

Seeking Answers

Strategies for Interpreting Consumption Analyses

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Consumption
Analysis

vs

Metering and On-
site Measurement

Less expensive



More expensive

Large sample size



Smaller sample size

Consumption



Equipment

May not explain
reasons for RR



May identify project-
specific issues

Can consumption analysis be used to determine
the underlying reasons for RRs? Yes!



Steps Involved

- 1 Review algorithms and pick out inputs likely to affect measure performance
- 2 Select inputs that are potential key drivers to overstatement of savings
- 3 Reality check using consumption data
- 4 Sensitivity analysis to isolate impacts
- 5 Consider field observation or targeted metering on a small sample if needed
- 6 Review other relevant studies to inform results





MF Program Evaluation

MF Program Evaluation

Impact evaluation of a multifamily (MF) program in the Northeast

Four program components: electric common area, natural gas common area, in-unit, and custom measures.

Common area measures were the focus of this evaluation.

Primary common area measures were lighting and boiler controls.

Conducted billing analyses, resulting in low RRs (~40%) for electric and gas measures.



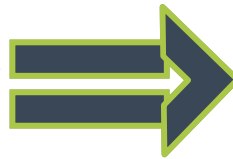
Reasons for Low Lighting RR

Units



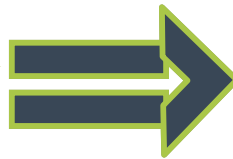
Overstate number of lighting products

Baseline W



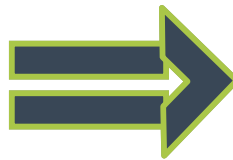
Overstate baseline W

Efficient W



Understate efficient W

HOU



Overstate baseline and efficient HOU



re·al·i·ty check

[rē'alədē CHek]

NOUN

reality

checks (*plural noun*)

To provide a gross
check on whether
the *ex ante* baseline
and efficient
lighting

consumption is
within a reasonable
range, each program
input was tested,
and the estimated
consumption was
compared to pre- or
post-consumption
data.



$$\text{kWh}_{base} = \left[\frac{(W \times \text{units})_{base}}{1,000} \right] \times HOU \times (1 + \text{HVAC}_c)$$



Determine baseline lighting use from program inputs



Compare baseline program use to pre-install bills



Assess whether lighting use is within a reasonable range of the overall use



Red flag alert: Program use is greater than billed use.



Baseline Lighting Analysis

Determine
program baseline
kWh from
program inputs.

1

kWh Program =
Units x W x HOU

Divide baseline
use by pre-install
billed use.

2

% bills =
kWh program/
kWh bills*

*Removed weather effects

Group buildings
by % bills
from Step 2.

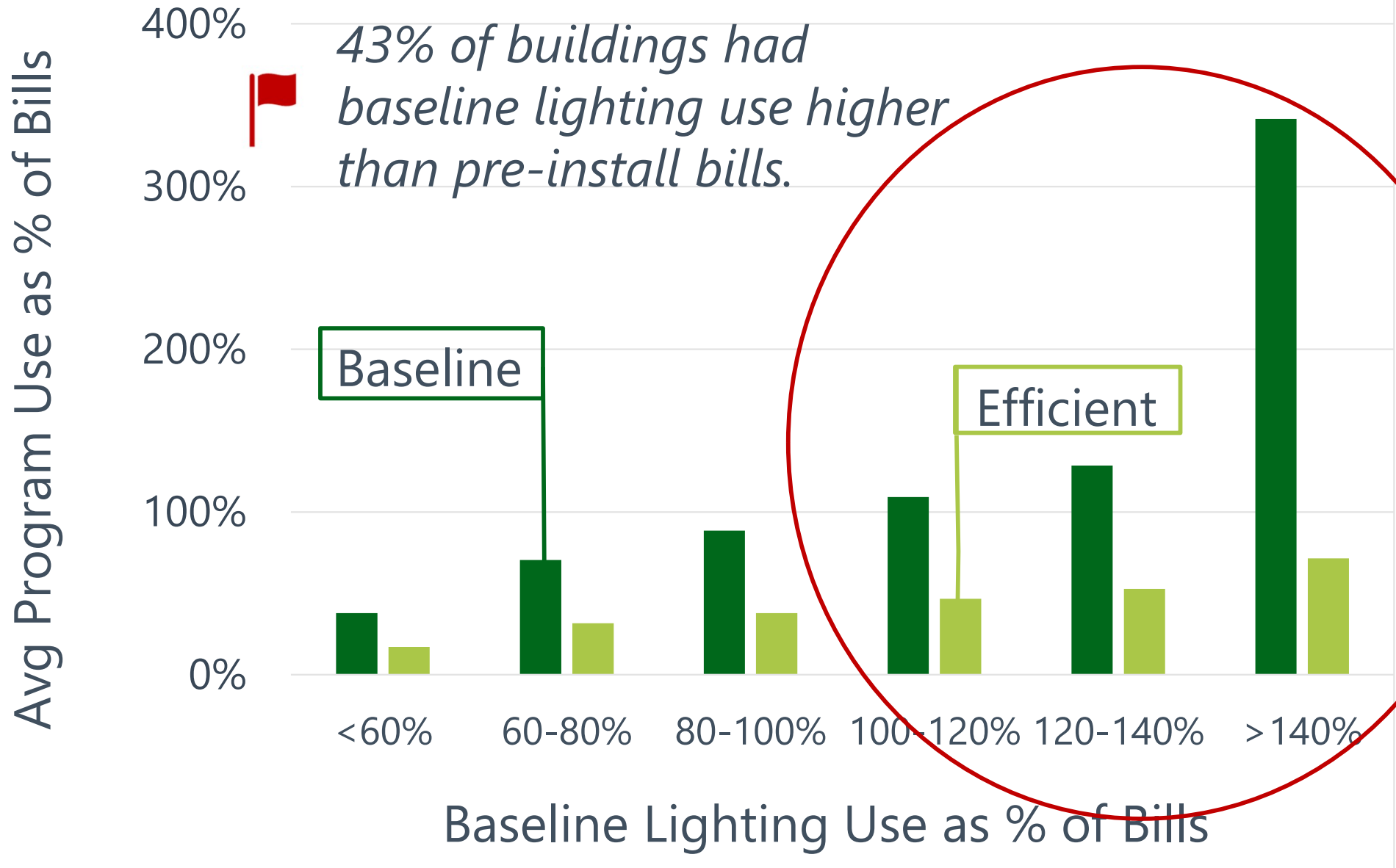
3

 **Red flag alert**

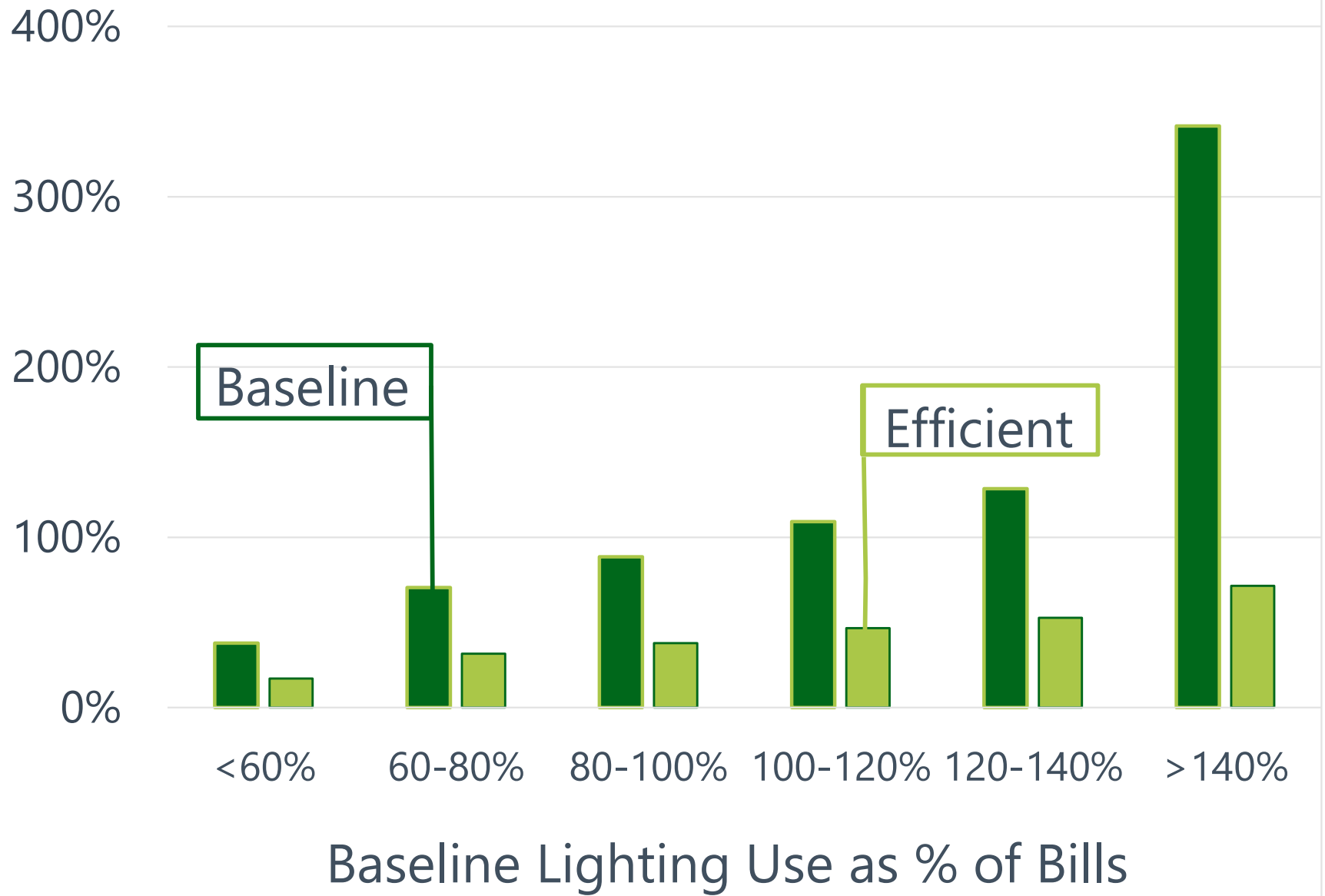
% bills > 100%,
program baseline
kWh is too high.



What Did We Find?

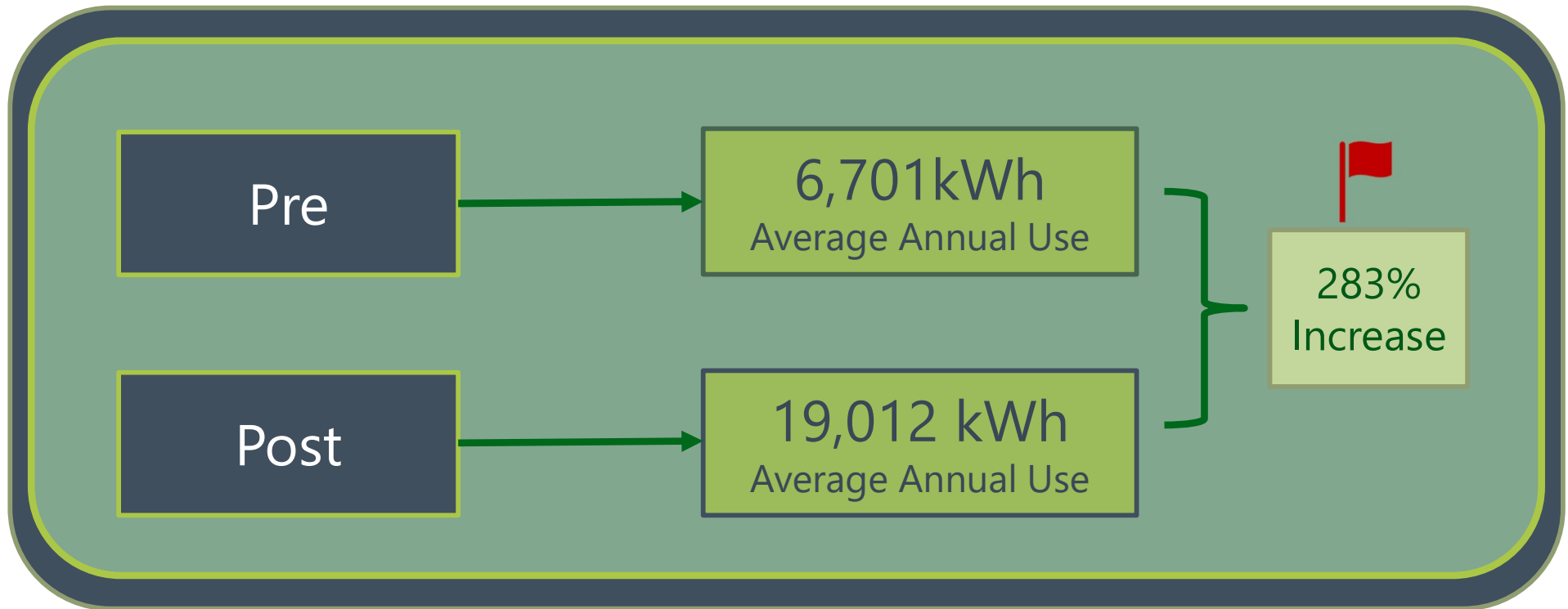


Avg Program Use as % of Bills



What about Non-lighting?

Non-lighting use should be *roughly the same* between pre and post periods.



Backing out the lighting use from consumption also suggests pre-period lighting use is overstated.



Which Baseline Inputs are the Problem?

Hours of Use?



Possible, low impact:

Efficient use in reasonable range

Units?



Unlikely:

Same units in both baseline and efficient

Baseline W?



Likely, high impact:

Baseline kWh is overstated but efficient kWh is not.

Efficient W?



Unlikely:

Efficient use in reasonable range



**sen·si·tiv·i·ty
a·nal·y·sis**

[sensə'tivədē
ə'naləsəs]

NOUN

sensitivity analyses
(plural noun)

Determines
how different values
of an independent
variable affect a
particular dependent
variable under a
given set of
assumptions



	% Change in Median Value	% Increase in Savings
Baseline Watts	30%	70%
Efficient Watts	30%	10%

Baseline Watts are likely to be the culprit as a small variation results in a large swing in savings.



Drivers of Low RR

1

Key driver is overstatement of baseline W.

Basis: Reality check, sensitivity analysis

2

Secondary contributor is overstatement of HOU.

Basis: Limited on-site metering, supported by previous evaluation



Proposed Program Changes

Review and adjust TRM
baseline W and HOU

Future Applications

Approach can be applied to a
variety of measures.

Changes

Same process was used
for natural gas boiler
controls.

HOU Caveats

- Measures need to represent a substantial proportion of the overall consumption.
- RRs should be substantially above or below 100%.



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