Nathaniel Jones

WSU CESI Lab

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Building Demand Characterization Metrics

1. Turndown Ratio
   1. Max. value / min. value
2. Minimum 95% Range
   1. 95% of data points that result in lowest range (min-max).
3. Outlier Difference – (low, high)
   1. Low: Absolute minimum minus min. 95% range minimum
   2. High: Absolute maximum minus min. 95% range maximum
4. Demand Histogram (% of peak demand)
   1. Number of data points within 0-10%, 10-20%, …, 90-100% (For width = 10%)
5. Cumulative Demand Histogram (% of peak demand)
   1. Cumulative histogram of Demand Histogram.
6. Peak Magnitude Standard Deviation with Seasonal Bias Correction
   1. Average a week or two to left and right to get seasonally averaged demand. Then find st. dev. of daily peaks.
7. Peak Magnitude Standard Deviation without Seasonal Bias Correction
   1. Average all data points to get total averaged demand. Then find st. dev. of daily peaks.
8. Peak Time (hrs)
   1. Range of hours between which peak occurs. Peak defined as the hours within 5% of peak value determined by Min. 95% Range.
9. Trough Time (hrs)
   1. Range of hours between which trough occurs. Trough defined as the hours within 5% of minimum value determined by Min. 95% Range.
10. Peak Duration (hrs)
    1. Number hours within 5% of peak value determined by Min. 95% Range
11. Trough Duration (hrs)
    1. Number hours within 5% of trough value determined by Min. 95% Range
12. Maximum Ramp Rate to Peak (%/hr)
    1. Maximum slope of 3-point averaged (current, one behind, and one ahead) demand.
13. Transience (%/hr)
    1. Mean abs. value of slope
14. Turbulence (%/hr2)
    1. Mean abs. value of change in slope
15. Maximum Slope Difference (%/hr)
    1. Maximum of slope differences from hour to hour
16. Number Local Peaks
17. Peak Demand Value (kWh)
    1. Absolute largest magnitude of demand.
18. Average Demand Value (kWh)
    1. Mean of all values in one day
19. Annual Trend (kWh/hr)
    1. Final minus initial value of seasonally averaged demand, divided by 8760 hours.
20. Peak Skew (%) (only applies for non-plateauing behavior)
    1. This would be difficult…
21. Time Unsteady (hrs)
    1. Number of hours within which demand is changing by more than 10% of peak demand.
22. Noise
    1. St. dev. of data minus smoothed data (2- or 4-hr smoothing).
23. Measurement Noise
    1. Average of % Peak Power Demand minus % Peak Energy Demand values.
24. Heating-Electric Overlap
    1. L2-norm (sum of square errors). Errors are abs(%electric - %heating).
25. Cooling-Electric Overlap
    1. L2-norm (sum of square errors). Errors are abs(%electric - %cooling).