Metering: A Practitioner's Perspective

Dr Paul Bannister
Getting value of metering takes effort ....but it’s worth it.
Overview

> Why is metering important?
> Design/construction issues
> Operational issues
> The future
Why is Metering Important?

> Metering is important because

– The environmental and financial cost of your energy use is determined by the metered energy use
– It shows what is actually happening
  • Not just what the BMS thinks is happening
– It gives visibility to the things you don’t control
  • Or the things you’ve lost control of
– It tells us what’s important
  • What really needs to be fixed?
– It tells us whether interventions have actually worked
  • Also how well and when they have worked
  • Which feeds into continuous improvement of those interventions
Why does Metering get a Bad Name?

> Metering is not a universal panacea!
> Many metering systems suffer because:
  – Coverage/location of meters unclear
  – Meter readings don’t make any sense
  – Metering data is presented poorly
  – Potential beneficiaries of metering data are time poor
  – Ownership of data sometimes problematic
  – Interpretation needs skills
  – No benefits achieved without someone actually acting on the information
    • A lot of cats to herd to make this happen!
> Getting it right takes effort
Designing a Useful Metering System

- Metering systems must provide useful information
  - The consumption of “MSSB-1A/3” is not necessarily useful information
    - What’s on that board?
    - Green Star has a bit to answer for on this point
    - If I see a spike, what system does that come from?
  - So metering systems have to be designed to produce information
    - Not just data
  - Best to avoid subtraction meters
    - Almost always problematic

> What are the key information needs of your site?
  - Billing
  - NABERS
  - Major end-uses (HVAC/Lights/Power)
  - Minor end-uses (chillers, pumps, fans, boilers.....)
For a functional metering system you need:

- Meters marked on a single line diagram
- Meters marked up on distribution board listings
- Meter model and CT size listing
- One naming convention, the same:
  - On the meters
  - On the drawings
  - On the screen
Commissioning

> Key commissioning questions
  – Documentation Check:
    • Meter type/model
    • CT size, ratio
    • Physical location, and position on single line diagram
    • Coverage
  – Validation
    • CT ratio programming; CT polarity
    • Current, voltage vs independent measurement
    • Data on meter vs data on remote meter reading system
Communications

> Best to have:
  – On-board data storage for the meter
  – High level interface from meter to meter reading system
    • E.g. Modbus, etc

> Problem systems
  – Manual reading
    • Won’t get done; limited data makes it useless other than billing
  – Pulse meters
    • Highly prone to comms issues; data loss, misreads
> Data points are just numbers so how to make them useful?
  – Present data by energy end-use using aggregates of physical meters
    • Individual meter data only interesting as a drill down
  – Enable real time data plots and time-based aggregates
    • Actual energy time of use profile today/other day
    • Aggregate energy end use breakdown last 24 hours
  – Think about the user, who is trying to fix issues:
    • Focus on useful and timely information
    • Reporting and screens configured to empower the user
  – Benchmarking processes:
    • How am I doing today?
    • How am I doing this week/month/year
    • How am I doing against external benchmarks or my peers
Today’s activities and events immediately visible
Another Useful Top Level Presentation

- Exterior lighting, 2,044, 0%
- Back of House Lighting, 10,569, 1%
- Bathroom Lighting, 6,501, 1%
- Common Area Lighting, 51,369, 7%
- Fire stair Lighting, 27,233, 4%
- VSD, 13,775, 2%
- VAV Reheat, 84,811, 11%
- Tenant Condenser Water Pumps, 30,886, 4%
- General Exhaust Fans, 5,770, 1%
- Fan Coil Units, 20,948, 3%
- GF Elec Duct Heaters, 12,266, 2%
- Cooling Towers, 21,146, 3%
- Condenser Water Pumps, 38,402, 5%
- Chillers, 84,927, 11%
- Chilled Water Pumps, 23,770, 3%
- Carpark Fans, 8,824, 1%
- Air Handling, 244,681, 33%
Some Screen Logic: Investigative workflow

Whole Building

Major Subsystems

Minors subsystems & meters
Benchmarking

> Compare:
  > How are you doing against your own history
  >   • In this hour
  >   • Comparable day (Wednesday vs Wednesday)
  >   • Comparable week/month/year
  >   • Comparable circumstances (weather, production adjustment)
  > How are you doing against an external benchmark?
  >   • NABERS
  >   • Net Zero
  >   • In-house/external benchmark from other sites
Useful Profile Benchmarking

Issues are immediately visible

Energy Demand (kW)

Time (hr)

Actual
Expected
Turning Information into Action

> Alerts and alarms must be really worth it
  – Must be timely, relevant and worthy of attention
  – Otherwise they’re just noise
> Who is going to use the metering system?
  – Ease of access
  – Information presentation
  – Time, skill, responsibility?
> May be value in third party oversight
  – Contractor/consultant engaged to keep an eye on the data, diagnose issues and advise solutions
Metering....and beyond

At the forefront of metering:

- Multi-site systems
  - Enabling comparisons at site/subsystem level within a portfolio

- Automatic Fault Diagnosis (AFD)
  - Most often these look at BMS not metering data for failure patterns
  - Also possible with metering systems by themselves
  - Fully integrated BMS/Metering AFD very powerful
    - Somewhat underdeveloped at present, though

- Cloud metering
  - Current, voltage measurement in the field
  - KWh, kVA calculation and data in the cloud

- Wireless
  - Meters, CTs ....
Metering can be great value but it takes effort in:

- Design
- Documentation
- Commissioning
- Turning data into information
  - Relevant and worthy of attention
  - Timely
  - Actionable
- Turning information into action
- Information presentation
Questions

Twitter: @EnergyActionAUS
LinkedIn: www.linkedin.com/company/energy-action
Email: info@energyaction.com.au
Web: www.energyaction.com.au
National number: 1300 553 551