

# EEAC EM&V BRIEFING: INFORMAL LUNCH SESSION

## BASELINES 101

▶ June 21, 2017

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# BASELINES: WHY ALL THE FUSS?



- ▶ **As we will discuss in afternoon presentation, EM&V is finding increasing baseline efficiency across the board**
  - Residential and non-residential lighting
  - Residential and non-residential HVAC
  - Residential and non-residential new construction
  - High-rise new construction
- ▶ **This is decreasing gross savings, making it harder to sustain high in-program energy savings levels**
- ▶ **This trend is the subject of this afternoon's talk**
- ▶ **This talk lays the groundwork by providing background on baseline concepts**

# DEFINITION



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- ▶ **The baseline is the measure that would have been in place in lieu of the one that was actually installed**
- ▶ **What the baseline is not:**
  - **Not** synonymous with pre-existing conditions
  - **Not** the same as attribution

# BASELINES AND ATTRIBUTION: TWO FUNDAMENTAL IMPACT EVALUATION CONCEPTS

- ▶ **Baseline and attribution are two very different concepts that are often confused – even by evaluators!**
  - Baseline: the measure that would have been in place in lieu of the one that was actually installed
  - Attribution: effect of the program in moving the customer from the baseline measure to the measure that was actually adopted
- ▶ **Once we have estimated both the baseline and attribution, we can estimate net savings**

# WHY ARE BASELINES AND ATTRIBUTION OFTEN CONFUSED?

- ▶ **Both concepts are fundamentally counter-factual in nature**
- ▶ **The two concepts are occasionally combined in a single step**
  - Here net savings is simply the difference between the world with the program and the world without the program
  - One example would be OPower
  - Existence of such exceptions tends to further blur the distinctions between the two concepts for people
- ▶ **The two concepts can interact**
  - What you think about the influence of the program depends on what you think the alternative was!
  - More on this later

# WHY IS THE BASELINE NOT SYNONYMOUS WITH THE PRE-EXISTING CONDITION?

- ▶ Typically, the customer would have had to adopt some other measure if they had not adopted the program measure
  - Example: equipment dies, customer must replace
  - More examples later
- ▶ By definition, the baseline is that other measure, *not* the pre-existing condition
  - *Remainder of this talk provides more specifics*
- ▶ **Evaluators are therefore typically not focused on simply measuring the change from pre to post**

# BASELINES AND MARKET EVENTS

- ▶ **A market event is the context within which an EE measure is adopted**
  - Replacement on Failure (ROF): new efficient equipment replaces failed equipment
  - New Construction (NC): new efficient equipment installed in conjunction with new building or renovation
  - Early Replacement (ER): new efficient equipment installed well before old equipment would have failed
- ▶ **For each of these market events, the baseline is derived differently**
- ▶ **In each case, the baseline is more complicated than being simply the pre-existing condition**

# BASELINES FOR ROF MEASURES

- ▶ **ROF: old equipment dies, customer installs new EE equipment rather than standard**
- ▶ **Here the baseline is the new standard equipment**
- ▶ **New standard equipment generally estimated in one of two ways:**
  - What's required by codes/standards
  - Industry Standard Practice (ISP): What is most commonly installed by similar customers replacing similar equipment
- ▶ **MA is turning increasingly to ISP rather than code baseline**
  - Driver is increasing evidence that non-participants are installing equipment more efficient than required by codes/standards
  - Determining ISP takes work and is not always easy



# BASELINES FOR NEW CONSTRUCTION

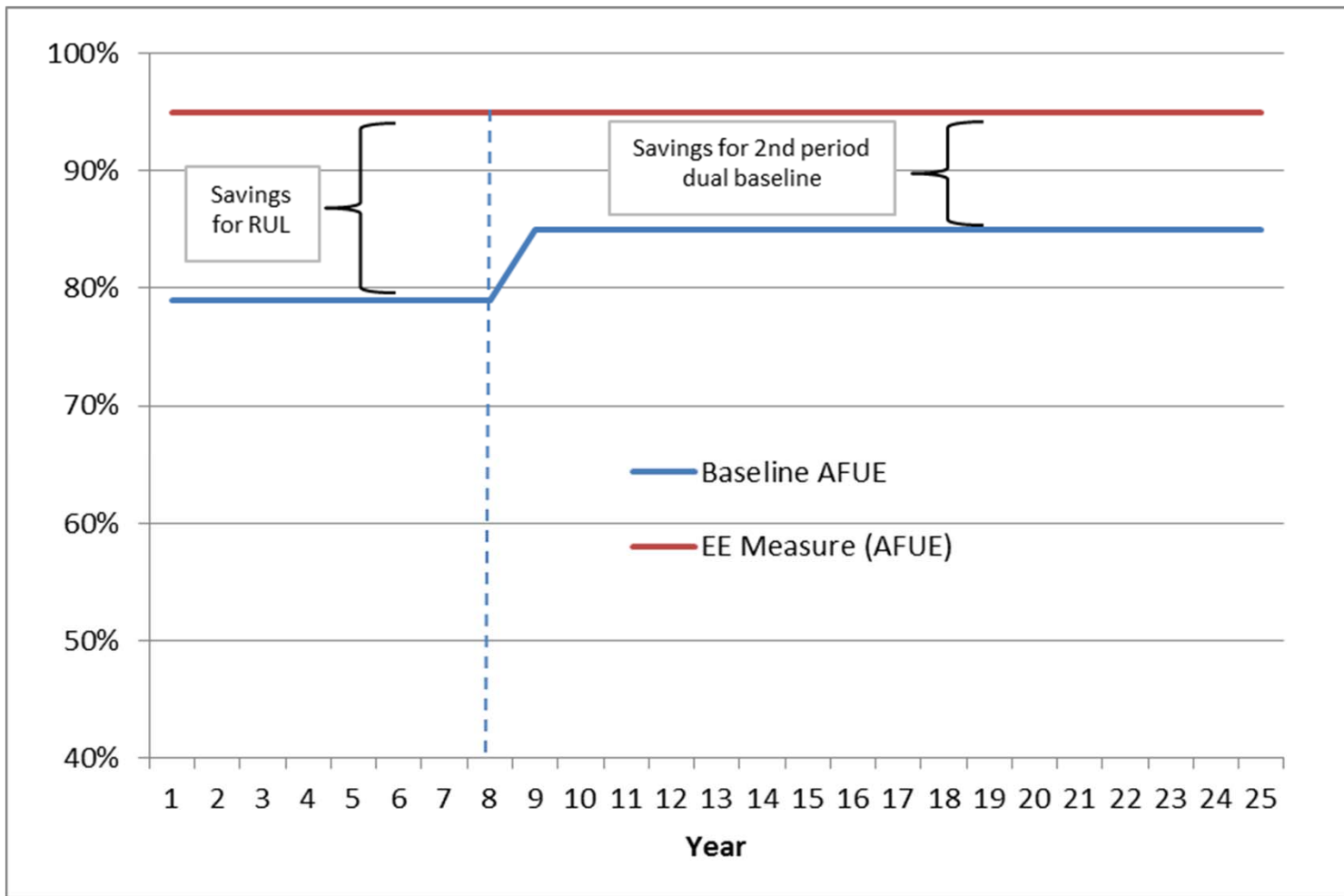
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- ▶ Here, as with ROF, the customer would had to have done *something* in lieu of the adopted measure
- ▶ Whatever they would have done is the baseline
- ▶ As with ROF, baseline can be estimated either as code or ISP, but evidence is leading MA to move increasingly to ISP

# BASELINES FOR EARLY REPLACEMENT MEASURES

- ▶ Early replacement occurs when a customer replaces a piece of equipment well before it would have failed
- ▶ ***Even in this case***, the baseline is not typically simply the pre-existing condition
  - Most types of equipment have finite lives
  - In this case, the replaced measure generally would have failed before the EUL of the new measure expires
  - At that time, customer would have been forced to buy some type of new equipment
  - This results in a **dual baseline**:
    - Until old equipment would have failed: pre-existing equipment
    - After old equipment would have failed: industry standard practice at the time of failure

# THE DUAL BASELINE ILLUSTRATED: AN EXAMPLE BASED ON COMMERCIAL BOILER REPLACEMENT



# WHATEVER THE MARKET EVENT, BASELINE EFFICIENCY GENERALLY INCREASES OVER TIME

- ▶ **This happens either with or without programs in place**
  - Even without programs, technological progress occurs and more efficient equipment gets commercialized
  - Programs accelerate this process
  - It is rare for a program to cause widespread adoption of a measure that would *never* have been commercialized without intervention
- ▶ **Sometimes programs can accelerate improvements in baseline efficiency**
  - We call this “market effects”
  - EM&V tries to document and credit it when it occurs, but this is challenging

# MORE ON INTERACTIONS BETWEEN BASELINES AND ATTRIBUTION

- ▶ **What you think of the effects of the program depends on assumptions regarding the baseline**
- ▶ **Example #1: New construction measure**
  - We know that ISP is more efficient than code
  - We must choose between defining baseline as either code or as ISP
  - This choice will affect our estimate of attribution
    - Easier to get someone to improve over code than over standard practice
- ▶ **Example #2: Replacement measure**
  - We are uncertain whether it is early replacement or replace on failure
  - What we assume about this will affect our estimate of attribution
    - For ROF, only need to worry about effect on efficiency level
    - ER, also need to worry about effect on replacement decision

# Thanks!

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