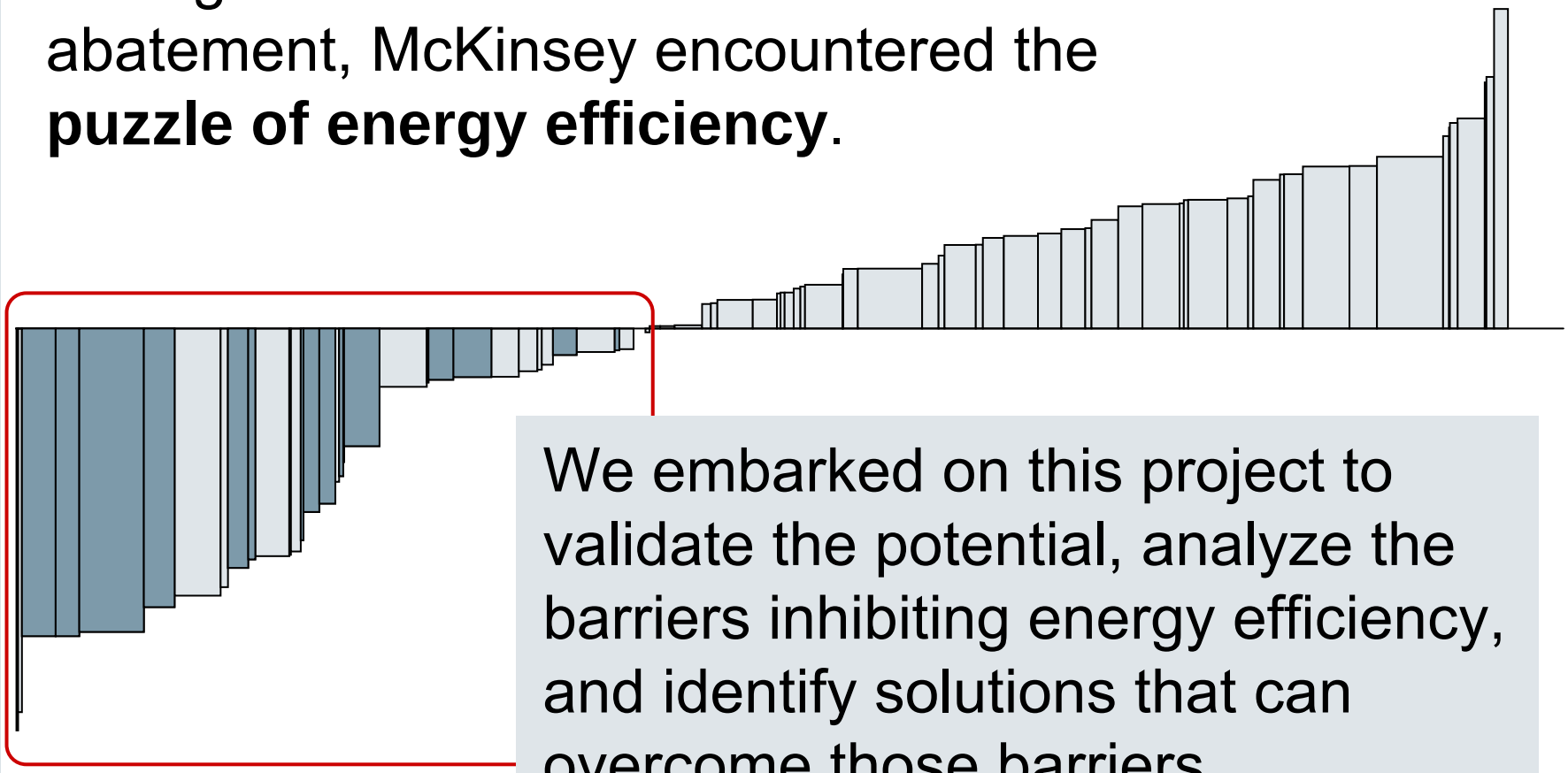
Unlocking Energy Efficiency in the U.S. Economy

State Energy, Environment, and Utility Commission Staffs Briefing
November 19th, 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.*

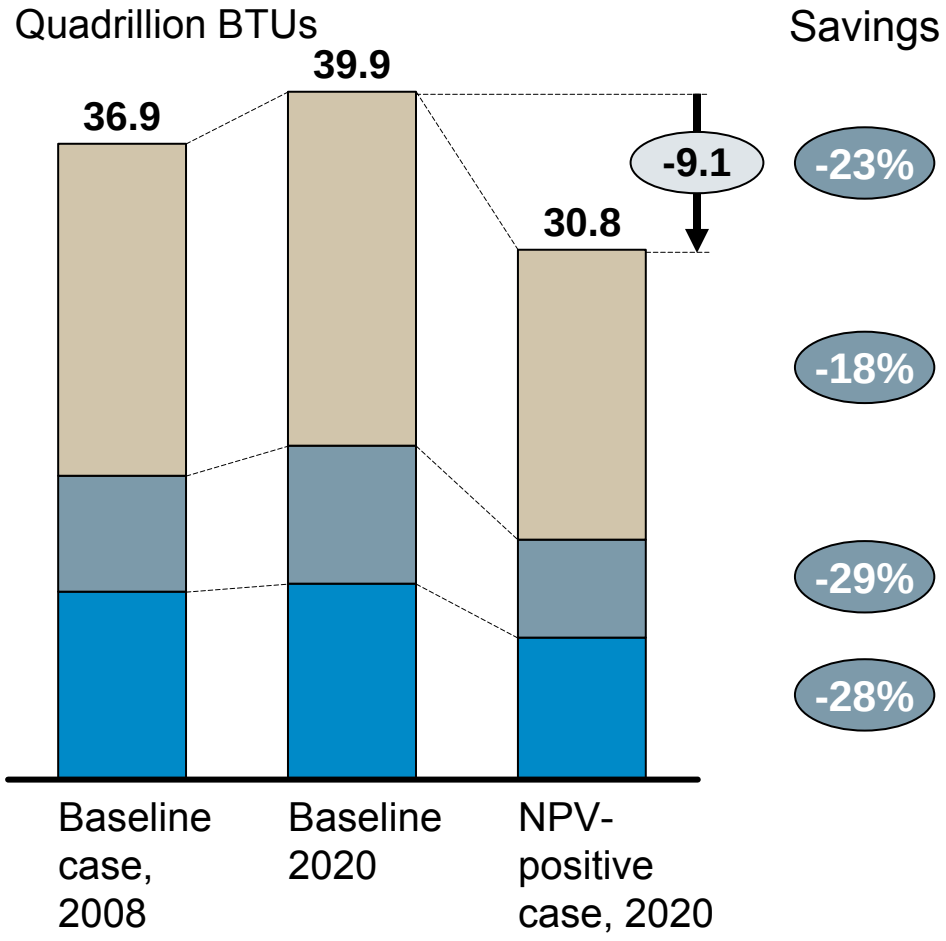
Significant and persistent barriers will need to be addressed *at multiple levels to stimulate demand for energy efficiency and manage its delivery across more than 100 million buildings and literally billions of devices.*

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).*

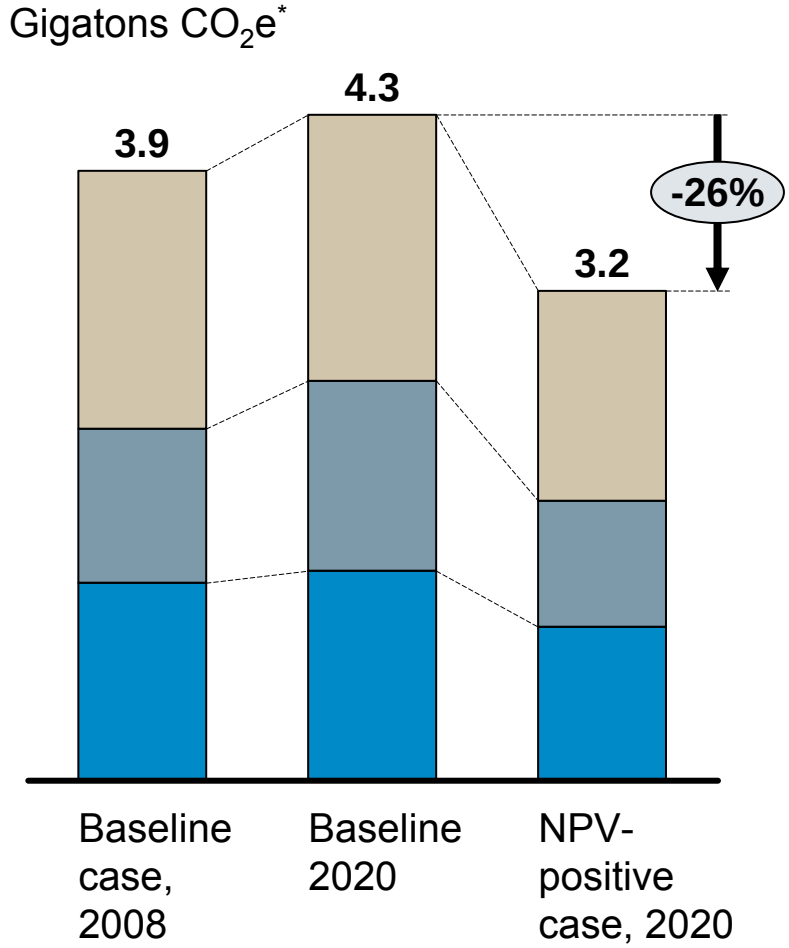
Such a program is estimated to reduce end-use energy consumption in 2020 by 9.1 quadrillion BTUs, roughly ***23 percent of projected demand****, potentially abating up to* ***1.1 gigatons of greenhouse gases annually.***

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

End-use consumption



Carbon emissions

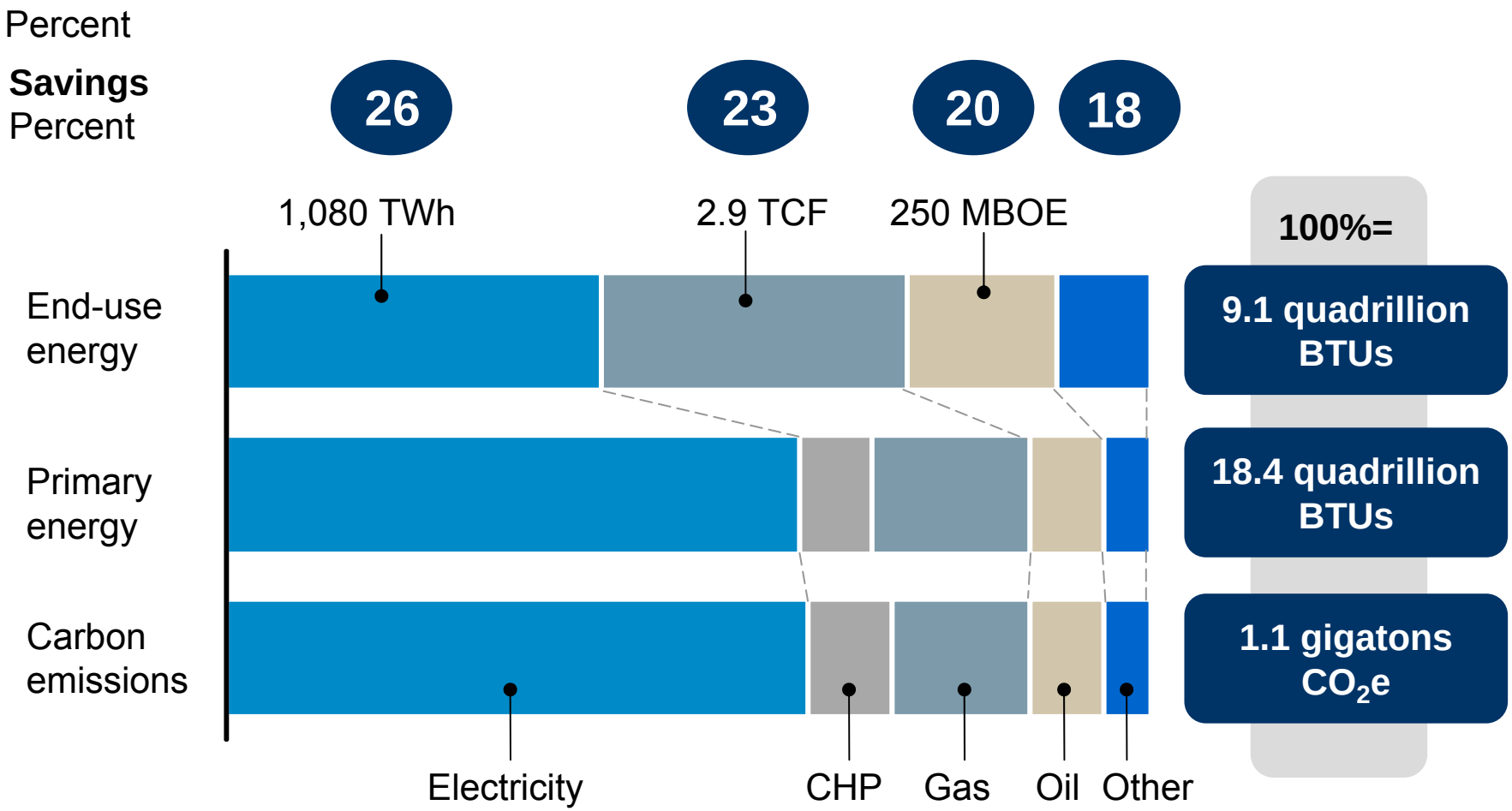


* Includes carbon emission abatement potential from CHP

Source: EIA AEO 2008, McKinsey analysis

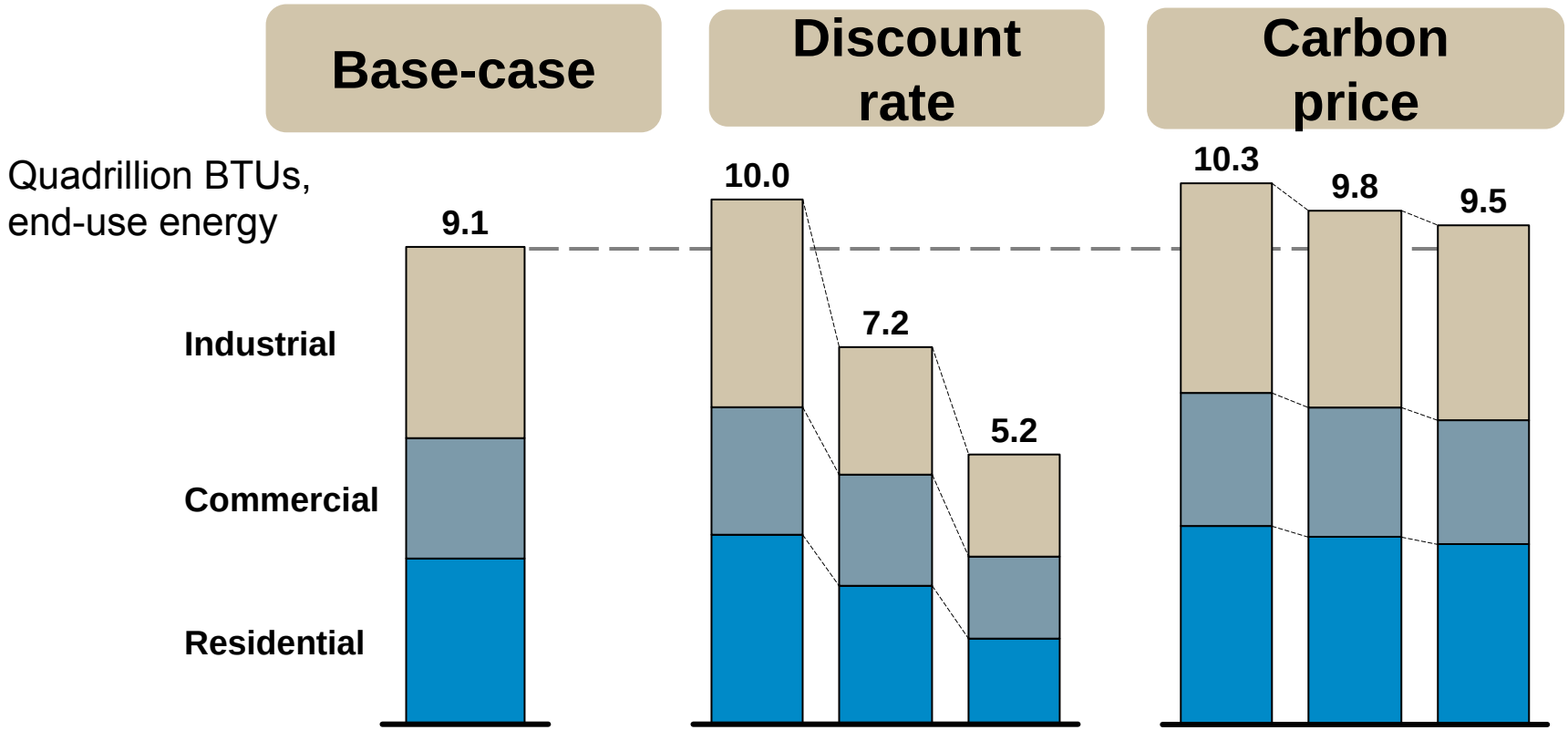
Significant efficiency potential across fuel types

Contribution by energy source to 2020 efficiency potential



Source: EIA AEO 2008, McKinsey analysis

Potential remains attractive even under significant changes in assumptions

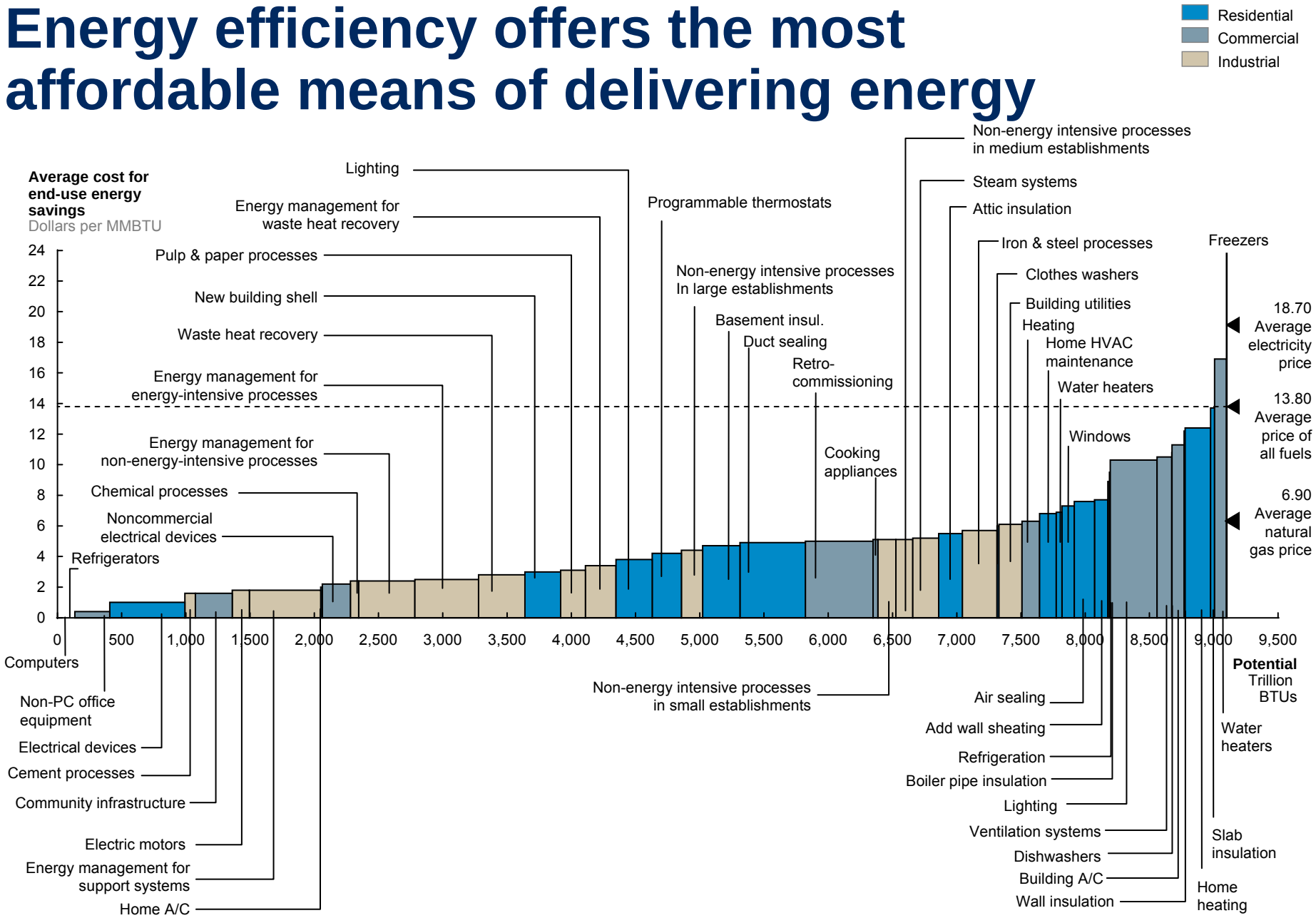


Discount factor (%)	7	4	20*	40*	7	7	7
Carbon price ($ /ton CO_2e)	0	0	0	0	50	30	15

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

Source: EIA AEO 2008, McKinsey analysis

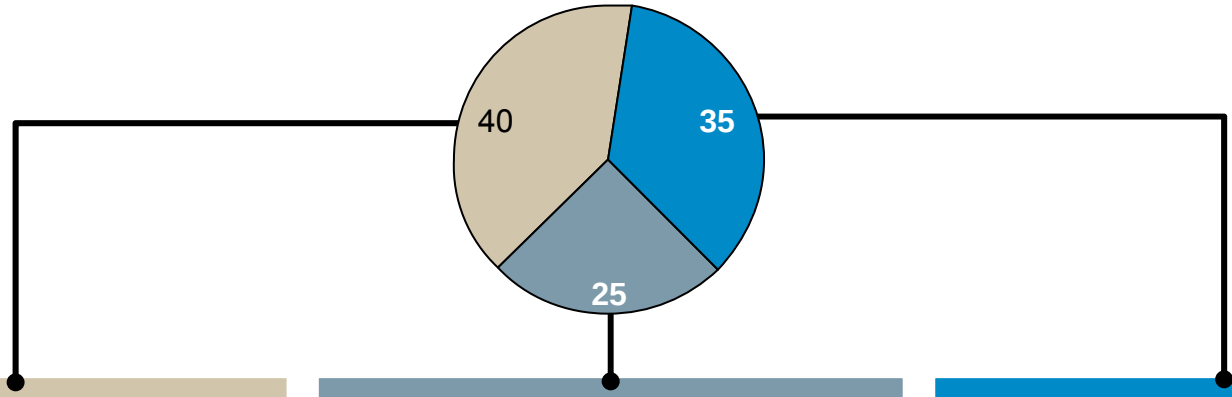
Energy efficiency offers the most affordable means of delivering energy



Source: EIA AEO 2008, McKinsey analysis

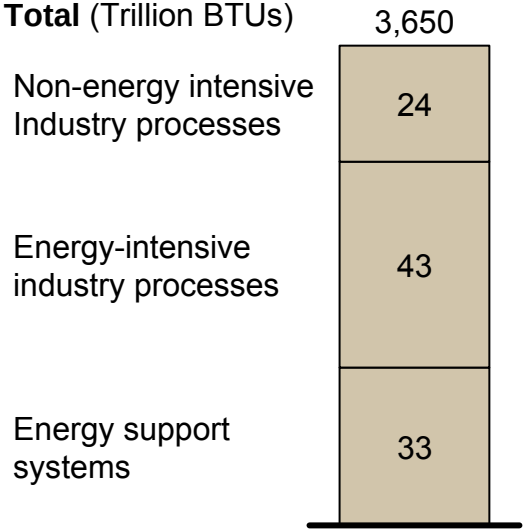
Clusters of opportunity emerge

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



Industrial

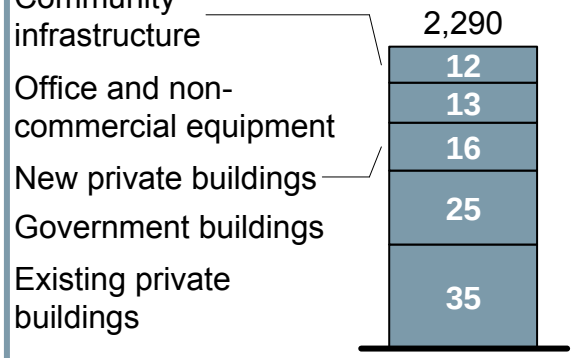
Total (Trillion BTUs)



N = 330,000 enterprises

Commercial

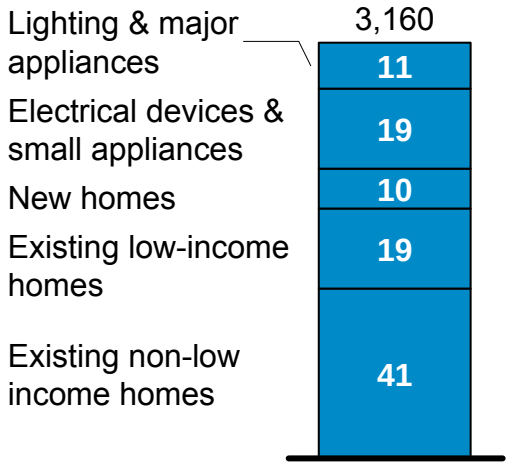
Total (Trillion BTUs)



N = 4.9 million buildings,
~3 billion devices

Residential

Total (Trillion BTUs)



N = 129 million homes,
2.5 billion devices

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

Source: McKinsey analysis

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

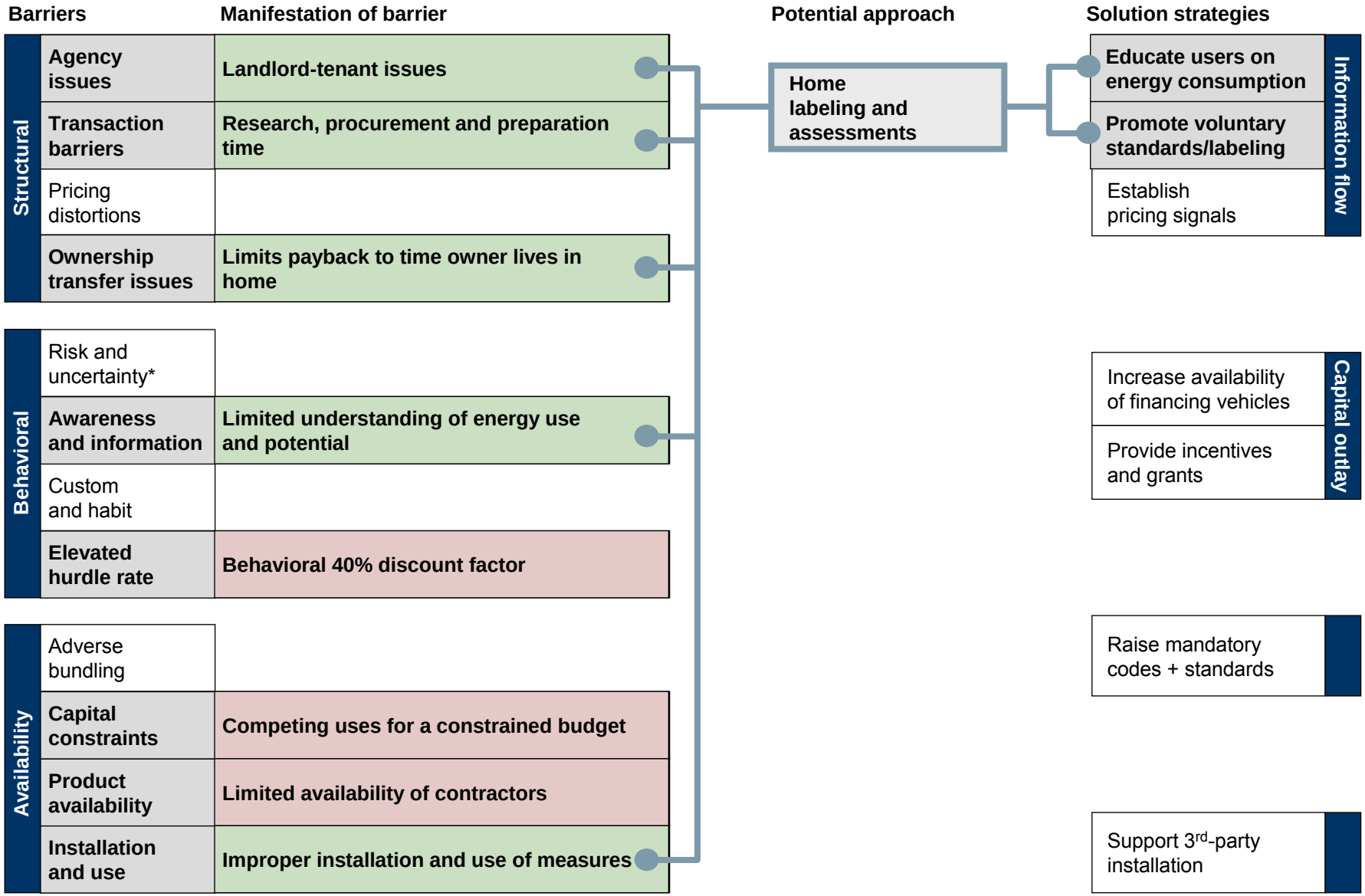
Additional opportunity-specific barriers inhibit energy efficiency

OPPORTUNITY-SPECIFIC BARRIERS

Structural | Behavioral | **Availability**

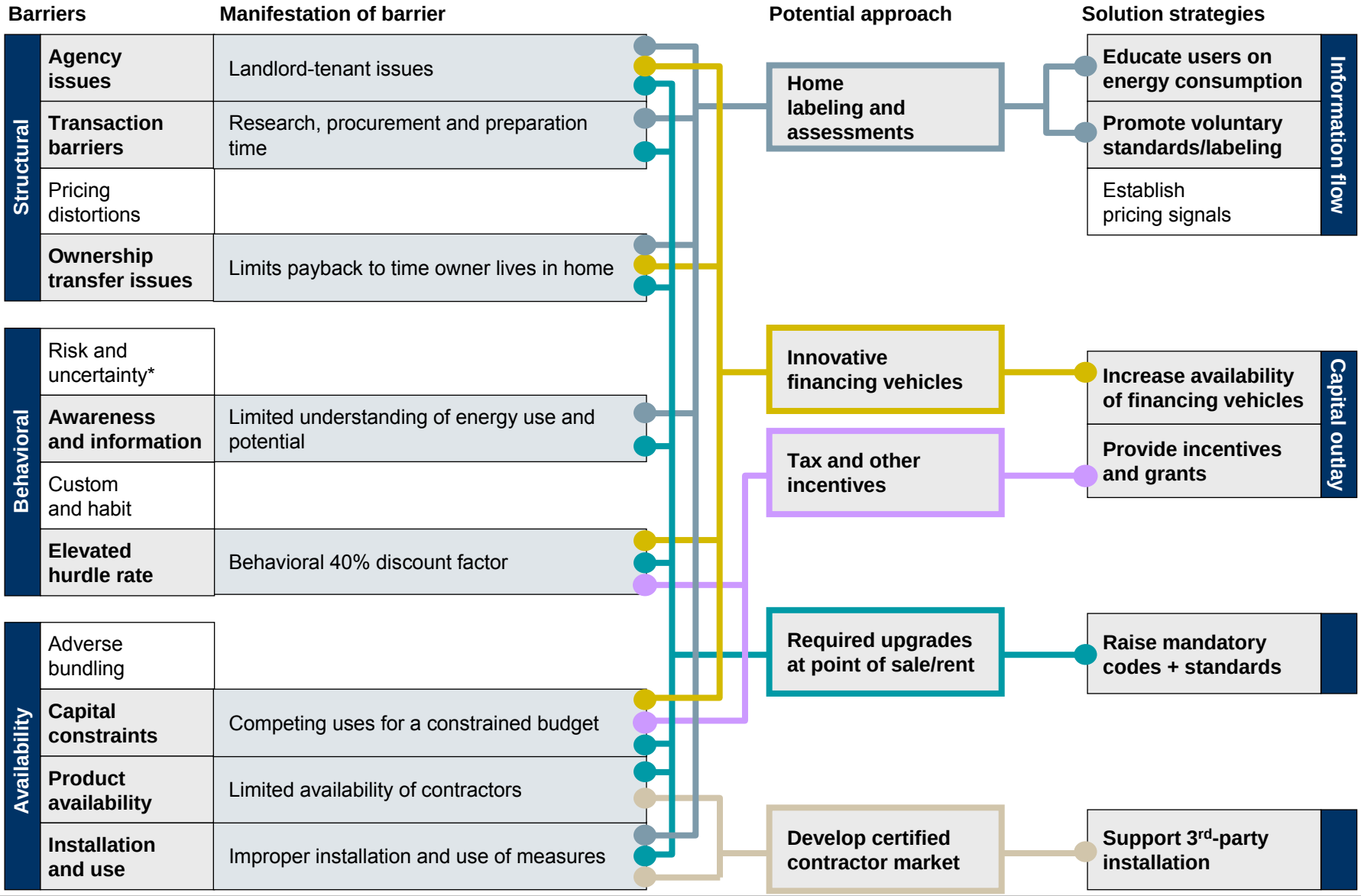
Adverse bundling	Combining efficiency savings with costly options
Capital constraints	Inability to finance initial outlay
Product availability	Insufficient supply or channels to market
Installation and use	Improperly installed and/or operated

Addressing barriers in non-low income homes



Source: McKinsey analysis

Addressing barriers in non-low income homes



Source: McKinsey analysis

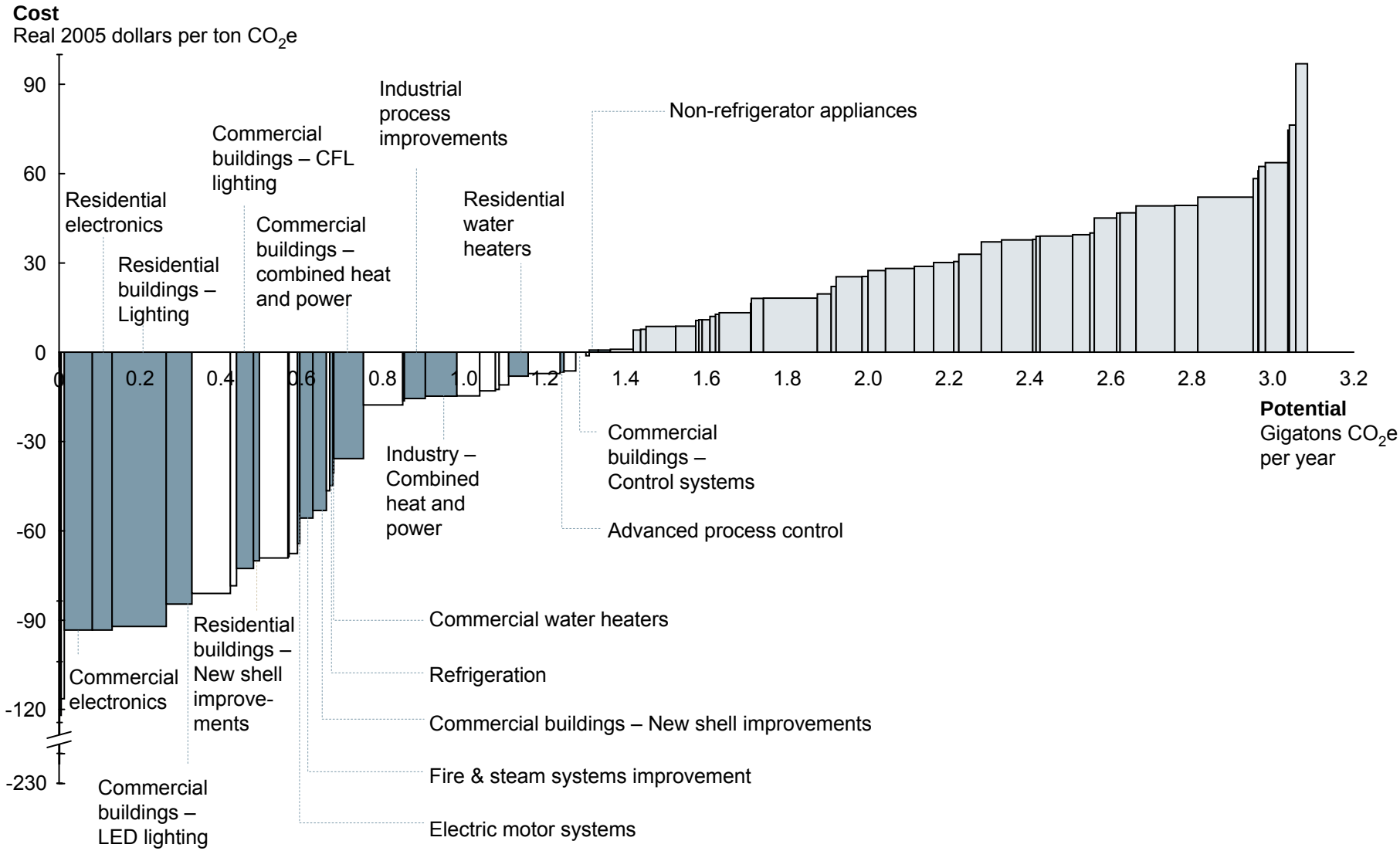
Solution strategies, with varying degrees of experience, are needed to unlock barriers

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

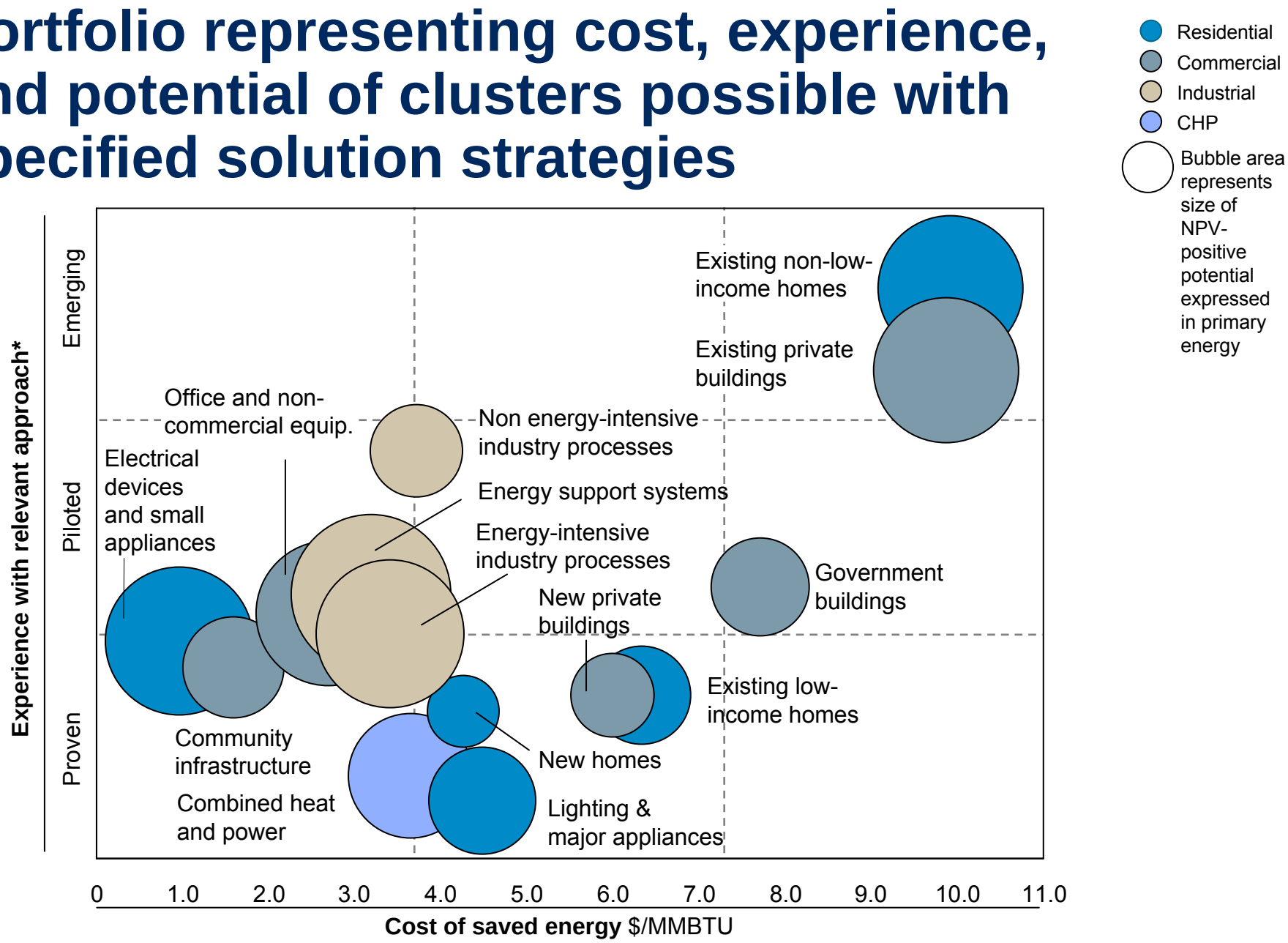
- **Recognize energy efficiency as an important energy resource** while the nation concurrently develops new energy sources
- **Launch an integrated portfolio** of proven, piloted, and emerging approaches
- Identify methods to **provide upfront funding**
- **Forge greater alignment** among stakeholders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

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



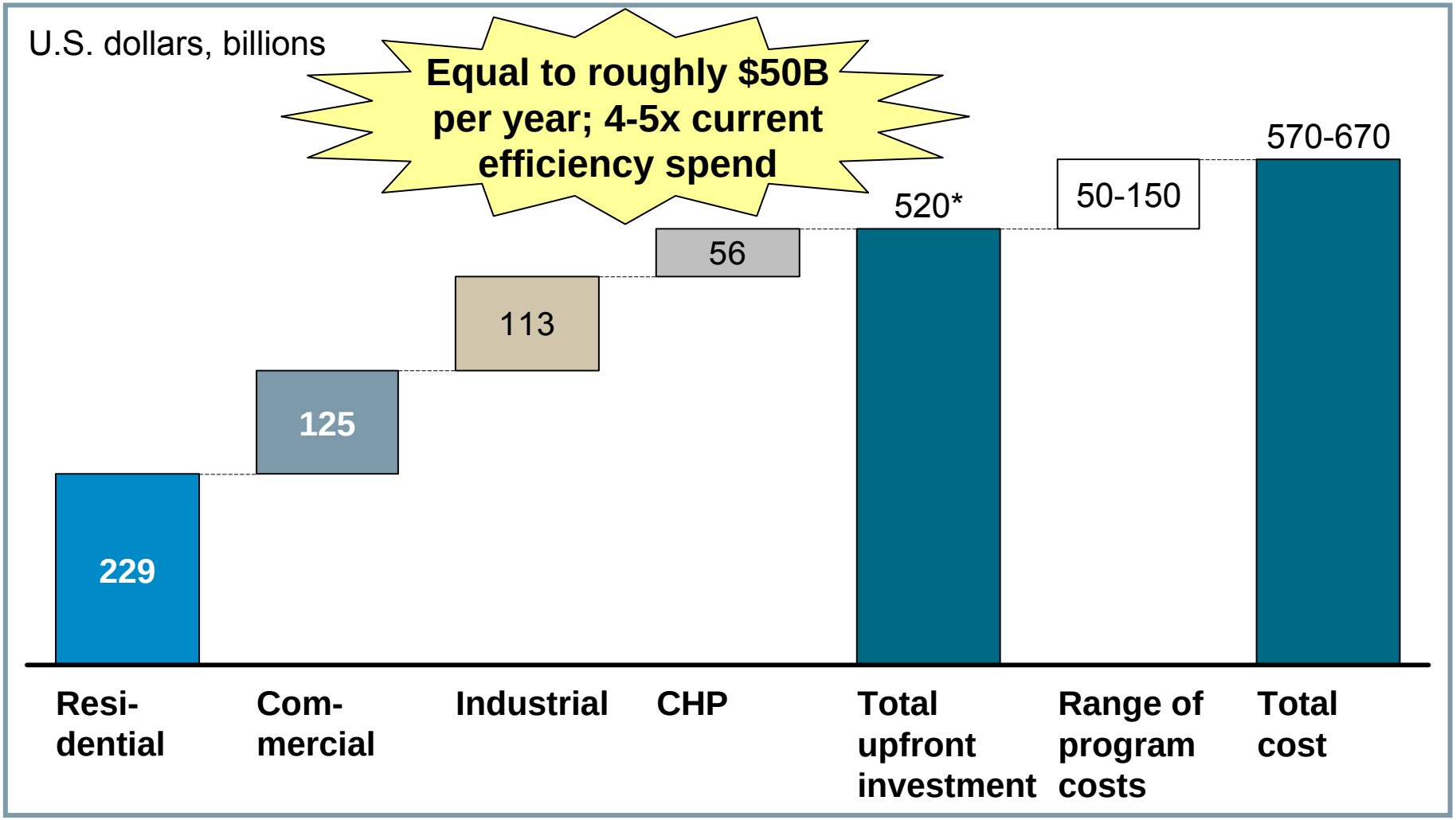
Source: McKinsey analysis

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



Source: McKinsey analysis

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

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

Central Conclusion of our work

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