Residential Energy Savings Opportunities in the City of Baltimore, Maryland

OCTOBER 2014
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Nationally and internationally, a growing body of research provides compelling evidence of the significant energy savings that can be achieved through shifts in the choices and behaviors of residents. In the United States, research findings suggest that the readily available savings from U.S. households could reduce energy consumption by roughly 9 percent (or 9 quadrillion BTUs) and carbon emissions by 7.4% in less than a decade – more than the total annual energy consumption of the United Kingdom (8.5 qBtu).

What are the implications of national level findings for the residents of Baltimore? While Baltimore and other cities continue to lead the charge in addressing energy and climate challenges, national level research findings have proven inadequate for informing municipal-level strategies due to differences in climate conditions, building stock characteristics, technology saturation, and social and cultural norms among other factors. The finding presented in this report are meant to help fill the information void. This report represents an innovative effort to use existing data sources to develop city-specific indicators of the achievable energy savings that could be attained through behaviorally-focused programs in Baltimore. As such, the savings estimates presented here provide a first look at the behavioral opportunity landscape with the expectation that the reader will use additional data sources – including their own primary research – to supplement, triangulate, and evaluate the information presented in this report and to develop specific program goals, strategies, and tactics.

By identifying and quantifying the most promising behavior-related opportunities at the city level, the Municipal Behavior Wedge Project provides cities and organizations with an opportunity to develop more targeted and strategic programs and achieve greater savings.

WHAT IS BEHAVIOR CHANGE?
We define it as changing how PEOPLE use resources through:

CONSERVATION ACTIONS:
Turning off electronics, appliances and devices when not in use, consolidating equipment, and minimizing demand through planning and design..

TECHNOLOGY USE PATTERNS:
Maximizing the efficiency of existing technologies (HVAC systems, appliances, electronics and other devices) through proper maintenance, technology settings, use patterns and choices between existing technologies.

TECHNOLOGY PURCHASING DECISIONS:
Accelerating the adoption of energy-efficient appliances, electronics, and equipment.

Learn more about the Behavior Wedge Profile Project
Our Methodology

Estimates of achievable savings are developed using data from the 2009 Residential Energy Consumption Survey (RECS) and the Census Bureau as well as special insights gleaned from both a set of expert advisors as well as a wide variety of research reports on buildings, energy, and behavioral programs.

1. Census Data
   - Population & demographic information
   - Housing stock characteristics
   - Economic & poverty measures

2. RECS Data (Residential Energy Consumption Survey)
   - Technology saturation & housing characteristics
   - Technology use patterns
   - Energy consumption data

3. Expert Insights & Literature Review
   - Household participation rates
   - Energy savings estimates
   - Compliance rates

Estimates of achievable savings represent a conservative estimate of the energy savings that could be achieved through the actions reviewed in this report. For each behavior, achievable savings are calculated by multiplying: energy consumption x the proportion of households who are eligible to participate in the behavior x the estimated participation rate x estimated rate of energy savings. Estimates of btus presented in this report are rough estimates and are meant to serve as indicators of the general magnitude of the savings opportunity rather than precise estimates.

Inside This Report, You Will Find:

- Estimates of achievable short and mid-term savings opportunities for both single and multi-family housing sectors
- A ranking of the behaviors that offer the largest savings opportunities given Baltimore’s particular climate, building characteristics, and technology use patterns
- Contextual information concerning Baltimore’s demographic characteristics and building stock
- A detailed review of energy savings opportunities for each energy end use from heating and cooling to appliances, electronics and lighting

Why People-Centered Initiatives Are Effective

Focusing on PEOPLE first offers a variety of benefits, including:

- Significant Savings
  - The medium-term estimates of achievable energy savings for most cities are between 7 and 12% of residential consumption.

- Faster Results
  - Shifting away from wasteful energy practices toward greater efficiency is something everyone can do at any time.

- Lower Program Cost
  - People-centered initiatives require fewer financial resources to implement when compared to technology-focused programs.

Learn more about Our Methodology by requesting the methodology report: The Municipal Behavior Wedge Project: Modeling Methodology.
Baltimore’s opportunity to reduce residential energy consumption by 7.7% using behavior change programs is predominantly in the single-family market.

**6.3% Reduction**
in Baltimore’s city-wide residential energy use can be achieved through single-family behavior initiatives over an 8-year timeframe.

**1,775 bBtus in Savings**
would be realized from the 6.3% reduction in energy use. Add equivalency.

**Building Stock Ratio**

<table>
<thead>
<tr>
<th></th>
<th>Single Family</th>
<th>Multi-Family</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>% of (SF) Opportunity</strong></td>
<td>67%</td>
<td>33%</td>
</tr>
<tr>
<td><strong>bBtu Savings</strong></td>
<td>1,775</td>
<td>390</td>
</tr>
</tbody>
</table>

**SINGLE-FAMILY SAVING OPPORTUNITIES**

<table>
<thead>
<tr>
<th>Category</th>
<th>Short-term Savings (1-4yrs)</th>
<th>Medium-term Savings (5-8yrs)</th>
<th>% of (SF) Opportunity</th>
<th>bBtu Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>32.3%</td>
<td>20.4%</td>
<td>52.7%</td>
<td>936</td>
</tr>
<tr>
<td>Cooling</td>
<td>5.5% / 3.1%</td>
<td></td>
<td>8.6%</td>
<td>153</td>
</tr>
<tr>
<td>Appliances</td>
<td>10.7% / 8.7%</td>
<td></td>
<td>19.4%</td>
<td>344</td>
</tr>
<tr>
<td>Electronics</td>
<td>2.4% / 1.5%</td>
<td></td>
<td>3.9%</td>
<td>69</td>
</tr>
<tr>
<td>Lighting</td>
<td>2.5% / 4.1%</td>
<td></td>
<td>6.6%</td>
<td>117</td>
</tr>
<tr>
<td>Pools &amp; Spas</td>
<td>4.7% / 4.1%</td>
<td></td>
<td>8.9%</td>
<td>157</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td></td>
<td>1,776</td>
<td></td>
</tr>
</tbody>
</table>

**MULTI-FAMILY SAVING OPPORTUNITIES**

<table>
<thead>
<tr>
<th>Category</th>
<th>Short-term Savings (1-4yrs)</th>
<th>Medium-term Savings (5-8yrs)</th>
<th>% of (MF) Opportunity</th>
<th>bBtu Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td></td>
<td></td>
<td>35.9%</td>
<td>28.9%</td>
</tr>
<tr>
<td>Cooling</td>
<td></td>
<td></td>
<td>8.6% / 6.2%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Appliances</td>
<td></td>
<td></td>
<td>4.9% / 3.1%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Electronics</td>
<td></td>
<td></td>
<td>4.1% / 2.5%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Lighting</td>
<td></td>
<td></td>
<td>1.5% / 4.2%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Pools &amp; Spas</td>
<td></td>
<td></td>
<td>0% / 0%</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100%</td>
<td>390</td>
</tr>
</tbody>
</table>

**Summary of Opportunities:**

- By engaging with residents of single-family households, Baltimore has the opportunity to reduce total residential energy consumption by 6.3%. These savings represent a 7.9% reduction in the current energy used by single-family homes.
- A focus on the 10 most impactful behaviors, could result in medium-term savings of 5.9% compared to current, single-family energy demand.

- By engaging with residents of multi-family households, Baltimore has the opportunity to reduce total residential energy consumption by 1.4%. These savings represent a 7.0% reduction in the current energy used by multi-family homes.
- A focus on the 10 most impactful behaviors, could result in medium-term savings of 5.3% compared to current, multi-family energy demand.
TOP 10 ENERGY SAVING BEHAVIORS

Opportunities represent combined single and multi-family savings in the medium-term.

1,630 bBtus OF SAVINGS Can be achieved through these 10 behaviors

5.8% REDUCTION in Baltimore’s residential energy use can be achieved through these 10 behaviors

1. HEATING & COOLING Home Weatherization
   The large number of old and drafty homes in Baltimore mean that caulking, weather stripping and duct sealing can save a lot of heat.
   15.9% OF TOTAL OPPORTUNITY 345 bBtus OF ENERGY SAVINGS

2. HEATING Conservation Actions
   By closing doors and ducts and reducing heat in unused rooms, households can reduce energy waste.
   10.8% OF TOTAL OPPORTUNITY 235 bBtus OF ENERGY SAVINGS

3. HEATING Thermostat Settings & Setbacks
   Thermostats should be set at or near EPA recommended temperatures and set back further at night and when no one is home.
   10.2% OF TOTAL OPPORTUNITY 221 bBtus OF ENERGY SAVINGS

4. HEATING Accelerated Heating Equip. Replacement
   Programs that encourage people to replace inefficient heating equipment before it breaks down can save a lot of energy.
   9.7% OF TOTAL OPPORTUNITY 210 bBtus OF ENERGY SAVINGS

5. APPLIANCES Unplug 2nd Refrigerator
   An estimated 37% of single-family households in Baltimore have a second (generally inefficient) refrigerator. Recycled it could save a lot of energy.
   8.3% OF TOTAL OPPORTUNITY 181 bBtus OF ENERGY SAVINGS

6. HEATING Equipment Maintenance
   Annual maintenance of heating equipment and replacement of filters ensures greater efficiency.
   4.8% OF TOTAL OPPORTUNITY 103 bBtus OF ENERGY SAVINGS

7. HEATING Window Insulation
   An estimated 40% of Baltimore’s homes have single pane windows. Using storm windows, window film and thermal window coverings could reduce heat loss.
   4.3% OF TOTAL OPPORTUNITY 94 bBtus OF ENERGY SAVINGS

8. LIGHTING Install Energy Efficient Bulbs
   CFL saturation in Baltimore is estimated at 15%. Installing more CFLS (and other efficient bulbs) can still have a big impact.
   4.2% OF TOTAL OPPORTUNITY 91 bBtus OF ENERGY SAVINGS

9. POOLS Increase Use of Pool Pump Timers
   Most households with pools, either don’t have a pump timer or fail to set it properly. Timers can reduce the hours of pump running time.
   3.6% OF TOTAL OPPORTUNITY 77 bBtus OF ENERGY SAVINGS

10. APPLIANCES Clothes Washer Conservation
    An estimated 50% of Baltimore’s households wash primarily in cold water. Cold water wash and load consolidation can reduce hot water use.
    3.4% OF TOTAL OPPORTUNITY 73 bBtus OF ENERGY SAVINGS
Every city is different. Multiple factors were considered when developing the achievable energy savings estimates for Baltimore.

**CLIMATE**

**HEATING DEGREE DAYS** | per year on average

- Miami 224
- Charlotte 3262
- Boston 5412
- Park City 5830
- Anchorage 10,092

**COOLING DEGREE DAYS** | per year on average

- Anchorage 52
- Boston 903
- Charlotte 1886
- Dallas 3414
- Miami 4560

**TECHNOLOGY SATURATION**

Percentages represent the proportion of Baltimore’s households (both single and multi-family) with the following characteristics.

- 32% Heating systems over 15 years old
- 44% Fail to perform regular heating system maintenance
- 22% Programmable Thermostat
- 40% Single pane windows
- 50% Two or more ceiling fans
- 25% Second fridge
- 27% Top Load Washer
- 51% Wash in Cold Water
- 5% Swimming Pools

**BUILDING STOCK**

Average home size in the US has been increasing over the past 60 years. Most of Baltimore’s housing stock was built before 1970 and is smaller than overall national averages or even state averages.

**BUILDING STOCK RATIO**

of the 296,056 housing units in Baltimore

- **SINGLE-FAMILY**
  - 31.7% Rent | 68.2% Own
- **MULTI-FAMILY**
  - 90.4% Rent | 9.6% Own

**BUILDING STOCK AGE**

Combined single & multi-family data

- <1950 6.9%
- 1950-1969 10.4%
- 1970-1989 25.7%
- 1990-2009 57.0%

**BUILDING STOCK**

- Average single-family home size: 2,233sf
- Average multi-family housing unit size: 924sf

**SQUARE FOOTAGE PER HOUSING UNIT (SOUTHERN REGION)**

- <40s
- '40s
- '50s
- '60s
- '70s
- '80s
- '90s
- '00s
**CURRENT USAGE PATTERN**

Single-family homes use roughly twice as much energy a year compared to multi-family units.

- **SINGLE-FAMILY**
  - 113,165 tBtus
  - Average annual energy use

- **MULTI-FAMILY**
  - 57,548 tBtus
  - Average annual energy use

**HOUSEHOLD INCOME**

Median household income in Baltimore is $40,803, however median income among renters ($26,861) is less than half the median income of owners ($59,923). Nearly a quarter of Baltimore’s adult residents (23.4%) live below the poverty line.

- **HOUSEHOLD COMPOSITION**
  - Single-family homes are more likely to have youth, teens and older adults living in them. Young adults and elderly residents are equally likely to be found in single-family or multi-family homes.
  - **FAMILY HOUSEHOLDS**
    - HHs w/children under 18 years old: 22.2%
    - Married couples: 24.0%
    - Married couples w/children: 8.1%
    - Female headed household: 23.4%
    - Female headed household w/children: 12.0%
    - Male headed household: 5.0%
    - Male headed household w/children: 2.0%
  - **NON-FAMILY HOUSEHOLDS**
    - Living alone: 39.2%
    - 65+ years: 11.2%

**EDUCATION LEVEL**

- Less than 12 years of education: 18.4%
- High school graduate: 25.9%
- Some college: 26.3%
- College degree or more: 29.3%
HEATING
offers the greatest savings opportunities of all end-uses in Baltimore

Heating offers 54.9% of Baltimore’s total achievable saving opportunity (7.7%). Potential savings vary across range of heating-related behaviors and decisions including weatherization, conservation, and thermostat settings and setbacks. Compared with other energy end uses, heating-related practices are particularly important in Baltimore due to the large number of heating degree days combined with the disproportionately high age of the housing stock.

13,605 bBtus
OF ENERGY
is used for heating single and multi-family homes annually.

8.7% REDUCTION
of current energy use for heating is possible through the behavior related activities identified in the following pages.

ESTIMATES OF ACHIEVABLE SAVINGS FROM HEATING

<table>
<thead>
<tr>
<th>Opportunities by End Use</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE-FAMILY</td>
<td>52.7%</td>
</tr>
<tr>
<td>Heating-related actions account for 52.7% of energy savings opportunities in single-family homes – with potential savings of 936 billion btus of energy per year by year 8.</td>
<td></td>
</tr>
</tbody>
</table>

| MULTI-FAMILY             | 64.8% |
| Heating-related actions account for 64.8% of energy savings opportunities in multi-family homes – with potential savings of 253 billion btus of energy per year by year 8. |

KEY FINDINGS

Weatherization Represents the Largest Savings Opportunity.
Given the age of the housing stock, households could reduce their heating-related energy consumption by 326 billion btus per year through a variety of weatherization activities. The use of window insulation could boost those estimated savings by an additional 94 billion btus.

Conservation and Waste Reduction Practices also offer high levels of achievable savings. Both single-family and multi-family homes could significantly reduce their heat-related energy consumption through waste reduction strategies that include closing heating vents in unused rooms, closing doors to unused rooms and using draft protection strategies such as draft stoppers. Such strategies are likely to reduce energy consumption by 235 billion btus.

Thermostat Settings and Setbacks represent the second most effective heating-related strategy in single-family homes and would reduce Baltimore’s heating demand by 193 billion btus. Programs designed to install and set programmable thermostats will be essential to unlocking the achievable savings estimates.

The Accelerated Replacement of Heating Equipment could reduce current heating demand by 210 billion btus with 76% of the estimated savings coming from single-family homes. (The estimates presented here do not include potential savings that require actions by a landlord or facilities manager).
**HEATING**

Single-family energy saving opportunities

---

**8.6% SAVINGS**

in current heating demand is achievable through the identified behaviors. Single-family households in Baltimore are currently an estimated 10,842 bBtus annually.

---

936 bBtus could be saved through these behaviors alone.

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Left hand Bar= Estimated Annual Savings by end of Year 4.

Right hand Bar= Estimated Annual Savings by end of Year 8.

---

**Weatherization**

Target: Home Owner & Renter

Minimize heat loss through caulking, weather stripping and duct sealing.

- 28.2% % OF HEATING OPPORTUNITY
- 31% HOUSEHOLDS ELIGIBLE*
- Up to 25% ANNUAL HOUSEHOLD SAVINGS**

---

**Thermostat Settings & Setbacks**

Target: Home Owner & Renters

Set thermostats at EPA recommended settings (58 at night and away, 68 during the day when someone is home).

- 20.6% % OF HEATING OPPORTUNITY
- 91% HOUSEHOLDS ELIGIBLE*
- 4.6% ANNUAL HOUSEHOLD SAVINGS**

---

**Conservation**

Target: Home Owner & Renters

Reduce energy waste by closing doors and ducts and reducing heat in unused rooms.

- 18.4% % OF HEATING OPPORTUNITY
- 71% HOUSEHOLDS ELIGIBLE*
- 5.6% ANNUAL HOUSEHOLD SAVINGS**

---

**Accelerated Equipment Replacement**

Target: Home Owner

Increase efficiency through accelerated replacement of inefficient heating equipment (15+ years old) before it breaks down.

- 16.9% % OF HEATING OPPORTUNITY
- 29% HOUSEHOLDS ELIGIBLE*
- Up to 25% ANNUAL HOUSEHOLD SAVINGS**

---

**Window Insulation**

Target: Home Owner & Renters

Minimize heat loss by using storm windows, window film and thermal window coverings.

- 8.4% % OF HEATING OPPORTUNITY
- 42% HOUSEHOLDS ELIGIBLE*
- 5.7% ANNUAL HOUSEHOLD SAVINGS**

---

**Heating Equipment Maintenance**

Target: Home Owner & Renters

Increase performance of heating equipment with regular cleaning/service and changing of furnace filters.

- 7.5% % OF HEATING OPPORTUNITY
- 40% HOUSEHOLDS ELIGIBLE*
- 5% ANNUAL HOUSEHOLD SAVINGS**

---

*Household eligibility is determined independently for each behavior. More information is available in the methodology report. | **Estimates of annual households savings are for participating households.
**HEATING**

Multi-family energy saving opportunities

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.

**Savings**

9.2% savings in current heating demand is achievable through the identified behaviors. Multi-family households in Baltimore are currently using an estimated 2,763 Btus annually.

**Savings Opportunity**

253 Btus could be saved through these behaviors alone.

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Percentage</th>
<th>Eligibility</th>
<th>Annual Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conserving</td>
<td>25.0%</td>
<td>40%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Weatherizing</td>
<td>24.5%</td>
<td>17%</td>
<td>Up to 25%</td>
</tr>
<tr>
<td>Equipment Replacement</td>
<td>20.2%</td>
<td>24%</td>
<td>Up to 25%</td>
</tr>
<tr>
<td>Maintenance</td>
<td>13.2%</td>
<td>51%</td>
<td>5%</td>
</tr>
<tr>
<td>Thermostat Settings &amp; Setbacks</td>
<td>11.2%</td>
<td>60%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Window Insulation</td>
<td>5.9%</td>
<td>37%</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

**Eligibility**

- *Conserving*: 40% of households are eligible for annual savings of 5.6%.
- *Weatherizing*: 17% of households are eligible for up to 25% annual savings.
- *Equipment Replacement*: 24% of households are eligible for up to 25% annual savings.
- *Maintenance*: 51% of households are eligible for 5% annual savings.
- *Thermostat Settings & Setbacks*: 60% of households are eligible for 4.6% annual savings.
- *Window Insulation*: 37% of households are eligible for 5.7% annual savings.

*Left hand Bar* = Estimated Annual Savings by end of Year 4.

*Right hand Bar* = Estimated Annual Savings by end of Year 8.
COOLING
Accounts for a large proportion of electricity demand during summer months

Cooling-related behaviors can provide nearly 10% of Baltimore’s total achievable saving opportunity (7.7%). Cooling-related energy demand is an important contributor to peak electricity loads during Baltimore’s hot and humid summer months. Current estimates indicate that 54% of households have central AC and 29% have central AC units that are at least 10 years old. Higher temperatures associated with global climate change are likely to extend the number of days per year that households rely on air conditioning.

1,107 bBtus OF ENERGY
is used for cooling in both single and multi-family homes annually.

19% REDUCTION
of current energy use for cooling is possible through the behavior related activities identified in the following pages.

KEY FINDINGS
Increasing the prevalence and use of ceiling fans represents the largest opportunity to reduce cooling-related energy consumption. Currently, only half of all households have 2 or more ceiling fans (only 17% of multi-family households). Of those, 55% report using their fans infrequently. The use of ceiling fans can reduce reliance on air conditioning during moderately warm spells and can help people to increase their thermostat settings while maintaining comfortable conditions. Ceiling fans could help Baltimore residents save 66 billion btus per year.

Reducing solar heat gain through the use of window film, blinds and shades could reduce cooling-related energy consumption by nearly 32 billion btus. Both single-family and multi-family homes could benefit by covering south and west-facing windows during the hottest hours of the day.

Thermostat settings and setbacks represent 13% of cooling-related savings opportunities. If 40% of eligible households set their thermostats to the EPA-recommended settings, Baltimore could save 27 billion btus per year. Additional savings could be achieved through the use of more aggressive setbacks during vacations.

The Accelerated Replacement of Cooling Equipment could reduce current cooling demand by 30 billion btus with 75% of the estimated savings coming from single-family homes. (The estimates presented here do not include potential savings that require actions by a landlord or facilities manager. Old AC units in multi-family buildings are likely to represent significant opportunities for additional savings.)

ESTIMATES OF ACHIEVABLE SAVINGS FROM COOLING

<table>
<thead>
<tr>
<th>SINGLE-FAMILY</th>
<th>MULTI-FAMILY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling-related actions represent 8.6% of the energy-savings opportunities for single-family homes or 153 billion btus of energy per year by year 8.</td>
<td>Cooling-related actions represent 14.9% of the energy-savings opportunities for multi-family homes or 58 billion btus of energy per year by year 8.</td>
</tr>
</tbody>
</table>
COOLING

Single-family energy saving opportunities

Left hand Bar = Estimated Annual Savings by end of Year 4.

Right hand Bar = Estimated Annual Savings by end of Year 8.

17% SAVINGS

in current cooling demand is achievable through the identified behaviors. Single-family homes in Baltimore are currently using an estimated 899 bBtus annually.

153 bBtus could be saved through these behaviors alone.

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.

**Estimates of annual households savings are for participating households.
**Cooling**

Single-family energy saving opportunities

Left hand Bar = Estimated Annual Savings by end of Year 4.

<table>
<thead>
<tr>
<th>BIL BTU</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
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<tbody>
<tr>
<td>Conserving</td>
<td>5.74</td>
<td>10.26</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conservation**

Target: Homeowners and Renters

Reducing energy waste by closing doors and ducts and reducing heat in unused rooms.

- 6.7% of cooling opportunity
- 46% of households eligible
- 6.1% annual household savings

Right hand Bar = Estimated Annual Savings by end of Year 8.

<table>
<thead>
<tr>
<th>BIL BTU</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
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</thead>
<tbody>
<tr>
<td>Cooling Equipment</td>
<td>4.32</td>
<td>7.56</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cooling Equipment Maintenance**

Target: Homeowners and Renters

Increase performance of cooling equipment with regular cleaning/service and changing of filters.

- 5.0% of cooling opportunity
- 32% of households eligible
- Up to 8% annual household savings

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.*
**COOLING**

**Multi-family energy saving opportunities**

**27.9% SAVINGS**

in current cooling demand is achievable through the identified behaviors. Multi-family homes in Baltimore are currently using an estimated 208 bBtus annually.

<table>
<thead>
<tr>
<th>ESTIMATED ANNUAL SAVINGS</th>
<th>ESTIMATED ANNUAL SAVINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25%</td>
<td>Up to 33%</td>
</tr>
</tbody>
</table>

**58 bBtus**
could be saved through these behaviors alone.

<table>
<thead>
<tr>
<th>BIL BTU</th>
<th>BIL BTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.82</td>
<td>27.63</td>
</tr>
</tbody>
</table>

**Ceiling Fan Installation & Use**
Target: Home Owners and Renters
Increase the prevalence and frequency of use of fans and reduce AC use.

- 47.6% % OF COOLING OPPORTUNITY
- 71% HOUSEHOLDS ELIGIBLE*
- Up to 25% ANNUAL HOUSEHOLD SAVINGS**

**Accelerated Cooling Equipment Replacement**
Target: Home Owners
Increase efficiency through accelerated replacement of inefficient AC equipment (10+ years old) before it breaks down.

- 13.0% % OF COOLING OPPORTUNITY
- 18% HOUSEHOLDS ELIGIBLE*
- Up to 33% ANNUAL HOUSEHOLD SAVINGS**

**Window Film**
Target: Home Owners and Renters
Reduce solar heat gain and energy loss through the use of reflective film and window coverings.

- 8.8% % OF COOLING OPPORTUNITY
- 48% HOUSEHOLDS ELIGIBLE*
- Up to 13.2% ANNUAL HOUSEHOLD SAVINGS**

**Weatherization**
Target: Primarily Home Owners
Minimize the loss of cool air through caulking, weather stripping and duct sealing.

- 8.7% % OF COOLING OPPORTUNITY
- 9% HOUSEHOLDS ELIGIBLE*
- Up to 30% ANNUAL HOUSEHOLD SAVINGS**

**Wall Unit AC Settings**
Target: Primarily Renters
Set thermostats at EPA recommended temperatures and turn off when no one is at home.

- 8.2% % OF COOLING OPPORTUNITY
- 34% HOUSEHOLDS ELIGIBLE*
- Up to 11.4% ANNUAL HOUSEHOLD SAVINGS**

**Thermostat Settings & Setbacks**
Target: Home Owners and Renters
Set thermostats at EPA recommended temps (82 at night, 88 away, 78 during the day when someone is home).

- 6.7% % OF COOLING OPPORTUNITY
- 30% HOUSEHOLDS ELIGIBLE*
- Up to 15.6% ANNUAL HOUSEHOLD SAVINGS**

---

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.

**Estimates of annual households savings are for participating households.
Multi-family energy saving opportunities

Left hand Bar = Estimated Annual Savings by end of Year 4.

Conservation

Target: Home Owners and Renters
Reducing energy waste by closing doors and ducts and reducing heat in unused rooms.

4.6% % of Cooling Opportunity
22% Households Eligible*
6.1% Annual Household Savings**

Cooling Equipment Maintenance

Target: Home Owners and Renters
Increase performance of cooling equipment with regular cleaning/service and changing of furnace filters.

2.4% % of Cooling Opportunity
35% Households Eligible*
Up to 8% Annual Household Savings**

Right hand Bar = Estimated Annual Savings by end of Year 8.

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.

**Estimates of annual households savings are for participating households.
APPLIANCES
Represent the second largest source of achievable energy savings in single family homes

Changing appliance-related behaviors can provide nearly 17% of Baltimore’s total achievable saving opportunity (7.7%). The refrigeration of food and beverages, wasteful hot water practices, and laundry routines comprise some of the biggest opportunities for savings. Such opportunities are particularly important in single-family homes because they typically contain a disproportionately larger number of appliances and residents are more likely to have direct control over water heater settings and maintenance decisions.

KEY FINDINGS
Reducing the plug load from second refrigerators and stand alone freezers provides the largest appliance-related savings opportunity in Baltimore. Approximately 37% of single-family households have a second – usually very inefficient – refrigerator while 1/3 of households have a stand alone freezer. Unplugging or recycling these devices could help Baltimore residents save 180 billion btus per year.

Laundry routines offer another important source of energy savings in Baltimore. By encouraging more households to wash clothes in cold water, reduce the number of laundry loads per week, and air dry a larger proportion of their clothes, Baltimore could reduce household energy consumption by 120 billion btus per year. (These estimates do not include the additional savings that could come from a shift in laundry practices in Laundromats and other locations outside of the home.)

Making hot water available 24/7 uses a lot of energy, but a few simple strategies can reduce residential demand without large investments. By reducing water heater settings to 120 degrees and ensuring that hot water heaters are well insulated, Baltimore residents could save an estimated 65 billion btus of energy per year. Approximately 25% of both single-family and multi-family households have water heaters that are at least 10 years old and that don’t have any added insulation.
**APPLIANCES**

Single-family energy saving opportunities

Left hand Bar = Estimated Annual Savings by end of Year 4.

Right hand Bar = Estimated Annual Savings by end of Year 8.

**5.1% SAVINGS**

in current appliance demand is achievable through the identified behaviors. Single-family households in Baltimore are currently using an estimated 6,796 bBtus annually.

**344 bBtus**

could be saved through these behaviors alone.

<table>
<thead>
<tr>
<th></th>
<th><strong>Estimates of annual households savings are for participating households.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>Unplug Second Refrigerator/Freezer</strong></td>
</tr>
<tr>
<td></td>
<td>Target: Primarily Home Owners</td>
</tr>
<tr>
<td></td>
<td>Unplug and/or recycle old, inefficient or sparsely used second refrigerators and stand alone freezers.</td>
</tr>
<tr>
<td></td>
<td>48.5% % OF APPLIANCE OPPORTUNITY</td>
</tr>
<tr>
<td></td>
<td>82% HOUSEHOLDS ELIGIBLE*</td>
</tr>
<tr>
<td></td>
<td>8.8% ANNUAL HOUSEHOLD SAVINGS**</td>
</tr>
</tbody>
</table>

| **B** | **Cold Water Wash**                                                      |
|       | Target: Home Owners and Renters                                          |
|       | Switch from warm to cold water for clothes washing.                      |
|       | 13.1% % OF APPLIANCE OPPORTUNITY                                         |
|       | 46% HOUSEHOLDS ELIGIBLE*                                                 |
|       | 2.6% ANNUAL HOUSEHOLD SAVINGS**                                          |

| **C** | **Air Dry Laundry**                                                      |
|       | Target: Home Owners and Renters                                          |
|       | Hang dry a portion of laundry using hangers, drying racks and clothes lines. |
|       | 12.8% % OF APPLIANCE OPPORTUNITY                                         |
|       | 96% HOUSEHOLDS ELIGIBLE*                                                 |
|       | 1.9% ANNUAL HOUSEHOLD SAVINGS**                                          |

| **D** | **Water Heater Insulation**                                              |
|       | Target: Home Owners and Renters                                          |
|       | Add an insulation jacket to old/inefficient storage water heaters.       |
|       | 9.9% % OF APPLIANCE OPPORTUNITY                                         |
|       | 25% HOUSEHOLDS ELIGIBLE*                                                 |
|       | 4.6% ANNUAL HOUSEHOLD SAVINGS**                                          |

| **E** | **Load Reductions**                                                      |
|       | Target: Home Owners and Renters                                          |
|       | Reduce the number of laundry loads each week by 20%.                     |
|       | 7.2% % OF APPLIANCE OPPORTUNITY                                         |
|       | 99% HOUSEHOLDS ELIGIBLE*                                                 |
|       | 0.8% ANNUAL HOUSEHOLD SAVINGS**                                          |

| **F** | **Water Heater Settings**                                                |
|       | Target: Home Owners and Renters                                          |
|       | Reduce water heater settings to 120 degrees.                             |
|       | 6.0% % OF APPLIANCE OPPORTUNITY                                         |
|       | 30% HOUSEHOLDS ELIGIBLE*                                                 |
|       | 2.2% ANNUAL HOUSEHOLD SAVINGS**                                          |

*Household eligibility is determined independently for each behavior. More information is available in the methodology report. **Estimates of annual households savings are for participating households.
Residential Behavior Wedge Profile | Opportunities by End Use | 18

**EE Clothes Washer**

Target: Home Owners and Renters
Accelerate the replacement of old clothes washers with high efficiency models.

<table>
<thead>
<tr>
<th>% of Appliance Opportunity</th>
<th>Households Eligible*</th>
<th>Annual Household Savings**</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5%</td>
<td>24%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*Household eligibility is determined independently for each behavior. More information is available in the methodology report. **Estimates of annual households savings are for participating households.
**APPLIANCES**

Multi-family energy saving opportunities

1.9% SAVINGS

in current appliance demand is achievable through the identified behaviors. Multi-family households in Baltimore are currently using an estimated 1,680 bBtus annually.

**Residential Behavior Wedge Profile**

| Opportunities by End Use | 19 |

*Household eligibility is determined independently for each behavior. More information is available in the methodology report. **Estimates of annual households savings are for participating households.*

<table>
<thead>
<tr>
<th></th>
<th>Left hand Bar= Estimated Annual Savings by end of Year 4.</th>
<th>Right hand Bar= Estimated Annual Savings by end of Year 8.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><img src="image" alt="Graph" /></td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td><strong>Unplug Second Refrigerator/Freezer</strong></td>
<td>Target: Primarily Home Owners Unplug and/or recycle old, inefficient or sparsely used second refrigerators and stand alone freezers.</td>
<td></td>
</tr>
<tr>
<td>% OF APPLIANCE OPPORTUNITY</td>
<td>44.3%</td>
<td>20.1%</td>
</tr>
<tr>
<td>HOUSEHOLDS ELIGIBLE*</td>
<td>17%</td>
<td>28%</td>
</tr>
<tr>
<td>ANNUAL HOUSEHOLD SAVINGS**</td>
<td>8.8%</td>
<td>4.6%</td>
</tr>
<tr>
<td>B</td>
<td><img src="image" alt="Graph" /></td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td><strong>Water Heater Insulation</strong></td>
<td>Target: Home Owners and Renters Add an insulation jacket to old/inefficient storage water heaters.</td>
<td></td>
</tr>
<tr>
<td>% OF APPLIANCE OPPORTUNITY</td>
<td>20.1%</td>
<td>14.4%</td>
</tr>
<tr>
<td>HOUSEHOLDS ELIGIBLE*</td>
<td>28%</td>
<td>30%</td>
</tr>
<tr>
<td>ANNUAL HOUSEHOLD SAVINGS**</td>
<td>4.6%</td>
<td>2.2%</td>
</tr>
<tr>
<td>C</td>
<td><img src="image" alt="Graph" /></td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td><strong>Water Heater Settings</strong></td>
<td>Target: Home Owners and Renters Reduce water heater settings to 120 degrees.</td>
<td></td>
</tr>
<tr>
<td>% OF APPLIANCE OPPORTUNITY</td>
<td>14.4%</td>
<td>4.0%</td>
</tr>
<tr>
<td>HOUSEHOLDS ELIGIBLE*</td>
<td>30%</td>
<td>22%</td>
</tr>
<tr>
<td>ANNUAL HOUSEHOLD SAVINGS**</td>
<td>2.2%</td>
<td>0.8%</td>
</tr>
<tr>
<td>D</td>
<td><img src="image" alt="Graph" /></td>
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</tr>
<tr>
<td><strong>Cold Water Wash</strong></td>
<td>Target: Home Owners and Renters Switch from warm to cold water for clothes washing.</td>
<td></td>
</tr>
<tr>
<td>% OF APPLIANCE OPPORTUNITY</td>
<td>7.4%</td>
<td>4.0%</td>
</tr>
<tr>
<td>HOUSEHOLDS ELIGIBLE*</td>
<td>50%</td>
<td>22%</td>
</tr>
<tr>
<td>ANNUAL HOUSEHOLD SAVINGS**</td>
<td>2.6%</td>
<td>0.8%</td>
</tr>
<tr>
<td>E</td>
<td><img src="image" alt="Graph" /></td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td><strong>Air Dry Laundry</strong></td>
<td>Target: Home Owners and Renters Hang dry a portion of laundry using hangers, drying racks and clothes lines.</td>
<td></td>
</tr>
<tr>
<td>% OF APPLIANCE OPPORTUNITY</td>
<td>7.2%</td>
<td>22%</td>
</tr>
<tr>
<td>HOUSEHOLDS ELIGIBLE*</td>
<td>22%</td>
<td>22%</td>
</tr>
<tr>
<td>ANNUAL HOUSEHOLD SAVINGS**</td>
<td>1.9%</td>
<td>0.8%</td>
</tr>
<tr>
<td>F</td>
<td><img src="image" alt="Graph" /></td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td><strong>Load Reductions</strong></td>
<td>Target: Home Owners and Renters Reduce the number of laundry loads by 20% each week.</td>
<td></td>
</tr>
<tr>
<td>% OF APPLIANCE OPPORTUNITY</td>
<td>4.0%</td>
<td>22%</td>
</tr>
<tr>
<td>HOUSEHOLDS ELIGIBLE*</td>
<td>22%</td>
<td>22%</td>
</tr>
<tr>
<td>ANNUAL HOUSEHOLD SAVINGS**</td>
<td>0.8%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>
Multi-family energy saving opportunities

Left hand Bar: Estimated Annual Savings by end of Year 4.

Right hand Bar: Estimated Annual Savings by end of Year 8.

EE Clothes Washer

Target: Home Owners and Renters
Accelerate the replacement of old clothes washers with high efficiency models.

2.7% % of Appliance Opportunity
5% Households Eligible*
2% Annual Household Savings**

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.

**Estimates of annual households savings are for participating households.
ELECTRONICS
Represent a rapidly growing source of energy demand and energy savings

Electronics represent a rapidly growing source of household energy demand and a readily available source of savings. Electronics-related actions can provide at least 4.4% of Baltimore’s total achievable saving opportunity (7.7%). By focusing on concentrated electronics plug loads associated with entertainment systems and home office systems, the effort to reduce consumption is greatly simplified. Additional savings can be achieved by creating and managing centralized charging stations for the growing number of small electronics devices.

2,541 bBtus OF ENERGY
is used for electronics in single and multi-family homes annually.

3.7% REDUCTION
of current energy use for electronics is possible through the behavior related activities identified in the following pages.

ESTIMATES OF ACHIEVABLE SAVINGS FROM ELECTRONICS

<table>
<thead>
<tr>
<th>End Use</th>
<th>Achievable Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE-FAMILY</td>
<td>3.9%</td>
</tr>
<tr>
<td>MULTI-FAMILY</td>
<td>6.6%</td>
</tr>
</tbody>
</table>

SINGLE-FAMILY
Electronics-related actions account for 3.9% of energy savings opportunities in single-family homes – with potential savings of 69 billion btus of energy per year by year 8

MULTI-FAMILY
Electronics-related actions account for 6.6% of energy savings opportunities in multi-family homes – with potential savings of 25.7 billion btus of energy per year by year 8

KEY FINDINGS
Reducing the plug load and vampire load from home entertainment systems provides the largest electronics-related savings opportunity in Baltimore. Roughly 45% of US households have three or more televisions and many are connected to a range of peripheral devices such as digital video recorders, gaming systems and audio systems. Conservative estimates of achievable savings for Baltimore indicate that the use of smart strips (to ensure that all home entertainment devices are turned off when not in use) could help Baltimore residents save at least 42 billion btus per year.

Managing the plug load from home office equipment offers another important source of energy savings in Baltimore. More than three-quarters of US households have at least one computer while one-third of households have two or more. By encouraging more households to use smart strips with their home office systems, Baltimore could reduce household energy consumption by at least 18 billion btus per year.

Better management of miscellaneous plug loads can reduce residential demand even further by minimizing energy waste associated with leaving devices turned on when nobody is using them, using energy-inefficient settings, or leaving devices plugged in when fully charged. By reducing these sources of energy waste, households in Baltimore could reduce energy consumption by at least 25 billion btus.

Accelerating the shift from desktops to laptops could provide additional annual savings of more than 10 billion btus.
Single-family energy saving opportunities

**ELECTRONICS**

3.4% SAVINGS

in current electronics energy demand is achievable through the identified behaviors. Single-family households in Baltimore are currently using an estimated 2,015 bBtus annually.

Left hand Bar= Estimated Annual Savings by end of Year 4.

Right hand Bar= Estimated Annual Savings by end of Year 8.

---

**Replace Desktops with Laptops**

Target: Home Owners and Renters

Accelerate the replacement of desktops with laptops.

11.6% % OF ELECTRONICS OPPORTUNITY

50% HOUSEHOLDS ELIGIBLE*

2.8% ANNUAL HOUSEHOLD SAVINGS**

---

**Home Entertainment Vampire Load Management**

Target: Home Owners and Renters

Use smart strips to reduce vampire loads (standby power consumption) of home entertainment equip.

43.8% % OF ELECTRONICS OPPORTUNITY

99% HOUSEHOLDS ELIGIBLE*

4.1% ANNUAL HOUSEHOLD SAVINGS**

---

**Misc. Plug Load Management**

Target: Home Owners and Renters

Use energy efficient settings on computers, turn off TVs and video games, and use smart strip timers for charging devices.

26.2% % OF ELECTRONICS OPPORTUNITY

100% HOUSEHOLDS ELIGIBLE*

3.3% ANNUAL HOUSEHOLD SAVINGS**

---

**Home Office Vampire Load Management**

Target: Home Owners and Renters

Use smart strips to reduce vampire loads (standby power consumption) of office equipment.

18.5% % OF ELECTRONICS OPPORTUNITY

59% HOUSEHOLDS ELIGIBLE*

4.2% ANNUAL HOUSEHOLD SAVINGS**

---

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.

**Estimates of annual households savings are for participating households.
**Multi-family energy saving opportunities**

**ELECTRONICS**

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.

---

**Home Entertainment Plug Load Management**

Target: Home Owners and Renters

Use smart strips to reduce vampire loads (standby power consumption) of home entertainment equip.

- **45.3%** of **ELECTRONICS OPPORTUNITY**
- **100%** HOUSEHOLDS ELIGIBLE*
- **4.1%** ANNUAL HOUSEHOLD SAVINGS**

**Misc. Plug Load Management**

Target: Home Owners and Renters

Use energy efficient settings on computers, turn off TVs and video games, and use smart strip timers for charging devices

- **27.3%** of **ELECTRONICS OPPORTUNITY**
- **100%** HOUSEHOLDS ELIGIBLE*
- **3.3%** ANNUAL HOUSEHOLD SAVINGS**

**Home Office Plug Load Management**

Target: Home Owners and Renters

Use smart strips to reduce vampire loads (standby power consumption) of office equipment

- **19.0%** of **ELECTRONICS OPPORTUNITY**
- **45%** HOUSEHOLDS ELIGIBLE*
- **4.2%** ANNUAL HOUSEHOLD SAVINGS**

**Replace Desktops with Laptops**

Target Home Owners and Renters

Accelerate the replacement of desktops with laptops.

- **8.4%** of **ELECTRONICS OPPORTUNITY**
- **42%** HOUSEHOLDS ELIGIBLE*
- **2.8%** ANNUAL HOUSEHOLD SAVINGS**

---

*Estimated Annual Savings by end of Year 4.*

*Estimated Annual Savings by end of Year 8.*

---

*26 bBtus could be saved through these behaviors alone.*
**LIGHTING**

Continues to provide opportunities for energy savings

Lighting offers 6.4% of Baltimore’s total achievable saving opportunity (7.7%). These savings are rooted in the choice to use more energy-efficient light bulbs (CFLs and LEDs) as well as enhancing household energy conservation practices. Among single-family homes, reducing hours of outdoor lighting offers a notable savings opportunity.

1,758 bBtus OF ENERGY is used for lighting in both single and multi-family homes annually.

7.9% REDUCTION of current energy use for lighting is possible through the behavior related activities identified in the following pages.

### ESTIMATES OF ACHIEVABLE SAVINGS FROM LIGHTING

<table>
<thead>
<tr>
<th>Opportunities by End Use</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE-FAMILY</td>
<td>6.6%</td>
</tr>
<tr>
<td>LIGHTING-related actions account for 6.6% of energy savings opportunities in single-family homes – with potential savings of 117 billion btus of energy per year by year 8</td>
<td></td>
</tr>
<tr>
<td>MULTI-FAMILY</td>
<td>5.7%</td>
</tr>
<tr>
<td>LIGHTING-related actions account for 5.7% of energy savings opportunities in multi-family homes – with potential savings of 22 billion btus of energy per year by year 8</td>
<td></td>
</tr>
</tbody>
</table>

**KEY FINDINGS**

The most sizeable energy savings from lighting can be achieved by increasing the saturation rate of energy efficient light bulbs throughout Baltimore’s households. While CFL use is on the rise, overall socket saturation remains relatively low. **By increasing saturation levels of CFLs alone, Baltimore could help residents reduce energy demand by 91 billion btus.** Additional savings could be achieved through programs that focus on the adoption of LED bulbs.

Lighting conservation practices also offer high levels of achievable savings. An estimated 25% of single-family households in Baltimore leave at least one outdoor light turned on all night long. Baltimore residents can significantly reduce lighting demand by simply turning off unused lights – both indoors and outdoors. The combination of indoor and outdoor lighting conservation could achieve savings of 48 billion btus, with the largest proportion of these savings (about 60%) coming from a reduction in the hours of *outdoor* lighting.
**LIGHTING**

Single-family energy saving opportunities

Left hand Bar= Estimated Annual Savings by end of Year 4.

- **A** Replace Incandescents with CFLs
  - Target: Home Owners and Renters
  - Replace a greater proportion of incandescent bulbs with CFLs. (LEDs offer additional savings.)
  - 62.3% % of Lighting Opportunity
  - 85% Households Eligible*
  - 10.2% Annual Householder Savings**

Right hand Bar= Estimated Annual Savings by end of Year 8.

- **B** Turn off Unused Outdoor Lighting
  - Target: Home Owners and Renters
  - Turn off outdoor lighting or use timers to reduce hours of use.
  - 24.6% % of Lighting Opportunity
  - 24% Households Eligible*
  - 24.6% Annual Householder Savings**

- **C** Turn Off Unused Indoor Lighting
  - Target: Home Owners and Renters
  - Turn off indoor lighting in unoccupied rooms.
  - 13.1% % of Lighting Opportunity
  - 100% Households Eligible*
  - 3.1% Annual Householder Savings**

8.2% Savings in current lighting demand is achievable through the identified behaviors. Single-family households in Baltimore are currently using an estimated 1,422 bBtus annually.

117 bBtus could be saved through these behaviors alone.

* Household eligibility is determined independently for each behavior. More information is available in the methodology report.

** Estimates of annual households savings are for participating households.
Multi-family energy saving opportunities

**Lighting**

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Target</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Replace Incandescents with CFLs</td>
<td>Home Owners and Renters</td>
</tr>
<tr>
<td>B</td>
<td>Turn off Unused Indoor Lighting</td>
<td>Home Owners and Renters</td>
</tr>
<tr>
<td>C</td>
<td>Turn Off Unused Outdoor Lighting</td>
<td>Home Owners and Renters</td>
</tr>
</tbody>
</table>

### 6.6% Savings

In current lighting demand is achievable through the identified behaviors. Multi-family households in Baltimore are currently using an estimated 336 bBtus annually.

### 22 bBtus

Could be saved through these behaviors alone.

### 82.6% of Lighting Opportunity

- **Households Eligible**: 85%
- **Annual Household Savings**: 10.2%

### 17.4% of Lighting Opportunity

- **Households Eligible**: 100%
- **Annual Household Savings**: 3.1%

### 3.1% of Lighting Opportunity

- **Households Eligible**: -
- **Annual Household Savings**: -

*Household eligibility is determined independently for each behavior. More information is available in the methodology report.

**Estimates of annual households savings are for participating households.**
POOLS & SPAS
Provide surprising opportunities for energy savings in Baltimore

Pools and Spas tend to be energy hogs. In fact, homes with pools consume nearly 50% more electricity per year than homes without pools. Despite the fact that only a small percentage of homes typically have swimming pools or spas, achievable energy savings from pools is often notable. Our estimates indicate that roughly 7.5% of single-family homes in Baltimore have a swimming pool and that pools and spas represent 7.3% of Baltimore’s total achievable saving opportunity (7.7%).

665 bBtus
OF ENERGY
is used for pools and spas in single-family homes annually.

23.7%
REDUCTION
of current energy use for pools and spas is possible through the behavior-related activities identified in the following pages.

ESTIMATES OF ACHIEVABLE SAVINGS FROM POOLS & SPAS

<table>
<thead>
<tr>
<th>Opportunities by End Use</th>
<th>27</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE-FAMILY</td>
<td>8.9%</td>
</tr>
<tr>
<td>Multi-Family</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

8.9% Pool-related actions account for 8.9% of energy savings opportunities in single-family homes – with potential savings of 157 billion btus of energy per year by year 8

KEY FINDINGS

Increasing the prevalence and appropriate use of pool pump timers represents nearly 50% of the opportunity to reduce energy consumption from pools and spas. Studies suggest that pool owners in mid-atlantic states tend to run pool pumps for more hours than necessary. Reducing the run time of pool pumps could help Baltimore residents save 77 billion btus per year.

Accelerating the replacement of energy-inefficient pool pumps with more efficient models could help pool owners save 65 billion btus per year. Switching from a standard efficiency single speed pump to a multi-speed or variable-speed pump can achieve energy savings as high as 83 percent. Behavioral programs can help accelerate the adoption of such technologies.

Augmenting the appropriate use of hot tub timers represent nearly 6% of the savings opportunities for pools and spas. If just 40% of eligible households participate, they could help the city reduce energy consumption by roughly 15 billion btus per year. Additional savings could be achieved through the use of floating hot tub blankets.
### Residential Behavior Wedge Profile | Opportunities by End Use | 28

**POOLS & SPAS**

**Single-family energy saving opportunities**

Left hand Bar= Estimated Annual Savings by end of Year 4.

Right hand Bar= Estimated Annual Savings by end of Year 8.

#### Change Pool Pump Settings

**Target:** Single-family Homes with Pools

Use pool pump timers to limit the hours of pump run time.

- **48.9%** \(\text{% of pool/spa opportunity}\)
- **7%** \(\text{households eligible}\)
- **28.9%** \(\text{annual household savings}\)

#### Accelerated Pump Replacement

**Target:** Home Owners with Pools

Move pool owners toward a decision to install an energy efficient pump.

- **41.1%** \(\text{% of pool/spa opportunity}\)
- **3%** \(\text{households eligible}\)
- **27.8%** \(\text{annual household savings}\)

#### Install & Use Hot Tub Timers

**Target:** Owners and Renters with Hot Tubs

Use a hot tub timer to limit the temperature settings in hot tubs.

- **9.8%** \(\text{% of pool/spa opportunity}\)
- **3%** \(\text{households eligible}\)
- **5.8%** \(\text{annual household savings}\)

#### Use Pool Covers

**Target:** Homes with Heated Pools

Encourage the use of pool covers to reduce heat loss in heated pools.

- **0.2%** \(\text{% of pool/spa opportunity}\)
- **7%** \(\text{households eligible}\)
- **0.4%** \(\text{annual household savings}\)

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*Household eligibility is determined independently for each behavior. More information is available in the methodology report.**

**Estimates of annual households savings are for participating households.**