

# Impacts of Future Codes and Standards on U.S. Electricity Use (2010-2020)

Prepared for  
MEEA Midwest Energy Solutions Conference

Presented by  
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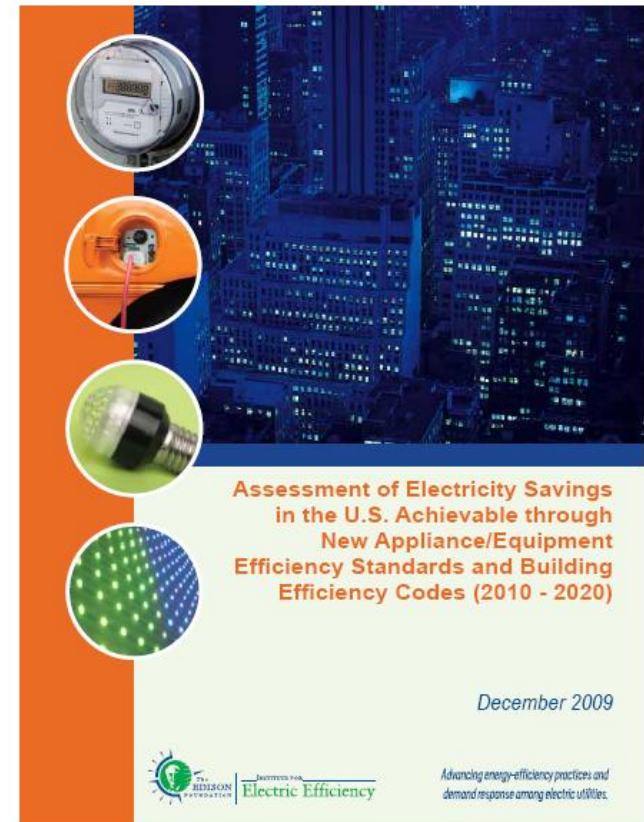
January 14, 2010

# Definitions

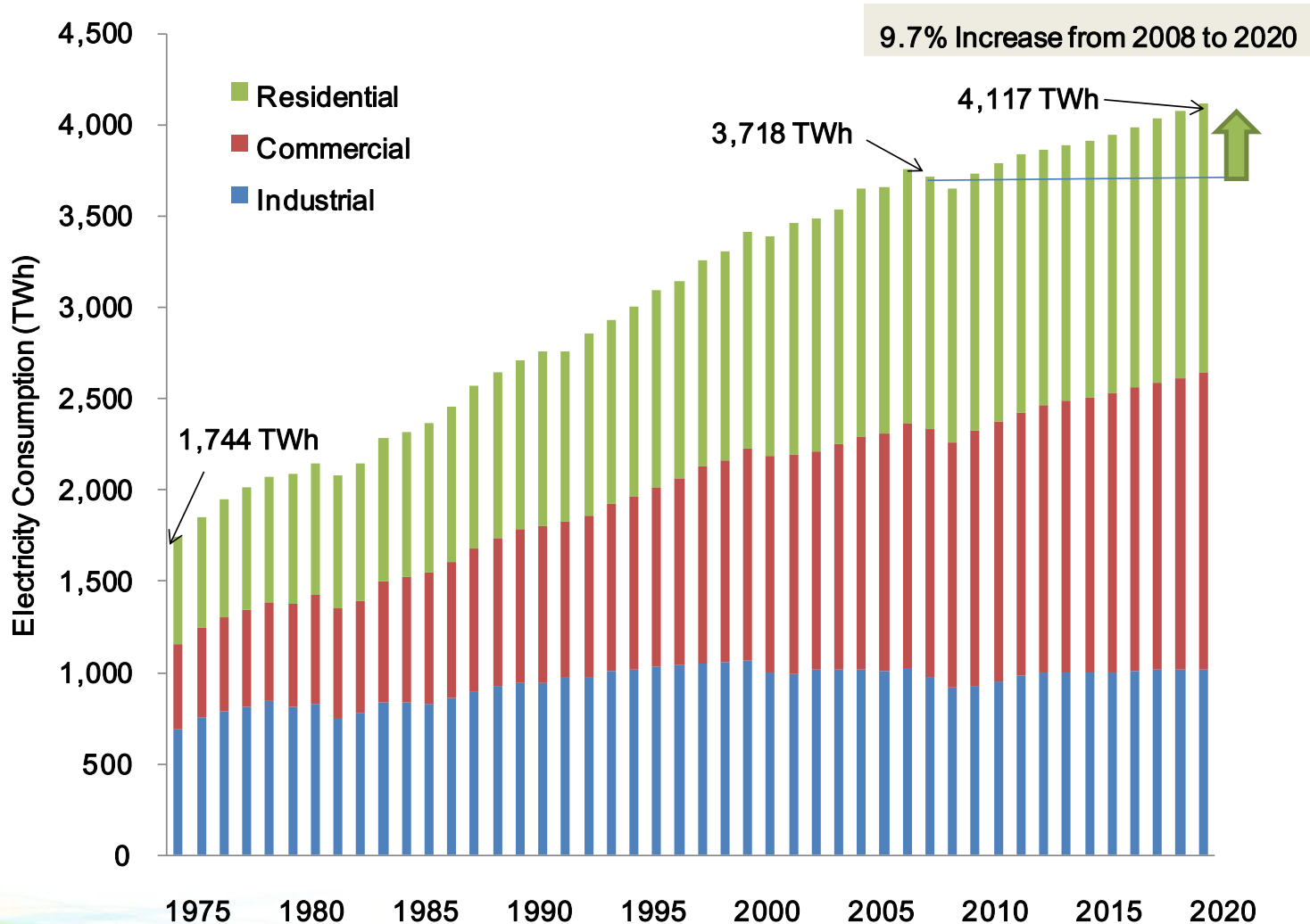
- **Building codes** focus on reducing energy consumption in newly-constructed buildings
- Federal or state appliance and equipment efficiency **standards** mandate minimum efficiency levels for energy-using equipment
  - Examples include central air conditioners, lamps and ballasts, furnace fans, and white-box residential appliances
  - Standards result in lower consumption levels for all units purchased
- Standards and codes do not address penetration of equipment, customer behavior or homes size

# Background

- The Institute for Electric Efficiency (IEE) sponsored this research – Lisa Wood, Executive Director
- Objectives
  - Quantify potential impacts of future codes and standards
  - Identify ways for utilities to address this issue
- Draft paper is available on IEE website  
[http://www.edisonfoundation.net/iee/reports/IEE\\_RohmundApplianceStandardsEfficiencyCodes1209.pdf](http://www.edisonfoundation.net/iee/reports/IEE_RohmundApplianceStandardsEfficiencyCodes1209.pdf)



# U.S. Electricity Use – Past and Future



Source: *Annual Energy Outlook 2009* with Provisions of the American Recovery and Reinvestment Act, April 2009

# Assumptions in the Baseline Forecast<sup>1</sup>

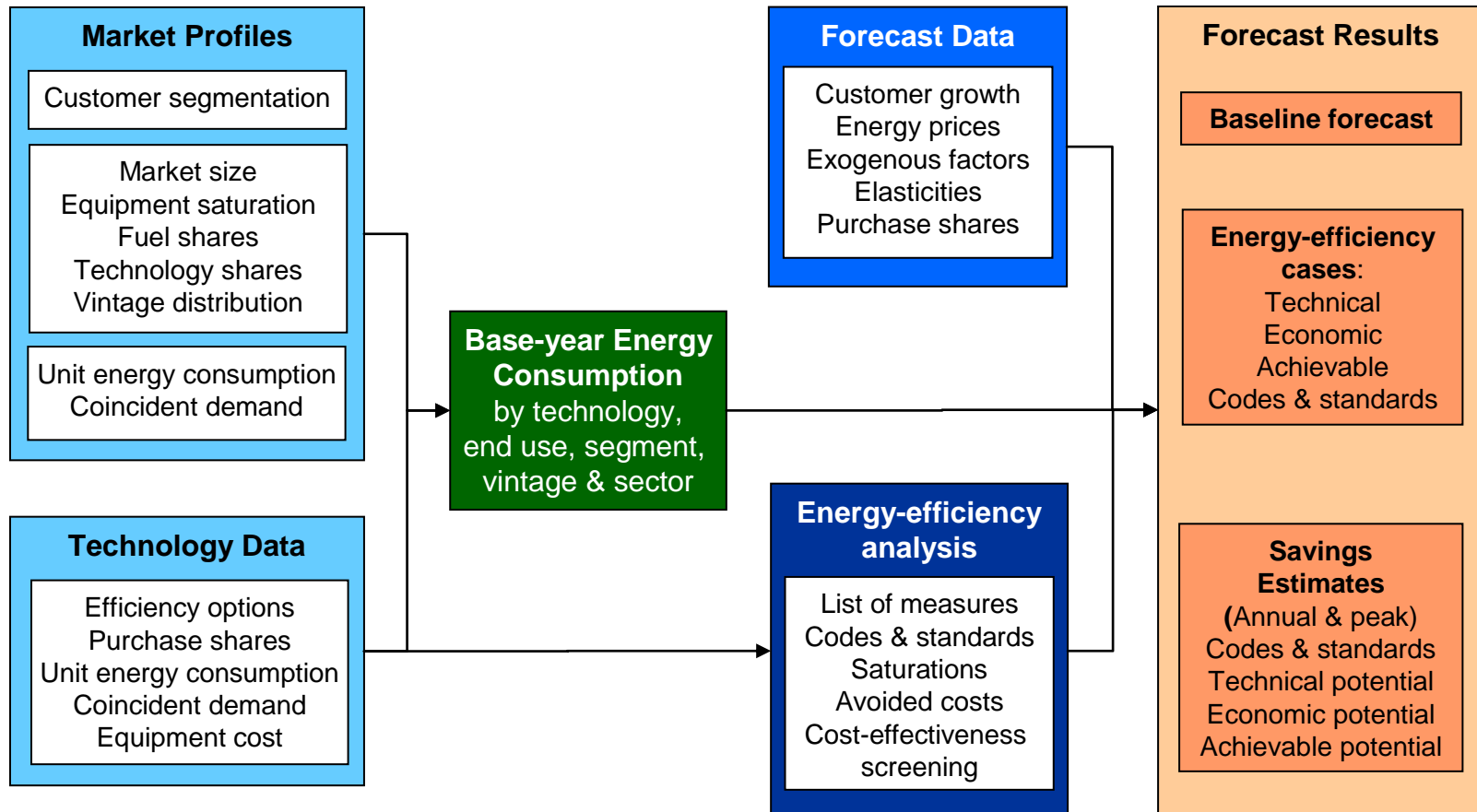
- Existing codes and standards
  - Both local and federal building codes (i.e., IECC 2006 and 2009; ASHRAE 90.1 2004 and 2007)
  - Appliance and equipment standards officially signed
  - Other energy-relevant legislation
- Naturally occurring efficiency
  - Technological improvements
  - Conservation response to rising prices
  - Market trends towards “green”
- Embedded demand-side management
  - Utility information and incentive programs
  - State funding and regulatory mechanisms
  - New funding through the ARRA

<sup>1</sup>Source: *Annual Energy Outlook 2009* with Provisions of the American Recovery and Reinvestment Act, April 2009

# Codes and Standards Analyzed

- Moderate
  - Building codes equivalent to IECC 2009 or ASHRAE 90.1 2007 code (100% compliance) are adopted by all states
  - Appliance and equipment standards for items scheduled or overdue under DOE's rulemaking process as set forth by the Energy Policy Act of 2005 (EPACT 2005) and the Energy Independence and Security Act of 2007 (EISA 2007)
- Aggressive
  - Building codes in the current version of the Waxman-Markey Bill (HR2454, Sec. 201) are passed and all states adopt the building code with 100% compliance
  - In addition to moderate scenario, standards expand to address all possible devices, with a second set of standards in later years of the forecast for some technologies

# Used LoadMAP™ to Perform Analysis



# Equipment Standards Assumptions - Residential CAC Example



# Residential Standards Assumptions

| Technology         | 2012 | 2013 | 2014                  | 2015                  | 2016                     | 2017 | 2018               | 2019               | 2020 |
|--------------------|------|------|-----------------------|-----------------------|--------------------------|------|--------------------|--------------------|------|
| Central AC         |      |      |                       |                       | SEER 14                  |      |                    | SEER 15            |      |
| Window AC          |      |      |                       |                       | EER 10.8                 |      |                    | EER 11.5           |      |
| Heat Pump          |      |      |                       |                       | HSPF 8.2                 |      |                    | HSPF 9.3           |      |
| Water Heating      |      |      |                       |                       | EF 0.95                  |      |                    | Ht Pump WH         |      |
| Interior Screw-in  |      |      | Advanced Incandescent |                       |                          |      |                    | CFL                |      |
| Exterior Screw-in  |      |      | Advanced Incandescent |                       |                          |      |                    | CFL                |      |
| Reflector Lamps    |      |      |                       |                       | Advanced Incandescent    |      |                    | CFL                |      |
| Torchiere          |      |      |                       |                       | Advanced Incandescent    |      |                    | CFL                |      |
| Linear Fluorescent |      |      | Super T8              |                       |                          |      |                    |                    |      |
| Refrigerator       |      |      | 2010 Code             |                       |                          |      | 2014 Code          |                    |      |
| Freezer            |      |      | 2010 Code             |                       |                          |      | 2014 Code          |                    |      |
| Dishwasher         |      |      |                       |                       |                          |      | Energy Star        |                    |      |
| Clothes Washer     |      |      |                       |                       | MEF 2.0                  |      |                    |                    |      |
| Clothes Dryer      |      |      |                       | Moisture Sensor (10%) |                          |      |                    | 15% More Efficient |      |
| Cooking            |      |      |                       |                       |                          |      | 13% More Efficient |                    |      |
| Personal Computer  |      |      |                       |                       |                          |      | Energy Star        |                    |      |
| Color TV           |      |      |                       |                       |                          |      | Energy Star        |                    |      |
| Furnace Fan        |      |      |                       |                       | Permanent Magnetic Motor |      |                    |                    |      |

Moderate Scenario  
 Aggressive Scenario

# Summary of Impacts in 2020

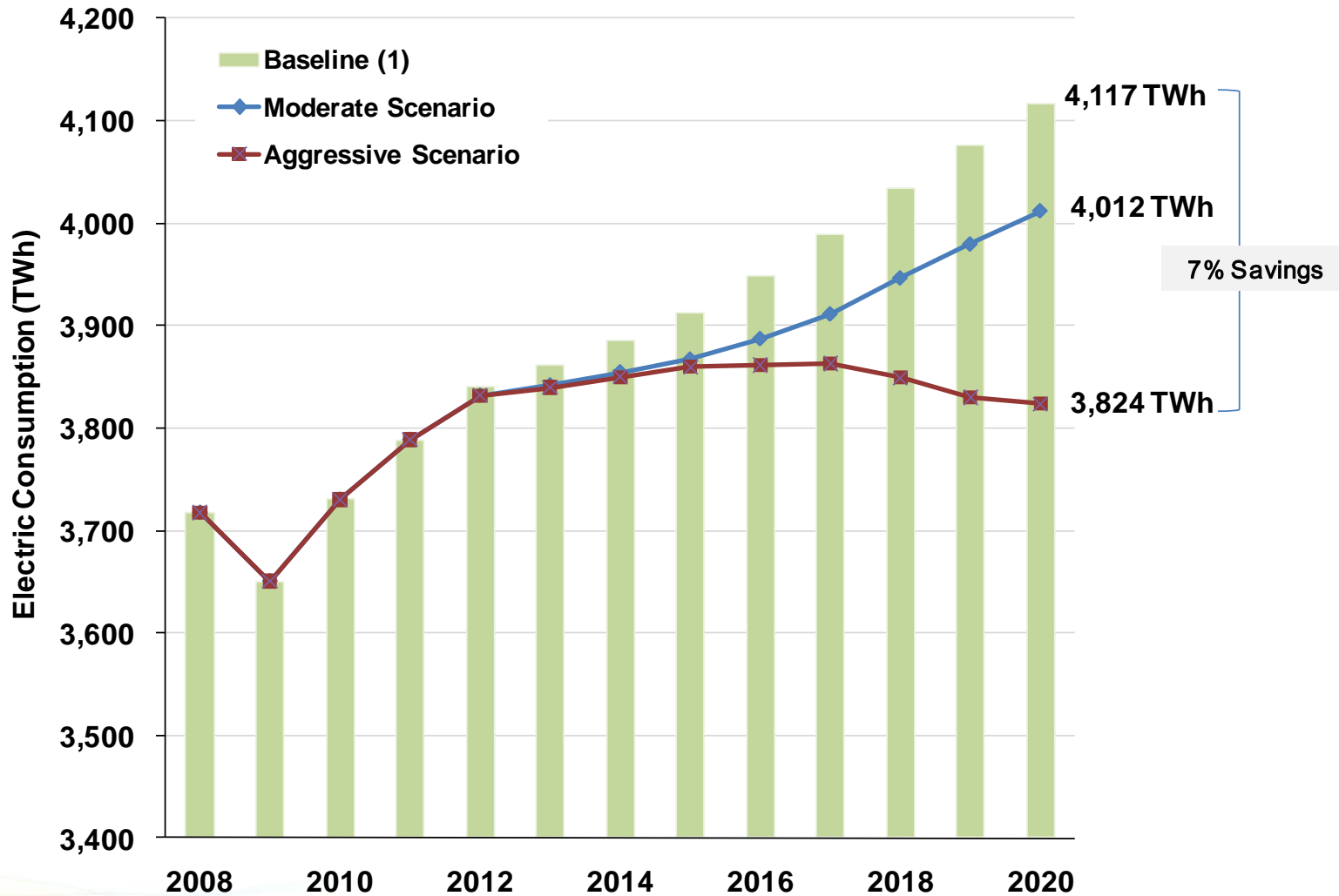
| Scenario              | Electricity Use in 2020 (TWh) | Savings from Building Codes (TWh) | Savings from Equipment Standards (TWh) | Total Savings in 2020 (TWh) | % of Baseline |
|-----------------------|-------------------------------|-----------------------------------|--|-----------------------------|---------------|
| AEO Baseline Forecast | 4,117                         |                                   |  |                             |               |
| Moderate Scenario     | 4,012                         | 18                                | 86                                     | 104                         | 2.5%          |
| Aggressive Scenario   | 3,824                         | 59                                | 234                                    | 293                         | 7.1%          |

# Building Code Assumptions

## Average Energy Reductions (% of Baseline Usage)

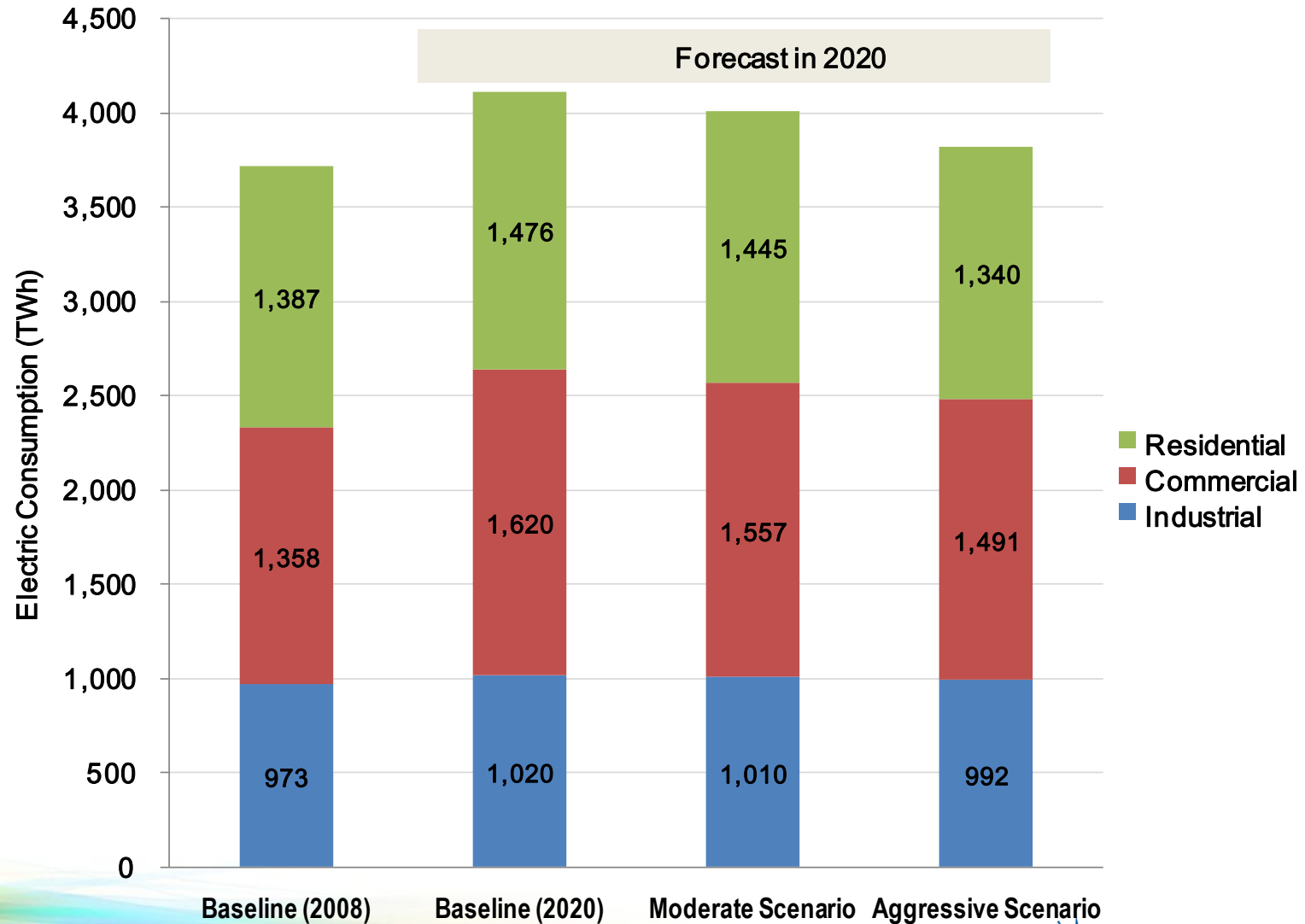
|                           | Moderate Scenario | Aggressive Scenario |                  |
|---------------------------|-------------------|---------------------|------------------|
|                           | IECC 2009         | Waxman-Markey I     | Waxman-Markey II |
| <b>Year Effective</b>     | 2013              | 2013                | 2017-2018        |
| <b>Residential Sector</b> | 15%               | 30%                 | 50%              |
| <b>Commercial Sector</b>  | 15%               | 30%                 | 50%              |
| <b>Industrial Sector</b>  | 15%               | 30%                 | 50%              |

# Impact of Codes and Standards

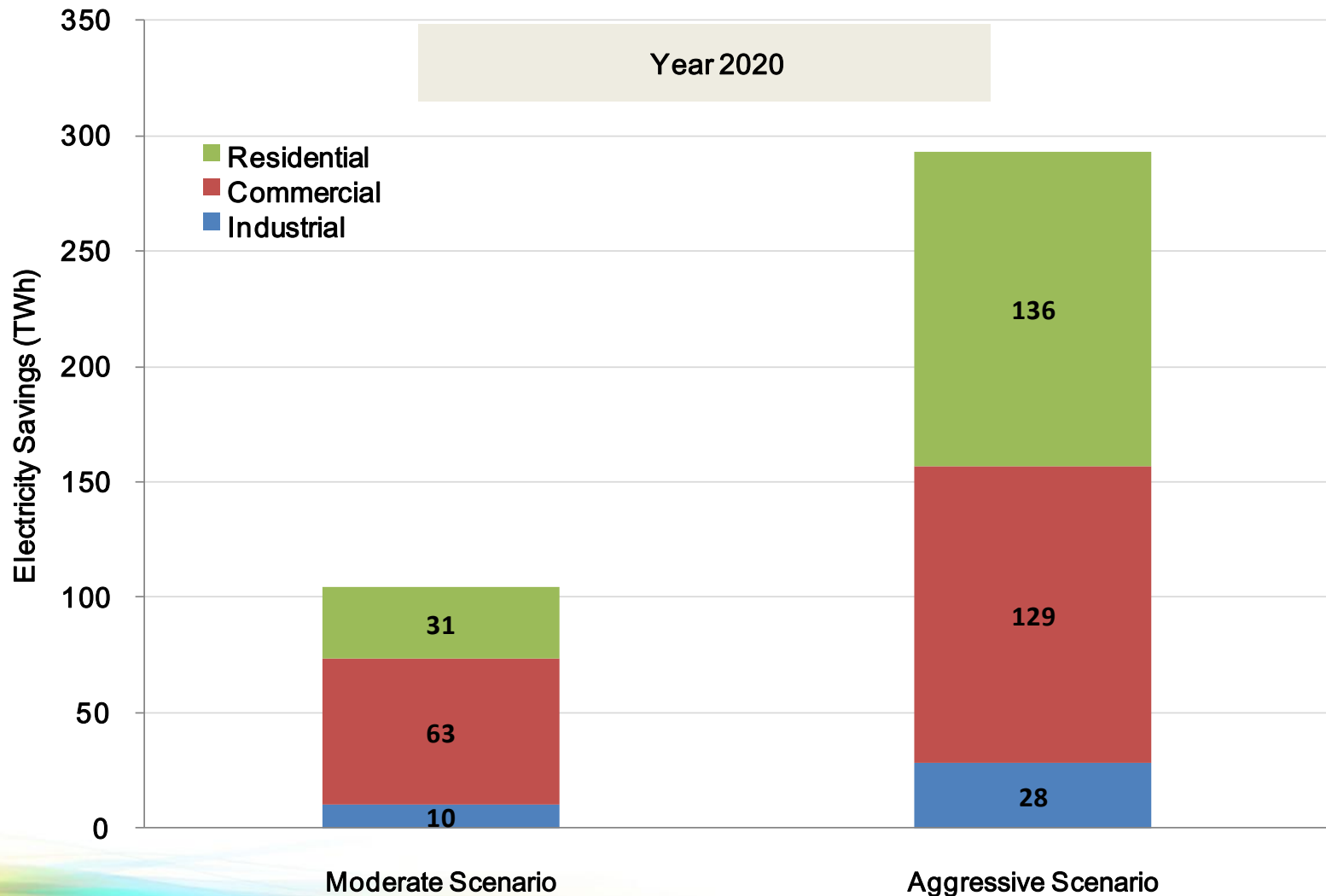


(1) Source: *Annual Energy Outlook 2009* with Provisions of the American Recovery and Reinvestment Act, April 2009

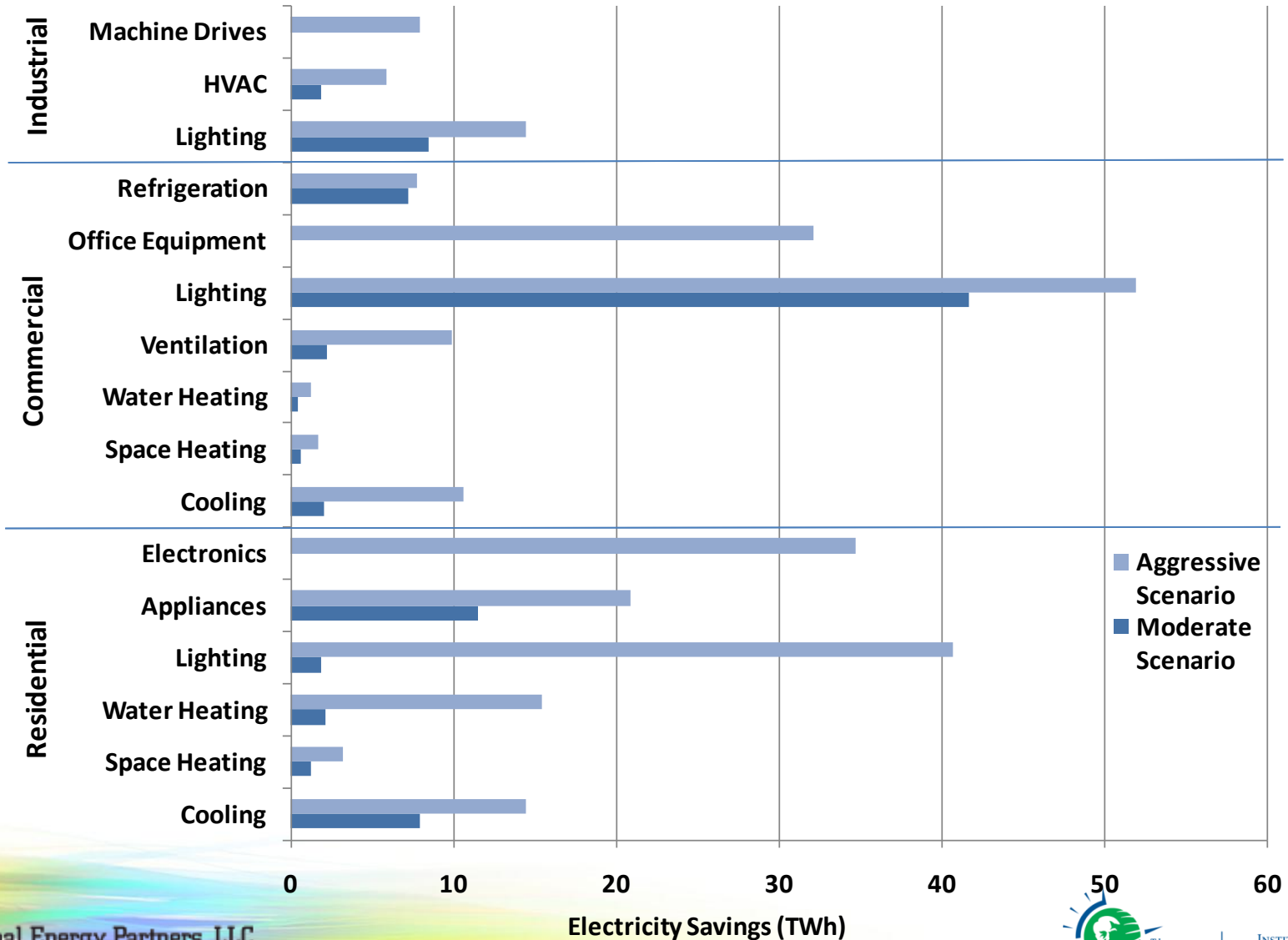
# Forecast by Scenario and Sector



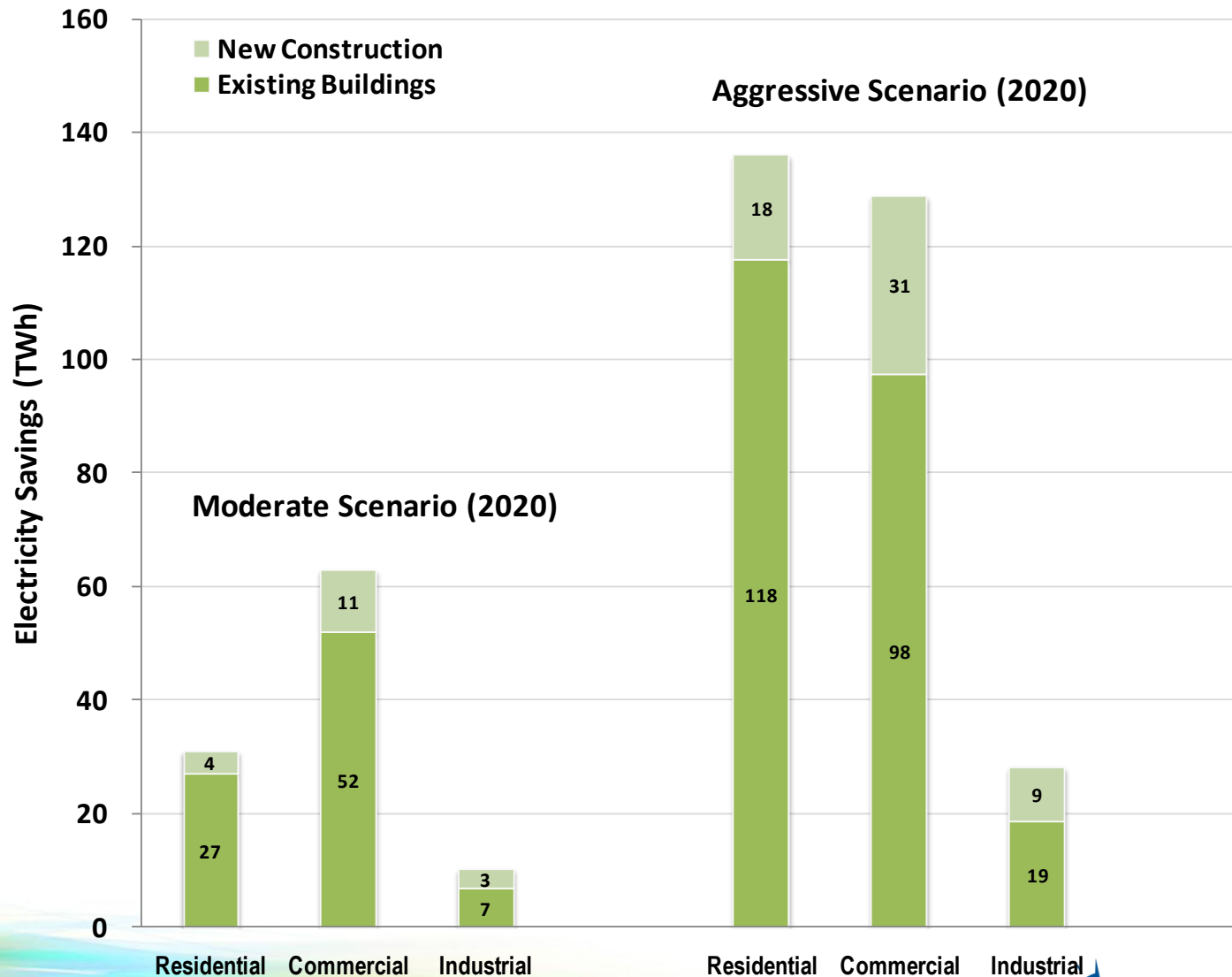
# Savings by Scenario and Sector



# 2020 Savings by End Use

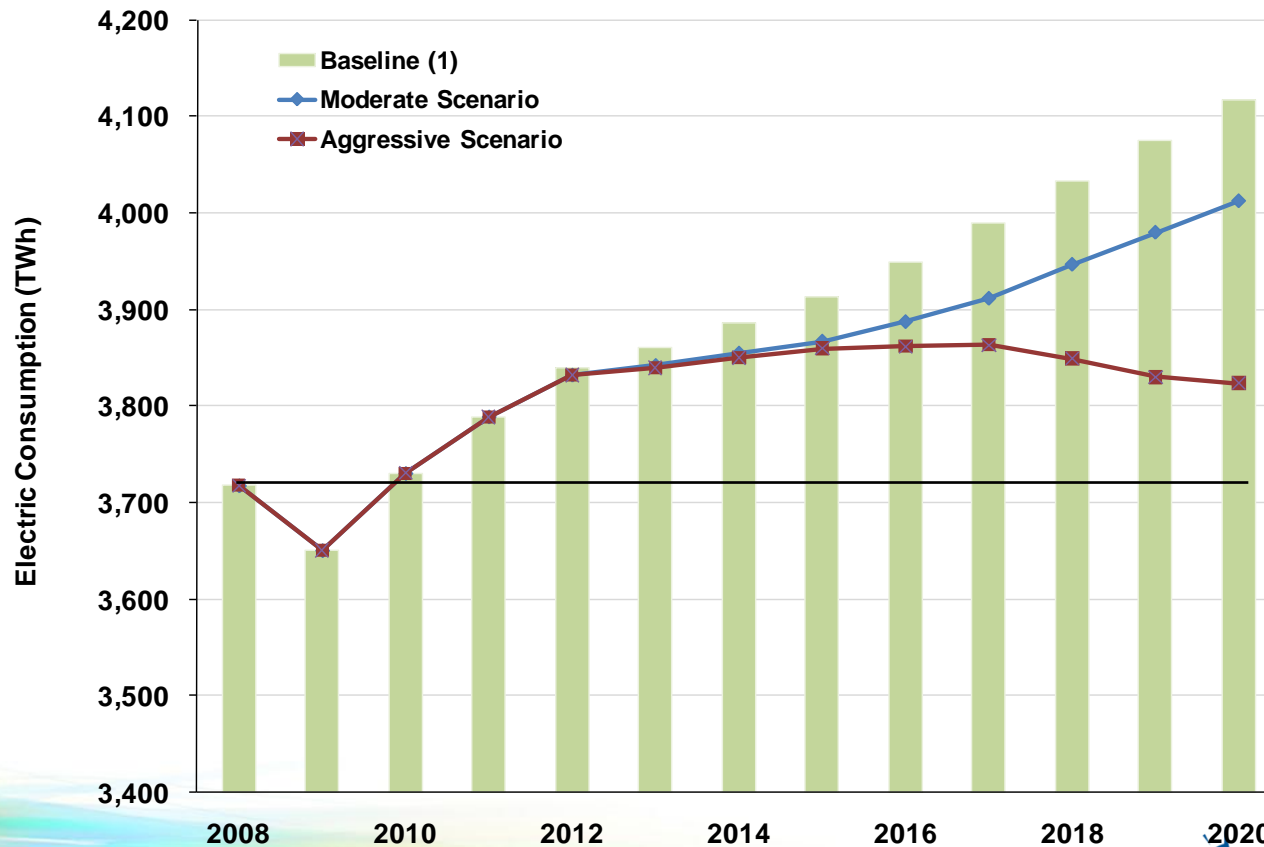


# 2020 Savings by Vintage and Sector



# Summary

- By 2020, future codes and standards
  - Reduce electricity use by **2.5-7.1%** of load in 2020
  - Offset growth in use from 2008 to 2020 by **26-73%**



# Implications

- Future codes and standards will affect savings possible from utility programs by
  - Lowering the baseline sales forecast
  - Raising the “efficiency bar” by addressing the low-hanging fruit
- Even so, there is still room for utility programs
  - Utilities will need to focus on higher-cost, harder-to-achieve opportunities
  - Focus on retrofit (existing building) market
  - Promote super-efficient technologies
  - Incorporate utility-sponsored codes and standards into EE programs

# For more information

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