Introduction to the BTO Goals Framework

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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Background

Opportunities:

BTO's Multi-Year Program Plan &

EERE's Strategic Plan

Objectives:

Develop ambitious, but realistic goals that:

1) Reflect BTO's strategic priorities to significantly impact sectoral energy efficiency,
2) Connect BTO program activities and goals, and
3) Can be tracked on a regular basis

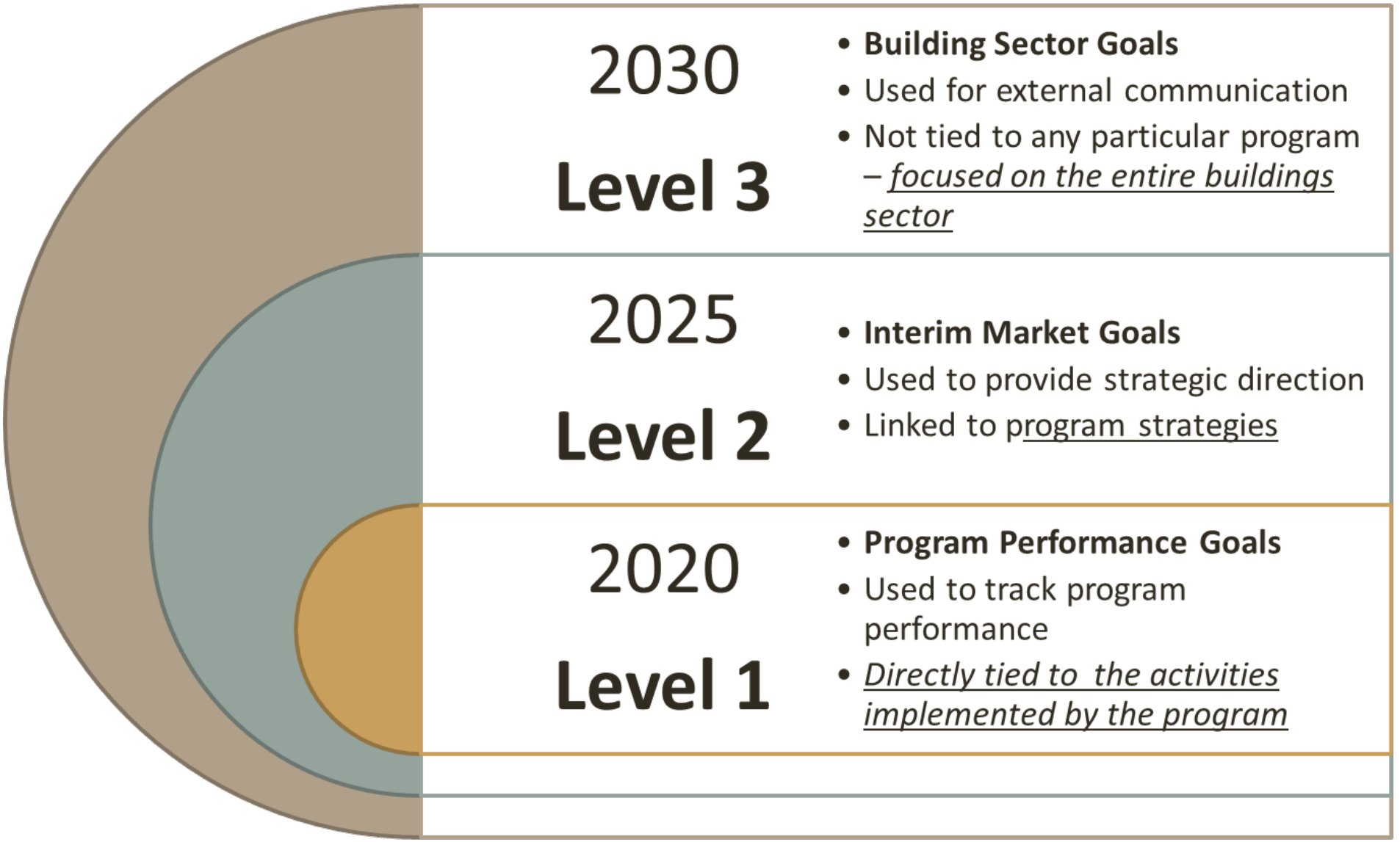
Characteristics of BTO's Goals

- **Clearly articulated,** the plain language meaning should be easily understood
- **Ambitious,** resulting in substantial national impacts
- **Achievable,** based on sound analysis
- **Measurable,** progress can be regularly assessed
- **Relatable,** goals can be rolled-up

Key Elements of BTO's Goals Framework

- **Common Baseline Year**: 2010
  - A common, fixed baseline enables linkages among all goals and multi-year tracking
  - Avoids the confusion and complications of comparisons to forecasts
- **Primary Metric**: Energy use intensity (EUI) measured as primary energy use per square foot
  - Measure of energy efficiency
  - Widely used indicator of building efficiency trends
  - Flexible – it is applicable to sectors, buildings, and specific end uses
  - EUI trends regularly reported and forecast by EIA
- **Tiered Goals**:
  - **Building Sector (2030 and beyond)** – Ultimate outcome BTO is working to bring about
  - **Interim Market (2020 and 2025)** – Strategically focused outcomes that highlight how BTO's activities link to the building sector
  - **Program Performance (2015-2020)** – Key outputs or near-term outcomes of BTO's planned program activities

Visualizing BTO's Goals Framework



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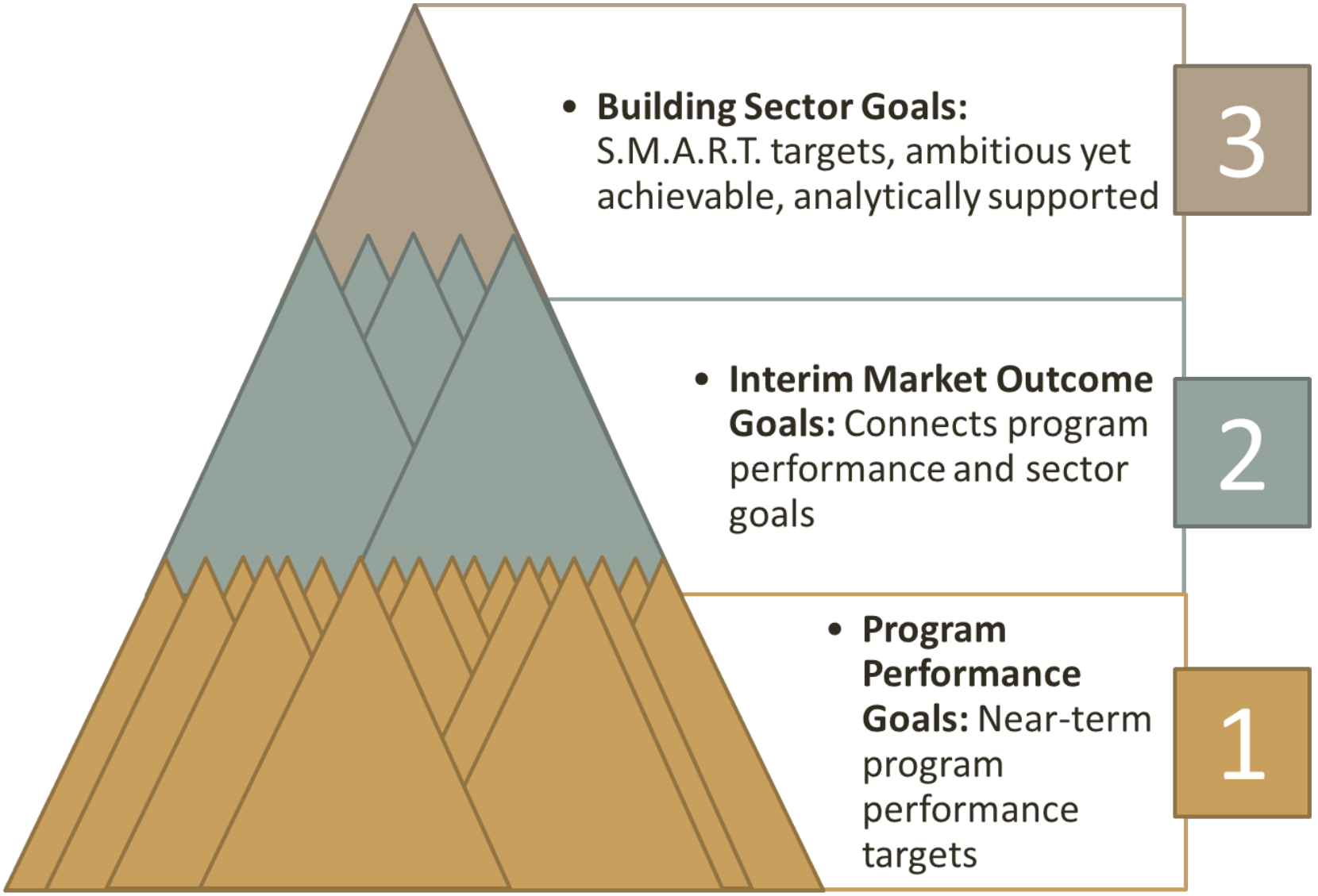
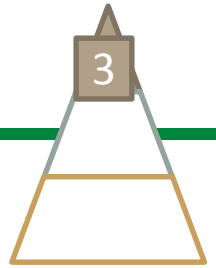


Footnote: Moving from the top of the pyramid to the bottom, goals become more specific and more closely tied to program activities. The sector and interim outcome goals will be measured using EIA data, while the program performance goals will be measured using program data.

BTO's Building Sector Goal



By 2030, reduce energy use per square foot of U.S. buildings by 30%, with a longer term goal of achieving a 50% reduction, relative to a 2010 baseline.

Characteristics of BTO's Goals:

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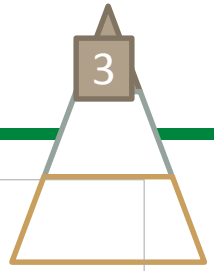
Clear Articulation



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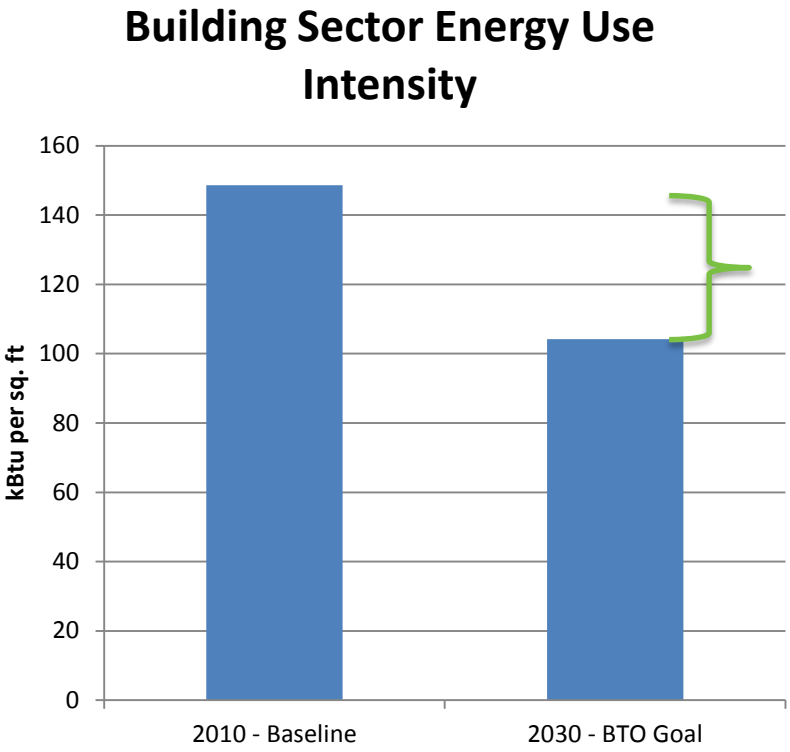

Long Version:

BTO will have achieved it's sectoral outcome goal if by 2030 the energy use intensity (EUI) of the building sector, measured as primary energy per square foot, is 30% lower than the EUI of the building sector in 2010.

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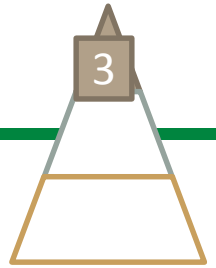

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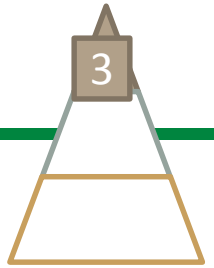
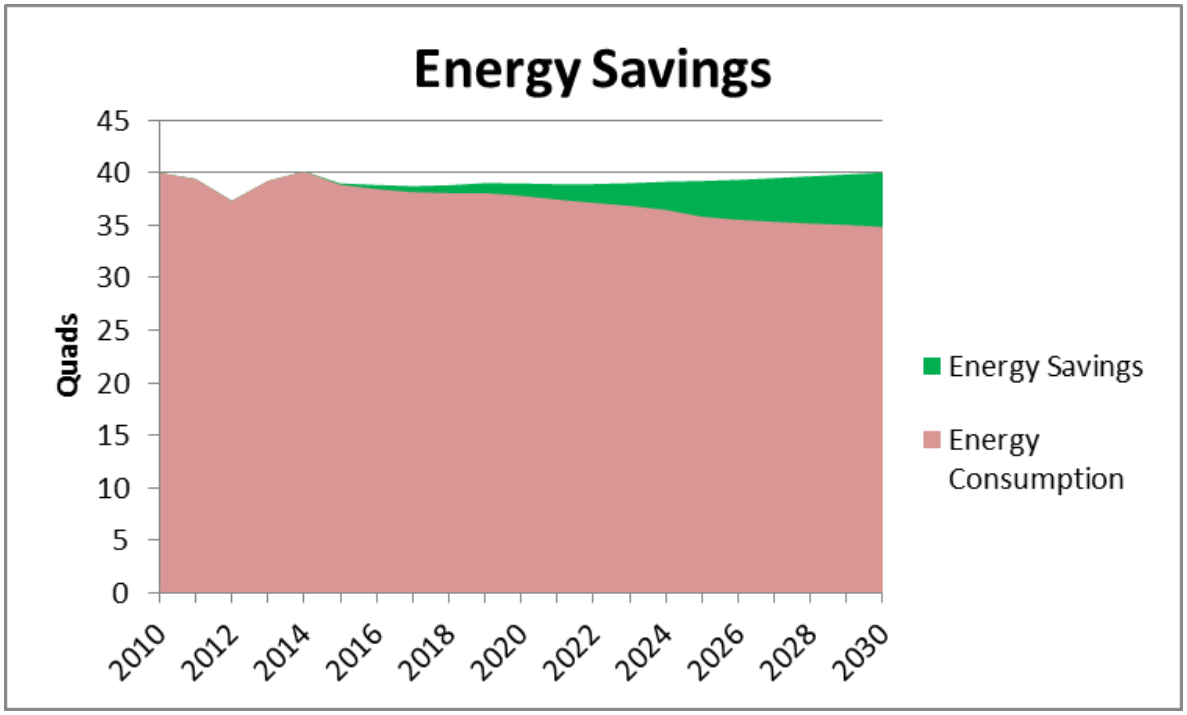
Are BTO's Goals Ambitious?



Assuming BTO achieves this goal – how much energy could be saved?

Energy Savings

Our initial analysis indicates that achieving BTO's goal would **reduce cumulative consumption from 2016-2030 by nearly 38 quads** and would result in a reduction in energy consumption in 2030 by over 5 quads

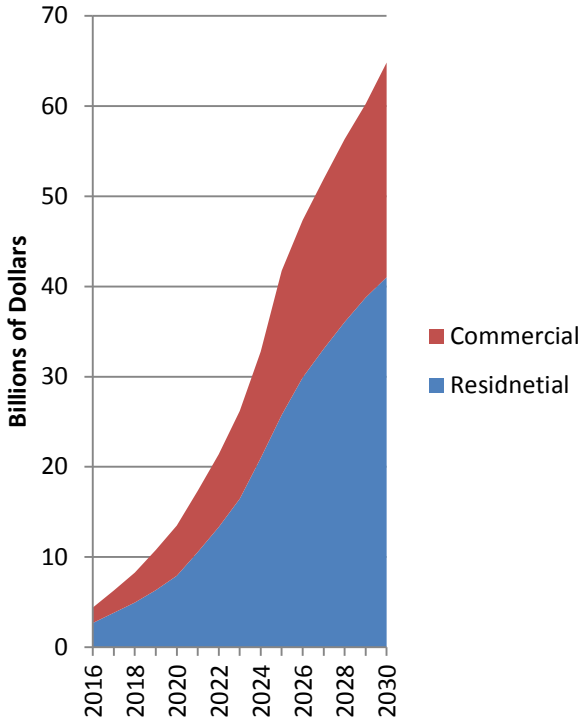


All numbers are relative to the 2015 AEO Reference Case Forecast.

Are BTO's Goals Ambitious?

Assuming BTO achieves this goal – how much money could be saved?

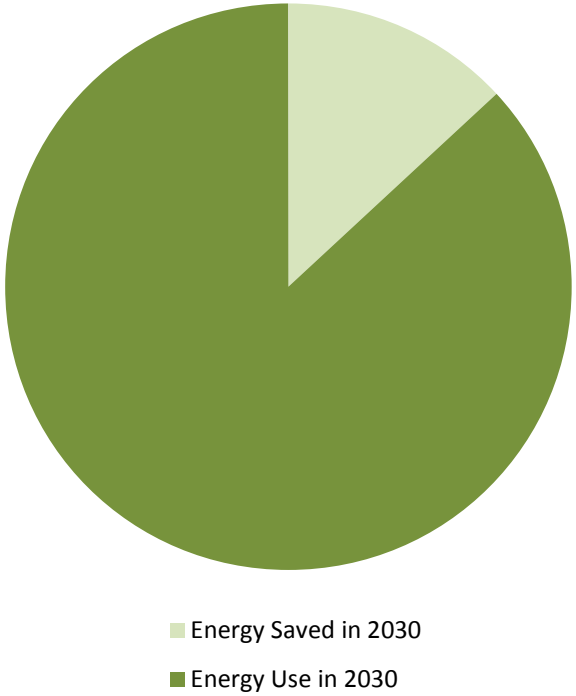
Annual Cost Savings



Cost Savings

If energy consumption were reduced in this way the **cost savings between 2016 and 2030 would be $460 billion.** Saving consumers $65 billion in 2030.

Share of Energy Cost Savings in 2030



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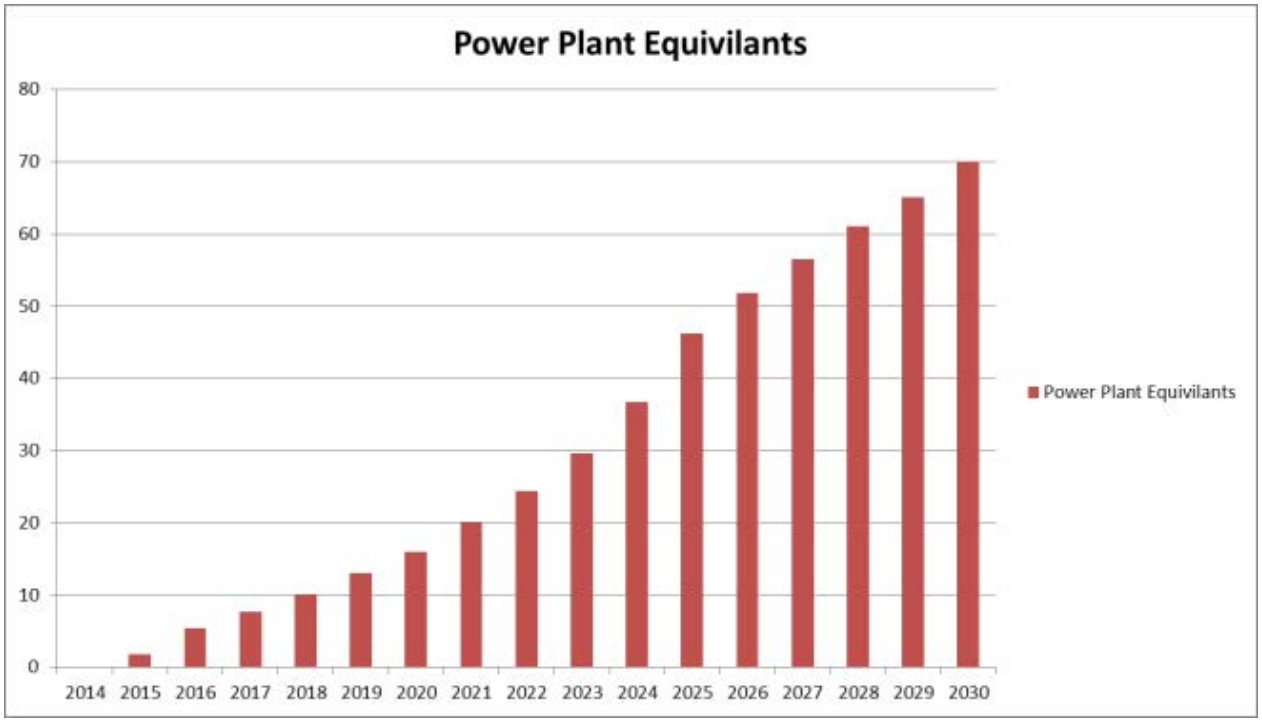
Are BTO's Goals Ambitious?

Assuming BTO achieves this goal – how much could carbon emissions be reduced?



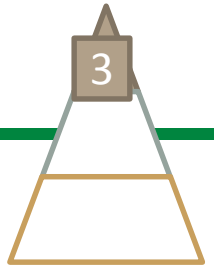
Power plant equivalents derived from EPA's "Greenhouse Gas Equivalences Calculator"

GHG Reduction

This would result in a **reduction of nearly 2 billion metric tons of CO_2 over 15 years**. This is would result in the equivalent of removing 70 coal fired power plants from the grid in 2030.

All numbers are relative to the 2015 AEO Reference Case Forecast.

Sufficient Ambition – Substantial National Impacts



Assuming BTO achieves this goal – what might the impact be?

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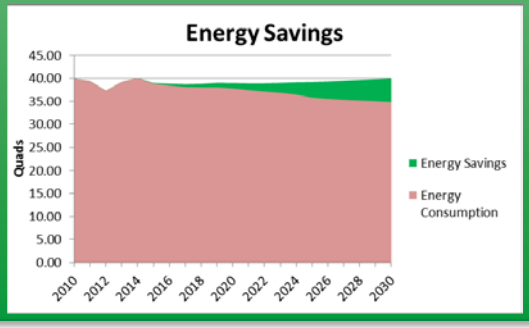

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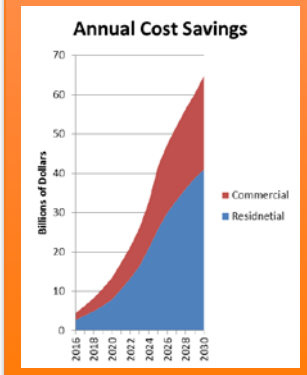

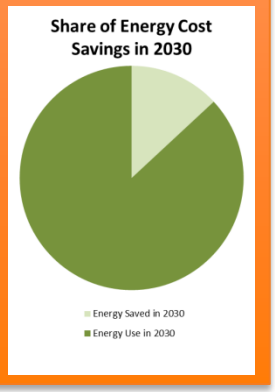

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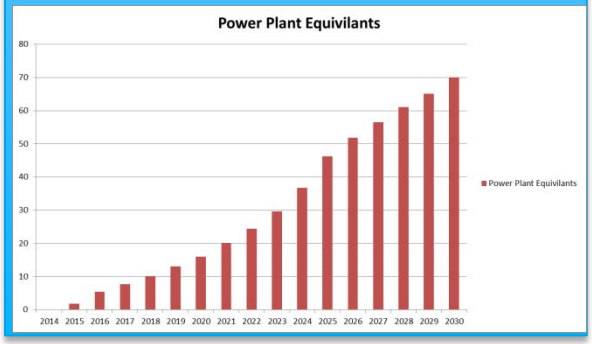

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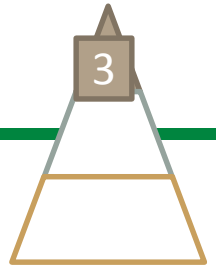

By 2030, reduce energy use per square foot of U.S. buildings by 30%, relative to a 2010 baseline.

Characteristics of BTO's Goals:

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- **Achievable**
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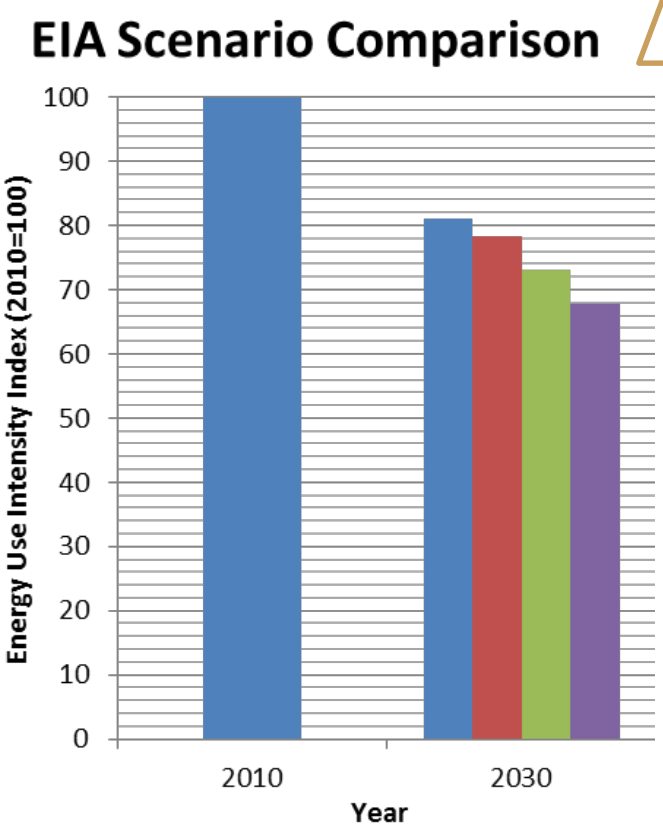
Analysis to Support Achievability

EUI Reductions Under Various 2014 Annual Energy Outlook Scenarios:

- **Reference Case:** 19%
- **Extended Policies**: 22%
- **High Technology**: 27%
- **Best Available Demand Technology**: 32%



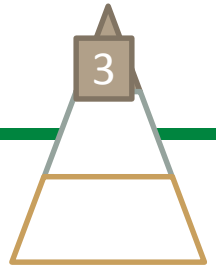
Substantial reductions in the energy use per square foot in the buildings sector are projected by EIA. We used the Reference and the Best Available Demand Technology scenarios to bound our BTO's goal.

Analysis to Support Achievability

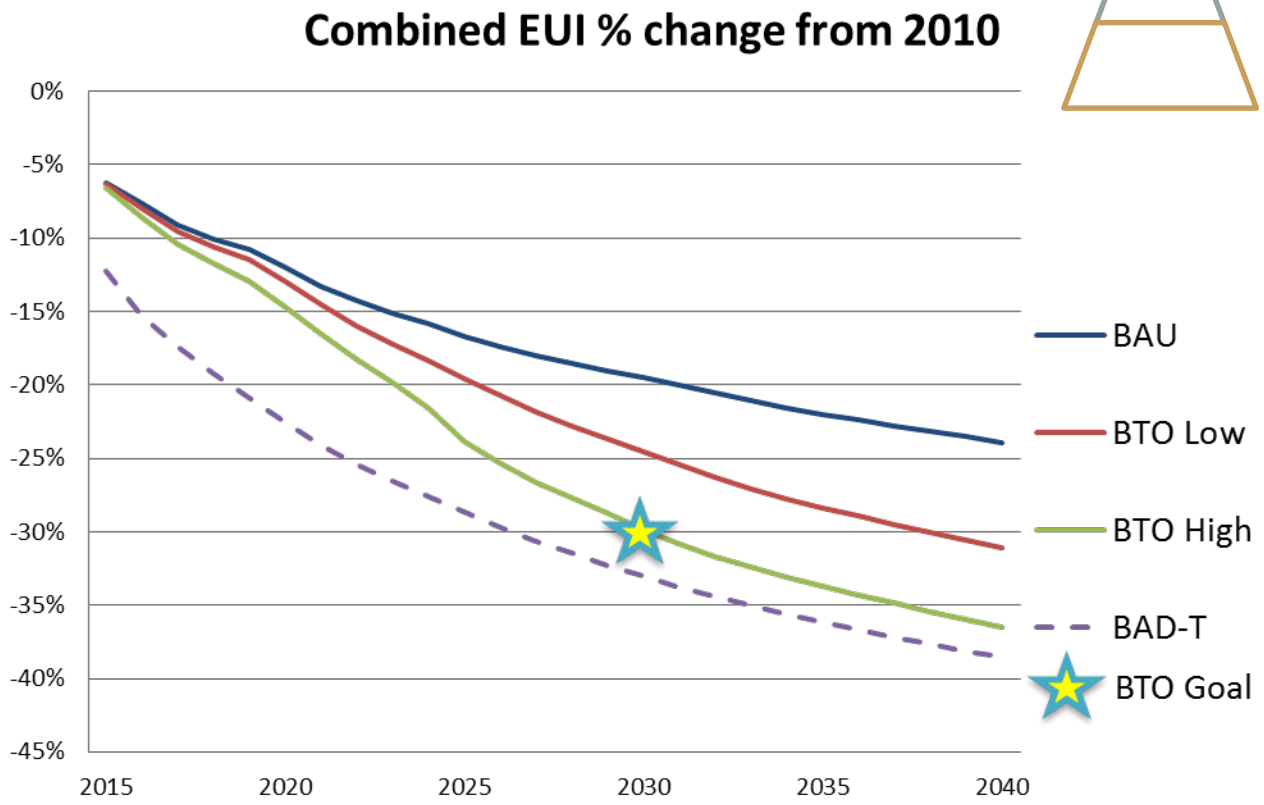
BTO is developing scenarios using the National Energy Modeling System (NEMS) to look at pathways to achieving this building sector goal using policy levers available to BTO.

Scenarios	Definitions	Interpretation
AEO 2015 Reference	Reflective of currently enacted policies; conservative technology adoption	A very conservative scenario, can be thought of as below the lower bound of likely efficiency outcomes
BTO Low (AEO 2015)	Codes and standards extended; Adoption of advanced technology and shell options	Modeled off of BTO's Interim Market Goals, this reflects one scenario that might happen should BTO achieve its interim market goals
BTO High (AEO 2015)	Codes and standards extended; High-level of adoption of advanced technology and shell options	A more aggressive scenario designed to push the limits of BTO's influence on the market
AEO 2014 BAD-T	Consumers are adopting the most efficient technologies regardless of cost	A very ambitious scenario, can be thought of as above the upper bound of likely efficiency outcomes

Analysis to Support Achievability

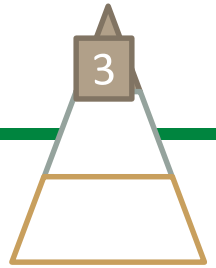


- Additional Modeling Work to Be Done:
  - Misc. Electric Loads
  - Sensors and Controls
  - AEO 2016



Initial analysis indicates that BTO's Sectoral Outcome Goal is very ambitious but still achievable.

BTO's Building Sector Goal



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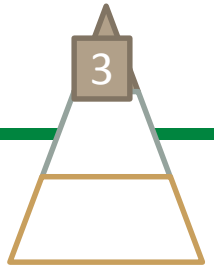
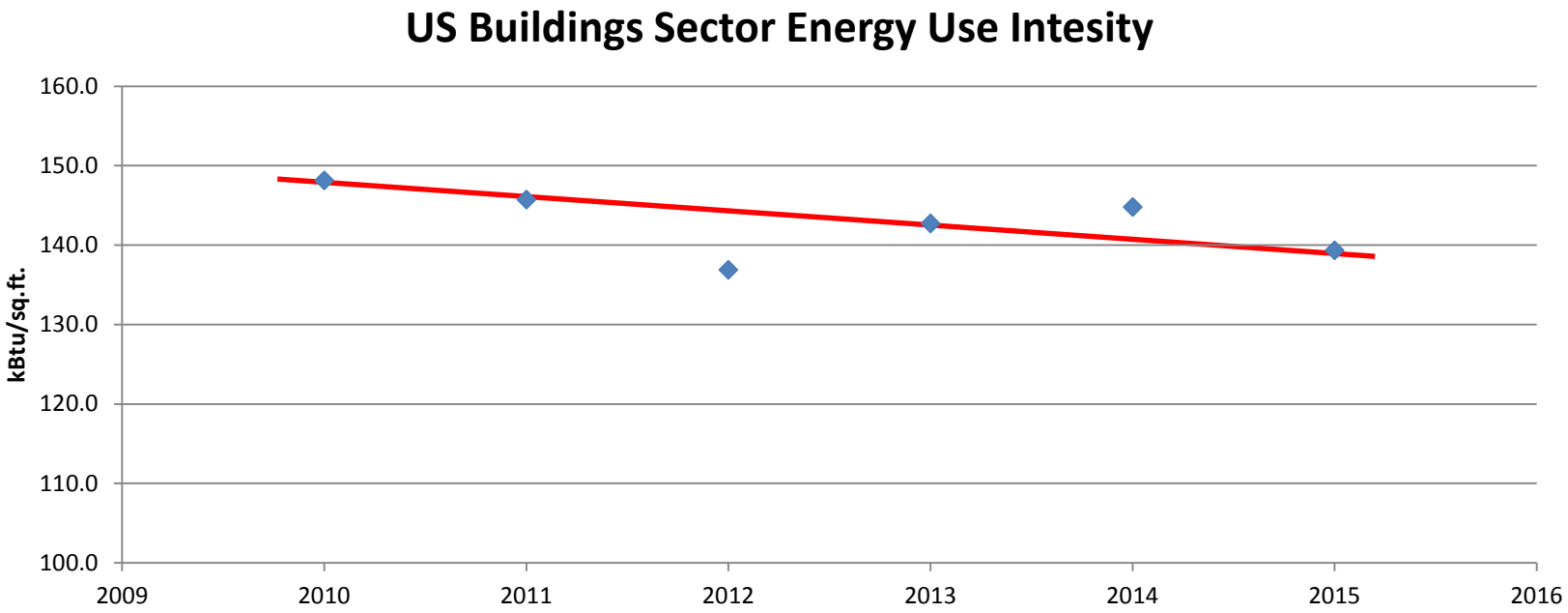
Plan for Measuring Progress





- In 2015 the EUI for the building sector was 6.0% lower than the 2010 baseline EUI
- Between 2010 and 2015 the EUI declined at an average rate of 1.2 kBtu per sq. ft. per year.

Data Source

- Energy Information Administration's *Annual Energy Outlook*

Key Issues

- Weather Variation
- Renewables

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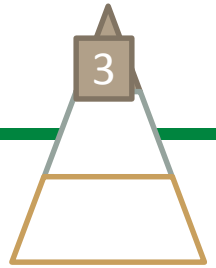

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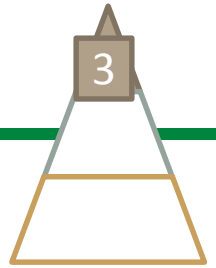
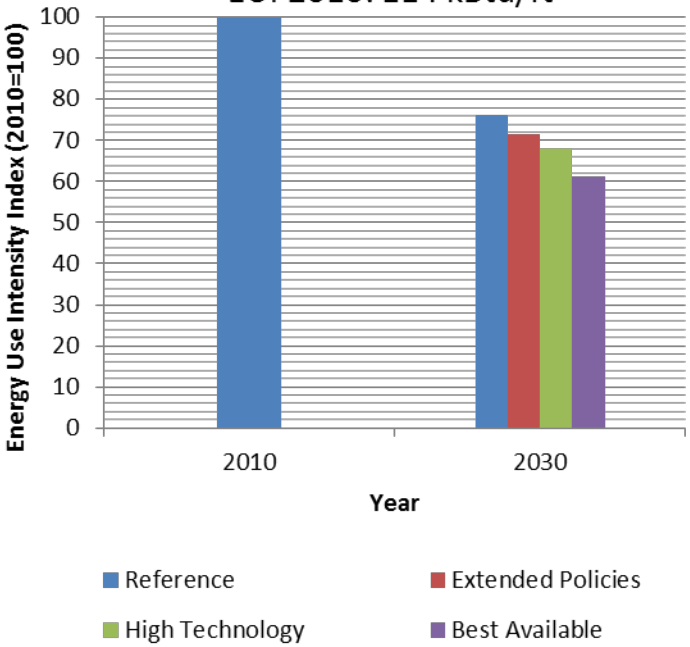
How Do BTO's Goals Relate to Each Other?



Residential Buildings

Total Consumption 2010: 21.8 Quads

EUI 2010: 114 kBtu/ft^2



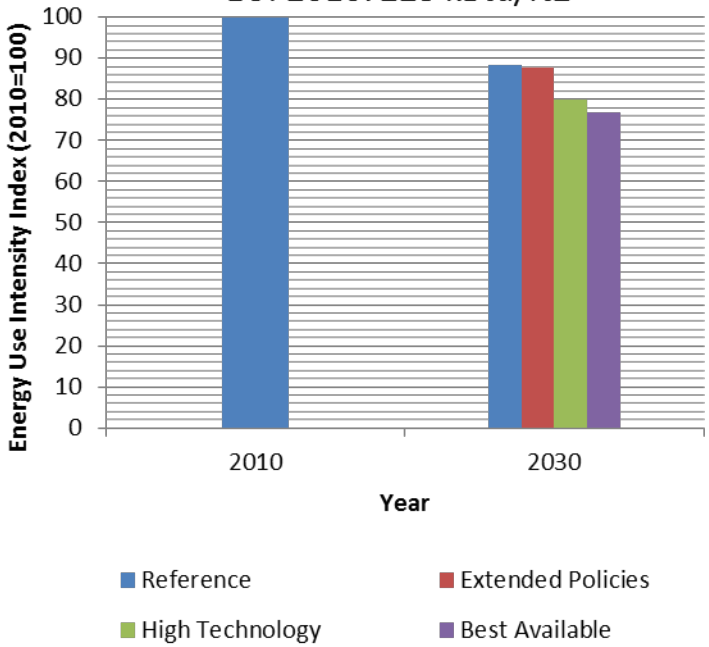
Predicted EUI Improvement in 2030:

- Reference – 24%
- Extended Policy – 29%
- High Technology – 32%
- Best Available – 39%

Commercial Buildings

Total Consumption 2010: 18.0 Quads

EUI 2010: 223 kBtu/ft2



Predicted EUI Improvement in 2030:

- Reference – 12%
- Extended Policy – 12%
- High Technology – 20%
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Source: 2014 Annual Energy Outlook, U.S. Energy Information Administration

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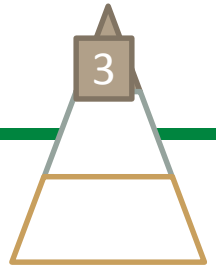
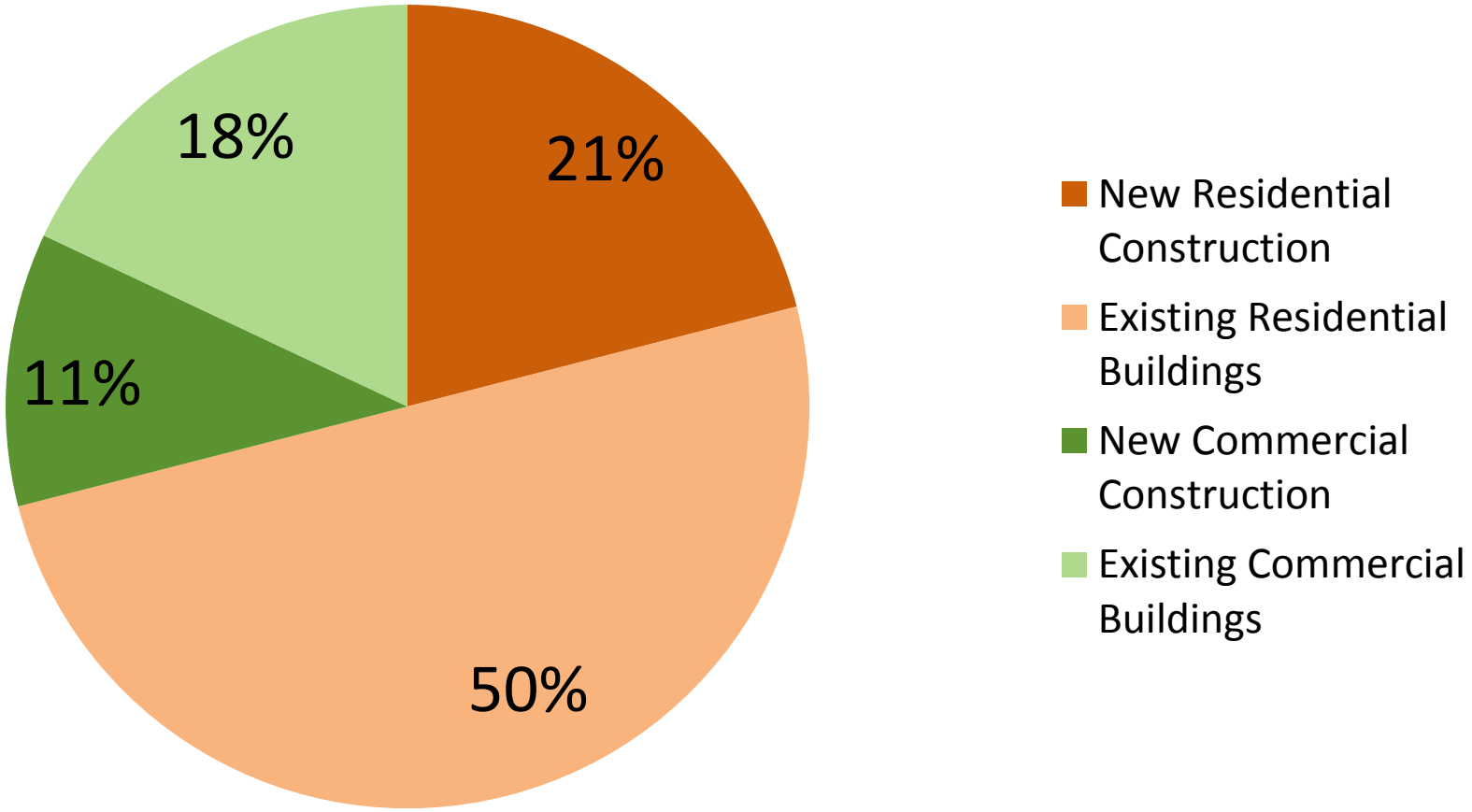


2030 Building Sector Floor Area



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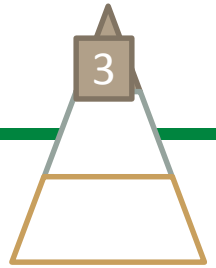

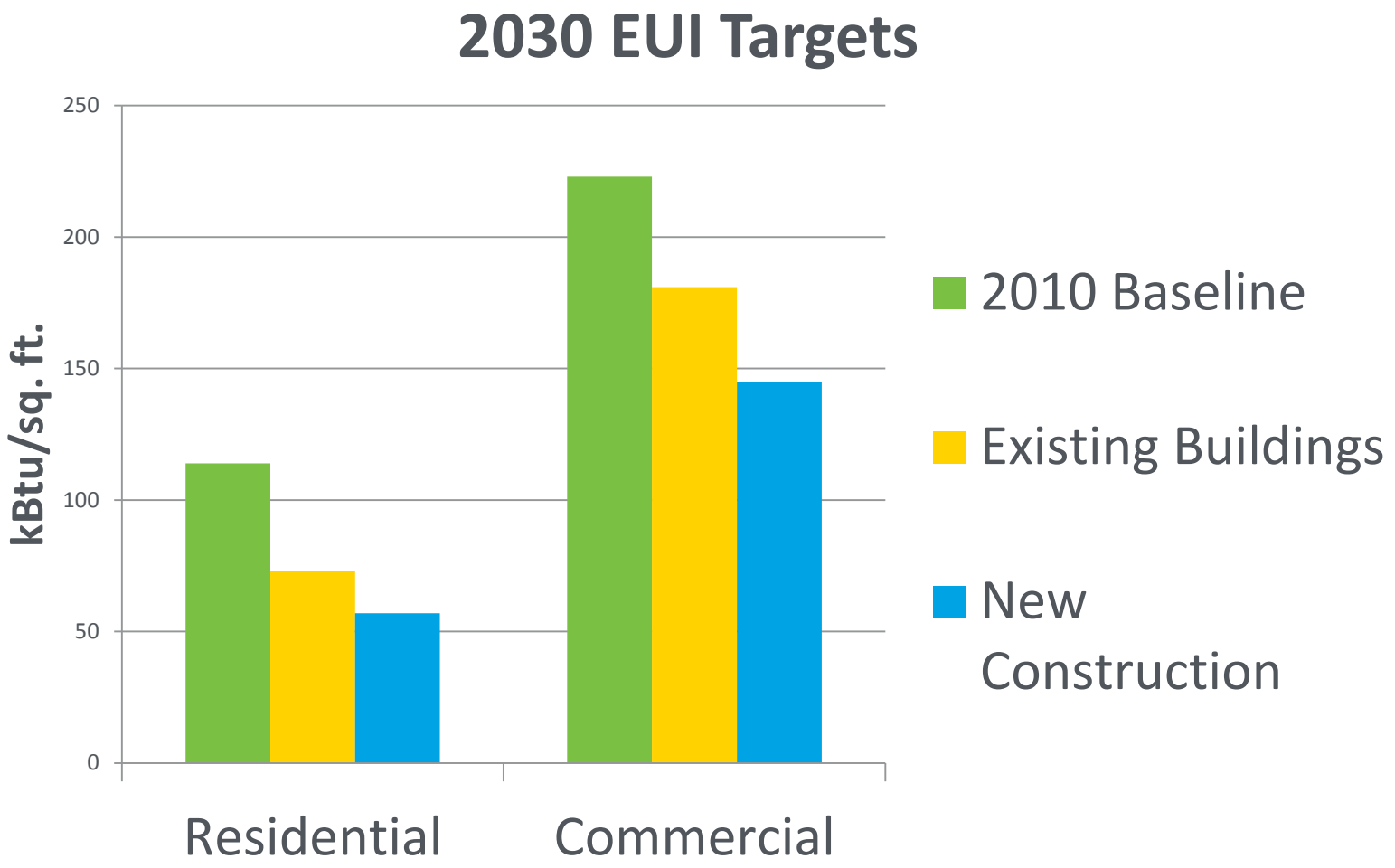

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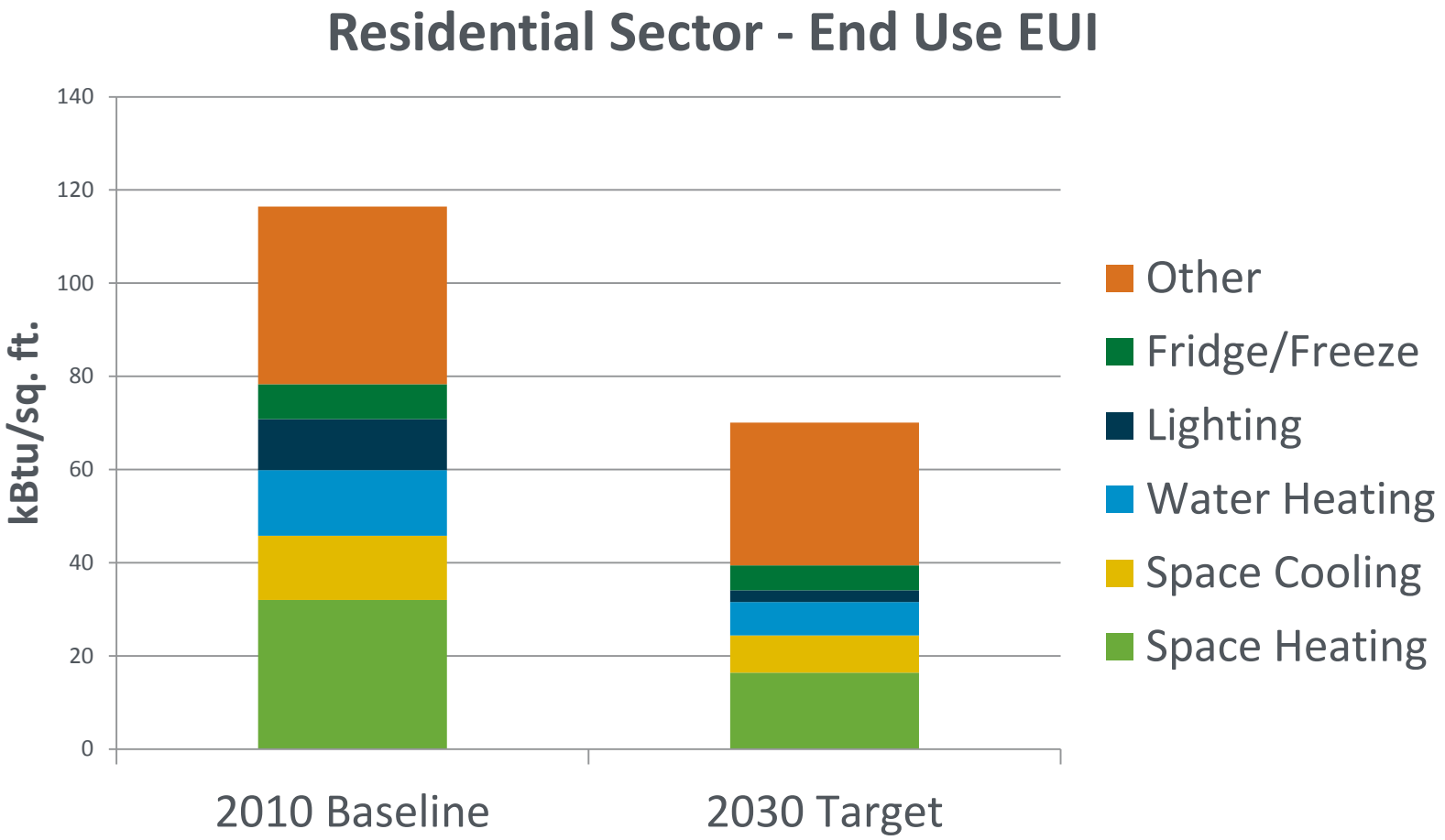
Goal Language for RBI Goal



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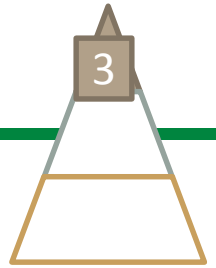

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Looking Forward

- Goal Related Discussions in Peer Review
  - Program Overview Sessions
  - Peer Review Presentations

- In Fall/Winter of 2016 Report on Goals Progress and Analysis
  - Progress to date on all goals
  - Updated NEMS analysis on pathways to achieving BTO's Sectoral Goal
  - Discussion of select building sector trends

THANK YOU

Contact:

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