Unbilled Revenue using AMI

Refining a Process
May 21, 2018

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A Fortis Company

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Content

• About UNS Energy and Fortis, Inc.
• Pre-AMR/AMI Unbilled Estimation
• The Evolution of Meter Reading Technology
• Leveraging Real-time Usage and Tariff Level Pricing
• How the Model Works
• Go-Live
Polling Question #1

Where are you on the AMR (Automated Meter Reading) meter exchange spectrum?

- No meter exchanges to date
- 0-25% converted
- 25-50% converted
- 50-75% converted
- 75-100% converted
About UNS Energy

• Holding company located in Tucson Arizona that Owns 100% of Tucson Electric Power Company (TEP), UniSource Energy Services, Inc. (UES), and two unregulated subsidiaries.
Tucson Electric Power & UniSource Energy Services

- **TEP**
  - Approximately 422,000 retail electric customers
  - 1,155 square miles of service territory in southeastern Arizona
  - Vertically integrated with generation, transmission and distribution

- **UES**
  - Holding company that owns 100% of two regulated utilities, UNS Electric (UNSE) and UNS Gas (UNSG)
  - Serves various counties in northern and southern Arizona
  - UNSE – vertically integrated electric company with approximately 96,000 retail customers
  - UNSG – gas distribution company with approximately 156,000 retail customers
Pre-AMR/AMI Unbilled Estimation

- Derived unbilled usage
  - City Load less estimated line loss/LNU (Net City Load)
  - Net City Load less estimate of kWh/Therms billed in current month by cycle
    - Billed usage obtained from CC&B
  - Large Industrial & Mining Customer Unbilled – calculated by Energy Settlements
    - Known unbilled deducted from net city load
  - = unbilled usage
  - Spread across customer class based on billed revenue proration
  - Value based on average billed rate by customer class
Pre-AMR/AMI Unbilled Estimation

• Reasonableness Test
  • % change in Net City Load period over period is expected to be reasonably consistent with the % change in kWh sales
  • Prior month look-back comparing what was billed in the period to the prior period estimate is typically within 1-3%; over 5% = outside expectations
Evolution of Metering Technology
Evolution of Meter Reading Technology
Leveraging Real-Time Data and Tariff Level Rates

- Transition to SMART meters brings access to daily usage in 15-minute intervals
- Metering Data group reviews MDM interval data by customer for completeness and accuracy
- Energy Settlements is using the “real-time” data for large industrial and mining hand-bill (contract) customers to determine unbilled at month-end
- Project to refine and automate the entire TEP unbilled estimate is born
Polling Question #2

• For those who have the data:
  • Have you already changed your unbilled process?
  • Are you in the process of changing?
  • Just thinking about it?
  • Not sure?
The Model

• Step 1: Identify Active Service Agreements
• Step 2: Calculate Average Daily Usage
• Step 3: Obtain Actual Usage from meter data management (MDM) system
• Step 4: Validate Usage
• Step 5: Estimate On-Off Ratio
• Step 6: Build Rate Table
• Step 7: Apply Rate Table
• Step 8: Incorporate Time of Use (TOU) variability
Step 1: Active Service Agreements

- Import a list of active service agreements and current rate from billing system into a table.
**Step 2: Average Daily Usage**

- Use this formula to calculate Average Daily Usage from previous bill
  - \((\text{Total KWH/Days}) = \text{Average Daily Usage}\)
- Combine into Average Daily Usage Total
  - \(\text{Average Daily Usage} \times \text{Days Since Last Bill} = \text{Total Average Daily Usage}\).
- Put that in your back pocket.
Step 3: Actual Usage (MDM)

• Method 1
  • Sum deltas between register reads, where previous read is less than current read between last billed date and current date.

• Method 2
  • Sum Interval Data between last billed date and current date.
Step 4: Validate Actual Usage

- Actual Usage should be
  - > 0
  - < 12 Month Max Usage
  - Based on Actual Reads, not estimated reads
  - Anything else you can think of

- If Actual usage fails one of these validations, use the Average Daily Usage Total instead.
Step 5: Estimate ON OFF Ratio

- Use On and Off from previous bill to estimate ON/OFF Ratio
  - On-Peak KWH/Total
- Example
- 20 On-Peak /100 KWH = 20% OnPeak
- Save for later.
Step 6: Build Rate Table

- Rate table will contain one row per unique combination of Rate Code, Season, and tier.

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- Rate table will contain one row per unique combination of Season and tier.

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Step 6: Build Rate Table

- Find the right row through process of elimination
- Rate: EGSGS
- Season: Winter
- Usage: 6500

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Step 7: Execution - Use Rate Table

- Find the right row through process of elimination
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Step 7: Execution - Use Rate Table

- Formula:
  - \((\text{Usage} - (\text{LowerLimit} - 1)) \times \text{EC} + \text{FullLoad}\)
  - \(((6500 - 400) \times 0.0434) + 13.36\)
  - \((6100 \times 0.0434) + 13.36\)
  - \(264.74 + 13.36 = 278.1\)

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Step 8: Time of Use (TOU)

- Formula:
  - \((\text{Usage} - (\text{LowerLimit} - 1)) \times (1 - \text{OnPeakRatio})\)
  - \(*\text{EC}\)
  - +
  - \((\text{Usage} - (\text{LowerLimit} - 1)) \times (\text{OnPeakRatio})\)
  - \(*\text{EC\_Peak}\)

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Step 8: Time of Use (TOU)

- Formula:
  - \(((\text{Usage} - (\text{LowerLimit} - 1)) \times 0.8) \times \text{EC}_\text{ONPEAK}\)
  - +
  - \(((\text{Usage} - (\text{LowerLimit} - 1)) \times 0.2) \times \text{EC}_\text{ONPEAK}\)

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Model Summary

- Use previous bill to get Average Daily Usage (ADU)
- Multiply by days since last bill to get ADU Total
- Use previous ON/OFF to get On-Peak Ratio
- Try to get Actual Usage from MDM
- If Actual is not reasonable use ADU Total.
- Build rate table by hand
  - One Row per Rate Code, Tier and Season
  - Include both On and Off Peak charges
Model Summary

- Using Rate Code, Season and Usage total to find the row you need to generate the estimate.
- Apply On-Peak Ratio for TOU and calculate the estimate.
- Repeat 500K times.
- Calculate Daily
- Snapshot only on the first of each month.
Go-Live Success

• We rolled out the TEP estimation model in Jan-18
• Large Industrial and Mining unbilled still calculated by Energy Settlements outside of model
  • Phase II underway to include in model
• Mar-18 unbilled JE – earliest posting time on record
• Still evaluating impact on analysis
• Minimal change in SEC disclosure
  • Refinement of a process not a change in estimate
Polling Question #3

• If your unbilled revenue calculation uses AMI data:
  • How many replaced usage and price?
  • If you replaced an average price with actual rates, is your process similar to what Ken described?
  • Do you still consider it an estimate?
Questions