

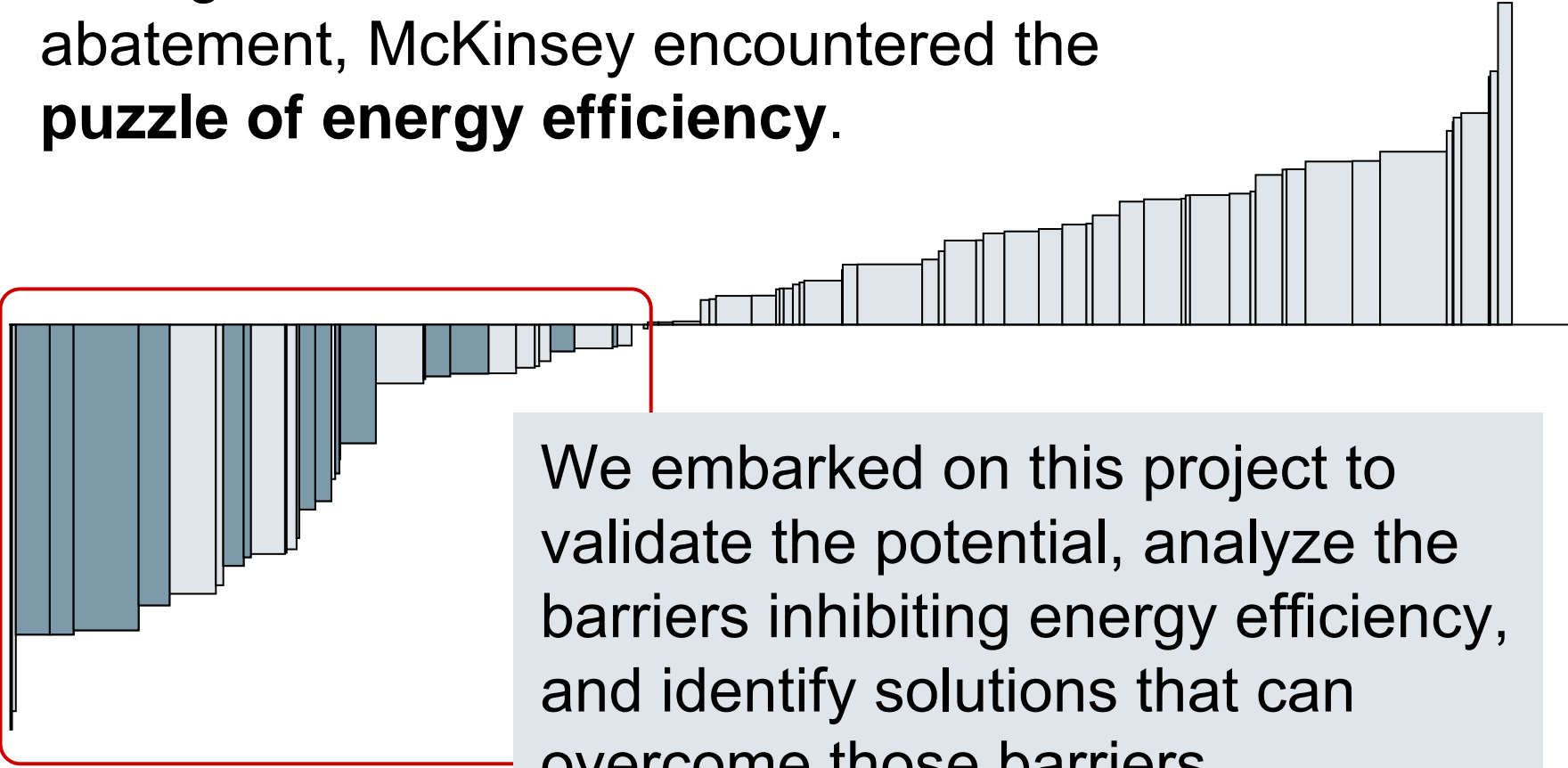


Unlocking Energy Efficiency in the U.S. Economy

Oct 1st, 2009

Project Background

During our research on U.S. GHG abatement, McKinsey encountered the **puzzle of energy efficiency**.



We embarked on this project to validate the potential, analyze the barriers inhibiting energy efficiency, and identify solutions that can overcome those barriers

Project scope

- Analyzed **stationary** uses of energy across residential, commercial, and industrial sectors, including CHP
- Examined over 675 efficient end-use measures, but only **existing technologies**
- Focused on **productivity**; not on conservation (no changes in lifestyle or behavior)
- Analyzed **NPV-positive** applications of energy efficiency; based on incremental capital, operations, and lifetime energy costs – excluded program costs and indirect benefits – discounted at 7 percent
- Identified the **potential** for energy efficiency, the barriers, and potential solutions – no attempt to declare how much potential will be achieved

Central Conclusion of our work

Energy efficiency offers a **vast, low-cost energy resource** for the U.S. economy – but only if the nation can craft a comprehensive and innovative approach to unlock it.

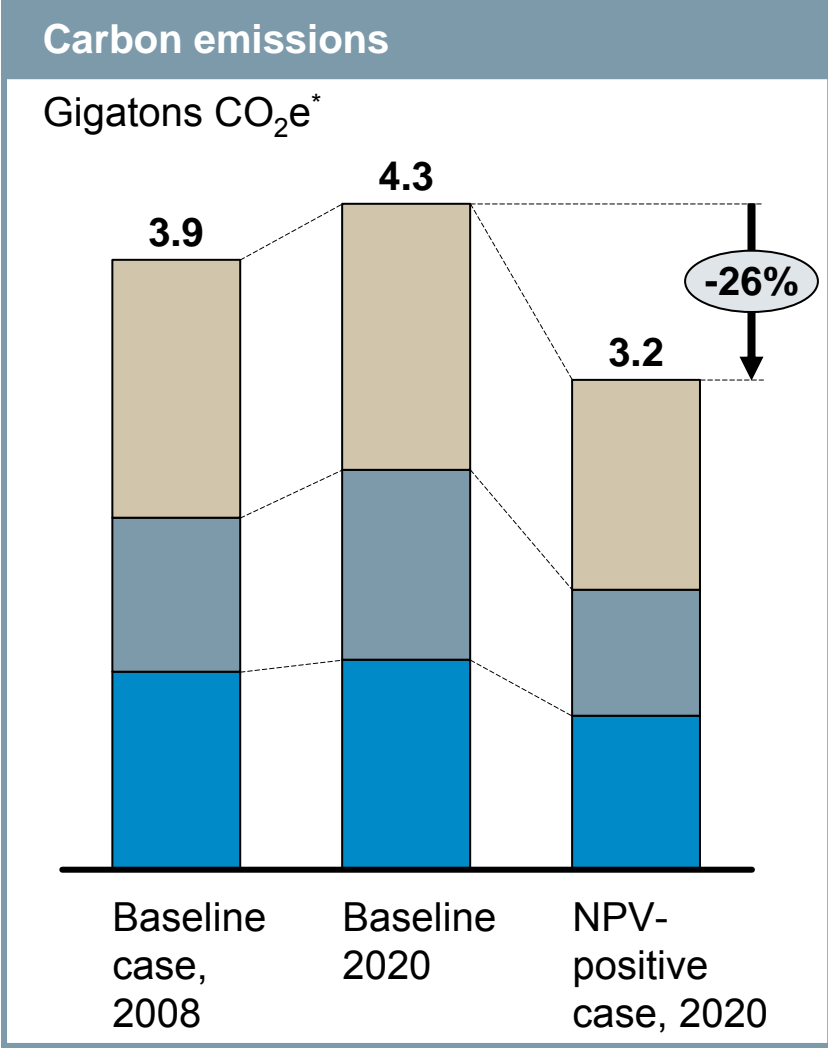
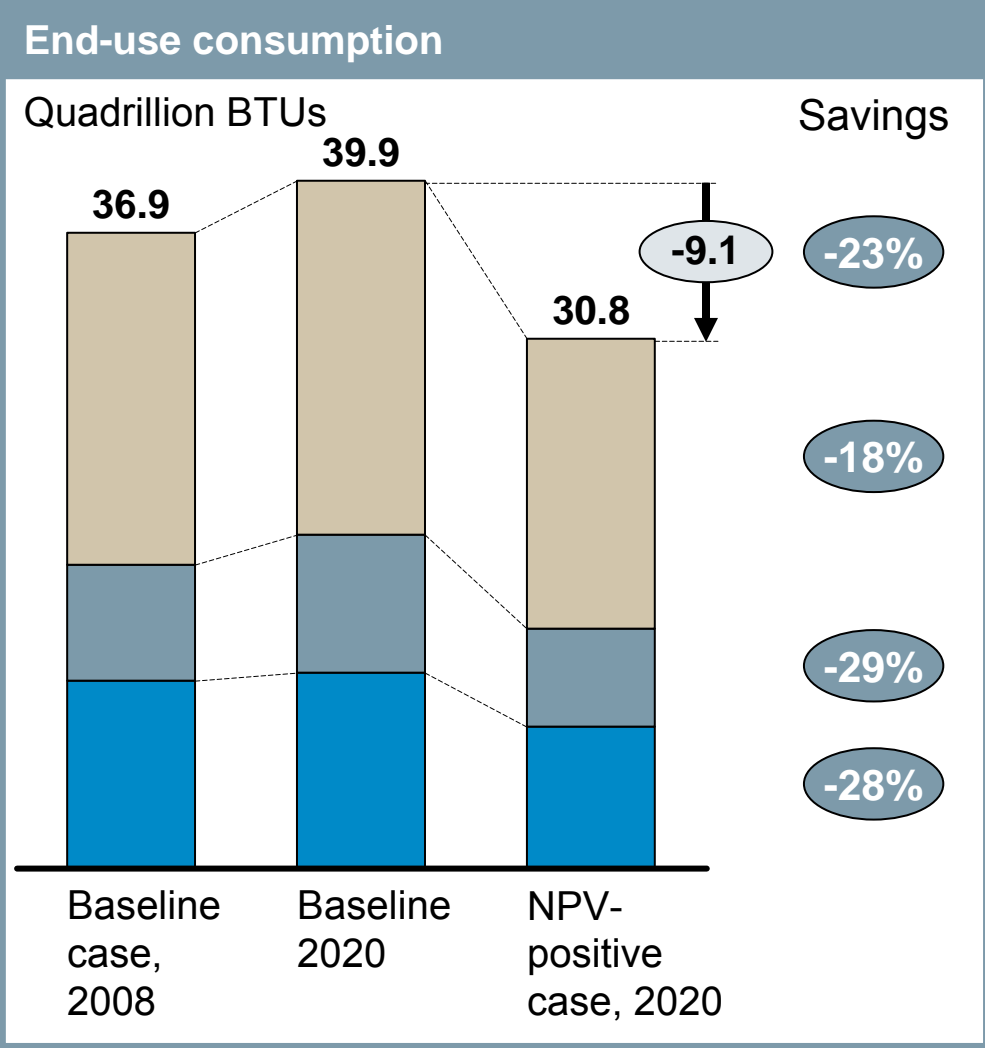
Significant and persistent barriers will need to be addressed at multiple levels to stimulate demand for energy efficiency and manage its delivery across more than 100 million buildings and literally billions of devices.

If executed at scale, a holistic approach would yield gross energy **savings worth more than \$1.2 trillion**, well above the **\$520 billion needed for upfront investment** in efficiency measures (not including program costs).

Such a program is estimated to reduce end-use energy consumption in 2020 by 9.1 quadrillion BTUs, roughly **23 percent of projected demand**, potentially abating up to **1.1 gigatons of greenhouse gases annually**.

Significant energy efficiency potential exists in the U.S. economy

- Industrial
- Commercial
- Residential



* Includes carbon emission abatement potential from CHP

Significant efficiency potential across fuel types

Contribution by energy source to 2020 efficiency potential

Percent Savings Percent

26 23 20 18

1,080 TWh

2.9 TCF

250 MBOE

100%=

End-use energy

9.1 quadrillion BTUs

Primary energy

18.4 quadrillion BTUs

Carbon emissions

1.1 gigatons CO₂e

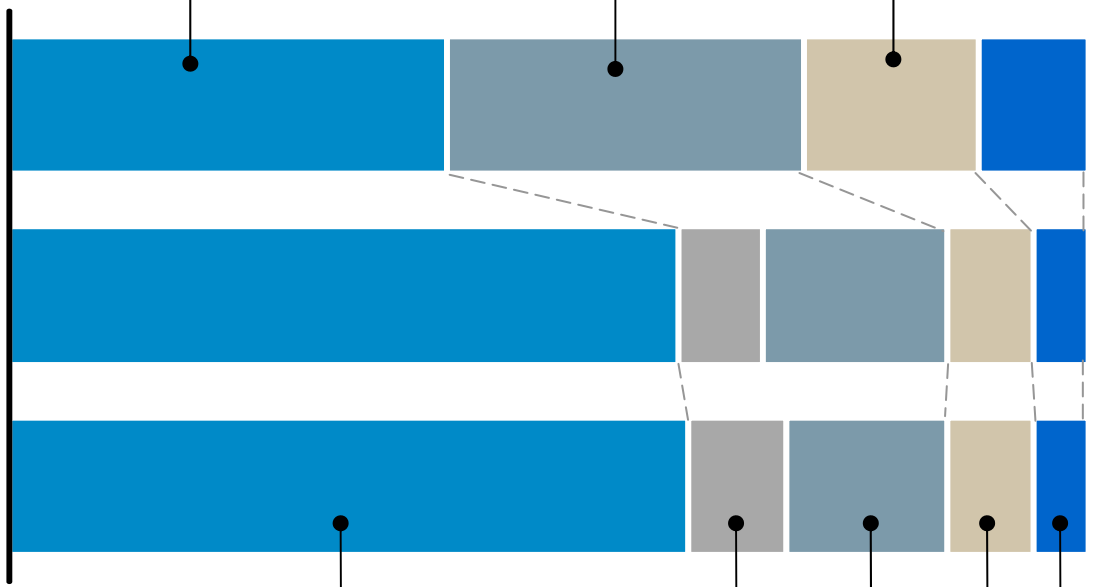
Electricity

CHP

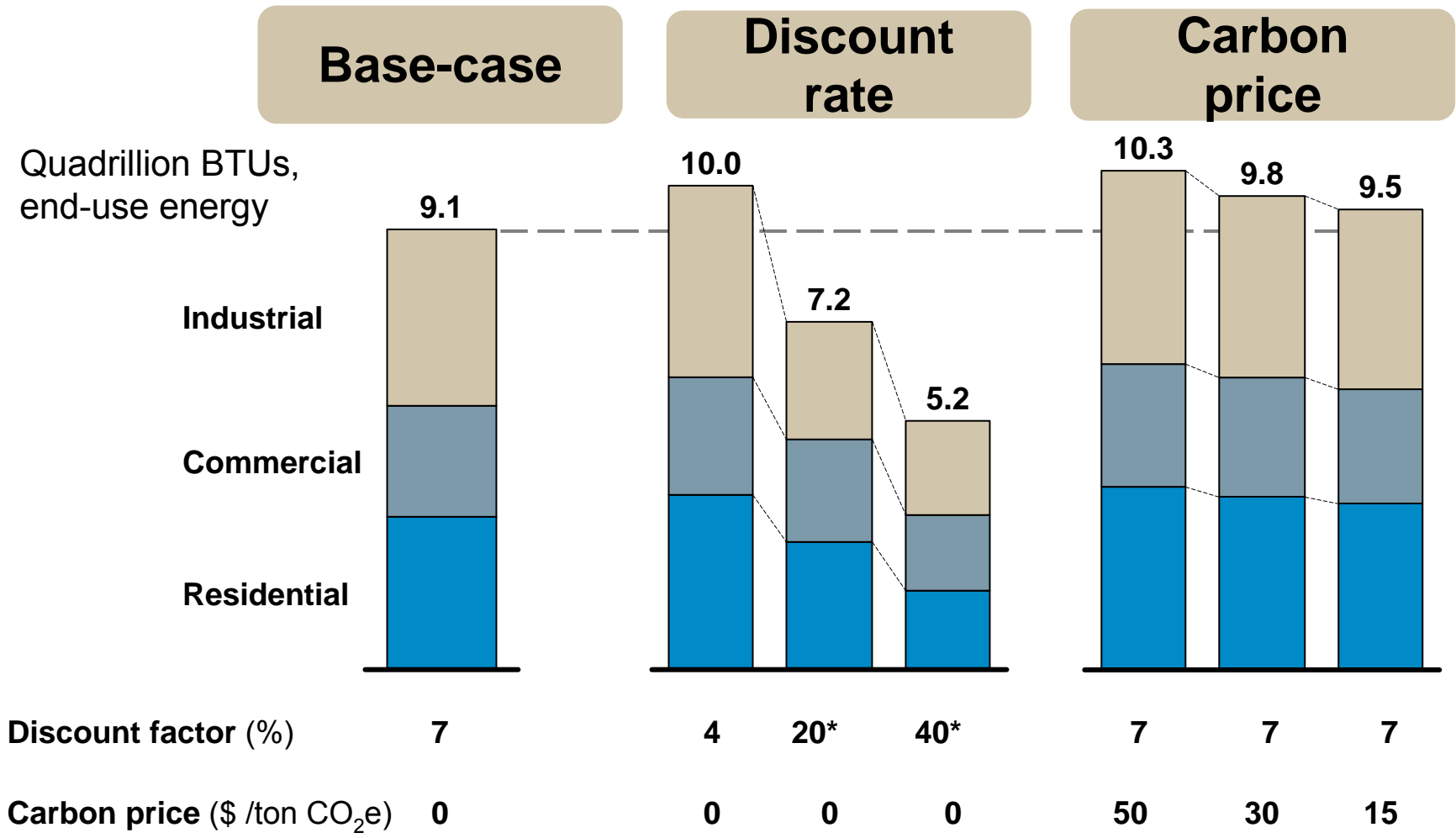
Gas

Oil

Other



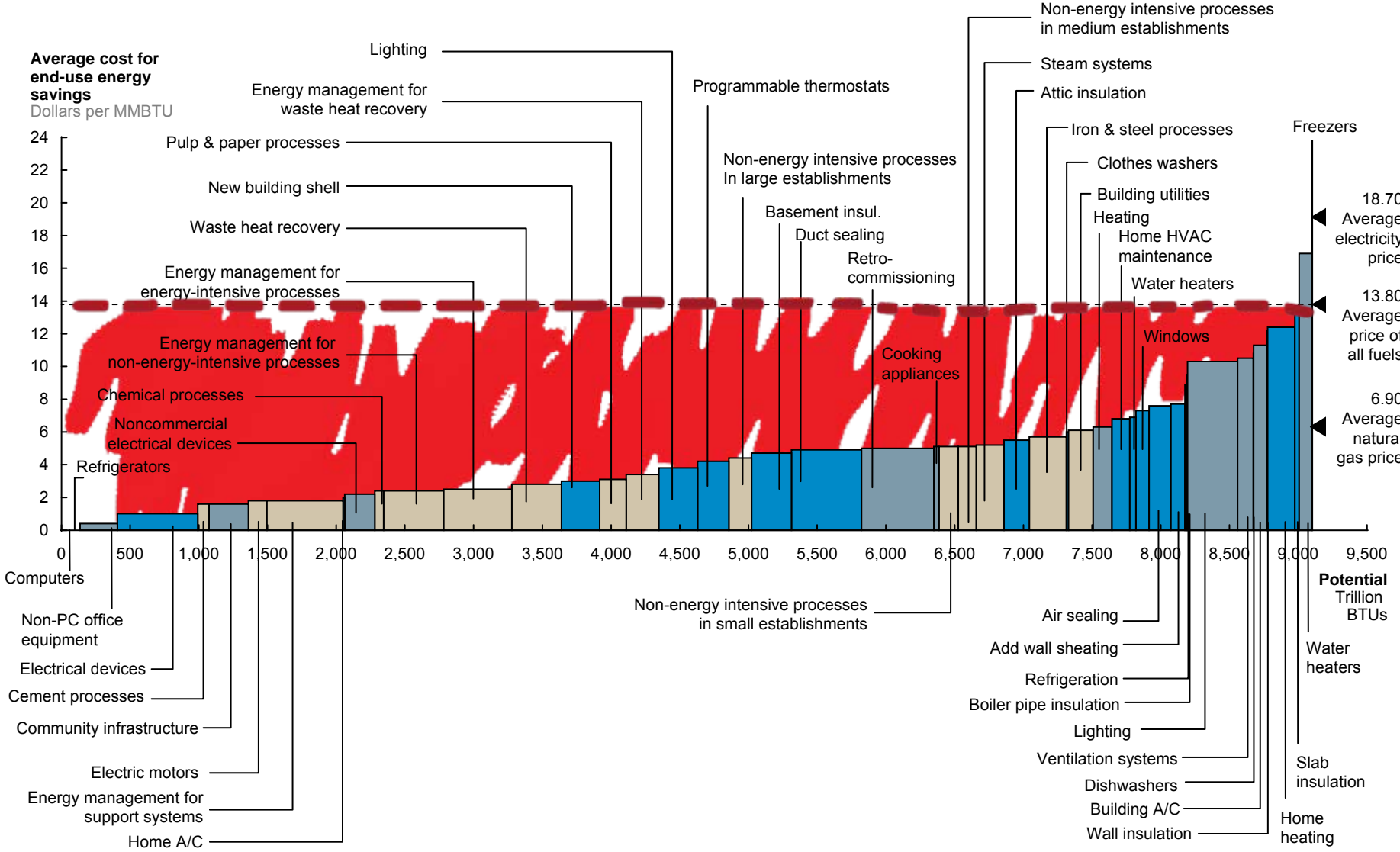
Potential remains attractive even under significant changes in assumptions



* Utilizes retail rates (vs. lower “avoided cost” rate proxy of industrial rates)

Energy efficiency offers the most affordable means of delivering energy

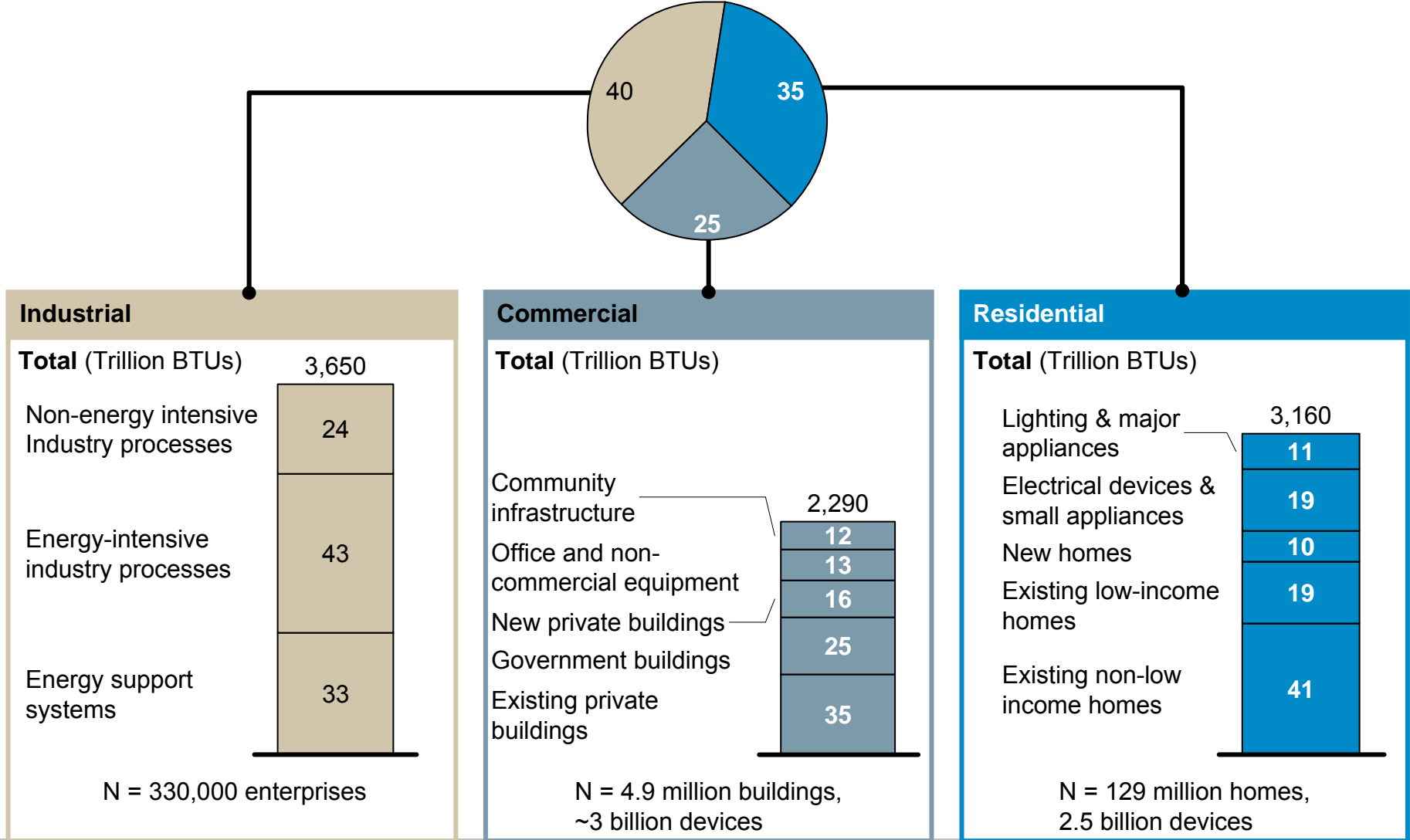
Residential
Commercial
Industrial



Source: EIA AEO 2008, McKinsey analysis

Clusters of opportunity emerge

Percent, 100% = 9,100 trillion BTUs of end-use energy efficiency potential



Source: Energy Information Agency's Annual Energy Outlook 2008; McKinsey analysis

The fundamental nature of energy efficiency creates challenges

FUNDAMENTAL ATTRIBUTES OF ENERGY EFFICIENCY

Requires outlay

Full capture would require upfront outlay of about \$50 billion per year, plus program costs

Fragmented

Potential is spread across more than 100 million locations and billions of devices

Low mind-share

Improving efficiency is rarely the primary focus of any in the economy

Difficult to measure

Evaluating, measuring and verifying savings, is more difficult than measuring consumption

Additional opportunity-specific barriers inhibit energy efficiency

OPPORTUNITY-SPECIFIC BARRIERS

Structural

Behavioral

Availability

Agency

Incentives split between parties, impeding capture of potential

Ownership transfer issue

Owner expects to leave before payback time

Transaction barriers

Unquantifiable incidental costs of deployment

Pricing distortions

Regulatory, tax, or other distortions

Additional opportunity-specific barriers inhibit energy efficiency

OPPORTUNITY-SPECIFIC BARRIERS

Structural

Behavioral

Availability

Risk and uncertainty

Regarding ability to capture benefit of the investment

Lack of awareness

About product efficiency and own consumption behavior

Custom and habit

Practices that prevent capture of potential

Elevated hurdle rate

Similar options treated differently

Additional opportunity-specific barriers inhibit energy efficiency

OPPORTUNITY-SPECIFIC BARRIERS

Structural

Behavioral

Availability

Adverse bundling

Combining efficiency savings with costly options

Capital constraints

Inability to finance initial outlay

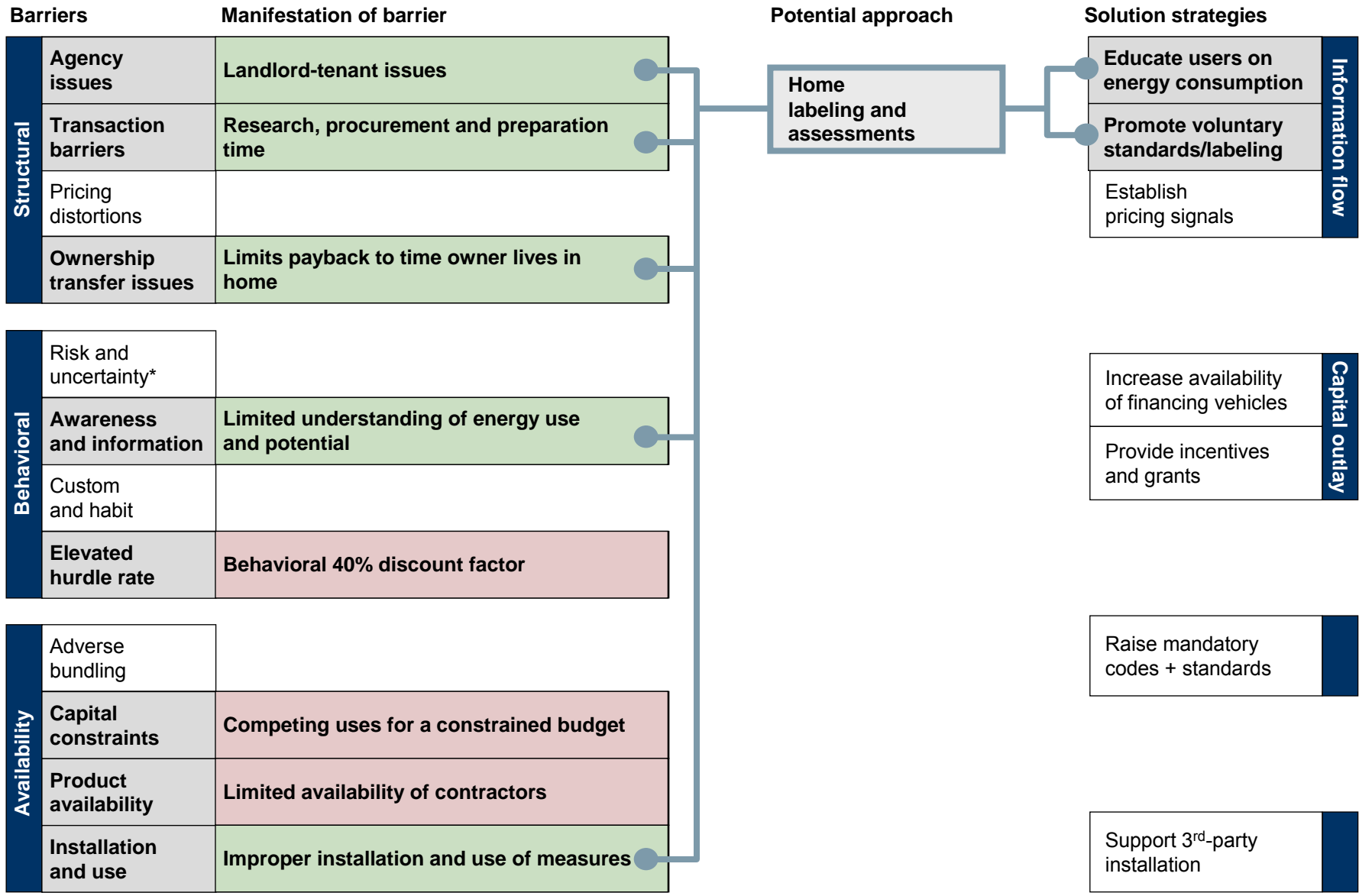
Product availability

Insufficient supply or channels to market

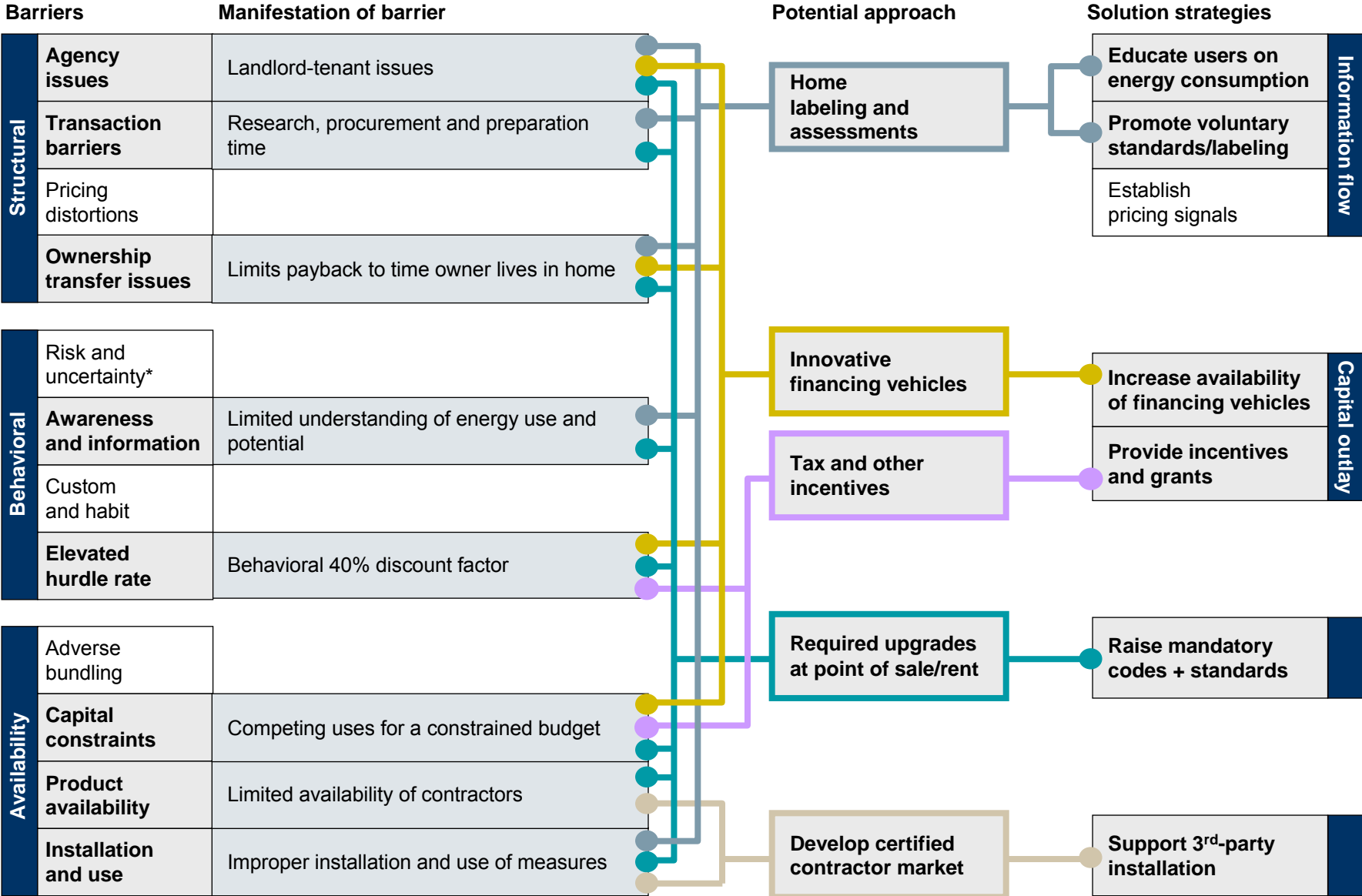
Installation and use

Improperly installed and/or operated

Addressing barriers in non-low income homes



Addressing barriers in non-low income homes



Solution strategies, with varying degrees of experience, are needed to unlock barriers

SOLUTION STRATEGIES

Proven

ENERGY STAR for appliances
Mandatory building codes

Piloted

LEED certified commercial buildings
Promoting energy management

Emerging

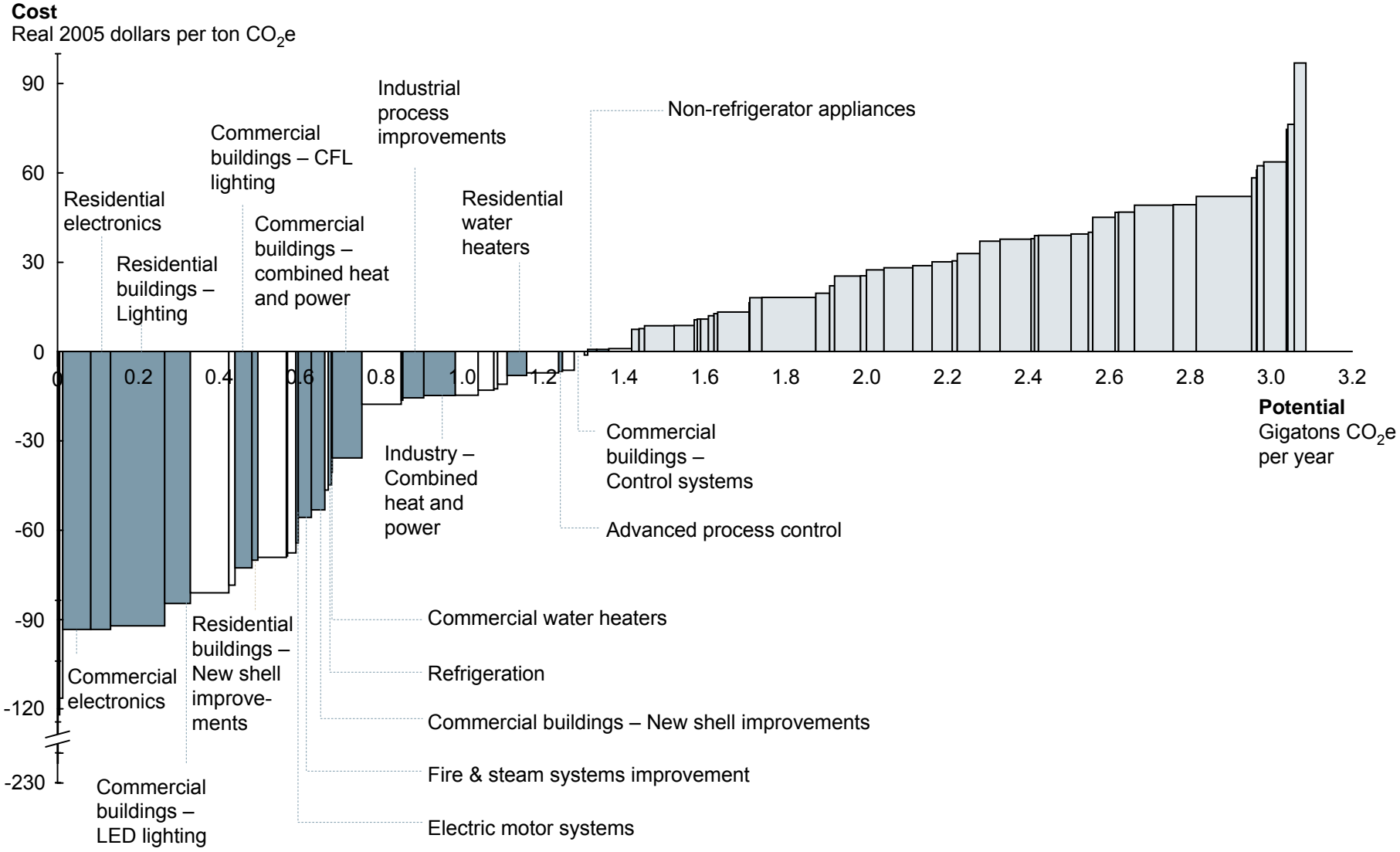
Long Island Green Homes in Babylon, NY
Loan guarantees for performance contracting

Important observations

- **Recognize energy efficiency as an important energy resource** while the nation concurrently develops new energy sources

U.S. mid-range greenhouse gas abatement curve – 2030

■ NPV-positive efficiency in stationary energy uses



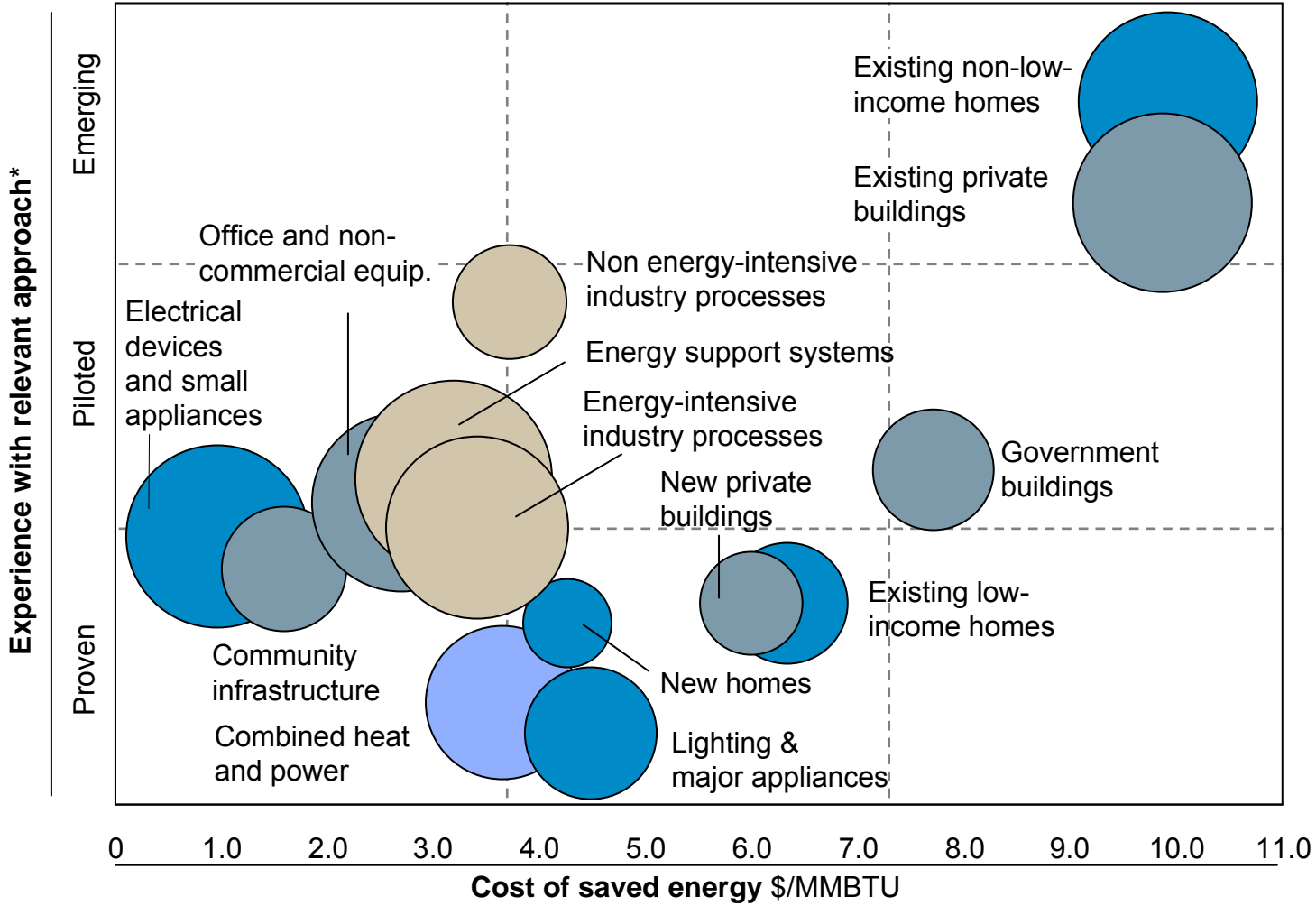
Source: McKinsey analysis

Important observations

- **Recognize energy efficiency as an important energy resource** while the nation concurrently develops new energy sources
- **Launch an integrated portfolio** of proven, piloted, and emerging approaches

Portfolio representing cost, experience, and potential of clusters possible with specified solution strategies

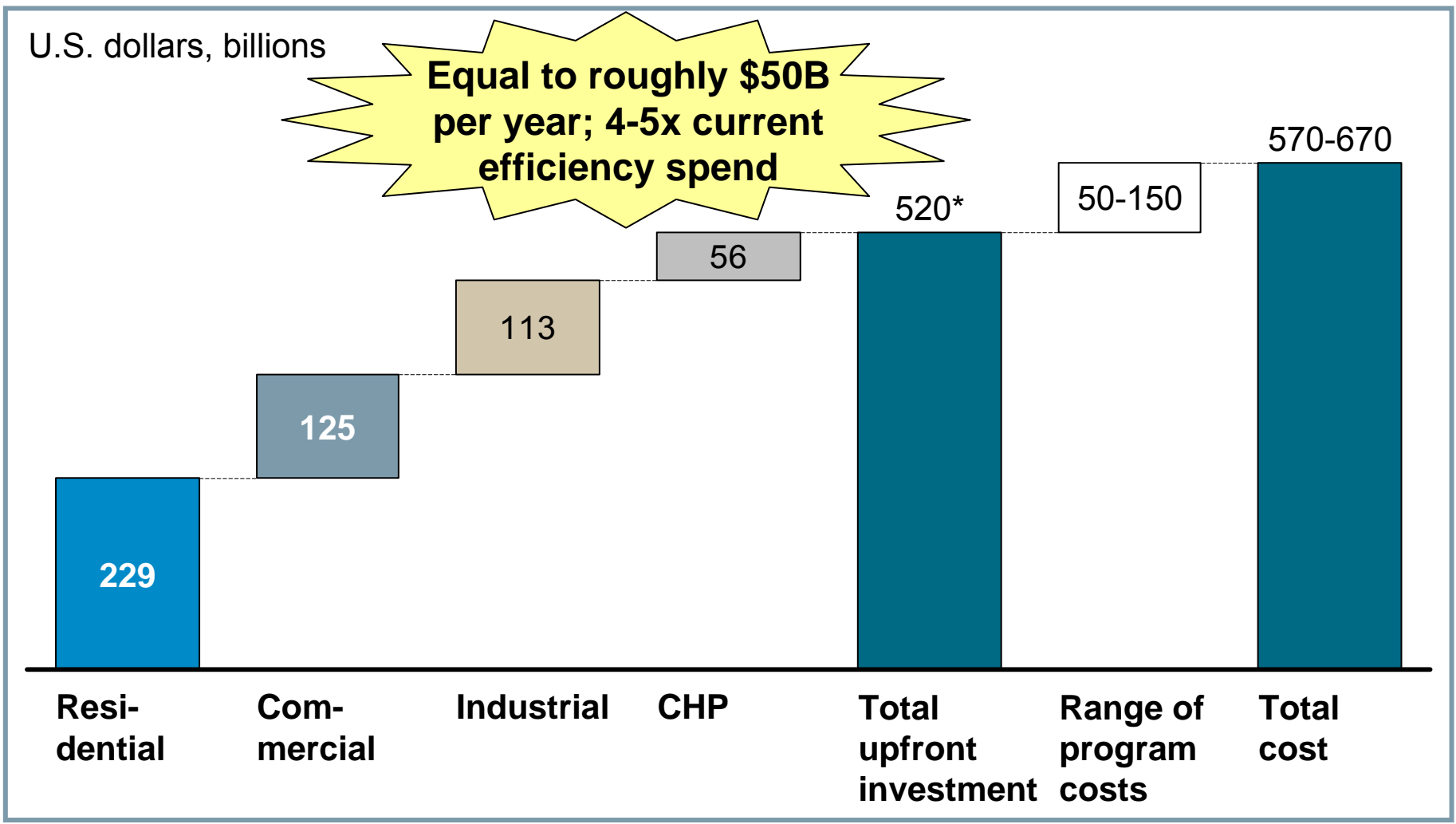
- Residential
- Commercial
- Industrial
- CHP
- Bubble area represents size of NPV-positive potential expressed in primary energy



Important observations

- **Recognize energy efficiency as an important energy resource** while the nation concurrently develops new energy sources
- **Launch an integrated portfolio** of proven, piloted, and emerging approaches
- Identify methods to **provide upfront funding**

To deliver the \$1.2 trillion in savings will require \$ 520 billions in upfront investments



* Rounded to the nearest ten billion
Source: EIA AEO 2008, McKinsey analysis

Important observations

- **Recognize energy efficiency as an important energy resource** while the nation concurrently develops new energy sources
- **Launch an integrated portfolio** of proven, piloted, and emerging approaches
- Identify methods to **provide upfront funding**
- **Forge greater alignment** among stakeholders

Aligning multiple stakeholders is an important enabler for unlocking efficiency potential

Regulators

Manufacturers



Customers

Utilities



Achieving regulatory alignment on cost recovery

Understanding the relationship between rates and bills

Clarifying leadership for each category of efficiency potential

Implementing appropriate measurement and verification

Important observations

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- **Launch an integrated portfolio** of proven, piloted, and emerging approaches
- Identify methods to **provide upfront funding**
- **Forge greater alignment** among stakeholders
- **Foster development** of next-generation energy efficient technologies

Central Conclusion of our work

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Significant and persistent barriers will need to be addressed at multiple levels to stimulate demand for energy efficiency and manage its delivery across more than 100 million buildings and literally billions of devices.

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