UNIQUE TECHNIQUES IN GIS TO IMPROVE DATA QUALITY

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COMMON DATA GAPS IN GIS DATA

• TRACKING IDLE SERVICES AND TRANSFORMER LOSSES
  • APPLYING BILLING LOAD TO MEMBERS
  • FINDING LOAD ISSUES
  • TRANSFORMER LOSSES

• HOW TO SOLVE DATA GAPS
  • WHAT TO CAPTURE OR NOT CAPTURE DURING FIELD INVENTORIES
  • MAKE SURE ALL WORK FLOWS THROUGH GIS

• BENEFITS IN SOLVING DATA GAPS IN GIS
TRACKING IDLE SERVICES AND TRANSFORMER LOSSES
• By using the Transformer Loading tool, Windmilm provided us with a list of transformers that had potential loading issues.

• This was extremely good data to have and investigate, but we were after transformers with no load and still active.
• Using the defined query below, we were able to query out all the transformers that had no load downline from each unit.

• Status of the upline sections can be defined by symbology telling us the state the upline parent is in.
FINDING MEMBERS WITH NO LOAD
MEMBERS WITH NO LOAD BUT STILL ENERGIZED
TRANSFORMER LOSSES

• The amount of loss depends on the conductor material and size, core material and lamination thickness, as well as the type of transformer—liquid-filled or dry type. Copper wire has less loss than aluminum conductor wire. Larger conductor wire and thinner core laminations have reduced losses as well. Liquid-filled transformers typically have lower losses than dry types. The following table provides loss amounts for a typical 75 KVA dry-type transformer. An aluminum conductor wire requires 66 percent more cross-sectional area than a copper wire to obtain the same current carrying capacity. As shown, the copper conductor wire transformers have significantly lower no-load losses.

<table>
<thead>
<tr>
<th>75 KVA 3 phase Dry-type Transformer</th>
<th>Winding Material</th>
<th>Core Losses (watts)</th>
<th>Load Losses (watts)</th>
<th>Total Losses (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard efficiency</td>
<td>AL</td>
<td>599</td>
<td>3,057</td>
<td>3,656</td>
</tr>
<tr>
<td>Premium efficiency</td>
<td>AL</td>
<td>290</td>
<td>2,700</td>
<td>2,990</td>
</tr>
<tr>
<td>Premium efficiency</td>
<td>CU</td>
<td>330</td>
<td>2,250</td>
<td>2,580</td>
</tr>
</tbody>
</table>
Data Gaps Increase Losses

Estimating the costs

How much can transformer losses cost a facility? Let's take as an example a manufacturing facility with 50 transformers rated at 500 KVA that are energized on weekends, but not providing any load. They would draw about 730 watts of no-load power each. Assuming an electric rate of 8 cents per kWh, it would cost:

\[
\text{Transformer no-load cost} = \text{Power (kW)} \times \text{Time (Hours)} \times \text{Electric rate ($/kWh)}
\]
\[
= 0.73 \text{ kW} \times 48 \text{ hrs/weekend} \times 50 \text{ weekends} \times 0.08\text{/kWh}
\]
\[
= $140 \text{ a year per transformer}
\]

At $140 each, those 50 units would cost about **$7,000 per year without doing any useful work**. That's the kind of number that will get your customer's attention.

Reducing transformer losses

The actual amount and cost of transformer losses will depend on the size, operations and type of equipment at each facility.

How do you reduce transformer losses? One way is to shut off the primary windings of unused transformers. Investing in higher efficiency transformers can also yield substantial long-term savings. How much? For an estimate, download National Grid's Transformer Savings Tool. The tool provides preliminary savings estimates and replacement specifications for each project.

*Image source: U.S. Department of Energy*
HOW TO SOLVE THE DATA GAPS
WHAT TO CAPTURE OR NOT CAPTURE DURING FIELD INVENTORIES

- What to be cautious of during field inventories:
  - More data collected increases price per point collected
  - Collected data that is not maintained becomes STAGNANT
  - Too much unnecessary collected data can be overwhelming to the end user
  - Storage requirements for all data being collected
    - Do You have Enough?
  - Is the data collected in a format the Utility can use for all applications
  - Pictures of Assets
    - Do you have a place to store them?
    - Do you have a process to maintain them?
    - Do you have means of displaying the pictures? Etc.
MAKE SURE ALL WORK FLOWS THROUGH GIS

This is the key to making sure GIS systems are always up to date

• Ensure all changes in the field get entered into the GIS system
  • Helps in OMS Systems to predict outages correctly because correct attributes are modeled in correct state
  • Engineering Analysis studies become more accurate
  • Allows the Utility to correctly predict Plant Net Worth

• Create process to ensure contracting crews can send data back to the utility

• When Correct data is being entered, all parties start to buy into the process everyone is now relaying on.
  • Buy in from all Parties
MODELING ATTRIBUTES TO TRUE STATUS IN THE FIELD
MODELING ATTRIBUTES TO TRUE STATUS IN THE FIELD
BENEFITS IN SOLVING DATA GAPS IN GIS
ENGINEERING MODELS ARE MORE ACCURATE

• All our Engineering Studies run on what is truly modeled in the field.
  1. Voltage Drop
  2. Capacitor Placement
  3. Load Balancing
  4. Arc Flash
  5. Coordination
  6. Work Plan Projects
OUTAGE PRACTICES AND RESPONSE TIMES

• Mobile viewers showed true state of systems.
  • What’s ENERGIZED versus what’s NOT.

• Field Crews could now exactly show the where services were disconnected.

• Idle services were left until the very end to work on in Storms.

• User By-In.
  • Gaining the lineman's trust.

• Work Flows changed
  • All model and asset changes flowed through the GIS system
ADDED REVENUE

• Created several new fields to track how long service was idle. (Asset data)
  • Clients were contacted after meter was inactive for 5 years
  • Clients can be notified that the line was going to retired if a meter was not energized
  • This creates revenue for the utility by applying monthly meter charges

• Sectionalizing radial taps
  • Allows utilities to sectionalize off the taps that were previously energized, but had no load

• The controversial one. REUSE OF EQUIPMENT. (meters, Trans, etc.)
  – Cost of Meter=$96.00
  – Cost of 25 kVA Overhead Trans=$830-$1700.
  – Labor to hang overhead trans=$117.70.(Subsidized) $3355(Unsubsidized Materials and Labor).

• How much is Line Loss Worth to a Utility?
THANK YOU!