An Animated Look at Demand Response Baseline Parameters

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Abstract

In previous WLRA's, authors have taken statistical looks at alternative Demand Response Baselines. This presentation examines the ramifications of typical baseline parameters and explores the relative sensitivity on peak days.

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Overview

We aggregated service meter data for a PJM demand response program for the summer of 2015. We consider the 5CP hours as the demand response hours for which to create the demand response baselines. We explore through animation, the sensitivity to various baseline parameters:

- individual prior days
- aggregate of prior days
- additive and multiplicative adjustments
- adjustment windows
- adjustment limits

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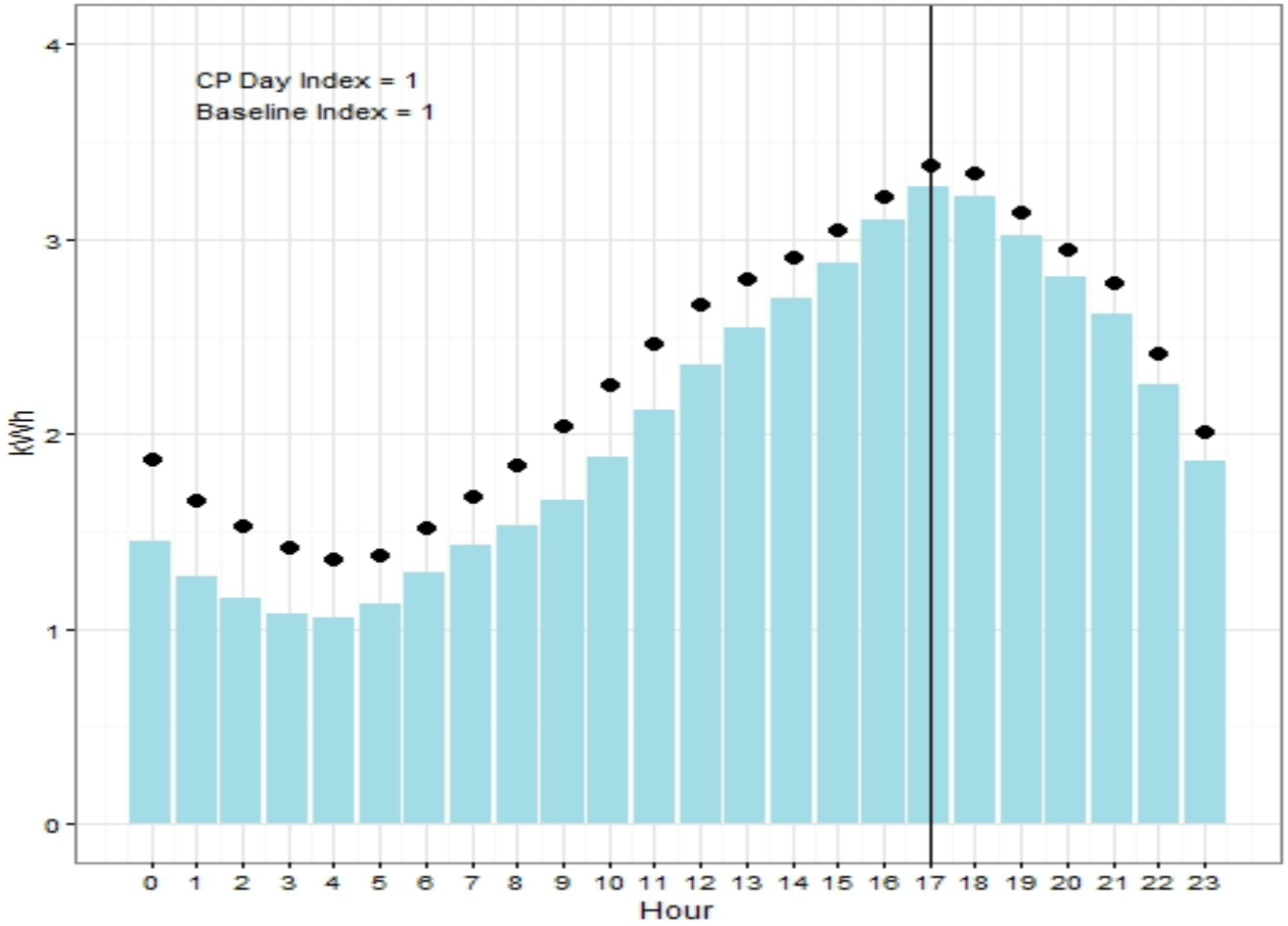
Contribution of Different Prior Days

Steps through different CP days (colored bars)

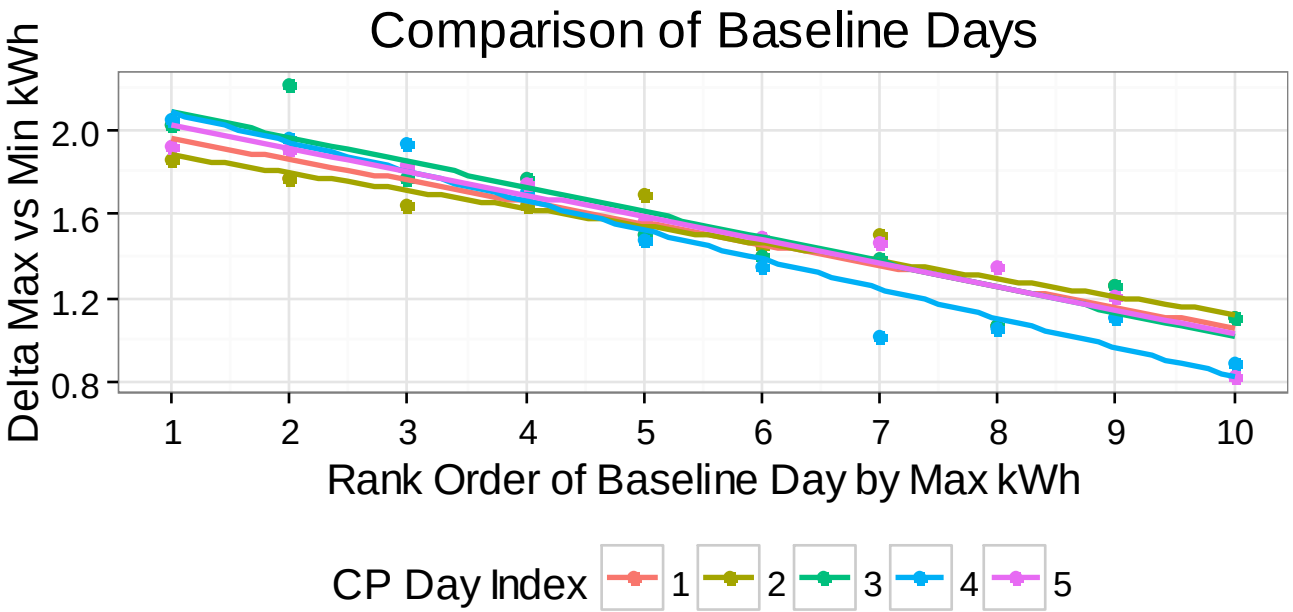
And steps through 10 eligible baseline days for each CP day

CP hour – solid line



Contribution of Different Prior Days

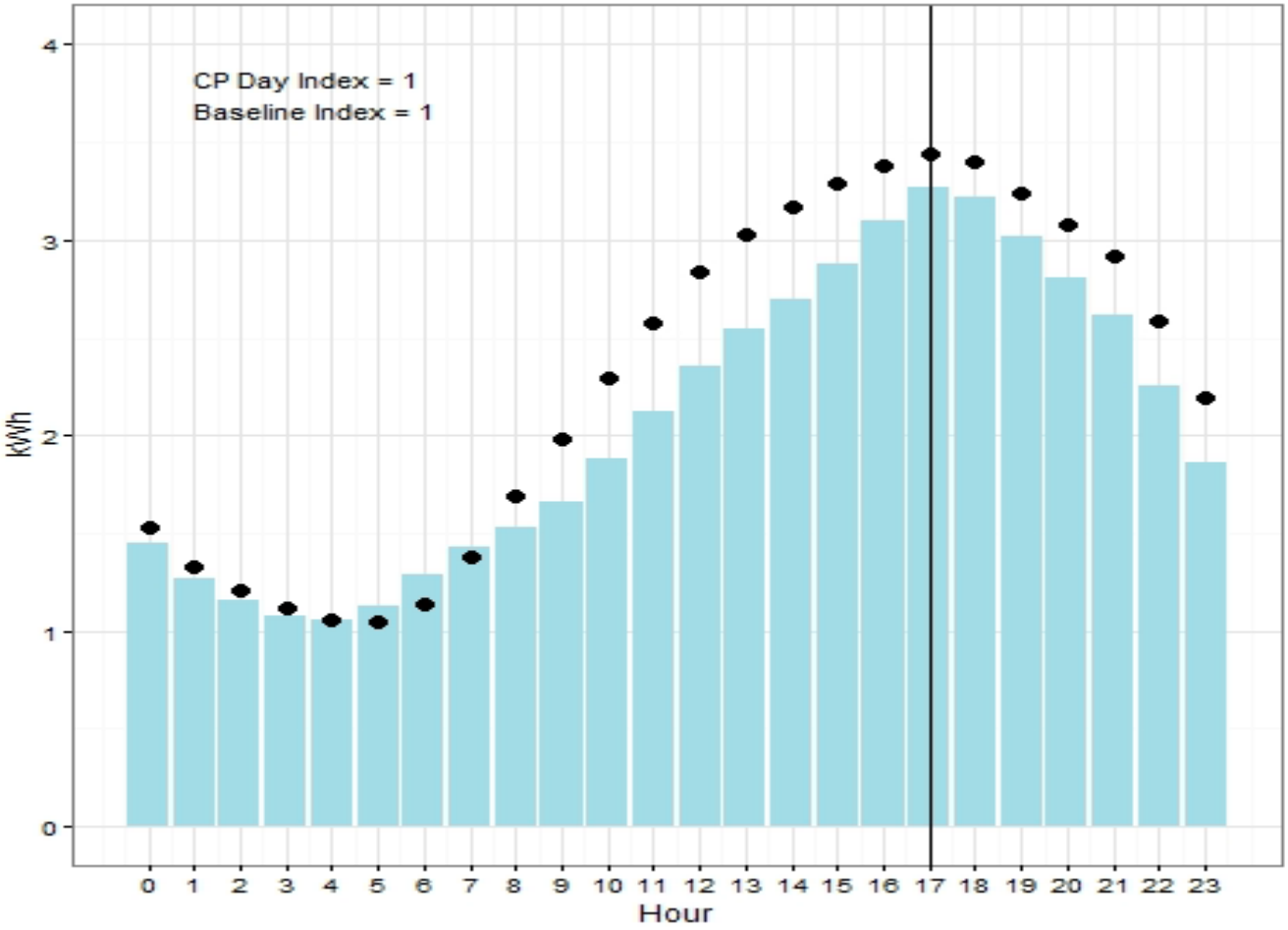
- High load days more closely match shape of critical peak days
- First order is the relative magnitude
- Consider delta of maximum use versus minimum use
- Smaller delta use will impact match with classic adjustments



n of 10 Averaged Baseline

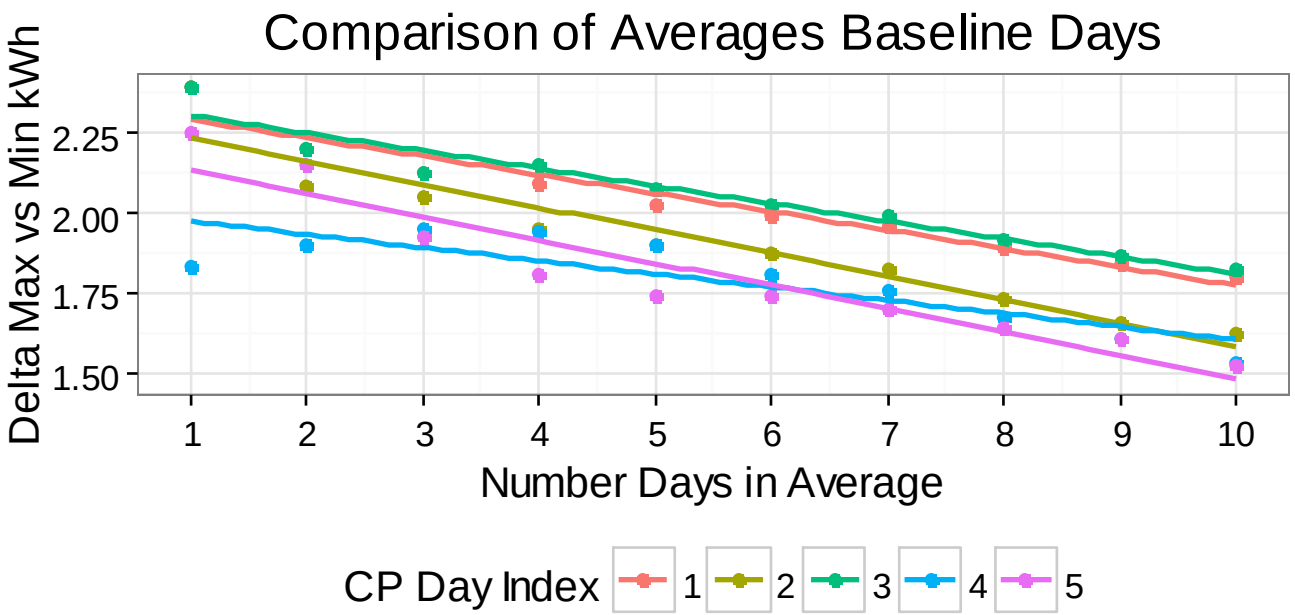
Steps through different CP days (bars)

And steps through averages of 1 to 10 eligible baseline days for each CP day



Contribution of averaging prior days

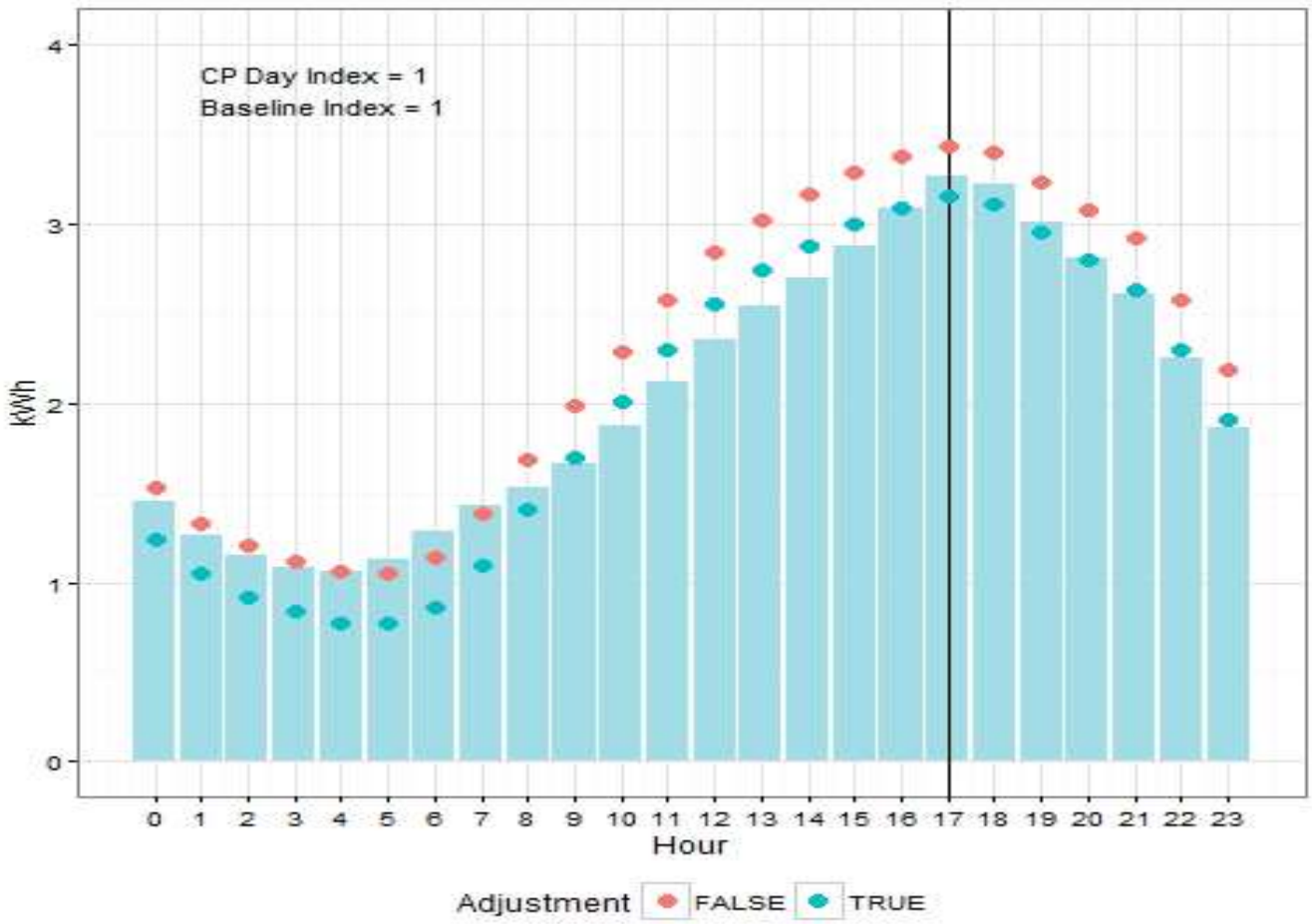
- Averaging many dates leads to baselines that are much flatter than peak days
- Shape of peak days are not matched well
- Generally underestimates peak hour



Prior Hour Additive Adjustment - n of 10 days

Steps through different CP days (bars)

Step through averages of 1 to 10 eligible baseline days for each CP day with adjustment



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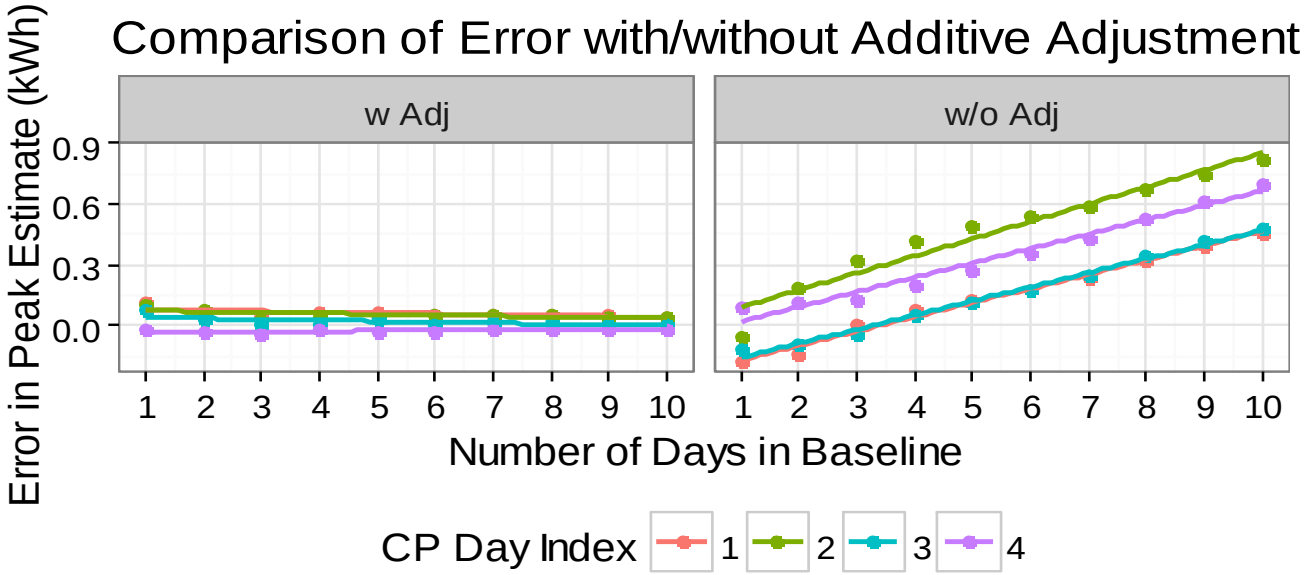
Prior Hour Additive Adjustment

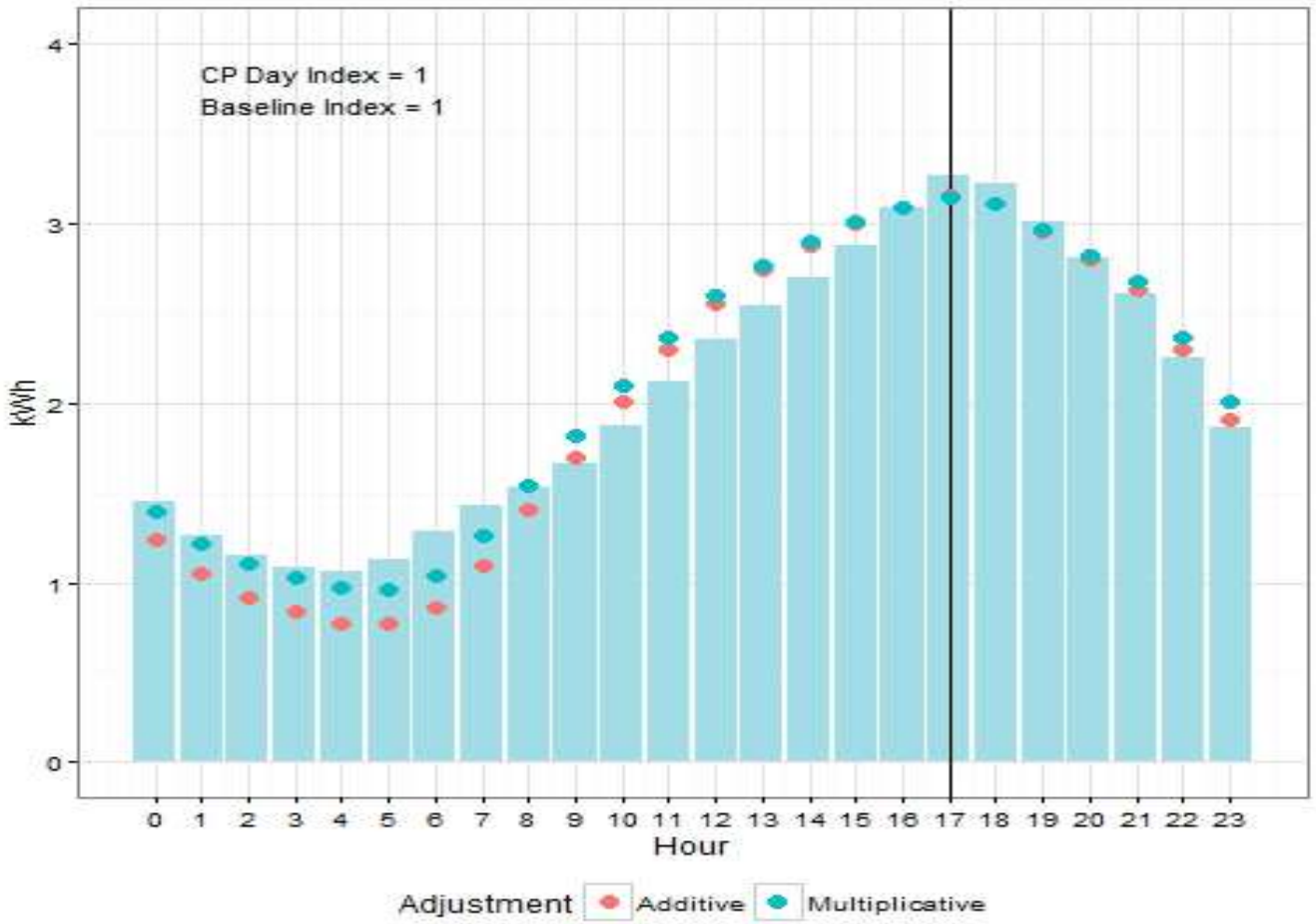
- Forces baseline to match peak day load in adjustment hour
- In the peak hour, the adjustment may be inadequate due to rapidly increasing load leading up to peak hour
- But an adjustment is needed to come close to matching peak load



Add vs Mult - n of 10 Days

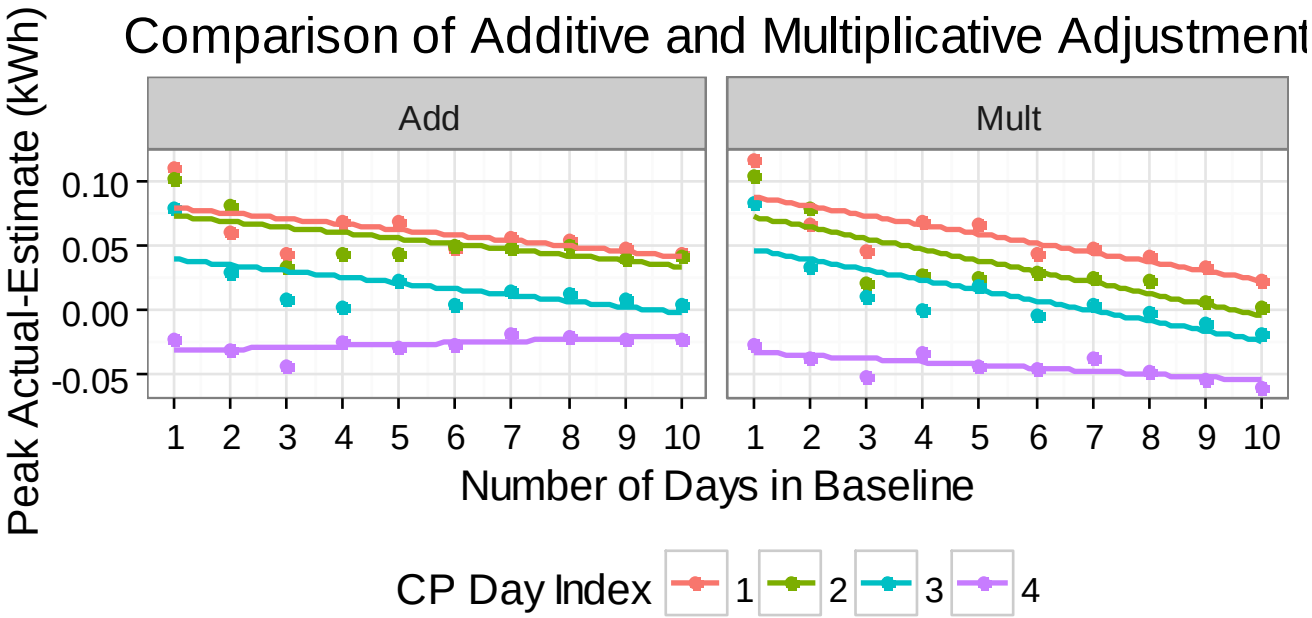
Steps through different CP days (bars)

Step through averages of 1 to 10 eligible baseline days for each CP day with both adjustments



Add vs Mult - n of 10 Days

- Difference between the two is not compelling
- Multiplicative appears to tend to eliminate error with more days on average

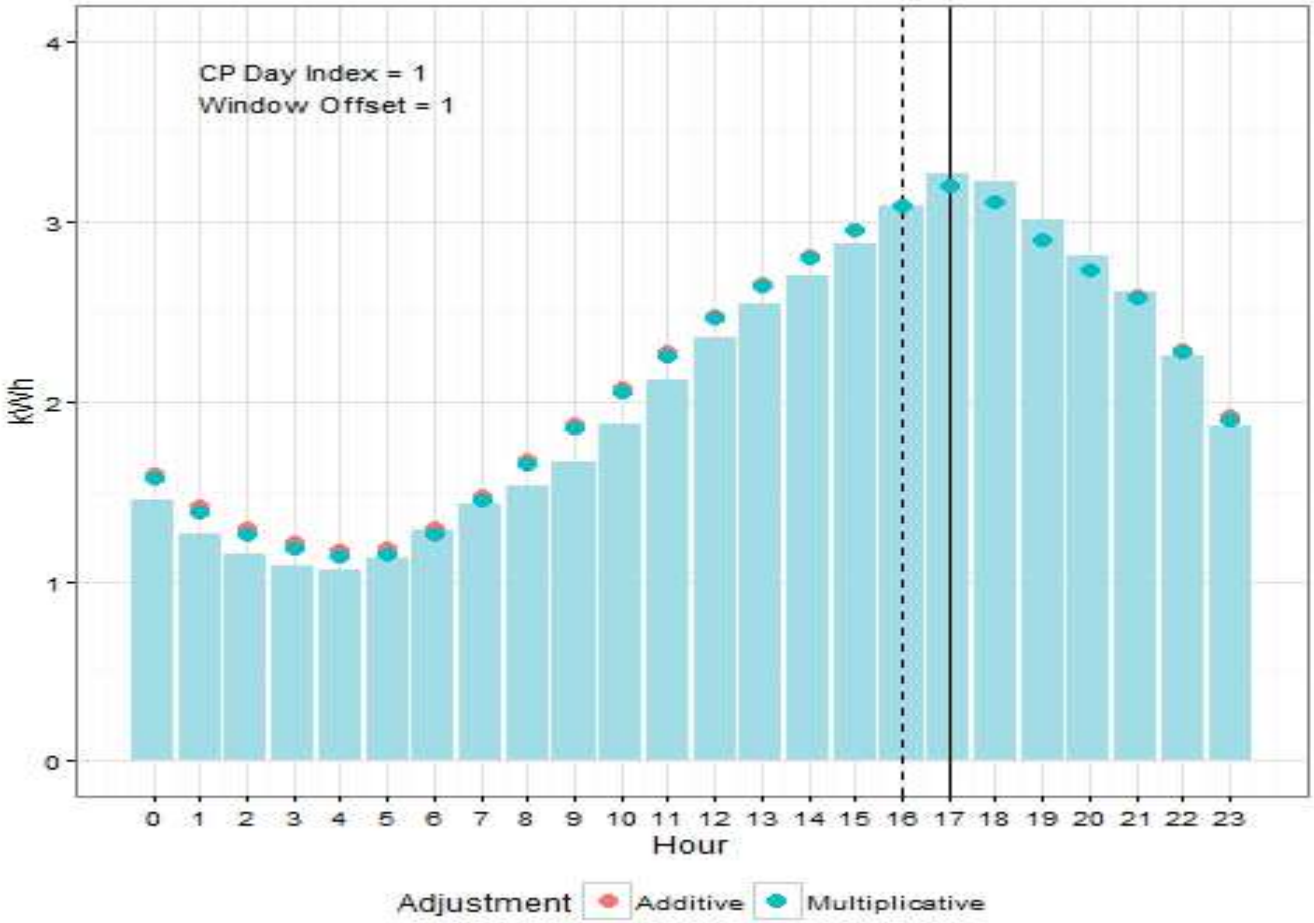


Adjustment Window

Steps through different CP days (bars)

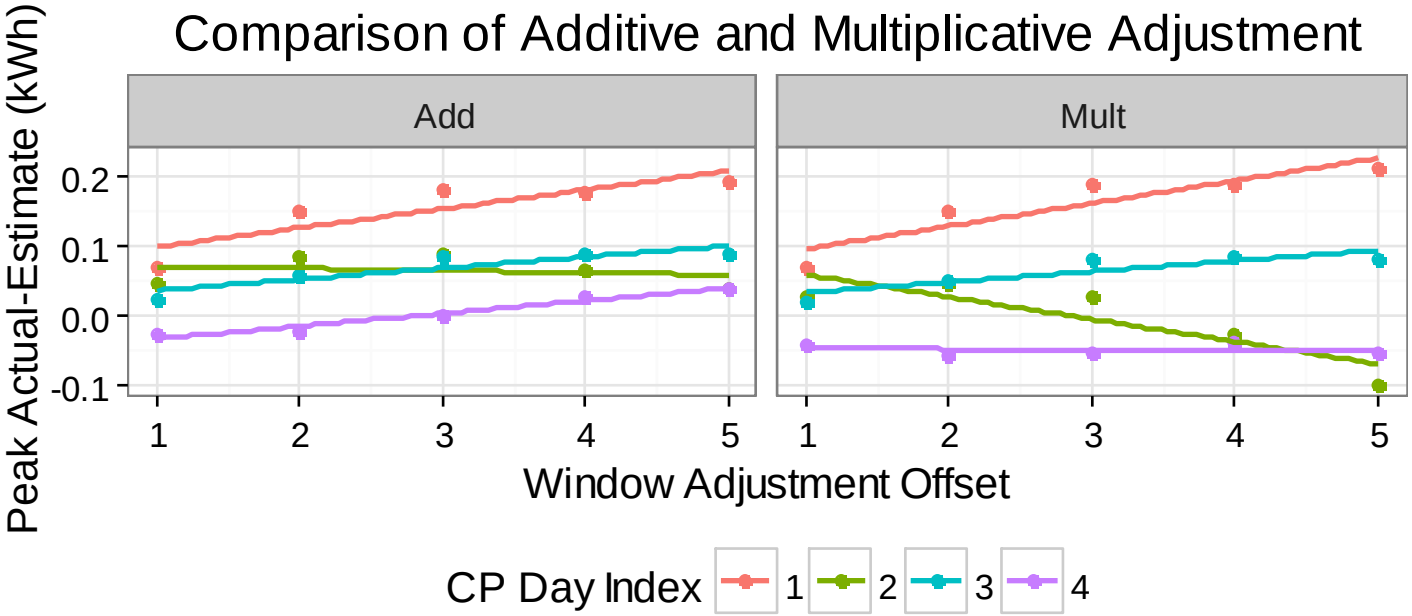
Varies the hour of the adjustment window (dotted line)

Uses 5 baseline days



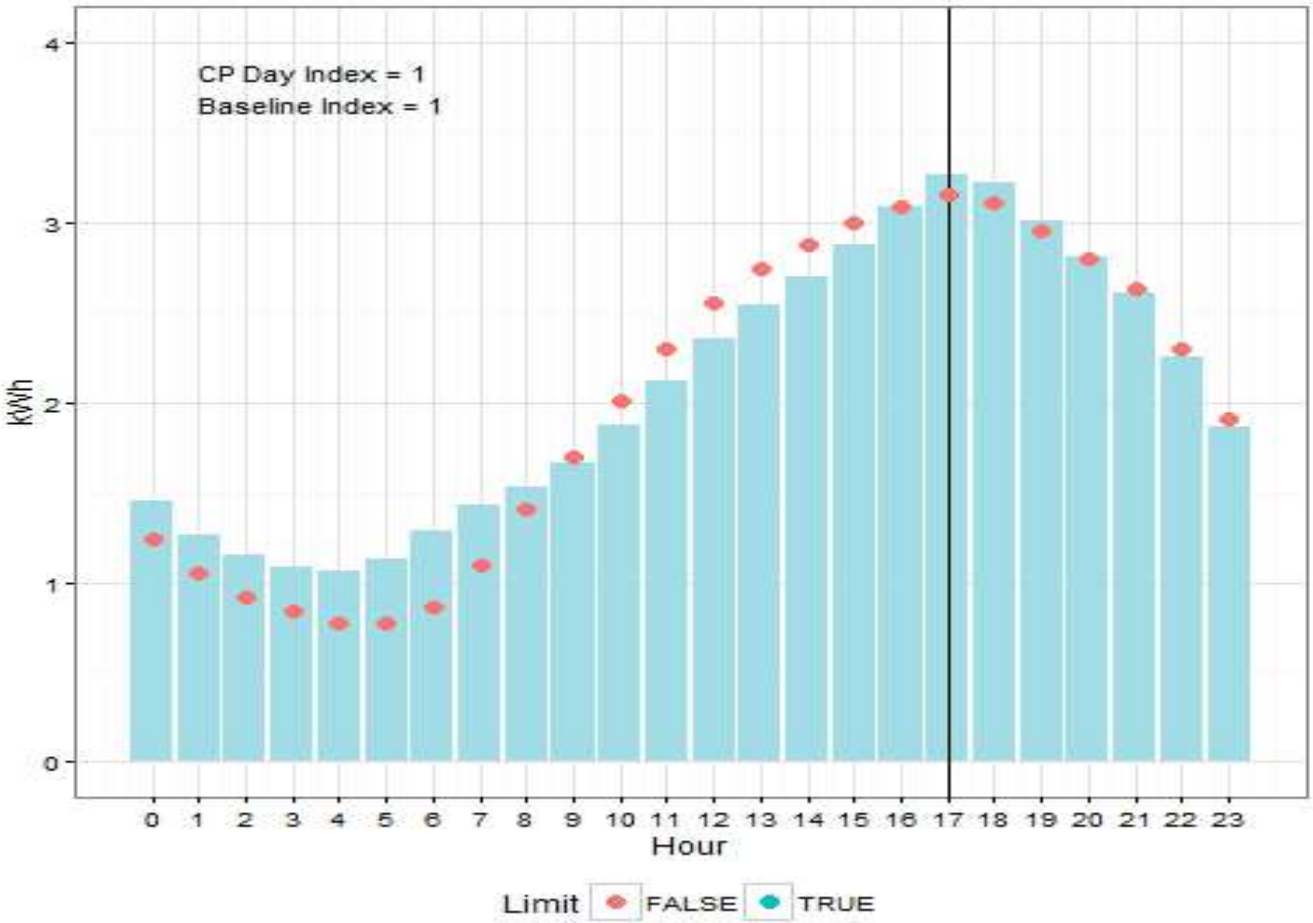
Adjustment Window

- Earlier adjustment windows are believed to minimize gaming by participants who can increase their load to modify their adjustment factor.
- But moving adjustment window back accentuates effect of flatter unadjusted baselines that do not scale to the peak load (one hour presented)



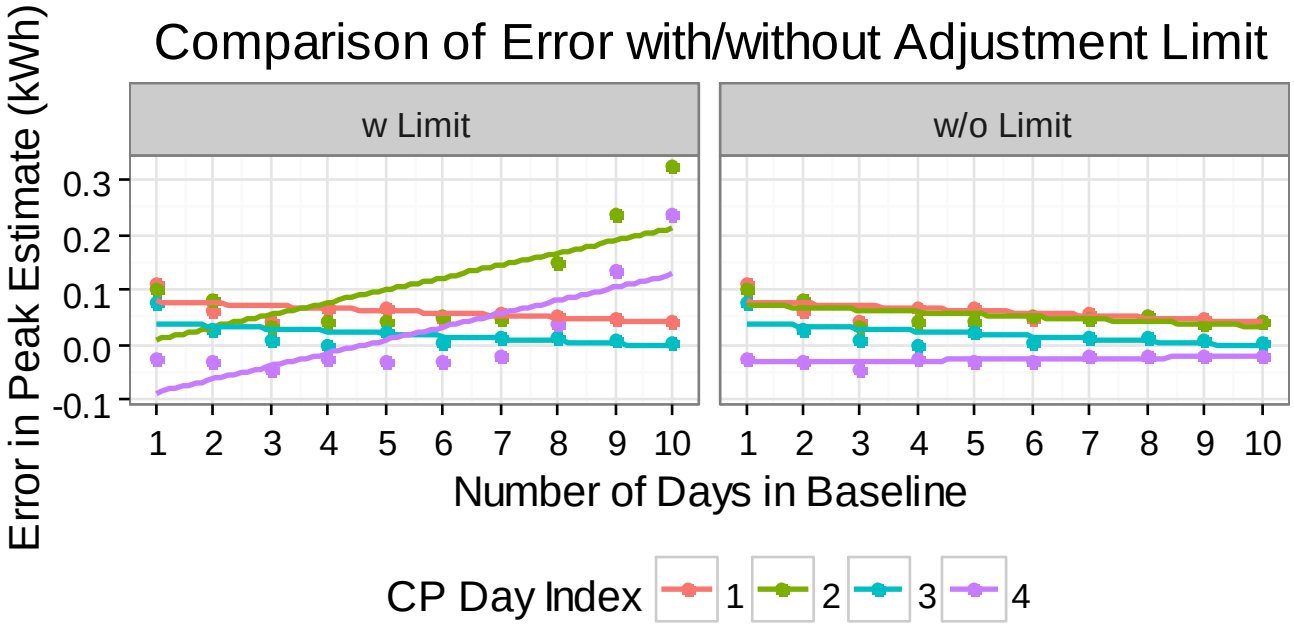
Adjustment Limits

Shows effect of 20% limit on additive adjustment



Adjustment Limits

- Nature of the residential customer profile makes these more constraining than for commercial/industrial customers



Overall Observations

- We see following trends
  - Using high usage days helps to match peak days
  - More days in baseline makes it harder to match a peak day
  - Additive or Multiplicative adjustments are important
  - Adjustment window should be close to curtailment hours
  - Adjustment limits constrain matching of peak days

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