

# Presenting Revenue Protection And How One Utility Embraced it as a Standard Operating Procedure

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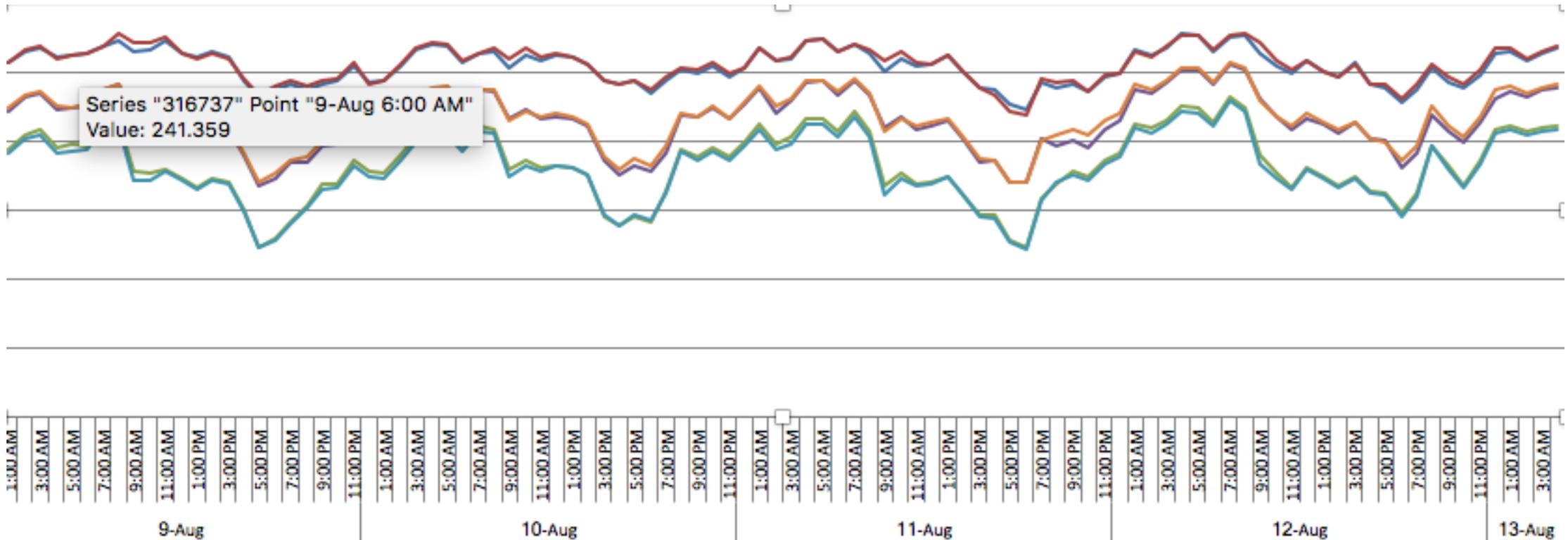
# Discovery

- July 2012 began networking with other electric utilities and discussing methods for identifying energy theft.
- Visited a local utility to discuss energy diversion, there was a brief mention of using voltage to identify diverted loads.
- August 2012 I had a lengthy conversation with Portland Gas and Electric on detecting fraud using voltage.
- Began a process of reading residential meter voltage, amps, kWh.
- Three days of data mining and charting high transformer standard deviation found first major diverted load.



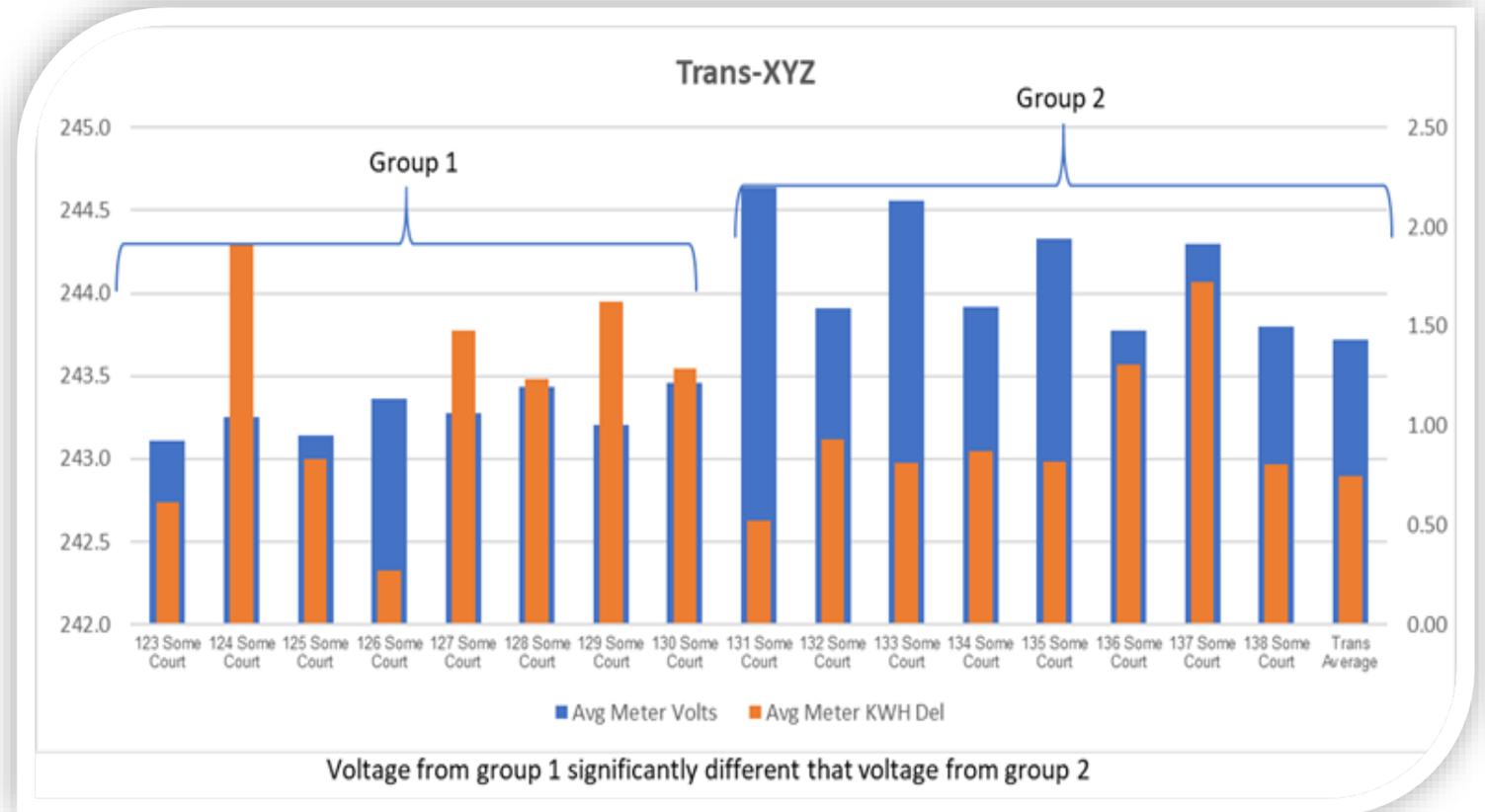
# Combining art with scientific electrical theory

First low-voltage outlier chart which identified a 100 amp diverted load.



# Sample of Mapping Error

The chart to the right shows the voltage and kWh for one transformer. It appears there may be a mapping issue as we see two distinct groups when looking at voltage. Mapping issues will mask voltage drops.



# Overcoming Hurdles to Implementation

- Management buy-in
- Organizing for Success
- Working With IT
- Where to Start



# Management Buy-in

## Building an Economic Case:

- Identify costs of NOT implementing - injuries, liabilities, lost revenues.
- Calculate revenue-only time-to-break-even for a low-voltage outlier analytics service -- likely to be within first several theft finds and recoveries.
- Generate a pro forma report validating the investment -- likely to be at least a 200%-600% return annually at the typical mid-sized utility.

World Bank says it is 3X cheaper to save 1 KWH by improving efficiency than investing in new generation plants

# Management Buy-in, continued

## Calculating back billing of diverted load

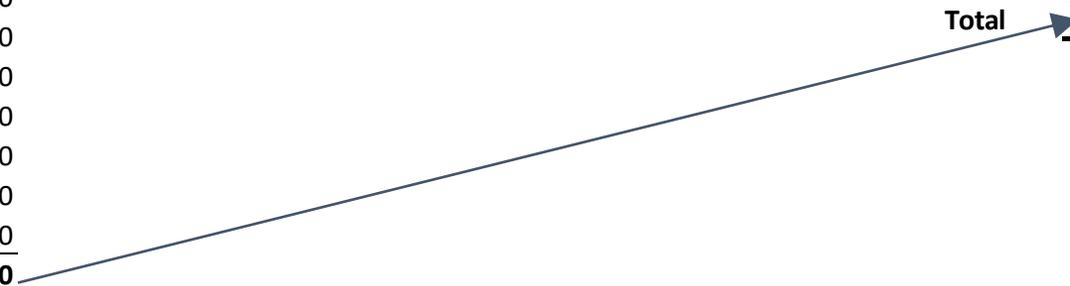
- Use measured diverted amperage to calculate the interval KWH diverted.
- Total the KWH diverted for each month in question.
- Apply rate structure to calculate amount due.

*Assumes 3.6 kWh per 1 Volt Drop*

Period	Transformer Voltage	Meter Voltage	Voltage Drop	KWH
1	240.598	239.058	1.540	5.5440
2	240.041	238.205	1.836	6.6096
3	240.561	238.613	1.948	7.0128
4	239.949	237.963	1.986	7.1496
5	240.468	238.483	1.985	7.1460
6	240.468	238.483	1.985	7.1460
7	240.468	238.483	1.985	7.1460
8	240.468	238.483	1.985	7.1460
9	240.468	238.483	1.985	7.1460
10	240.468	238.483	1.985	7.1460
11	240.468	238.483	1.985	7.1460
				<b>76.3380</b>

Example of 15 amp diverted load and interval voltage drop =>1 volt

Tier	kWh	Amount	Actual	
			kWh	\$ Amount
1	10	\$0.10	10.000	\$1.00
2	20	\$0.12	10.000	\$1.20
3	>30	\$0.15	56.338	\$8.45
<b>Total</b>			<b>76.338</b>	<b>\$10.65</b>



# Management Buy-in, continued

## Sample Proforma Using Outsourcing

### Revenue Recovery From Diverted Loads Found

#### Example Proforma

	QTR 1	QTR 2	QTR 3	QTR 4	Total
Number of Diversions Found	60	60	60	60	240
Recapture revenue	\$ 720,000	\$ 720,000	\$ 720,000	\$ 720,000	\$ 2,880,000
Net Revenue	\$ 720,000	\$ 720,000	\$ 720,000	\$ 720,000	\$ 2,880,000
Recapture Expenses	\$ (100,000)	\$ (60,000)	\$ (60,000)	\$ (60,000)	\$ (280,000)
Cost to investigate	\$ (30,000)	\$ (30,000)	\$ (30,000)	\$ (30,000)	\$ (120,000)
Legal Costs	\$ (120,000)	\$ (120,000)	\$ (120,000)	\$ (120,000)	\$ (480,000)
Total Expenses	\$ (250,000)	\$ (210,000)	\$ (210,000)	\$ (210,000)	\$ (880,000)
Net income (Expense)	\$ 470,000	\$ 510,000	\$ 510,000	\$ 510,000	\$ 2,000,000

\* Estimates only, for demonstration purposes

# Organizing for Success

- Internal or outsourced database analytics
- Group set up to respond to possible diversions
  - Technicians fully trained to test voltage, inspect fo diverted loads, verify proper meter installation, investigate and identify faulty secondary connections
- May need position created for these job duties.
- Energy diversion procedures may need to be revisited.



# Working With IT

- IT collaboration is critical whether outsourcing diversion analytics or setting up an internal operation.
- If outsourcing: Work with IT to feed a separate database used for diversion analytics -- outsourcing provider handles the rest.
- If performing analytics internally, need the above plus IT resources to:
  - Write the data mining queries and reporting
  - Interface with IT to explain electrical theory for rules to apply when writing queries
  - Monitor and backup database

# Where to Start

- Make sure your system is sending back **voltage** data!
- Write a trip report on what you have learned from this conference.
- Share resource materials provided.
- Connect with other utilities who have successful revenue protection programs as well as those who are searching for more resources.

