Easy Ways To Save Money And Energy

Why Bother?

- SMALL WATER SYTEMS SPEND ABOUT <u>1 BILLION DOLLARS PER YEAR</u> ON ELECTRICITY !!!
- DEMONSTRATED SAVINGS OF 10 TO 20% AT NO COST TO SYSTEM
- SOME EXAMPLES
  - 1000 CUSTOMERS - $12,000
  - 1200 CUSTOMERS - $18,000
  - 2500 CUSTOMERS – $50,000

WOULD YOU SPEND THE EFFORT ?

TWO PARTS

- Direct Electric Power ReductionThrough Operational Adjustments
- Reduce Water Loss Through Timely Leak Detection

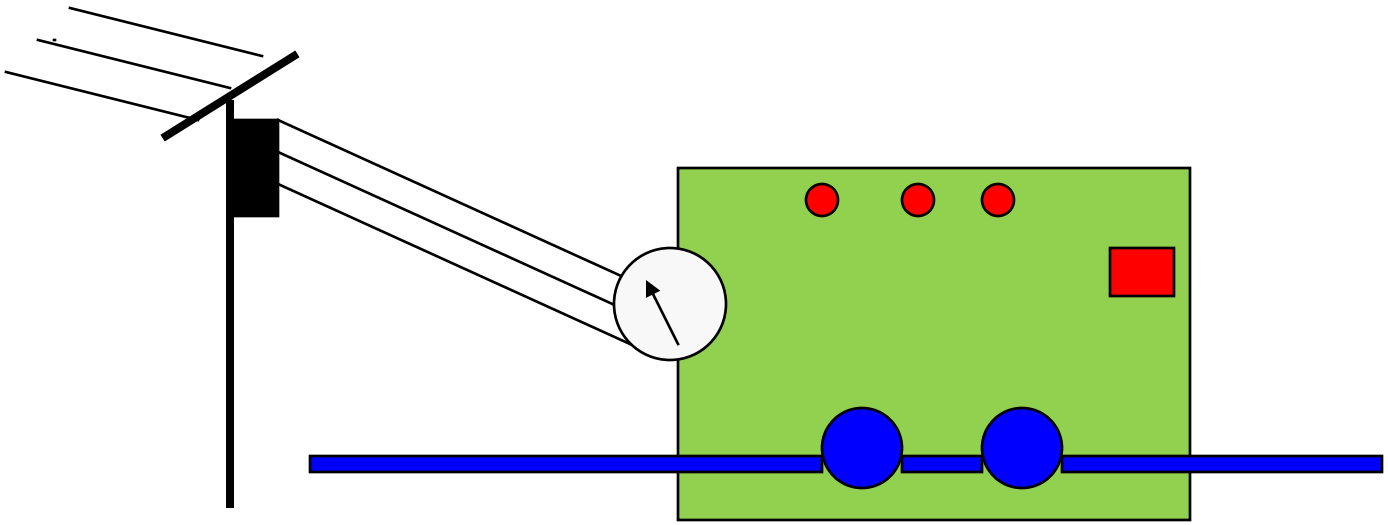
Part 1

Direct Power Reduction

How Power Is Charged

Demand **plus** **Time at Demand**

kW **kWh**



KEY ELEMENTS

- **Bills**
- **Rates**
- **Site visit**
- **Kilowatt-hour Management**
- **Demand Management**

BILLS

- Most Critical Part of Savings Effort
- Contain a wealth of information
- Allow audit from desk

Sample Bill

www.alabamapower.com
ACCOUNT ACCESS CODE: 648057
ACCOUNT NUMBER 76614-65002
CUSTOMER NAME
SERVICE ADDRESS POPLAR

ALABAMA POWER COMPANY
1550 S Alabama Ave

AVAILABLE 24 HR / 7 DAYS
1-888-430-5787

RATE NAME	SERVICE PERIOD FROM	TO	METER NUMBER	READING TYPE	METER READING PREVIOUS	PRESENT	METER CONSTANT	USAGE
LPM	07-30-08	08-29-08	XX7953	Tot kWh			1	38,795.346
				Pk kW			1	160.08
				Power Factor			1	0.8301
				Co Pk kVA			1	192.8371

EXPLANATION OF CHARGES

LPM - Light and Power Medium	07/30-08/29
Contract Term Discount	
Contract Term Discount .1	
Power Factor Adjustment	
Demand 174 KW * 4.740000	824.76
Energy Charge 38795 KWH * 0.066419	2576.73
Discount	-340.15
Fuel Charge 38795 KWH * 0.034329	1331.79
Natural Disaster Reserve	1.86
Alabama Tax Adjustment	-105.61
Alabama Utility License Tax	77.21
EnergyDirect.com Premium	50.00

BILLING INFORMATION

Tot kWh	38,795
Adj Pk kW	174
Pk kW	160
Adj Rtch Bill kW	174
Bill Demand	174

HISTORICAL DATA

	Days	KWH	KW/KVAR BILL	KW/KVAR ACT
This Mth	30	38795	174	160
Last Mth	30	37914	169	160

	Bill Amount	Excess RKVA	Power Factor
This Mth	4366.59		
Last Mth	4263.02		

Rates

- Unique to each power supplier
- Understanding a must for savings
- Usually several for each supplier
- Can range from easy to difficult to follow

Sample Rates

ALABAMA POWER
A SOUTHERN COMPANY

RATE LPM
LIGHT AND POWER SERVICE - MEDIUM

By order of the Alabama Public Service Commission dated October 20, 2008 in Docket # 24860.

The kWh charges shown reflect adjustment pursuant to Rates RSE and CNP for application to monthly bills effective for April 2010 billings.

PAGE	EFFECTIVE DATE	REVISION
1 of 3	January, 2009 Billings	Fifteenth

AVAILABILITY

Available in all areas served from the interconnected system of the Company.

APPLICABILITY

Applicable for lighting, power and miscellaneous electric service when the Consumer's entire electrical requirements are furnished by the Company. Service to more than one premises shall not be combined. Service shall not be resold or shared with others.

CHARACTER OF SERVICE

Single or three phase service directly from the Company's 44 kV or higher transmission system (transmission) or distribution lines (primary). Single or three phase service at the secondary voltage of transformation facilities supplied from the Company's transmission system (primary) or distribution system (secondary).

MONTHLY RATE (SECONDARY)

Base Charge:
$50.00 per customer; plus

Charge for Billing Capacity:
$4.74 per kW of billing capacity; plus

Charge for Energy:
For the first 250 kWh per kW of billing capacity:
7.5283¢ per kWh for all kWh.

For all over 250 kWh per kW of billing capacity:
5.5620¢ per kWh for all kWh.

ARKANSAS PUBLIC SERVICE COMMISSION

2nd Revised Sheet No. 4.2 Schedule Sheet 2 of 3 (AT)

Replacing: 1st Revised Sheet No. 4.2

Entergy Arkansas, Inc.
Name of Company

Kind of Service: Electric Class of Service: Commercial/Industrial

Part III. Rate Schedule No. 4

Title: Small General Service (SGS)

2007 AUG -8 A 11: 35
FILED
Docket No.: 06-101-U
Order No.: 16
Effective: 6-16-07
PSC File Mark Only

4.4. NET MONTHLY RATE (MT) (RT)

4.4.1. Rate

Billing Item	Rate	
Customer Charge:	$16.16	(RT,CT) (RT,CR)
Demand Charge per kW:		
All kW over 6.0 kW	$ 2.94	(RT,CR)
Energy Charge per kWh:		
1st 900 kWh plus 150 kWh per kW over 6.0 kW	$ 0.03756	(RT,CR)
All additional kWh	$ 0.02646	

4.4.2. Minimum

The Minimum shall be the greater of the following:

Billing Item	Rate	
Customer Charge:	$16.16	(RT,CT) (RT,CR)
Plus		
Demand Charge per kW:		
Highest kW over 6.0 kW established in the twelve months ending with the current month;	$ 1.96	(RT,CR)

or,
An amount that may be required by Rate Schedule No. 60, Extension of Facilities.

4.4.3. Billing Amount (AT)

The Billing Amount will be the greater of the amounts calculated in § 4.4.1 or § 4.4.2 above, plus the Energy Cost Recovery factor times the billed energy, plus all other Adjustments required by § 4.4.4 below. When a minimum bill is rendered pursuant to § 4.4.2, the Adjustments will apply to the kW that would have been billed absent the ratchet in the minimum.

4.4.4. Adjustments (CT)

Applicable Riders which adjust this Rate Schedule are listed in Rate Schedule No. 17, Table of Riders Applicable to Rate Schedules.

THIS SPACE FOR PSC USE ONLY

ARKANSAS PUBLIC SERVICE COMMISSION
APPROVED
AUG 13 2007 ORDER 16 06 101-U

Site Visit

- Compare amounts with meter amounts
- Compare bill meter # with actual meter #
- Compare demand with horsepower
- Compare bill meter constant(s) with actual if available

Kilowatt-hour Management

- **Normally at least 2 savings possibilities**
  - **Reduced rate at higher consumptions**
  - **Off-peak rates**
- **Frequently, running longer time at lower demand better than shorter time at higher demand**

Demand Management

- Maximum demand during month controls
- Watch out for
  - Ratchet clauses
  - Contract clauses

CHECK LISTS

Bill Check List

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History
Look for major changes over time

Does kW match hp?

Is kWh/kW appx hours?

Is billed kW same as actual?

Is there power factor penalty?

Make note of meter number and meter constant (for site visit)

Rate Check List

ALABAMA POWER
A SOUTHERN COMPANY

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For all over 250 kWh per kW of billing capacity:
5.5620¢ per kWh for all kWh.

such capacity shall be no less than 90% of maximum capacity during June through September of preceding 11 months ….. Or 75% of contract capacity, which ever is greater."

Get Copies

Are other rates available?
- Off Peak
- Water Pumping

(this supplier has ~ 50 rates

kWh price break? When?

Ratchet clause?

Contract clause?

Site Visit Check List

- Check meter constant
  - If shown on meter, is it same as shown on bill?
  - Using bill meter constant, does meter kW match bill?
- Does actual meter # match bill meter #?

Kilowatt Hour Check List

- Reduced kWh rate available?
  - Standard?
  - Off Peak?
- Multiple sources with excess capacity on separate electric meters?
- Power factor correction?

kW Management Check List

- Is ratcheting active?
- Is contract controlling?

HISTORICAL DATA

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- Can simultaneous pump operation be minimized? eg.
  - Cut off high service while backwashing
  - Cut off aeration while spray irrigating

Summary
Part 1

1. Review bills for inconsistencies
2. Review rates for understanding and opportunities
3. Make site visit for metering errors
4. Evaluate kWh management
5. Evaluate kW management

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Success Here in Kentucky

- Hardin County Water District #2
- James Jeffries

- From 2000-2008: Electricity costs rose from $180k to over $400k per year
- Gallons pumped rose from about 1.2 MGD to 1.9MGD

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Success Here in Kentucky

- Their costs per 1000 gallons pumped rose 4.5% annually over the last 10 years
- 90% of electrical usage is for pumping
  - Raw water pumps
  - WTP
  - High service
  - Pump stations
- Only 10% of electrical use was related to the office

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Success Here in Kentucky

- What did they do to cut costs
  - Precise pump management to match flow
  - Eliminated inefficient pump combinations
  - SOPs for pump start up and shut down
  - Operate WTP auxilliary equipment when high service pumps are cycled down

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Part 2

Reduce Water Loss Through Timely Leak Detection

Current Practice

- Set acceptable water loss
- Monitor unaccounted-for-water monthly
- When outside acceptance limit, look for leaks
- Leak detection

Current Practice

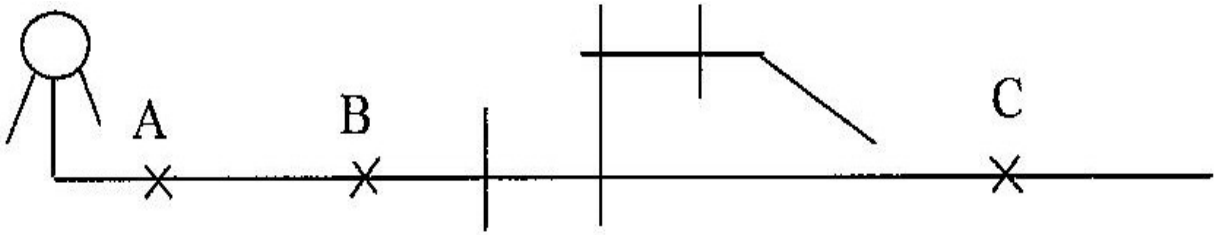
- Emphasis has been on leak detection
- Usual approach
  - Ride the system
  - Low pressure areas
  - More sophisticated techniques

What’s Wrong With It?

- Acceptance limit usually too high – 15% has been common- should be what’s practical to find – 10gpm?
- Too much delay before leak detection started and inefficient methods used

What’s The Impact?

- Typical Scenario - -
- System XYZ has 2000 meters



- Typical production = 14,000,000 gal/mo
- Loss @15% = 2,000,000 gal/mo
- 10 gpm leak starts between A&B day 1
- Day 30 loss is 2,432,000 or 17%

Continuing the Scenario

- At 17% unaccounted-for, does operator start leak detection? Probably not
- Assume on day 31 leak increases to 20 gpm because of water hammer.
- On day 60 loss for month is now 2,864,000 gal or about 20%
- Does operator now start leak detection? Best case – yes
- Assume leak found first day

Impact

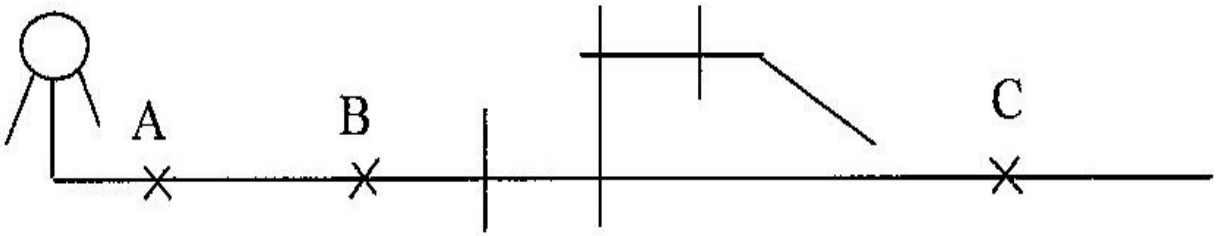
- Leak detection delay
  - Loss since leak started = 432,000 + 864,000 = 1,296,000 gallons
  - Electric cost = $650
  - Energy cost = 6500 kWh
  - CO_2 emission = 8450 lbs

Impact

- **Acceptable loss too high**
  - **15 % = 2,000,000 gal = 46 gpm**
  - **Should be about 10 gpm or ~ 35 gpm less**
  - **Water cost = 1,500,000 gal/mo or 18,000,000 gal/yr**
  - **Electric cost = $9,000/yr**
  - **Energy cost = 90,000 kWh/yr**
  - **CO_2 emissions =117,000 lbs**

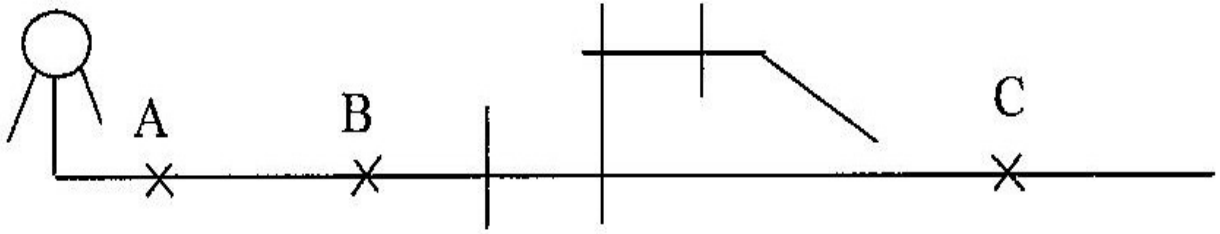
What’s The Solution?

Flow Measurement rather than unaccounted-for trigger



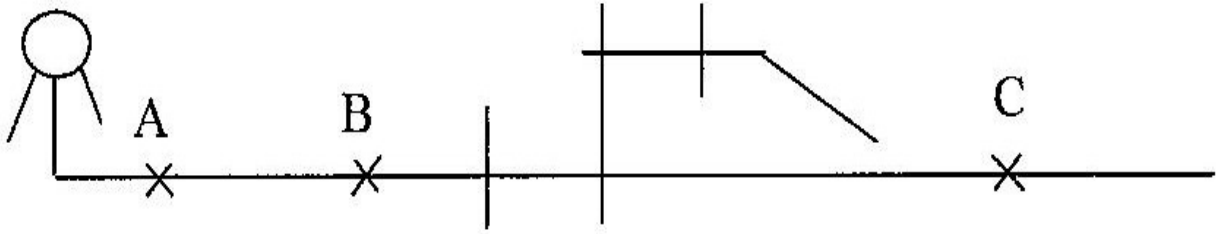
Put flow measurement device at point A In XYZ system

Revised Scenario



- Check flow every night at low use time
- Normally ~20 gpm but one morning 30 gpm
- Suspect 10 gpm leak
- That night or during day if low use, have someone watch meter and close valve B

Revised Scenario



- If flow stops, leak beyond B, if not it's between A & B
- By following this procedure, leak can rapidly be isolated between two valves.
- Once isolated, leak normally easy to find

Advantages

- Leak found in few days versus two or more months
- Save water lost through delayed detection
- Avoid loss due to inappropriate loss trigger (15%)
- Usually less man-hours spent on leak detection

Disadvantages

- Expense of flow measurement
- Possibility of working at night

Flow Measurement

- Two practical options
  - Saddle insert propeller meter – 4 – 8 inch
    - Cost - $1,700 to $2,000
  - Ultrasonic time-of-flight clamp on – one size
    - Cost – $2,500 to $5,000

Summary
Part 2

1. Percent acceptable loss no longer appropriate
2. Any leak that can be found should be – 10 gpm ?
3. Concentrate on flow measurement
4. Consider saddle insert propeller meters or ultrasonic time-of-flight clamp on meters

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