

Measure Savings Estimation: Subcommittee Meeting #3



CALIFORNIA

TECHNICAL FORUM

**AYAD AL-SHAIKH
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AUGUST 13, 2020**

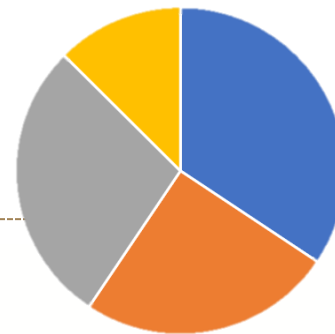
Subcommittee Goals

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- Goals
 - Definitions of the measure impact levels
 - ✦ Low Impact, Medium Impact, High Impact, Interim
 - Comments on Guideline 3's confidence and precision level recommendations
 - Comments on Guideline 7's addition of Data Collection for Midstream/Upstream Programs
 - Consider another Guideline to govern the timing of savings impacts updates
- End of meeting question:
 - General consensus on Fundamental Principles and Guidelines

Measure Impact to Portfolio

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- Demonstrated **High** impact measure:
 - A measure predicted to immediately be high impact or has demonstrated high portfolio impact through the course of implementation.
 - *Definition: >1% of savings for each fuel type (of deemed savings)*
- **Normal** impact measure:
 - A measure predicted to be normal impact, or that has demonstrated normal portfolio impact through the course of implementation.
 - *Definition: Savings of <1% (for each fuel type) to average (not including HIMs)*
- **Low** impact measure:
 - A measure that is predicted to have a lower impact on the portfolio than average.
 - *Definition: Savings that are below average*
- **Interim** measure:
 - A measure for which sufficient information is anticipated but not yet available that would satisfy the level of rigor for a measure predicted to be normal or high impact. Interim measures must be re-examined after 1 year or another duration determined by the Cal TF.
 - *Definition: New measure (used proxy of NTG = ET, <2 yrs, and Fuel-sub)*

Measure Impact to Portfolio

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- 2019 Deemed IOU Claims

- Definitions:

- **HIM:** >1% of gas or electric savings

- **Normal:** Average to 1% savings

- **Low:** Below average savings

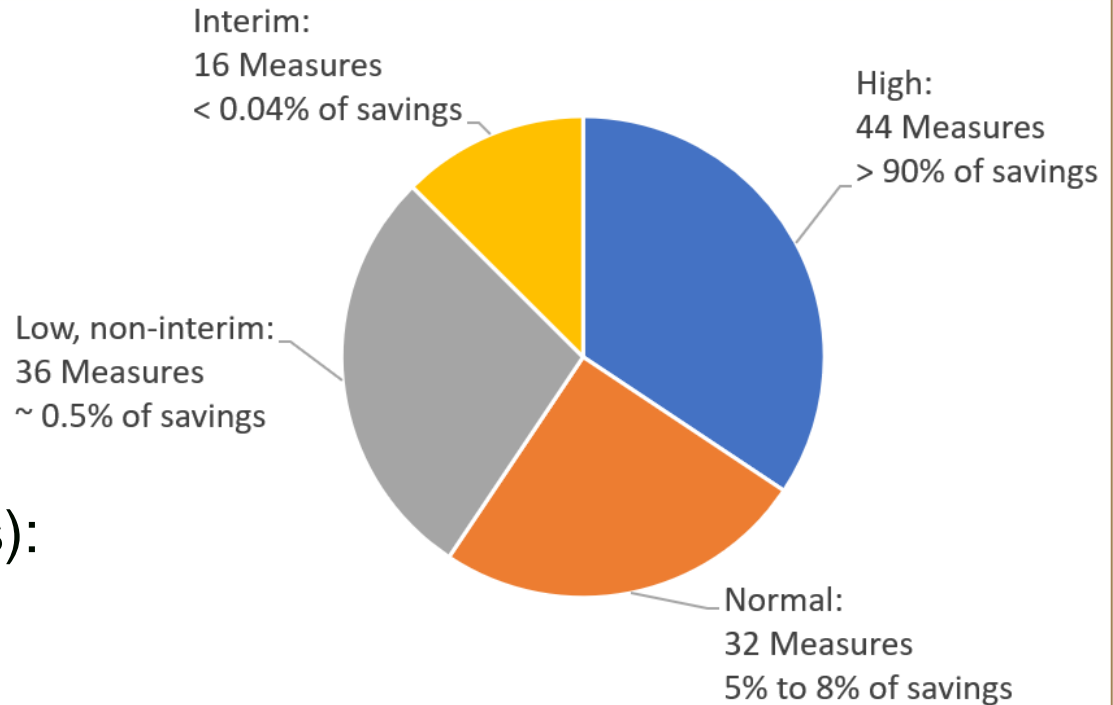
- **Interim** (new measures):

- ✦ ET-NTG

- ✦ All-Default<2yr

- ✦ Fuel Sub

- Observation: 1% is a much smaller threshold today for electric (since lighting dominance is going away)



Measure Impact Questions

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- When large lighting measures were sunset, the overall savings decreased substantially. The same 1% electric threshold shifted from >5M kWh/yr to <2M kWh/yr.
 - Should this threshold be calibrated to a certain number of measures due to resource limitations?
 - In this example, 10 additional electric measures are added to the HIM list.
- Measure impact size currently influences the precision of influential parameters.
 - Should there also be a matrix related to the frequency of measure updating?

Guideline 3: Documentation

Document Influential Parameters for Sensitivity Analysis

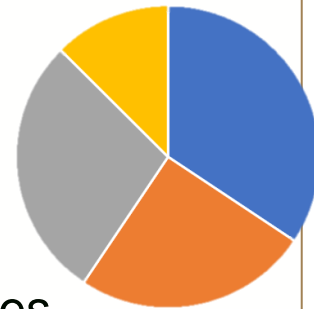
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- Document differently depending upon the impact to portfolio

Approval Type	Low Impact	Normal Impact	High Impact	Interim
Short Term (expires after 1 year)				Sensitivity analysis for highest impact parameters
				80% confidence level
				30% precision
Long Term	TF judgment	Sensitivity analysis for highest impact parameters	Sensitivity analysis for highest impact parameters	
		80% confidence level	90% confidence level	
		30% precision	10% precision	

- Questions:

- Input needed to apply precision and confidence levels
- Should we move from precision/confidence to number of samples



Guideline 3: Documentation

Document Influential Parameters for Sensitivity Analysis

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- Document differently depending upon the impact to portfolio

Approval Type	Low Impact	Normal Impact	High Impact	Interim
Short Term (expires after 1 year)				Sensitivity analysis for highest impact parameters
				5 samples
Long Term	TF judgment	Sensitivity analysis for highest impact parameters	Sensitivity analysis for highest impact parameters	
		5 samples	69 samples/offering	

- Conversion of precision / confidence level -> samples
 - 90/10 -> 69 samples (per distinct offering, could be bldg type, vintage, etc)
 - 80/30 -> 5 samples
 - Assumptions:
 - Normal distribution, 2-tailed (could be high or low)

Guideline 7: Program Data Collection

Identify Inputs That Should Be Collected Through Programs

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● Example measure types

Measure Type	Reason to Collect Data	Sunset Period
Interim Measure	New measure with not enough existing implementation data	1 year
Accelerated Replacement	Existing conditions baseline	Judgement
Add-On Equipment / To-Code	Existing conditions baseline	Judgement
<u>Midstream / Upstream Programs</u>	<u>Document customer data (BT, CZ, HTR, etc)</u>	<u>EM&V Feedback</u>

- Impose a “Sunset” date to reevaluate
 - Create a clear understanding of how the data will be evaluated and the next stage.
- Important to engage the right group for input so data collection will get what is expected.

Measure Details

MEASURE NAME

LED, High or Low Bay

USE CATEGORY

LG - Lighting

STATEWIDE MEASURE ID

SWLG011

EFFECTIVE DATE

February 19, 2020

SUNSET DATE

December 31, 2020

Guideline 8 (*new*): Savings Updates Timeline

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- Would a table that describes update trigger help manage workload:

Low Impact	Normal Impact	High Impact	Interim
Trigger by code/baseline change if determined to be greater than a 10% impact.	Trigger by code/baseline change or EM&V study.	Reviewed every 2 years. Trigger by code/baseline change or EM&V study.	Reviewed based upon sunset date to re-evaluate using collected Program Data.

- Thoughts?

Savings Methodology Fundamentals

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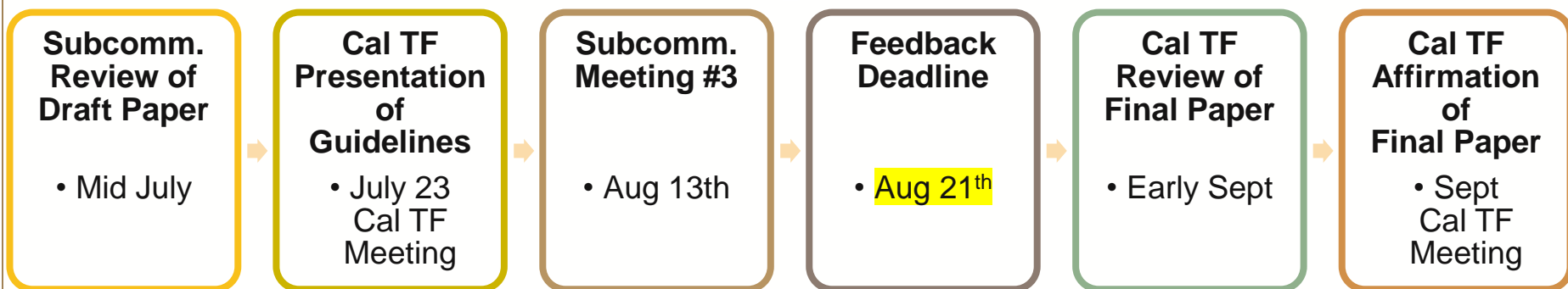
1. Comply with regulatory requirements.
2. Represent average savings achieved by customers.
3. Represent current market conditions.
4. Represent an “apples-to-apples” comparison between base and measure case usage.
5. Represent manufacturer agnostics savings.
6. Investment in measure savings development should be commensurate with the measure contribution of impacts to the portfolio.
7. Be transparent and well documented to foster consistency and reproducibility. Use of “best available data”.

Recommended Guidelines

1. **Methodology:** Choose an Impact Estimation Method that Aligns with the Measure Use Category
2. **Documentation:** Develop Measure Savings that Align with Cost-Effectiveness and Claims Requirements
3. **Documentation:** Document Influential Parameters for Sensitivity Analysis
4. **Documentation:** Document Base Case and Measure Case Energy Usage
5. **Interactive Effects:** Include Interactive Effects Consistently
6. **Permutations:** Reduce Measure Complexity
7. **Program Data Collection:** Identify Inputs That Should Be Collected Through Programs
8. **Measure Update:** Update Measure Based Upon Trigger

Next Steps

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- We need your feedback [by Aug 21st](#) to get this into the final draft that we will send to the Cal TF Members in early September 2020.

Measure Savings Estimation: Fundamentals & Proposed Guidance



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TECHNICAL FORUM

**AYAD AL-SHAIKH
CHAU NGUYEN
JENNIFER HOLMES
JULY 23, 2020**

Agenda

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- Objectives & Timeline
- Recap
- Fundamentals
- Proposed Guidelines
- Next Steps

Overview

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- **Goal**
 - Characterize current practices for developing savings by use category
 - Create best practice guidelines and templates for developing deemed savings
- **Value**
 - Facilitate the consistency of methods by use category
 - Ensure savings calculations are transparent and reproducible
 - Provide measure developers with trade-offs associated with each method to ensure accuracy and cost-efficiency

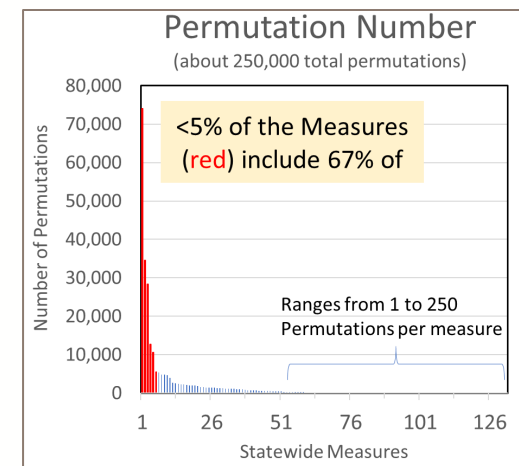
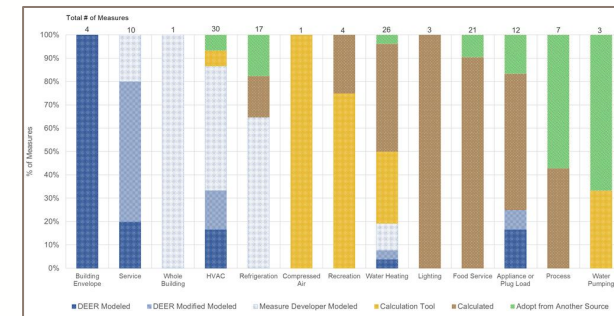
- **Next Steps**



Recap: Current Practices

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- Approach
 - Reviewed savings analysis documentation of 130+ statewide measures
- Categorization
 - Categorize in: Modeled, Calculation Tool, Calculated, Adopted from Another Source
- Permutation Analysis
 - Four common parameters that affect permutation number
 - Large variation does exist
- Claims Data Analysis
 - No significant correlation to calculation methodology or permutation count.



Savings Methodology Fundamentals

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1. Comply with regulatory requirements.
2. Represent average savings achieved by customers.
3. Represent current market conditions.
4. Represent an “apples-to-apples” comparison between base and measure case usage.
5. Represent manufacturer agnostics savings.
6. Investment in measure savings development should be commensurate with the measure contribution of impacts to the portfolio.
7. Be transparent and well documented to foster consistency and reproducibility. Use of “best available data”.

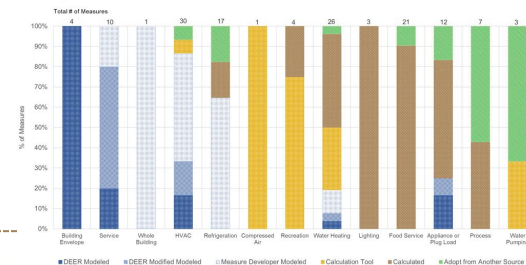
Recommended Guidelines

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3. **Documentation:** Document Influential Parameters for Sensitivity Analysis
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7. **Program Data Collection:** Identify Inputs That Should Be Collected Through Programs

Guideline 1: Methodology

Choose an Impact Estimation Method that Aligns with the Measure Use Category



Use Category – Technology Group	Modeled	Calculation Tool	Calculated	Adoption of Values from Another Source
Building Envelope	Whole-Building Energy Modeling (BEM) tools provide accepted packages to evaluate complex, interacting building systems.			RCT, ET Studies, custom projects, EM&V, or regression models constitute a large portion of this category.
Service (RCx)				
Whole Building				
HVAC				
Refrigeration				
Compressed Air		Simulation tools for specialized end-use categories used when interactions with other systems is not required.		
Recreation (Pools)				
Water Heating – Equipment				
Water Heating – Water Fixture			These measures involved relatively simple physics models or engineering calculations that are widely accepted.	
Lighting				
Water Pumping				
Food Service				
Appliance or Plug Load				
Process				

Guideline 2: Documentation

Develop Measure Savings that Align with Cost-Effectiveness and Claims Requirements

Measure Application Type	Description	1 st Baseline	2 nd Baseline
Accelerated Replacement (AR)	Measure is installed when the existing equipment is still operational. This type includes Repair Eligible and Repair Indefinitely measures.	Existing conditions	Code / Standard Practice
Normal Replacement (NR)	Measure is installed when the existing equipment fails, or maintenance requires replacement.	Code / Standard Practice	N/A
New Construction (NC)	Measure is installed during construction instead of code/standard equipment.	Code / Standard Practice	N/A
Add-on Equipment (AOE)	Measure is installed to pre-existing “host” equipment that is still operational.	Existing conditions	N/A
Building Weatherization (BW)	Measure includes improvements to nonmechanical building structures or existing equipment that is essential to building function without maintenance.	Existing conditions	N/A
Behavioral (BRO-Bhv)	Measure includes informational or educational programs that influence energy-related practices.	Existing conditions	N/A
Retrocommissioning (BRO-RCx)	Measure is installed/applied as part of retro-commissioning.	Existing conditions	N/A
Operational (BRO-Op)	Measures that improve the efficient operation of installed equipment.	Existing conditions	N/A

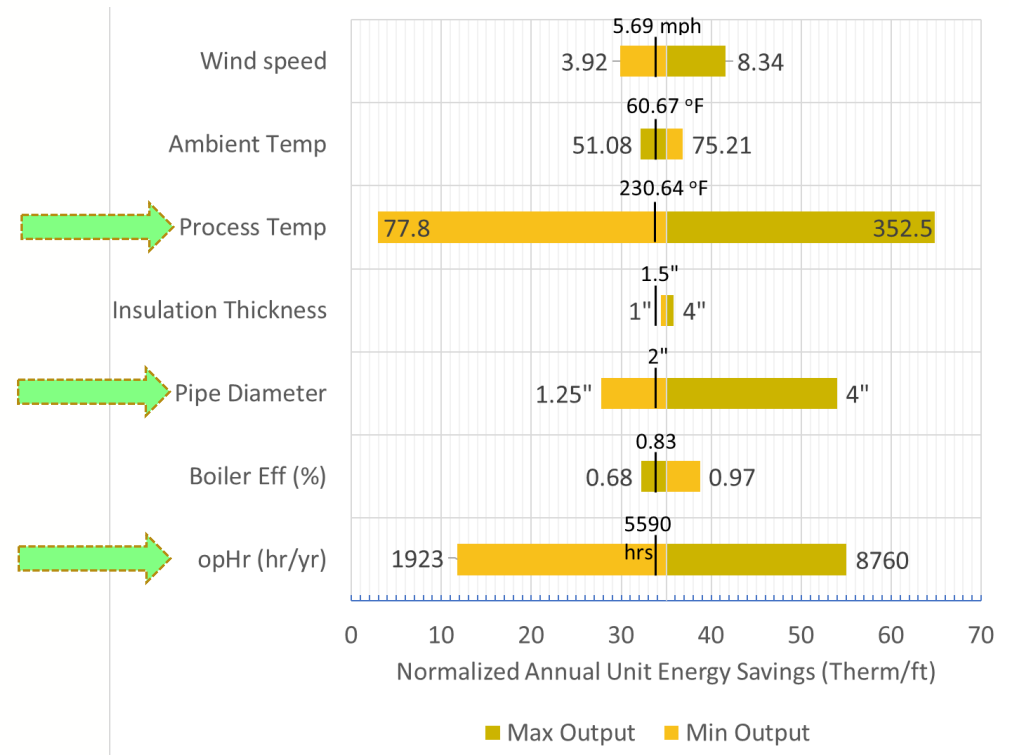
Guideline 3: Documentation

Document Influential Parameters for Sensitivity Analysis

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- Understand which Parameters are more influential in the sensitivity Analysis
- Document differently depending upon
 - Impact to the portfolio
 - Age of the measure

Example: Pipe Insulation



Guideline 3: Documentation

Document Influential Parameters for Sensitivity Analysis

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- Document differently depending upon the impact to portfolio

Approval Type	Low Impact	Normal Impact	High Impact	Interim
Short Term (expires after 1 year)				Sensitivity analysis for highest impact parameters <u>80% confidence level</u> <u>TF judgement for precision</u>
Long Term	TF judgement	Sensitivity analysis for highest impact parameters <u>80% confidence level</u> <u>TF judgement for precision</u>	Sensitivity analysis for highest impact parameters 90% confidence level <u>10% precision</u>	

- Input needed to apply precision and confidence levels
 - Consider 80% confidence limit for Normal Impact
- Results from this guideline feed into:
 - Measure Complexity ([Guideline 6](#))
 - Program Data Collection ([Guideline 7](#))



Guideline 4: Documentation

Document Base Case and Measure Case Energy Usage



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- All measures:

- *Measure Characterization Template* should be followed to guide developers
- *Measure Development and QA / QC Guidelines* document
 - ✦ Being updated this month! -> (Still can find these on the Cal TF website)

- Modeled Measures

- *Modeled Measure Documentation Template* provides additional guidance specifically for modeled measures.

Guideline 5: Interactive Effects

Include Interactive Effects Consistently

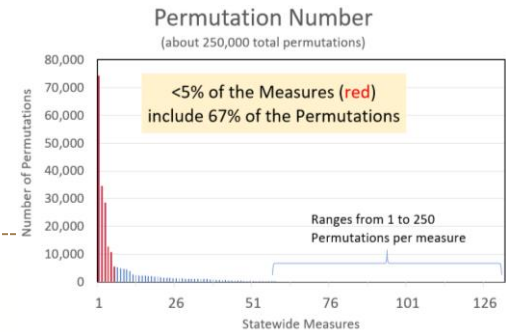
- **General Guidance**
 - Apply interactive effects when significant
 - Table supports general guidance
- **Specific Guidance**
 - Normal and Low Impact Measures
 - ✦ Impacts should vary by more than 10%
 - High Impact Measures
 - ✦ Consider the affect on the portfolio
- **Improve interactive effect definition**

Use Category – Technology Group	Apply Interactive Effects?	Recommended Approach
Building Envelope	Yes	Building Energy Model
Service (RCx)	Yes	Building Energy Model
Whole Building	Yes	Building Energy Model
HVAC	Yes	Building Energy Model
Refrigeration	Yes	Building Energy Model
Compressed Air	No	
Recreation (Pools)	No	
Water Heating – Equipment	No	
Water Heating – Water Fixture	No	
Lighting	Yes	Commercial and Residential Interactive Effect Table
Water Pumping	No	
Food Service	No	
Appliance or Plug Load	Yes	Commercial and Residential Interactive Effect Table
Process	No	

Guideline 6: Permutations

Reduce Measure Complexity

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- If permutations vary by less than 10%, collapse them
 - Avoid false precision

Low Impact	Normal Impact	High Impact	Interim
Savings vary by >10% due to variation by influential parameter	Savings vary by >10% due to variation by influential parameter	Consider the effect on the portfolio; include parameters as appropriate	Savings vary by >10% due to variation by influential parameter

- Consider for
 - Shared Parameters that Impact Savings or Cost
 - ✦ Bldg Type, Climate Zone, Vintage
 - Measure-Specific Parameter that Impact Savings or Cost
 - ✦ Efficiency Tiers, Product Subcategories, Measure Application Type
 - Parameters that Do Not Impact Savings or Cost
 - ✦ Delivery Type

Guideline 7: Program Data Collection

Identify Inputs That Should Be Collected Through Programs

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- Example measure types

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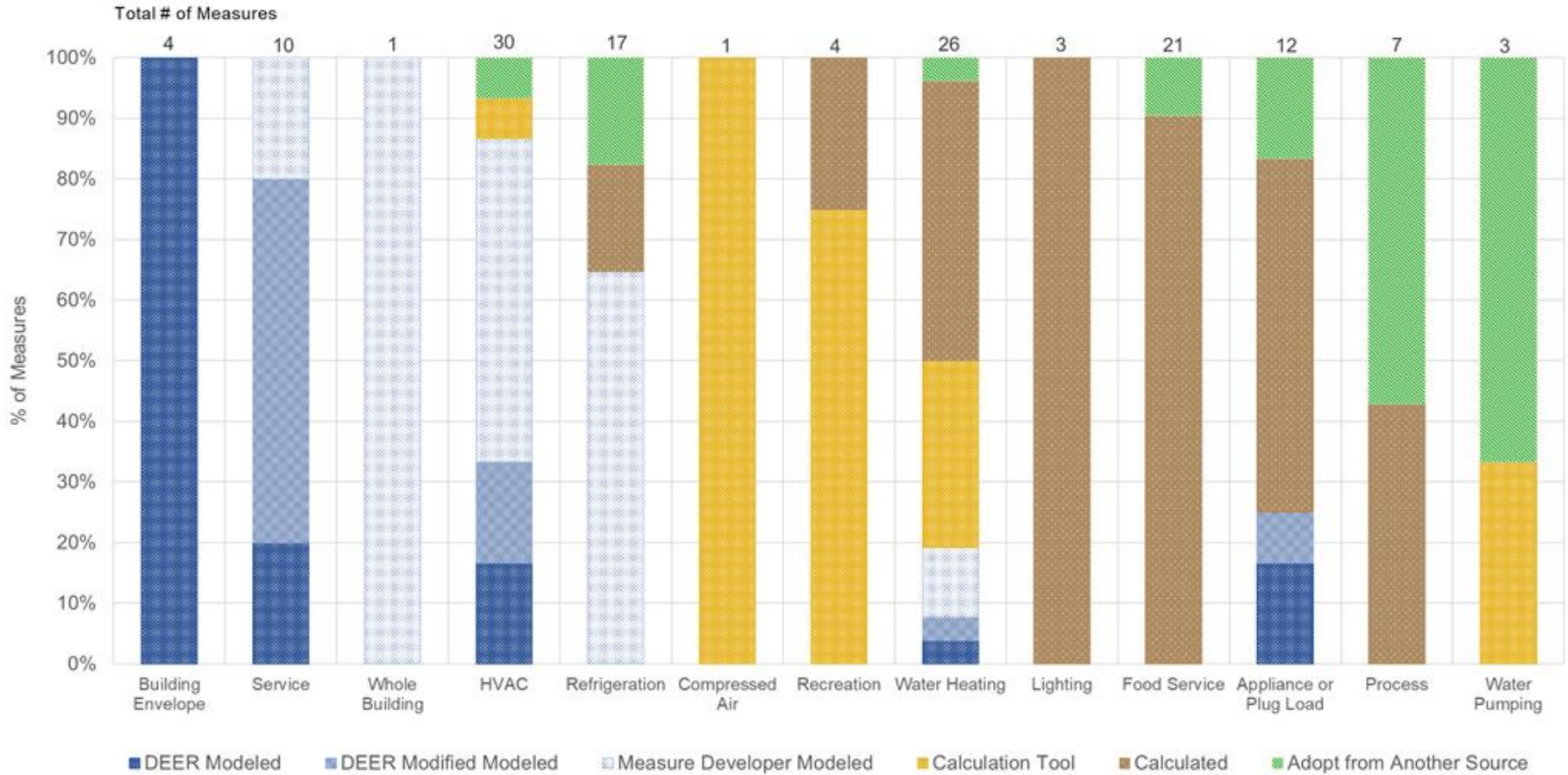
- If you can provide your feedback early (within July), we can work it into the presentation for the 3rd Subcommittee Meeting

Appendix

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- Current Methods Slides
 - Categorization
 - Permutation Analysis
 - Claims Analysis

Current Methods - Categorization

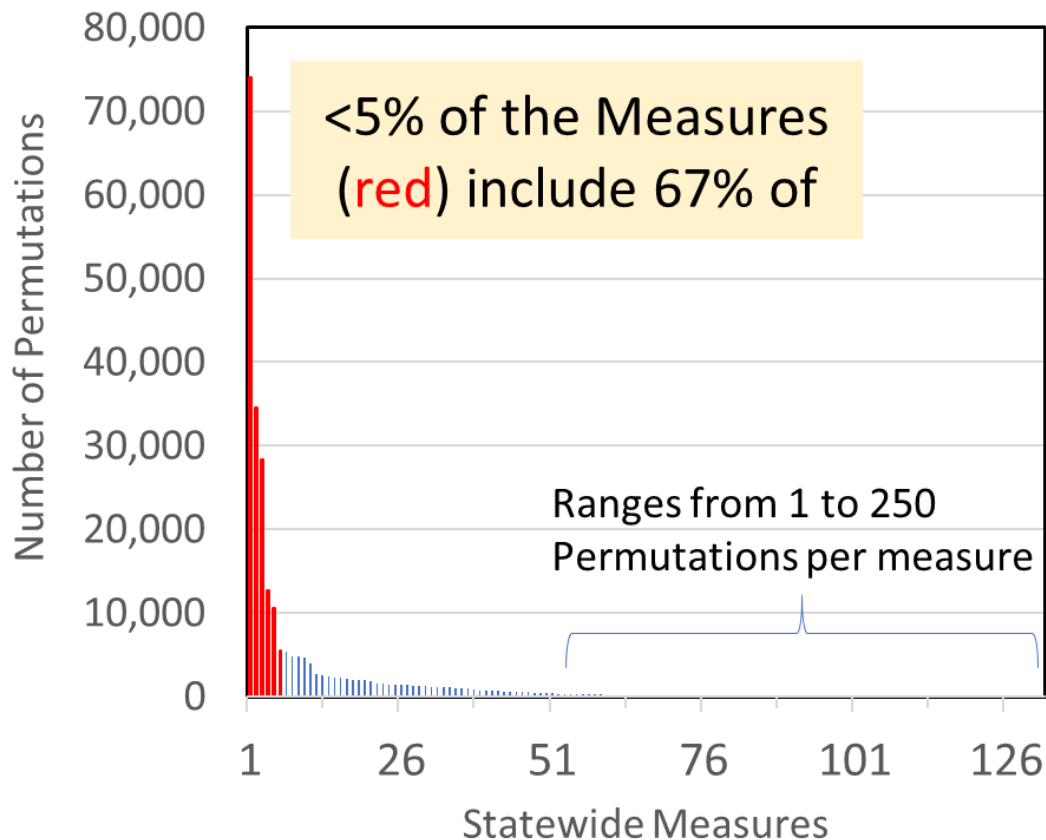


Current Methods – Permutation Analysis

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Permutation Number

(about 250,000 total permutations)



- Four factors dramatically effect the number of permutations
 - Building Types (24)
 - Climate Zones (16)
 - Delivery Types (3)
 - Offerings (varies)
 - *Vintages (in the future)*

Current Methods – Claims Data Analysis

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- Claims data from 2018 (Q1-Q4) correlated to statewide measures.
- No significant correlation to calculation methodology or permutation count.

Measure Impact: Claims Analysis



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- Normal impact measure:
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Measure Impact to Portfolio

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- 2019 Deemed IOU Claims

- Definitions:

- **HIM:** >1% of gas or electric savings

- **Normal:** Average to 1% savings

- **Low:** Below average savings

- **Interim** (new measures):

- ✦ ET-NTG

- ✦ All-Default<2yr

- ✦ Fuel Sub

- Observation: 1% is a much smaller threshold today for electric (since lighting dominance is going away)

