Utility Metering
Methods & Uses

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Utility Metering

- Snapshot of metering at UNL
- How we meter utilities
- How we got here, and why
- How we use the data
- What the future holds
<table>
<thead>
<tr>
<th>Meter</th>
<th>BAS</th>
<th>manual</th>
<th>muni</th>
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<tr>
<td>Steam</td>
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</table>
jEMS hourly meter readings
jEMS hourly meter readings
jEMS monthly meter totals
Diagnostic Tools
Electric Meters

- typically Landis & Gyr
  - On transformer, or
  - At main distribution panel
- 3 ph, 480V
- count KYZ pulses through modbus
- jEMS converts pulse rate into kW
Electric Meters
Chilled Water Meters

- Yokogawa electromagnetic meter
- read flow + 2 temps into jEMS
- recalculate Tons each minute
- installed in bypass

- vortex meters don’t provide turndown
Chilled Water Meters
Steam Condensate Meters

- Yokogawa electromagnetic (1”)
- count pulses (gallons)
- connect flow & temp to troubleshoot
- install on outlet of condensate pump
- install so bypass is always flooded

- bad history with mechanical meters and steam flow meters
Steam Condensate Meters
Electric
- clamp-on ammeter to measure power
- compare to meter kW output

CHW & condensate
- close valves to zero
- open valves to check max flowrate
- occasionally use clamp-on ultrasonic
Municipal Meters into jEMS

- Electric – just connect to KYZ
- Natural Gas
  - Rotary meters have pulse output
  - Diaphragm meters usually do not
  - Sometimes cheaper to install another
- Water – slowly installing our own
How did we get here?

- Historical divide between Utility Department and Bldg. Maintenance
  - utilities read meters monthly in revenue buildings and billed them
  - academic buildings had meters but they had not been read for decades
  - no idea what 70% of buildings used

- Maintenance metered a few buildings, mostly as a hobby
How did we get here?

- Nebraska Utilities Corporation
- Plan to bill departments for energy
  - edict: meter all buildings
  - jEMS was there to automate metering
- Facilities reorganization
  - created Utilities & Energy Management
  - Cooperation between Central Utilities and Building Maintenance & Controls
render monthly bills (revenue bldgs)
- mix of automatic and manual reads
- jEMS combines those into single list
- tabulate monthly use for all bldgs
- display on UEM dashboard
- use for planning and budgets
- municipal bills are still a problem
Education & Information
## Baseline & Prioritization

<table>
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<tr>
<th>bldg</th>
<th>elec</th>
<th>chw</th>
<th>steam</th>
<th>total_kbtu</th>
<th>total_cost</th>
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</table>
Troubleshooting

- automatic alarms
  - buildings using more/less than usual
- trend plots
  - when did a system mess up?
- coordinate device/system control
  - energy use can confirm device feedback or indicate faulty sensors
What are we working on now?

- Get all meters into jEMS
  - manual meters reading automatically
  - municipal bills received electronically
  - municipal meters read in real-time
- Near real-time operating costs
  - hourly data on our dashboards
  - real-time picture of energy flows
What are we working on now?

- predict chiller loading at plant
  - inputs: temperature, RH%, hour of day
  - predicting ±600 Tons 24 hours ahead
  - predicting ±200 Tons 4 hours ahead

better information for operators allows lower operating costs
What are we working on now?

- Integrate Plant with Campus
- jEMS reads Wonderware (plant SCADA) and uses it for calculations
- jEMS data displayed to Plant Operators to aid in operating decisions
- Plant data and Building Data give a better picture of system performance
What are we working on now?

- collect automatic data in 15-minute intervals
- improve peak load data
- faster response to problems
- more detailed data
- long term: campus “smart-grid”