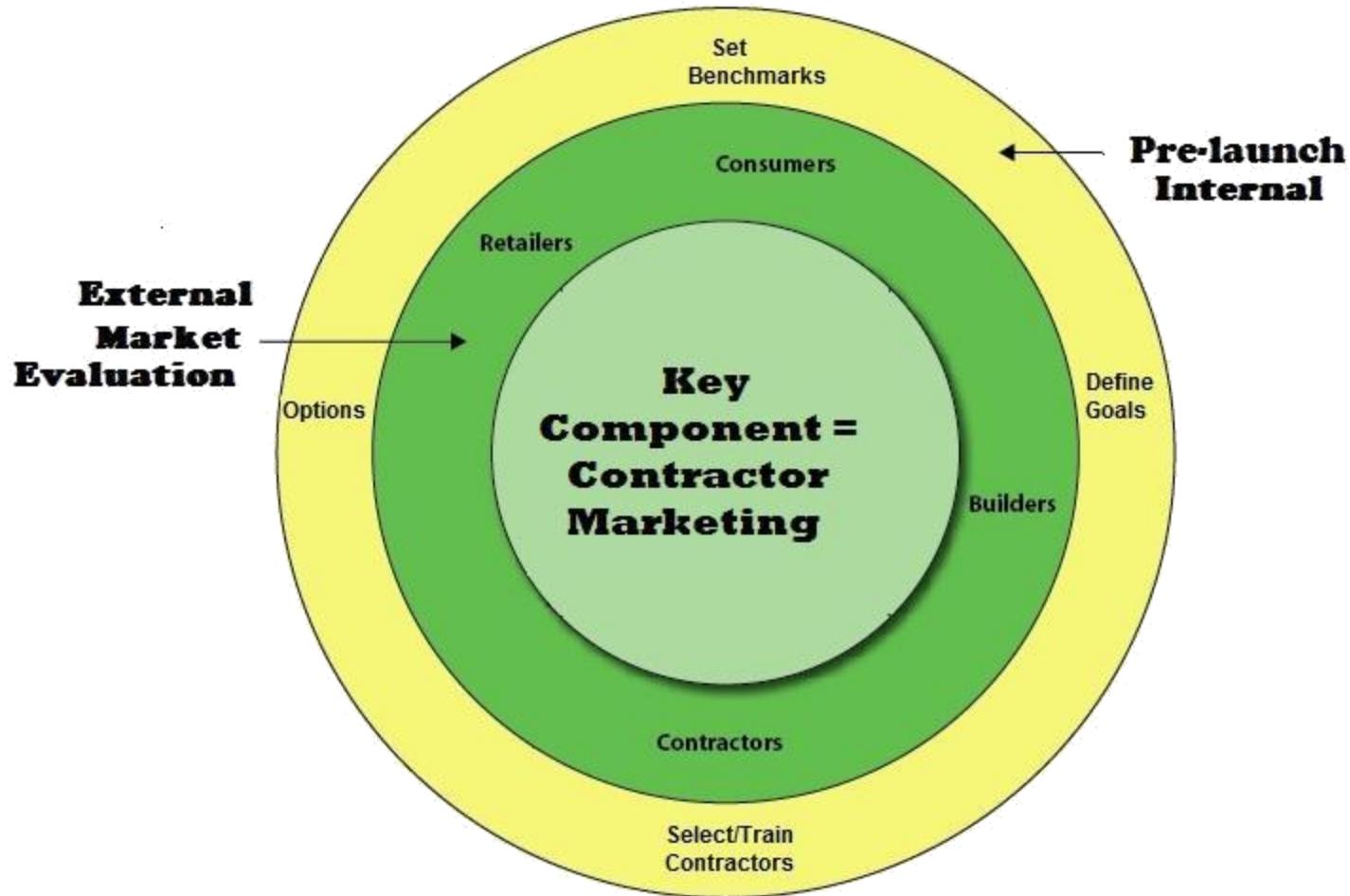
August 31, 2010
Westminster, CO





Successful Water Heating Case Studies

Best Practices in Water Heater Programs



Successful Water Heating Case Studies

- Portland General Electric
- Georgia Power/Southern Company
- East River Electric Power Cooperative
- Great River Energy G&T

Portland General Electric



Portland General Electric (PGE)

- PGE serves 680,000 households in Oregon
- Customer base with high market penetration for clean energy products and services
- Energy Trust of Oregon delivers energy efficiency programs on behalf of PGE to residential and business since 2001 customers
- PGE connects residential and business customers to energy efficiency programs, products and services
- Water heaters had not been promoted for at least 10 years prior to 2008



Background

- Declining market share for electric water heaters
- More than 50% of the water heaters are changed out due to an emergency
- About 50% of water heaters are DIY installs
- Lack of consumer education among residential customer base with regards to differing efficiency levels
- Non-transparent pricing by big box stores, vendors, and plumbers with installs ranging between \$600-\$1,100.
- Limited opportunity to upgrade water heaters every 6-15 years to make them more efficient



Program Goals

- Replace water heaters *before* they fail
- Provide education and information to residential customers
- Create price transparency for the replacement of water heaters
- Offer a long-efficient water heater at a competitive lasting market price
- Reduce the amount of research that customers have to do on products and vendors
- Offer an easy decision making and installation process



Reasons for Selecting Marathons

- Reviewed products with 6-, 9-, 12 year, lifetime warranty products in the market. The longer the warranty the better the insulation (less stand-by losses)
- Rheem Marathon water heater is equivalent or better in terms of energy efficiency compared to a 12 year warranty water heater
- Marathon's longer life-span (estimated to be 20 years) yield longer lifetime savings.
- Customer really hits a home run when other product starts to fail (tank failure). Marathons do not need to be replaced.

Program Operations

- Flat fee product plus installation for \$765 after incentives + rebates
- Roto-Rooter gave \$100 rebate on their installation charge: a \$75 instant incentive on the Energy Trust–provided Marathon product
- Simple 3-step Customer process
- Call 1-800-GETRoto to ask questions and set appointment
- Roto-Rooter comes out to provide a firm bid. Also installs product and removes old water heater
- Published Marathon call center phone number for technical customer inquiries
- PGE call center offered back-up services



Promotional Materials

- Promoted in January bill insert to 680,000 households
- Website up and running during promotion
- Offer valid for 120 days
- Pre-stacked inventory for Rheem Marathon water heaters with distributor (General Pacific) prior to the promotion
- Energy Trust of Oregon agreed to allow for an instant rebate instead of a mail-in rebate (less paperwork)



Results

- More than 300 Marathon water heaters installed
- Great customer satisfaction among program participants
- Ease of process, transparency, speed of install, product features, energy savings
- Year-round inquiries about where to get Marathon water heaters
- Moved Oregon's largest retailer and installer of water heaters (George Morlan Plumbing) to sell and install Rheem Marathon water heaters
- Many installations occurred in manufactured homes



Next Steps

- Bring more vendors retailers on board
- Signing up more plumbers for install
- Plumber spiffs for installs 
- Sweepstakes and customer stories in ongoing communication
- Donation of product and installations in construction/remodel projects



Georgia Power



Georgia Power

- Serves 2.25 million customers throughout Georgia,
- Largest of four electric utilities that make up Southern Company.



Strategy:

- An energy efficient alternative to tankless water heaters
- Part of the Save Money and Energy campaign
www.georgiapower.com/save.

Program Components

- Georgia Power offers customers up to a \$525 rebate (depending on house type) to switch from an existing natural gas water heater to a Marathon water heater.
- The program targets single family existing homes and the multi-family housing market.
 - The durability was a main selling point to the multi-family property managers
 - No worries about maintenance and service



Promoted Non-Energy Benefits Too

- It conserves landfill space because the water heater is designed to last forever
- Modeled these benefits into its program
 - Using an average 9-year gas water heater life and a 36-year life for Marathon, the landfill space avoided per Marathon Water Heater is 28.8 cubic feet. This is equivalent to 50 full dump truck loads of heaters saved from the landfill for every 1,000 Marathon water heaters that are installed.

**NOTHING LASTS FOREVER.
EXCEPT A MARATHON.**

Get a \$525 rebate when you replace your existing gas water heater with an all-electric Marathon® water heater.*

- Every Marathon water heater comes with a manufacturer's lifetime tank warranty. A Marathon will last a lifetime in your home — not in a landfill.
- A Marathon water heater is one of the most energy-efficient water heaters on the market today. Thick EnviroTeam™ insulation maintains a consistent hot water temperature.
- A Marathon is tough on the outside with an inner tank that won't rust, corrode or leak — ever!

Call 1-800-524-2421, ext. 975 now for rebate details and installer recommendations.

*Rebate available only on new installations for 2009. See the Georgia Power website.

we're **ON** so you can be.®

GEORGIA POWER
A SOUTHWEST ENERGY COMPANY

Implementation Tactics

- Employee pilot program in 2006; residential roll out in 2007, and commercial launch in 2008.
- Developed a dedicated program website georgiapower.com/marathon:

- a statewide map of recommended installers,
- an interactive Marathon water heater graphic illustrating all the benefits
- customer testimonials

Water Heaters - Georgia Power

GEORGIA POWER
A SOUTHERN COMPANY

[Residential](#) | [Business](#) | [Customer Svc](#) | [Community](#) | [Energy/Environment](#) | [About Us](#)

Products/Programs

- Marathon Water Heater
- Water Heaters**
- Heating and Cooling
- Premium Surge Protection
- Smart Meter
- Green Energy
- Power Credit
- College Students
- ENERGY STAR Home Assessment

Water Heaters

The Georgia Power \$525 Water Heater Rebate Offer.*

Georgia Power customers can take advantage of the **\$525 rebate offer** (PDF 587KB) by replacing their existing gas water heater with an energy-efficient electric Marathon® water heater.

Marathon Plumber Installers & Distributors

Plumber service abilities should include; installation within 24 hours, optional same day service, 24/7 customer service, and electrical services available. Distributors should meet certain minimum criteria based on geographical location.

Click on the map or use the legend on the right to view a list of qualified and recommended plumbers and distributors in your local area.

For a complete list of qualified installers in Georgia go to [Marathon's Web site](#).

Click [here](#) to locate a Plumbing and Mechanical Association member.

How to Order | Customer Testimonials | Home Recommended Plumbers & Distributors | For Plumbers | For Distributors

Program Ally Roles

- Worked with the distributor that serves the
- electric rural cooperatives throughout the southeast- GRESCO Utility Supply
 - With their large inventory of Marathons and fleet of trucks, GRESCO could quickly supply the while keeping costs down .
- Worked with several local plumbers and electricians including Roto-Rooter and expanded to more than 20 qualified plumbers across Georgia



Results

- More than 1,400 Marathon water heaters were installed in Georgia Power's service territory.
 - Huge penetration in the multi-family housing market, which accounted for approximately half of its installations.



Buy A Marathon And Have Peace of Mind.

*Your customers will get a \$525 rebate just by replacing their gas water heater with a Marathon® all-electric water heater.**

Your Customers will Benefit From:

- Marathon's lifetime tank warranty.
- One of the most energy-efficient water heaters on the market today.
- Marathon's inner tank that won't rust, corrode or leak – ever!

And, you will enjoy a customer for life!

Call GRESCO Utility Supply, Inc. at 1.800.329.3421 for program details and to order Marathon water heaters.

*Certain restrictions apply. 2008 rebate ends December 31, 2008. Must be a Georgia Power customer.

we're **ON** so you can be.®

GEORGIA POWER
A SOUTHERN COMPANY

Lessons Learned

- Team with a good plumber and electrician
- Look beyond the traditional residential housing market
- Look for new ways to bring the product to market
- Never stop marketing the program
- Water heaters can be a “green” technology



Great River Energy, MN

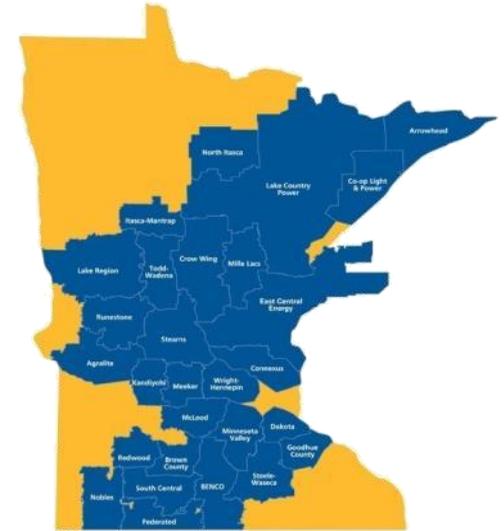


GREAT RIVER
ENERGY®

A Touchstone Energy® Cooperative 

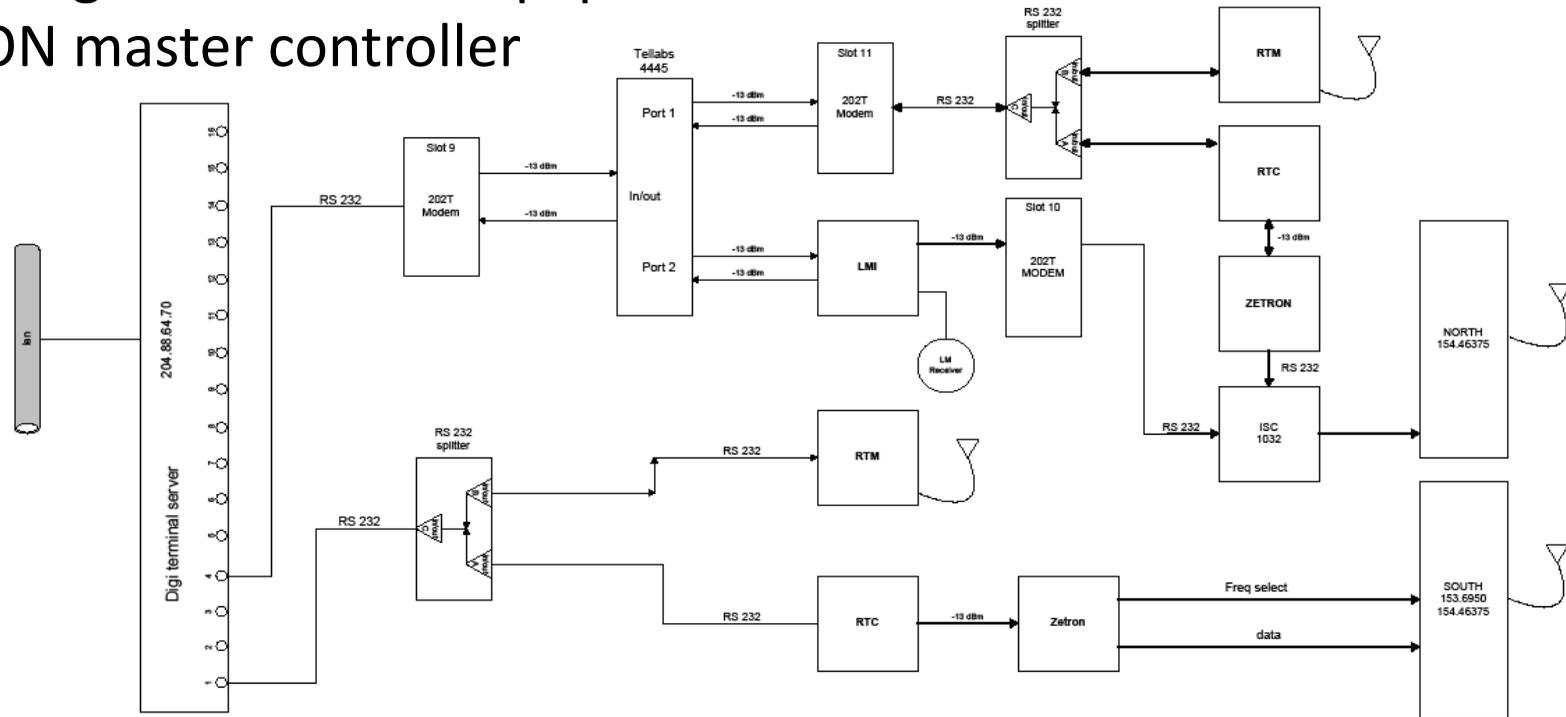
Great River Energy

- Nearly 850 employees (in MN and ND)
- 800 MW of generation
- 4,500 miles of transmission lines
- Revenue: \$776 million
- Most significant expenses:
 - Rising fuel
 - Purchased Power
 - Costs
 - Uncertainty around climate change



Load Management System

- 350 MW peak controllable load
- 330,000 receivers/switches
- 70 UHF transmitter towers
- Converge commercial equipment
- YUKON master controller



GRE Controlled Water Heating

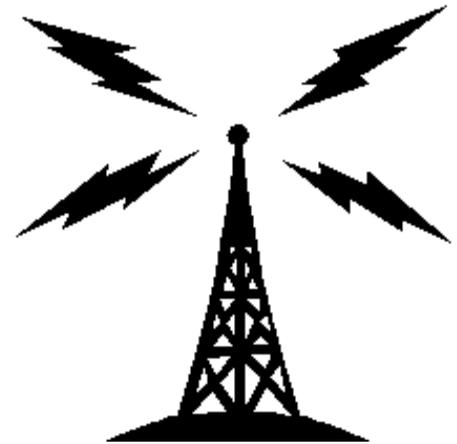
- 65,000 off-peak ETS* water heaters
- 40,000 interruptible peak shave water heaters
- 80 MW of peak load reduction
- 400 GWh controlled water heating energy sales (2008)



* Electric Thermal Storage

GRE Incentive

- GRE is able to reduce MISO module E capacity projections by 80MW each month
- ETS program saving \$10M by shifting 275 GWh off peak each year
- Interruptible program reduces daily market purchases by 150 MWh



Member Incentive

- ETS programs reduced ENERGY purchases by ~\$7.5M in 2008
- Interruptible programs reduced ENERGY purchases by ~\$ 2.5M
- DEMAND expenses reduced by ~\$13M



End-use Member Incentive

- \$50-500 rebate
- Marathon water heater at 15% over cost
- 5% off total monthly bill
- Reduced rate on metered water heater consumption (50% retail rate)
- \$1.50-12.50 per month credit
- Free water heater with 5 year contract



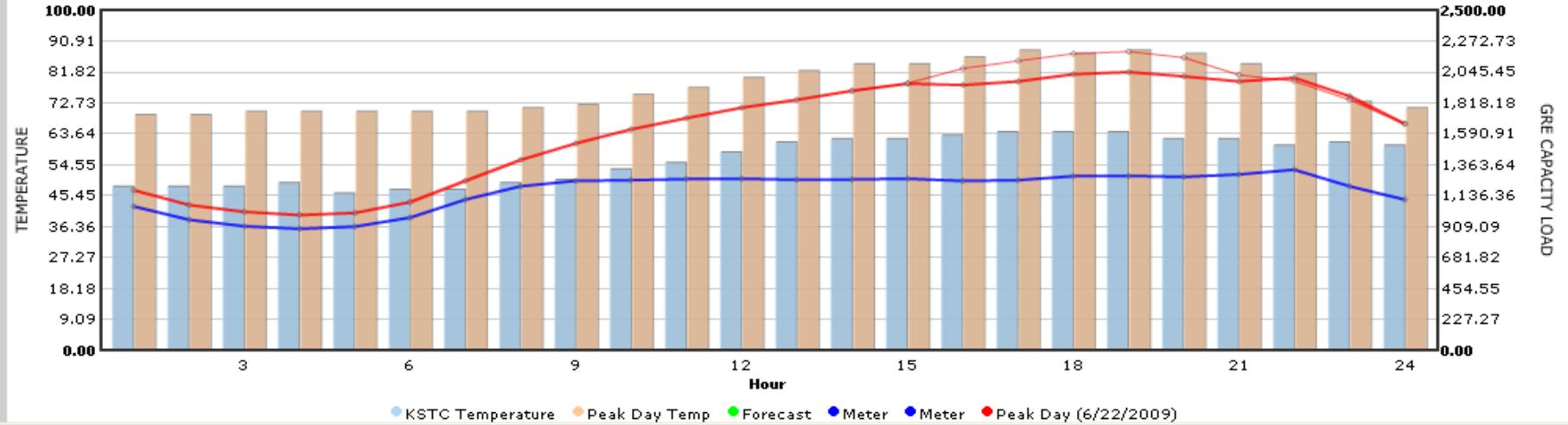
Demand | **Billing Peak** | **Control Schedule** | **Control Amount** | **Report** | **Date:** 6/9/2009

Hour	Composite	GRE.ALTW				GRE.GRE				GRE.MP.GRE				GRE.NSP.GREC				OTP.GRE			
	Demand	Demand	Temp.	Cloudpct	Dewpt	Demand	Temp.	Cloudpct	Dewpt	Demand	Temp.	Cloudpct	Dewpt	Demand	Temp.	Cloudpct	Dewpt	Demand	Temp.	Cloudpct	Dewpt
	Actual	Actual	KMCW			Actual	KMSP			Actual	KHIB			Actual	KMSP			Actual	KAXN		
7	1,108.17	61.18	43	75	43	467.91	47	75	47	112.41	44	100	44	392.58	47	75	47	74.09	45	0	42
8	1,205.62	67.55	48	50	48	510.22	49	75	49	120.55	45	100	45	428.89	49	75	49	78.41	47	0	47
9	1,246.28	70.07	55	0	55	535.47	50	75	50	122.33	46	100	46	440.34	50	75	50	78.07	50	0	48
10	1,251.55	70.55	60	0	60	540.66	53	100	53	119.59	50	100	50	445.23	53	100	53	75.52	51	0	51
18	1,278.89	70.82	61	100	61	539.73	64	100	64	110.37	62	75	62	486.04	64	100	64	71.93	61	19	61
19	1,281.48	70.84	61	100	61	536.13	64	100	64	111.91	62	75	62	487.76	64	100	64	74.84	60	75	60
20	1,274.68	69.84	63	75	63	530.43	62	100	62	112.37	62	50	62	486.28	62	100	62	75.76	59	75	59
21	1,293.55	68.88	62	100	62	542.83	62	100	62	113.74	62	75	62	491.08	62	100	62	77.02	58	19	58

Current DA Market Pricing

Hour	MINNHUB		GRE.ALTW		GRE.GRE		GRE.MP.GRE		GRE.NSP.GREC		OTP.GRE	
	LMP	Weight	LMP	Weight	LMP	Weight	LMP	Weight	LMP	Weight	LMP	Weight
7	17.74	19,658.94	26.04	1,593.13	17.62	8,244.57	17.65	1,984.04	18.77	7,368.73	18.26	1,352.88
8	23.07	27,813.65	36.91	2,493.27	22.68	11,571.79	21.79	2,626.78	24.55	10,529.25	21.95	1,721.10
9	24.97	31,119.61	40.96	2,870.07	24.57	13,156.50	23.52	2,877.20	26.43	11,638.19	23.48	1,833.08
10	29.10	36,420.11	50.27	3,546.55	28.53	15,425.03	27.09	3,239.69	30.88	13,748.70	26.88	2,029.98
18	24.02	30,718.94	41.41	2,932.66	23.58	12,726.83	22.59	2,493.26	26.01	12,641.90	23.04	1,657.27
19	22.67	29,051.15	39.97	2,831.47	22.30	11,955.70	21.27	2,380.33	24.36	11,881.83	21.47	1,606.81
20	20.48	26,105.45	38.82	2,711.19	20.04	10,629.82	18.94	2,128.29	22.28	10,834.32	19.14	1,450.05
21	20.37	26,349.61	38.94	2,682.19	19.91	10,807.75	18.85	2,144.00	22.28	10,941.26	19.13	1,473.39

Current day/Forecast day vs Peak day graph





Load Management

[Demand](#)
[Billing Peak](#)
[Control Schedule](#)
[Control Amount](#)
[Report](#)
 Date: 6/22/2009

Critical Peak Pricing

Program Type	Update	Probability	Start Time	Stop Time
Critical Peak Pricing	<input checked="" type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>

C & I / Residential

Program Type	Update	Probability	Start Time	Stop Time
C&I with GenSet	<input checked="" type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
Cycled Air Conditioning	<input checked="" type="checkbox"/>	Scheduled <input type="button" value="v"/>	15:00	21:00
Interruptible Metered C&I	<input checked="" type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
Interruptible Water Heating	<input checked="" type="checkbox"/>	Scheduled <input type="button" value="v"/>	14:00	22:00
Interruptible Irrigation	<input checked="" type="checkbox"/>	Scheduled <input type="button" value="v"/>	16:00	20:00
Interruptible Irrigation North	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
Interruptible Irrigation South	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
Dual Fuel	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
North Dual Fuel	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
South Dual Fuel	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>

Next Day

Program Type	Update	Probability	Start Time	Stop Time
Critical Peak Pricing	<input checked="" type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
C&I with GenSet	<input checked="" type="checkbox"/>	Scheduled <input type="button" value="v"/>	14:30	<input type="text"/>
Cycled Air Conditioning	<input checked="" type="checkbox"/>	Scheduled <input type="button" value="v"/>	14:30	<input type="text"/>
Interruptible Metered C&I	<input checked="" type="checkbox"/>	Scheduled <input type="button" value="v"/>	14:00	<input type="text"/>
Interruptible Water Heating	<input checked="" type="checkbox"/>	Scheduled <input type="button" value="v"/>	14:00	<input type="text"/>
Interruptible Irrigation	<input checked="" type="checkbox"/>	Scheduled <input type="button" value="v"/>	15:00	<input type="text"/>
Interruptible Irrigation North	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
Interruptible Irrigation South	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
Dual Fuel	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
North Dual Fuel	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>
South Dual Fuel	<input type="checkbox"/>	Unlikely <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>

Download historical data from 9/21/2009 to 9/21/2009 [Export](#)

Keys to Success

- The right price
- Quality product
- Quality installation and checkout
- Setting and communicating expectations
- Un-recognized control periods

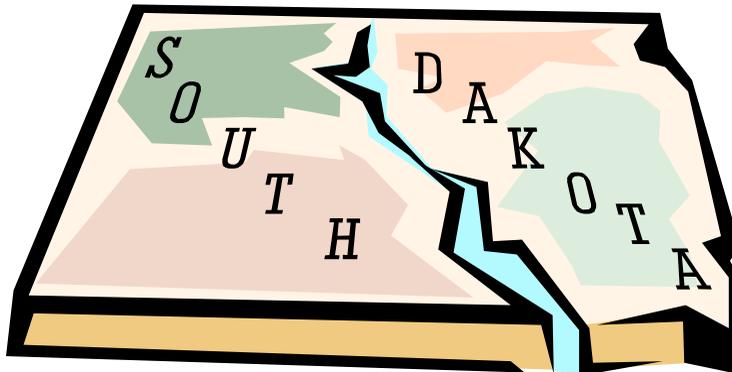


East River Electric Power Cooperative



About East River

- Headquarters in Madison, SD
- 8 regional maintenance centers
- 21 member systems
- 36,000 square mile service area
- 14 power supply substations
- 200 distribution substations
- 2600 miles of transmission line
- 90,000 retail accounts served
- 24 wheeling customers
- 104 Full-Time employees
- 2.3 million MWH Energy Sales in 2006
- 436 MW Winter Peak (1/16/07)
- 397.4 MW Summer Peak (10/30/06)

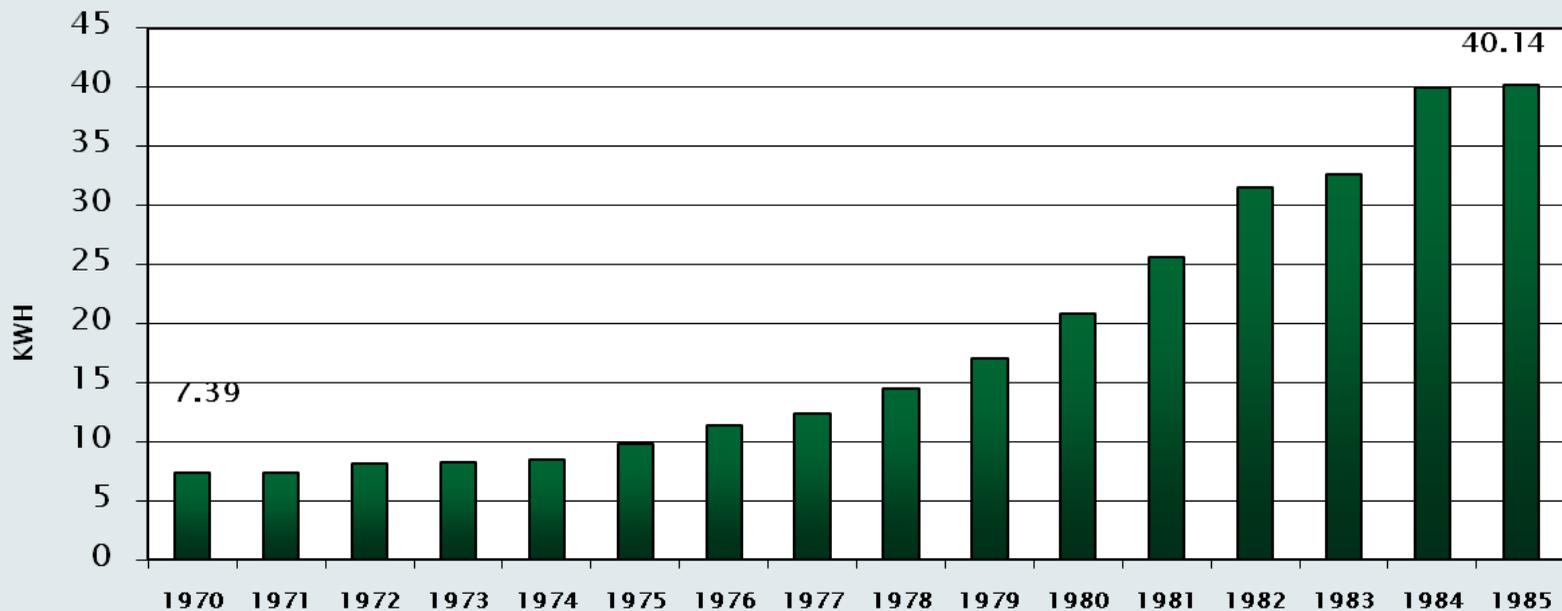


Current Installed Base

LCR	18,500
RCM	3,150
Zellweger	15,700
Enermet	14,650
Total	52,000

Rate Shocks

East River Average Rates (1970 – 1985)



During Past 8 Years

- 36,000 Water Heaters
- 6,000 Dual Fuel systems
- 58% Load Factor
- \$42,000,000 saved



Fundamental Goals

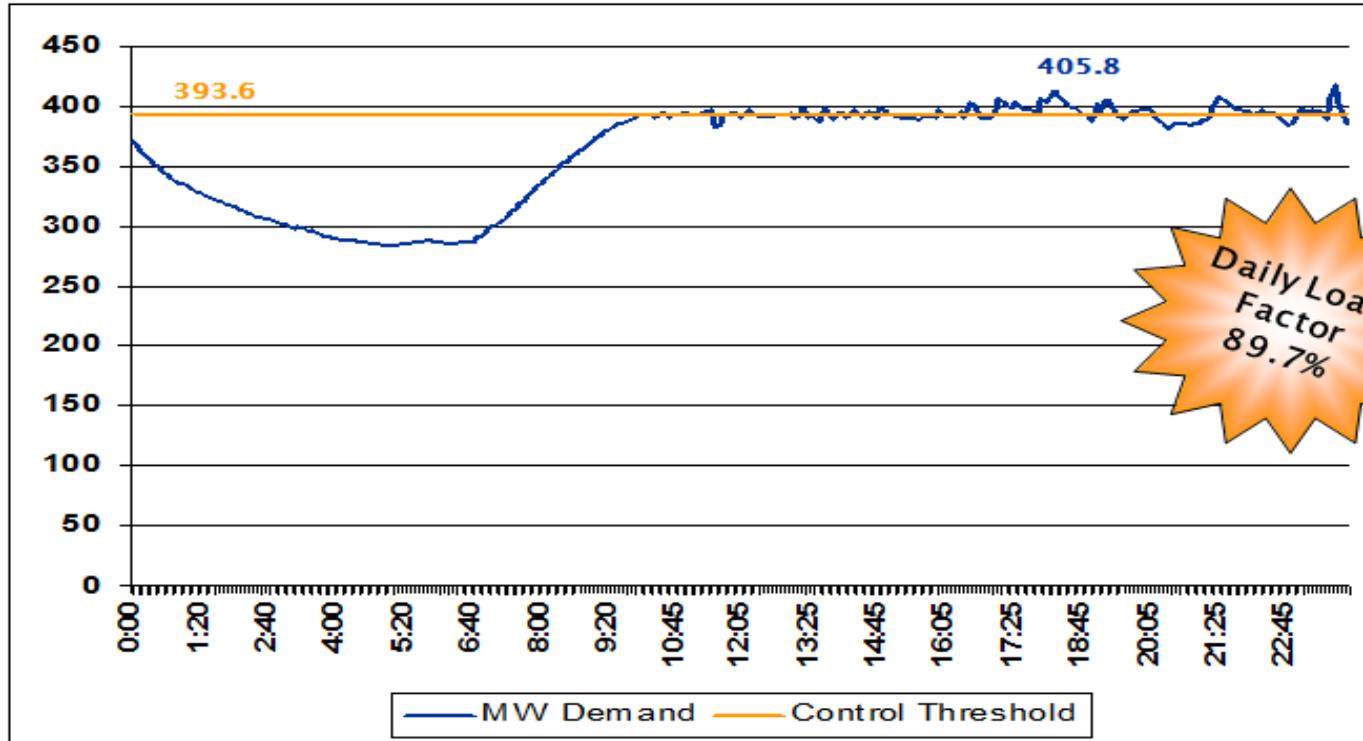
- Improve annual & monthly load factor
- Reduce East River monthly peak
- Increase energy sales by applying minimum interruption
- Encourage energy sales during non-peak periods

Load Management Created New Set of Customer Service Issues

- Is *my* water heater under control?
- Why? – It is not that hot (or cold) out!
- Was I controlled yesterday?
- Will I be controlled today?
- Am I being controlled more than my neighbor?

Load Curve

July 29th, 2006 - Peak Day 405.8 MW at 18:30



Overall Program Objectives

- To equitably distribute time off
- Benefits in proportion to the number of receivers installed
- “Operating Strategy” – Reviewed annually



Load Management Strategy

- Monthly Operating Strategy
- A Control Threshold or “Target” demand is established to initiate Load Control by Dispatchers
 - System Peak Demand
 - Initial Control Threshold
 - Valid Control



Total Connected Loads for East River

Total Connected Loads Today

Water Heater	42,092	192,662 kW
Irrigation	1,461	85,132 kW
Air Conditioning	13,477	49,367 kW
Industrial	2,500	36,877 kW
5/7 Industrial	190	26,863 kW

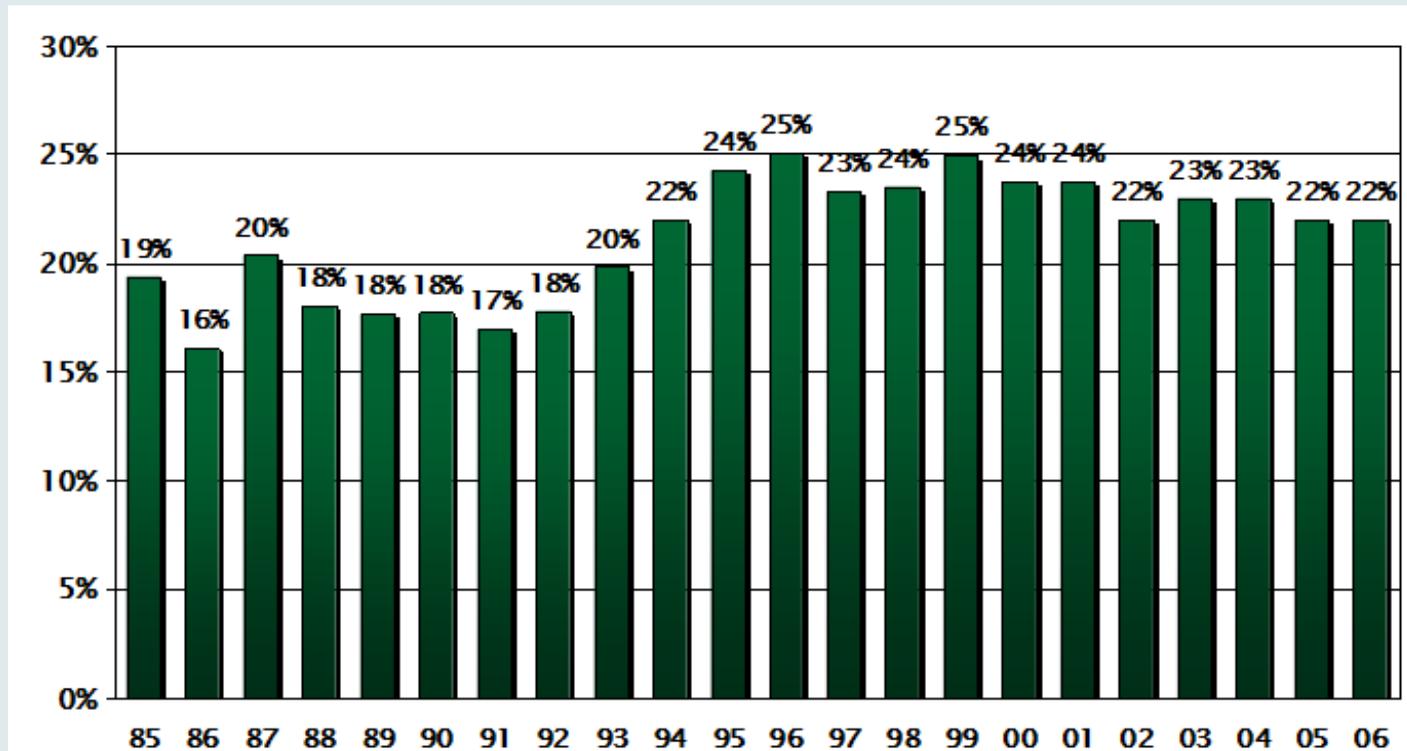
Connected Water Heaters

- Large capacity
- Great efficiency
- Great loads to control
- No customer inconvenience
- No lost energy sales



Percent of Load Under Control

Percentage of Total Load - July



Load Management Results

Results (1984-2006) BENCHMARKS

	<u>1992 Goal</u>	<u>2006 Actual</u>
Controllable Load	40 MW	105.4 MW
Annual Load Factor	60%	67.8%
Cumulative Savings	\$42.7 Million	\$93.4 million



Solar Water Heating Success Stories

Summary of Four Successful Water Heating Programs

Paper describes 4 utility solar water heating (SWH) success stories from Hawaii, Oregon and Florida and offers lessons learned to help others replicate their success

	HECO	EWEB	LE	JEA
Type of Utility	Investor-owned	Municipal	Municipal	Municipal
Number of Customers	394,000	81,000	106,000	360,000
Saturation of Electric Water Heaters, Percent	62	80	95	95
System Peak, Megawatts	1,250	560	663	2,636
Residential Electric Rate, cents per kilowatt-hour	14 – 20	7.2	7.5	6.9
Average Solar Radiation ¹ , kWh/m ² day	5.7	4.1	5.3	5.0
Sunshine Clearness Index, Percent ²	57	49	54	52

Utility Program Profiles

	HECO	EWEB	LE	JEA
Program Goals	Energy efficiency; Demand reduction	Customer service; Demand-side management; Environmental image	Profitable service; Distributed generation; Customer retention	Clean power goals
Start Date	1996	1984	1997	2002
Number of SWH systems	20,000	925	57	12 (approximate)
Most common system type	Open loop, direct	Closed-loop, antifreeze	Open loop, direct	Solar pool heating
Certification Required	SRCC OG 100; HECO approval	SRCC OG-300	FSEC or SRCC	FSEC or SRCC optional
Current Utility Incentive	\$750-\$1,000	Cash discount (\$700 max.); 0% loan (\$4,000 max.)	N/A; LE owns systems	\$1-4/ft ² ; varies by system
State Incentive	Tax credit 35%	Tax credit (\$1,500 max.); property tax exemption	Sales tax exemption	Sales tax exemption