ENERGY STAR

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SAVE FOR GOOD.

# ENERGY STAR®
# Products for All-Electric Homes

ESPPM 2020


EPA

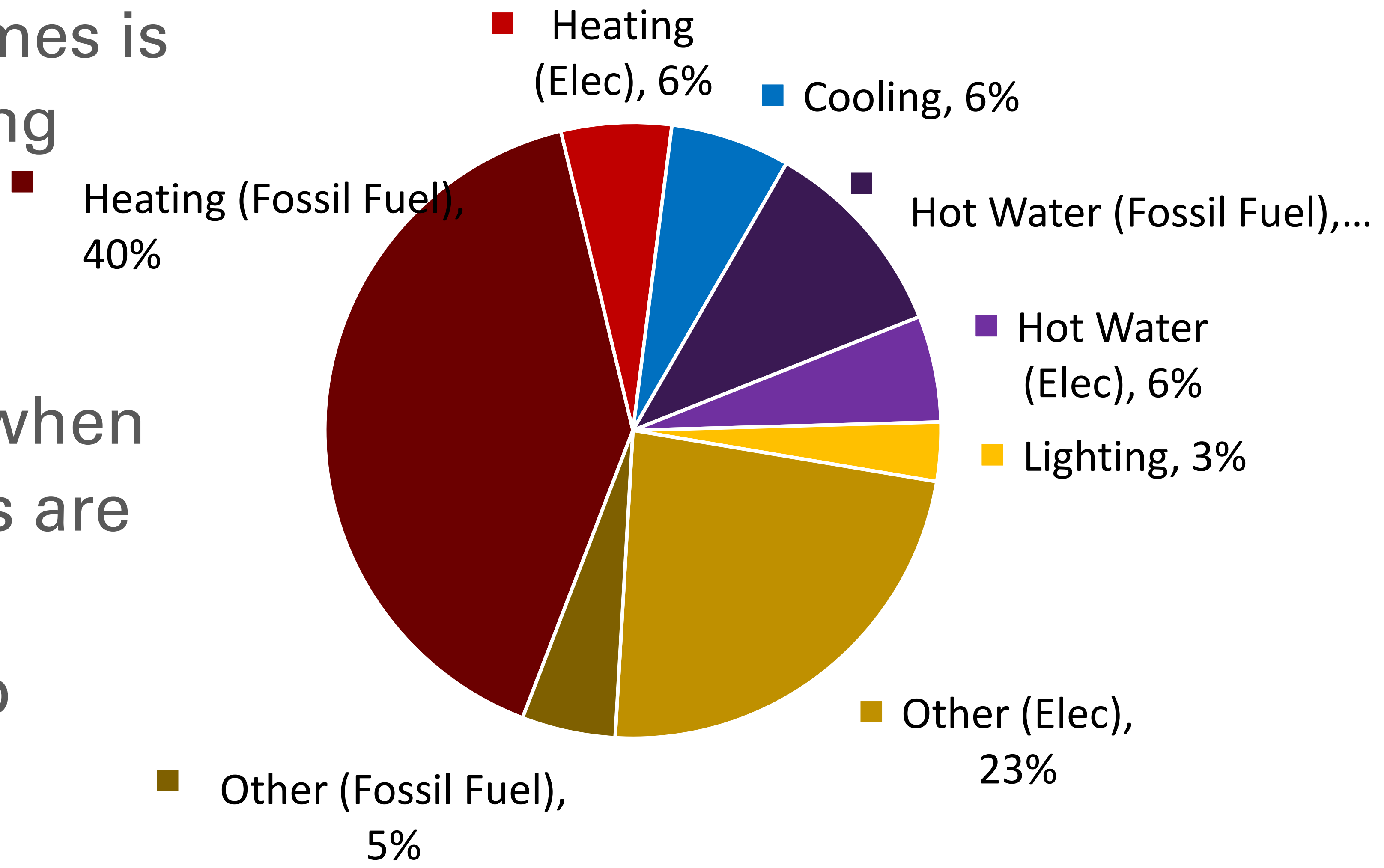
## ENERGY STAR Stakeholders: Electrification Key to GHG Reductions

- Northeast Energy Efficiency Partnerships (NEEP) GHG reduction focus include electrification
- New York State (85% GHG reduction by 2050)*
- > 30 CA cities and 5 others nationwide have proposed or are considering electric only codes/ordinances/etc for new construction + incentives for existing buildings
- Xcel Energy's decarbonization plan includes transportation and building electrification
- ENERGY STAR Products will be there to support our partners

* https://www.nyserda.ny.gov/-/media/Files/About/Strategic-Plan/strategic-outlook.pdf

## Water and Space Heating are Critical End-Uses…

- Most fossil fuel use in homes is for water and space heating
- Water heating: ✓
- Space heating:
  - Need peaks strongly when air source heat pumps are least capable
  - Traditional heat pump sizing favors cooling




2017 Residential Energy Consumption. Source: EIA AEO 2019

# But other end-uses matter too.

- In that 5% “other fossil fuel” slice is cooking
- Relatively small amount of household energy, but outsize impact on customer acceptance
- State-of-the-art induction cooktops offer similar performance

# Today's Panel

**Abigail Daken**
U.S. Environmental Protection Agency

**Chioke Harris**

National Renewable Energy Laboratory

**Jeremy Sager**

Natural Resources Canada

**Alicia (Ali) Cafferty**

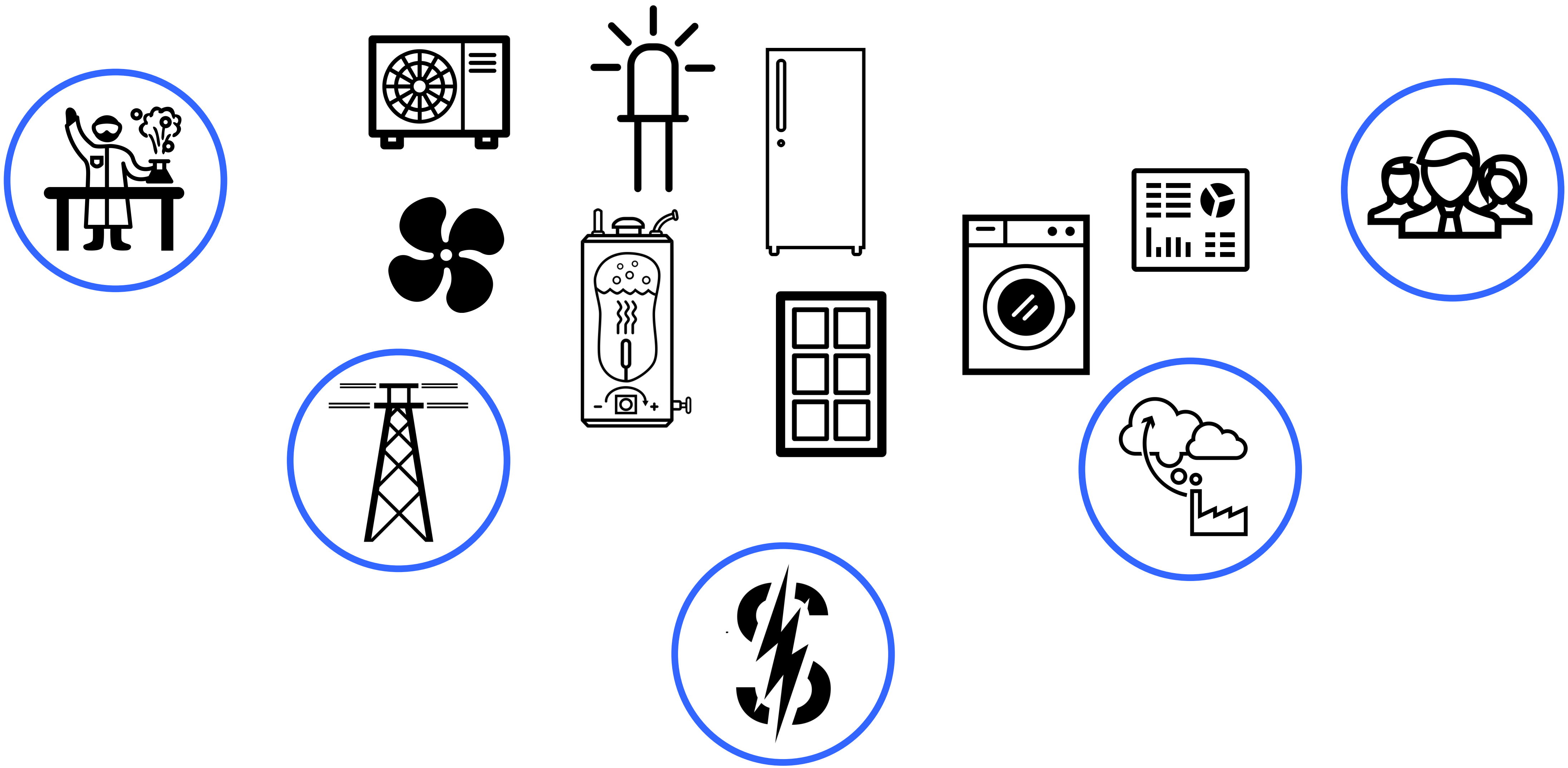
BSH Home Appliances Corporation

# Using Scout to explore the impacts of building efficiency on U.S. energy use and $CO_2$ emissions

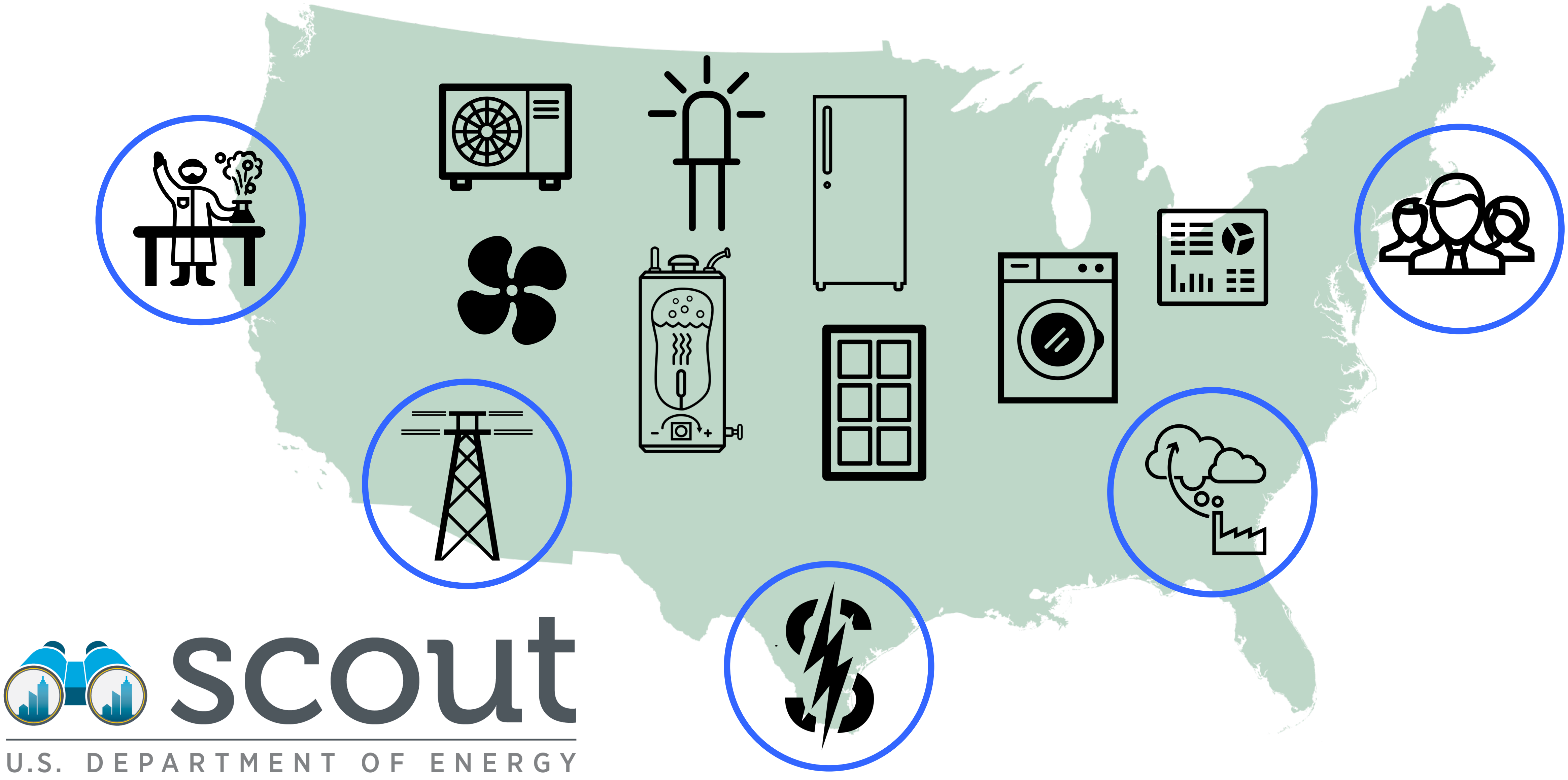
**Chioke Harris**, Research Engineer
National Renewable Energy Laboratory

ENERGY STAR Products for an All-Electric New Home,
2020 ENERGY STAR Products Partner Meeting, October 27–29, 2020

# A diverse playing field for building energy efficiency technologies



# Scout offers a rapid, repeatable method for evaluating U.S. building energy efficiency opportunities



# Analysis flow—from ECM definition to impact estimation

## Inputs

Baseline definition

EIA Annual Energy Outlook

Energy Conservation Measure (ECM) definition

**Defined for Specific Building Type(s), Climate Zone(s), End Use(s), and Fuel Type(s)**

**Building Stock Data**

# Buildings, Floor Area

**Technology Stock Data**

# Units, Energy Use

Cost, Performance, and Lifetime

Adoption Parameters

**Cost**
**Performance**
**Lifetime**
**Market Entry Year**

## Engine

**For each year, determine adoption of all available ECMs (those that have entered the market) subject to stock and flow dynamics and ECM competition**

**Stock and flow dynamics**

New stock and stock up for replacement or retrofit (baseline and ECM)

**ECM Competition**

Determine which technologies will be adopted by different types of consumers based on technology CAPEX and OPEX

## Outputs

**ECM/Portfolio Impacts**

Primary energy use savings (quads)

Avoided $CO_2$ emissions (Mt)

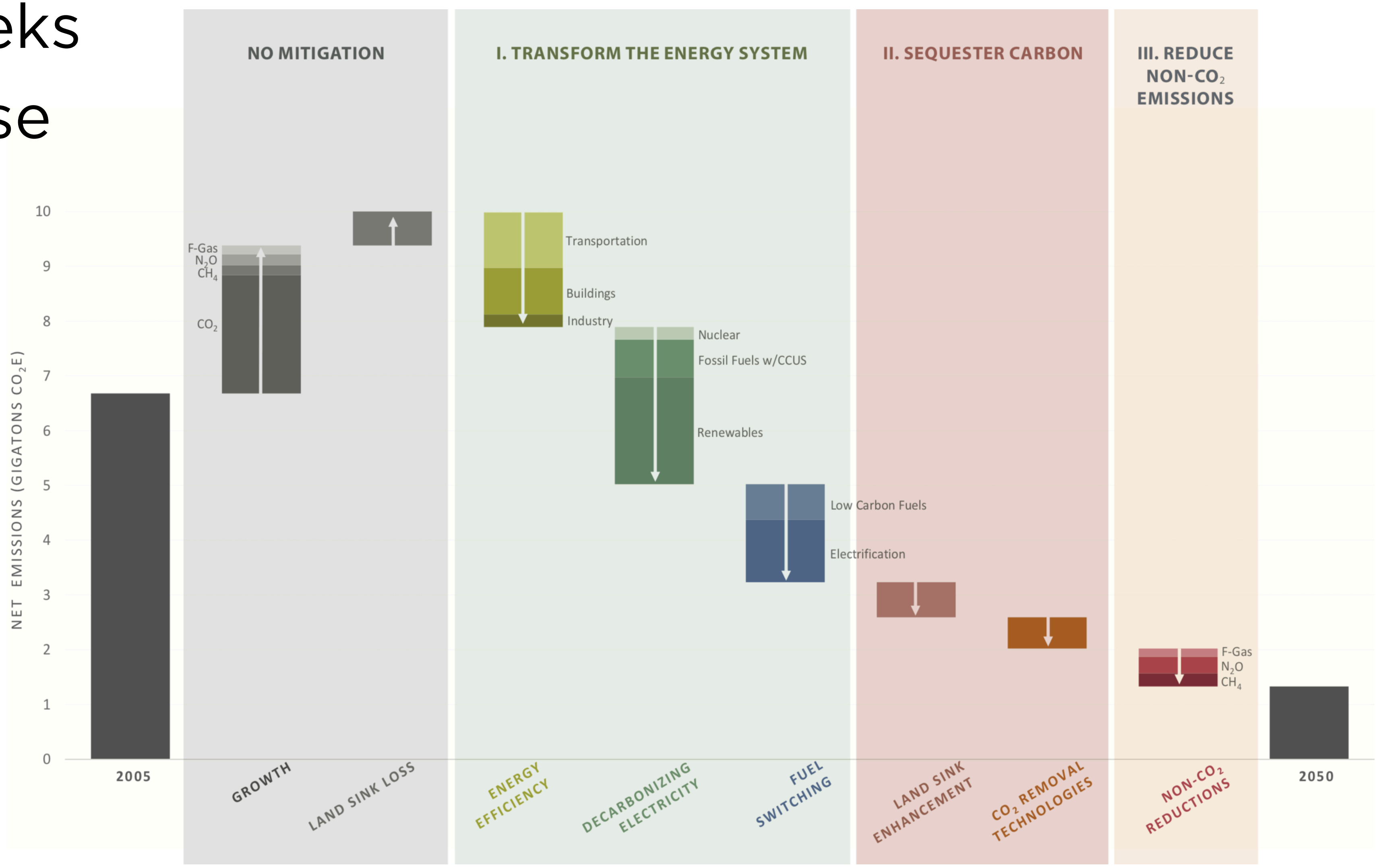
Avoided energy costs ($)

**ECM/Portfolio Cost Effectiveness**

IRR (%)
Simple Payback (years)
Cost of Conserved Energy ($/MMBtu saved),
Carbon ($/Mt avoided)

The U.S. Mid-Century Strategy (MCS) seeks 80% net greenhouse gas emissions by 2050 relative to 2005 levels.

What role can specific building technologies and operational approaches play?



United States Mid-Century Strategy for Deep Decarbonization, 2016

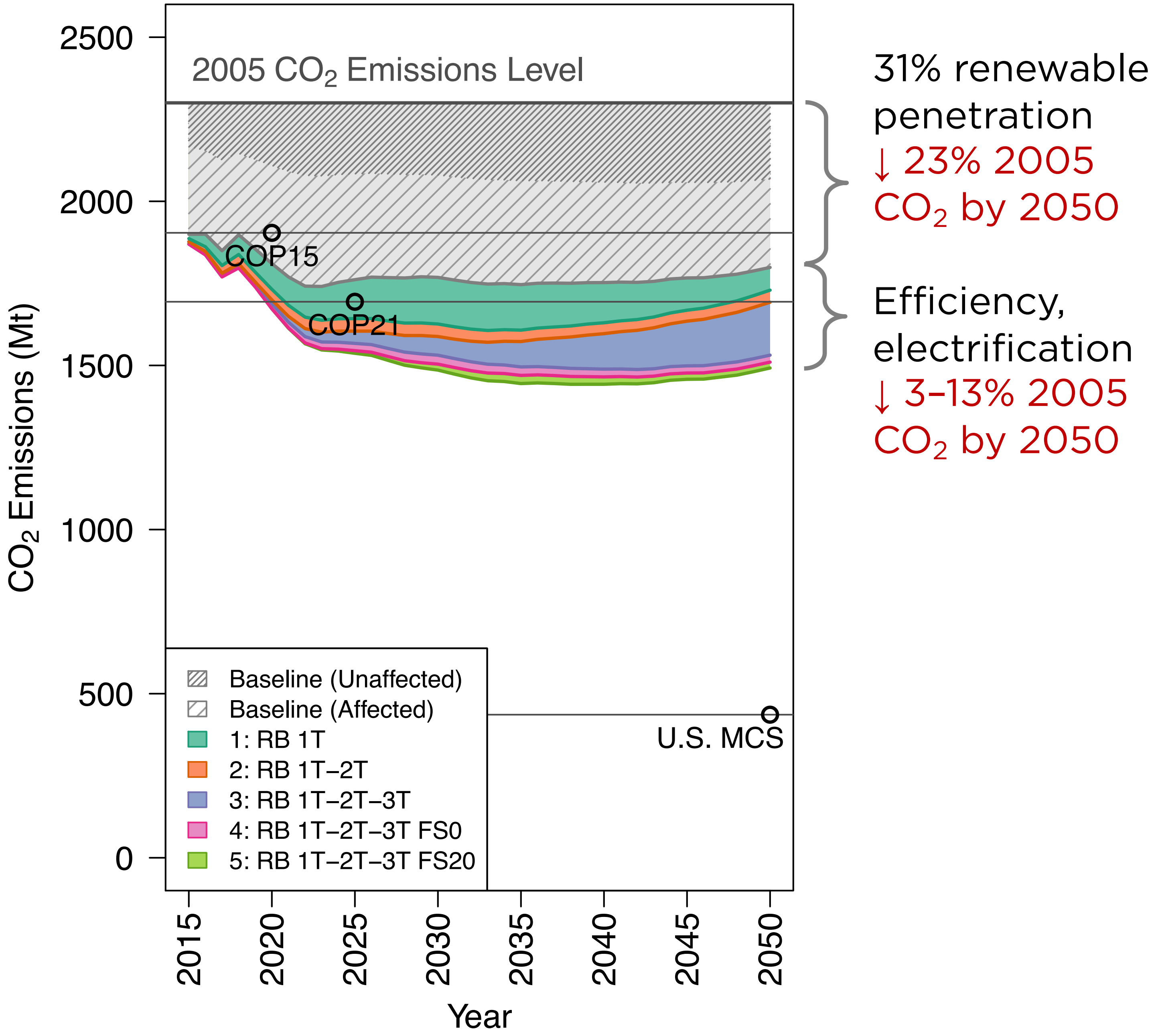
# Annually updated default Scout ECMs formed the basis of our analysis

| ECM Portfolio Name | ECM Portfolio Description | Data Sources |
|---|---|---|
| **Performance Guidelines** (40 ECMs) | • Current ENERGY STAR specifications for major equipment<br>• 90.1-2016 (res.) and IECC 2018 (com.) for envelope and other equipment not covered by ENERGY STAR | ENERGY STAR, ASHRAE 90.1-2016, IECC 2018 |
| **Best Available** (39 ECMs) | • Best performing technologies available on the market today<br>• Generally drawn from the "2017 Best" column of EIA's "Updated Equipment Costs and Efficiency" document | EIA Equipment Costs and Performance (2018), NREL Res. Eff. DB, AEDG (50%) |
| **Prospective (Target)** (50 ECMs) | • Early-stage technologies with prospective cost and performance targets (for market entry between 2020-2030) drawn mostly from the U.S. Department of Energy (DOE) Building Technologies Office (BTO) 2016 Multi-Year Program Plan (MYPP) | BTO Sub-program Future Targets from Roadmaps, RDOs |
| **Fuel Switching** (30 ECMs) | • ECM definitions from all portfolios (Performance, Best Available, and Prospective) adapted to enable/incentivize fuel switching | N/A |

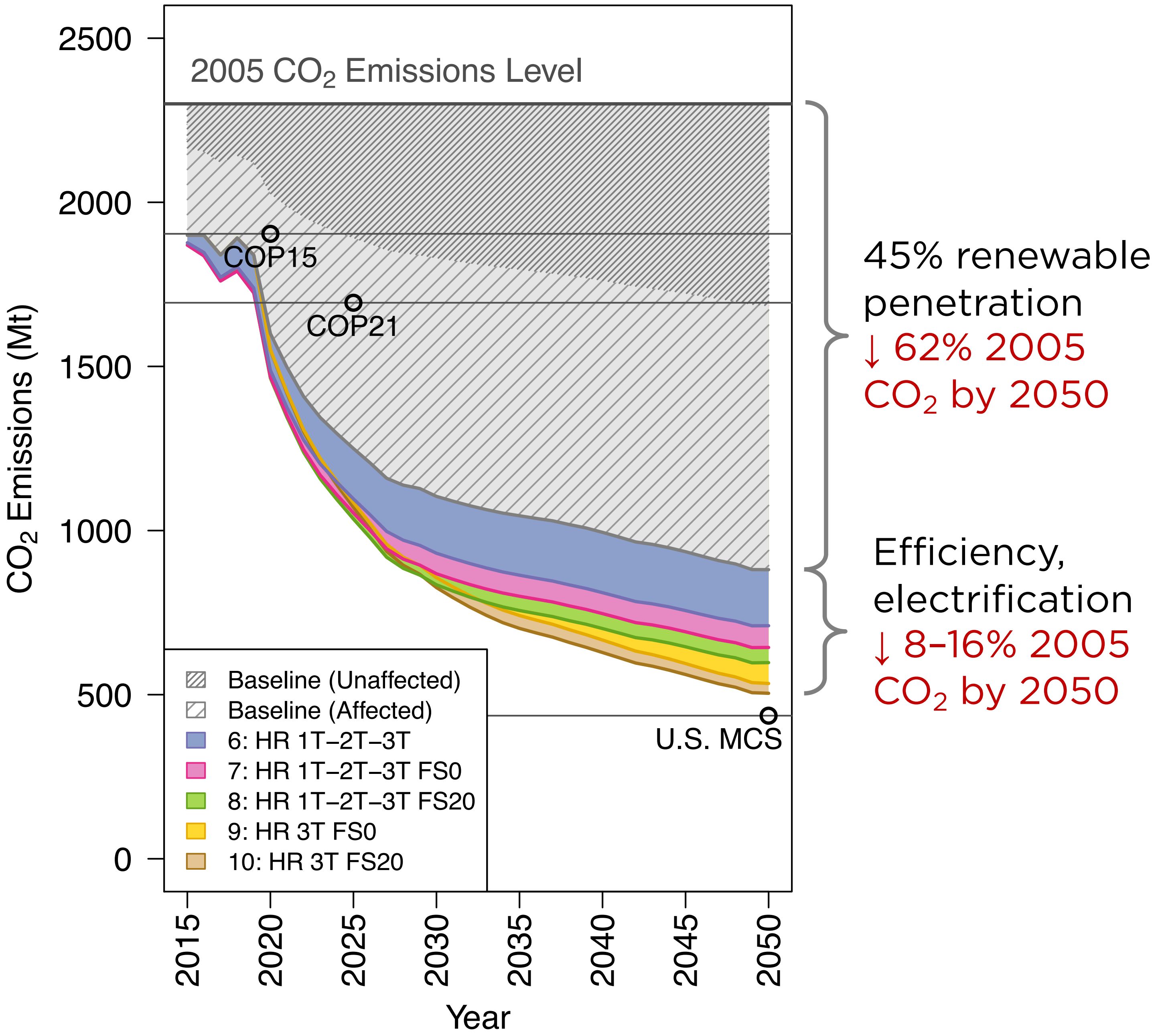
# Results scenarios explore the effect of efficiency, additional renewable generation, and electrification

| Scenario | ECM Portfolio | | | Electricity Supply | Electrification |
|---|---|---|---|---|---|
| | Performance Guidelines | Best Available | Prospective | | |
| | 1T | 2T | 3T | | |
| 1 | | | | Reference (RB) | No |
| 2 | | | | Reference | No |
| 3 | | | | Reference | No |
| 4 | | | | Reference | Yes (FS0) |
| 5 | | | | Reference | Yes + 20% Cost Credit (FS20) |
| 6 | | | | High Renewables (HR) | No |
| 7 | | | | High Renewables | Yes |
| 8 | | | | High Renewables | Yes + 20% |
| 9 | | | | High Renewables | Yes |
| 10 | | | | High Renewables | Yes + 20% |

With reference case renewable penetration, by 2050, efficiency and electrification can reduce building energy-related $CO_2$ emissions **26–36%** relative to 2005 levels.

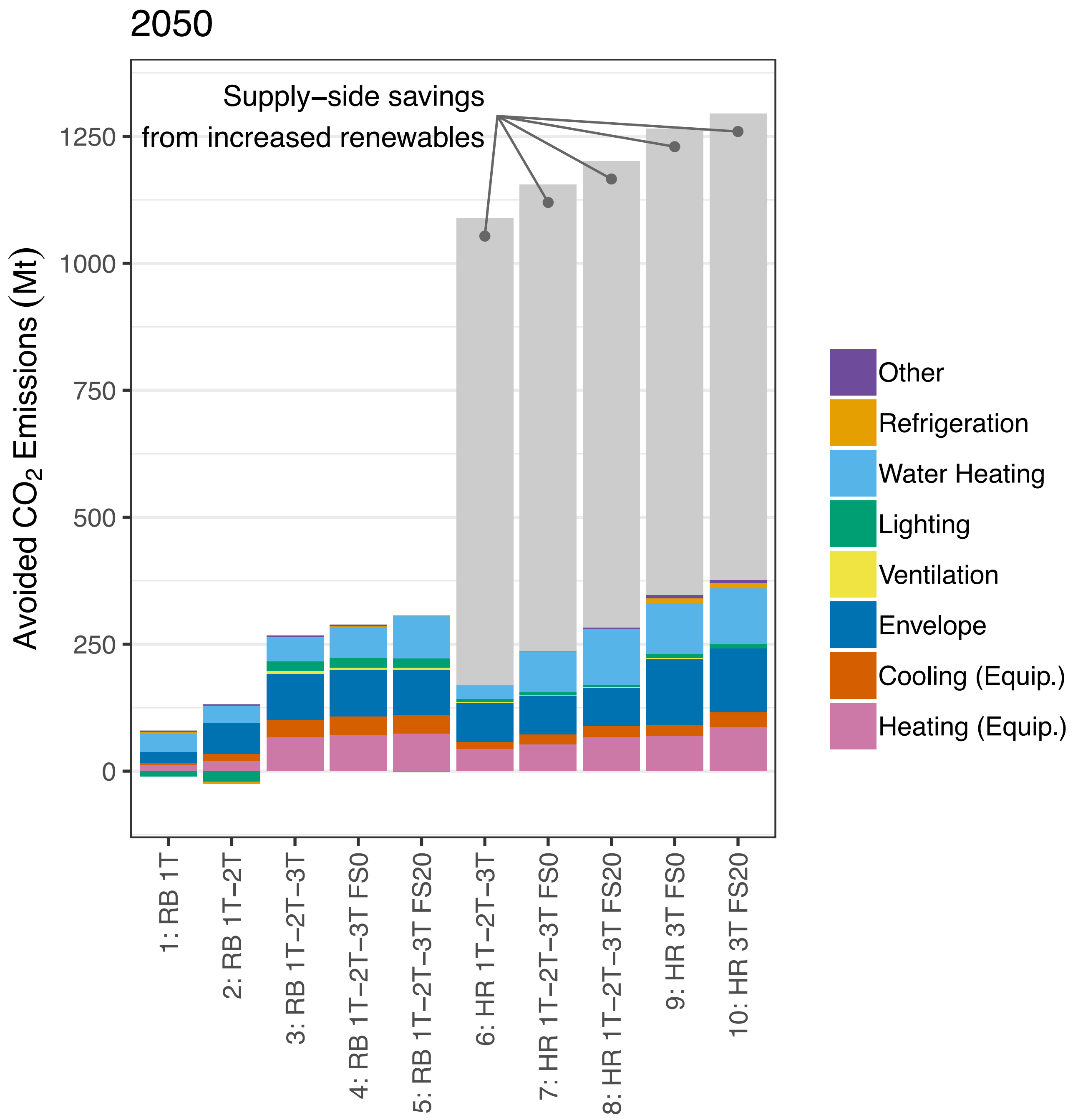


With high renewable penetration, by 2050, efficiency and electrification can reduce building energy-related $CO_2$ emissions **70–78%** relative to 2005 levels.

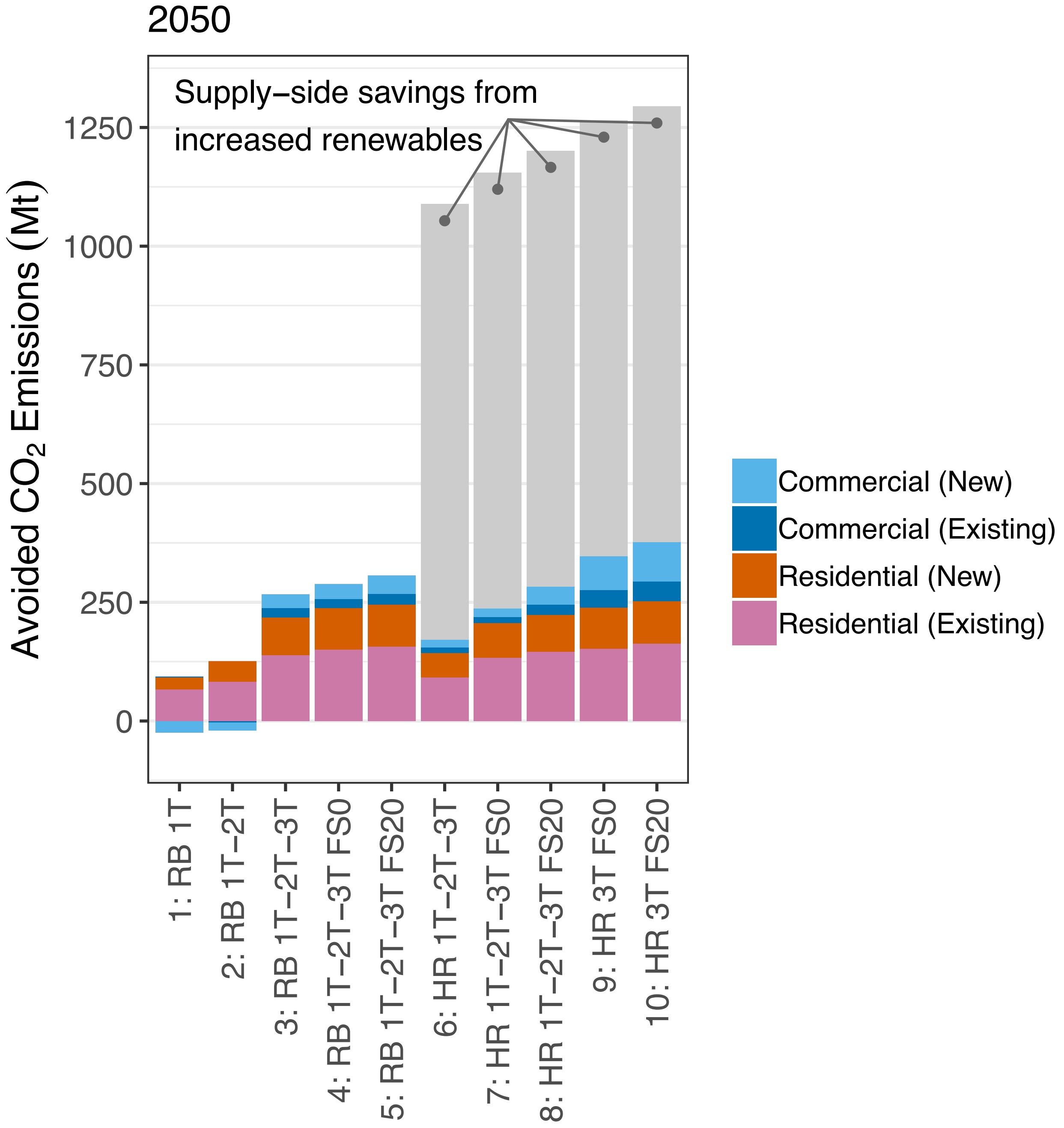


Building energy-related $CO_2$ emissions reductions are driven by the heating, water heating, and envelope* end uses.

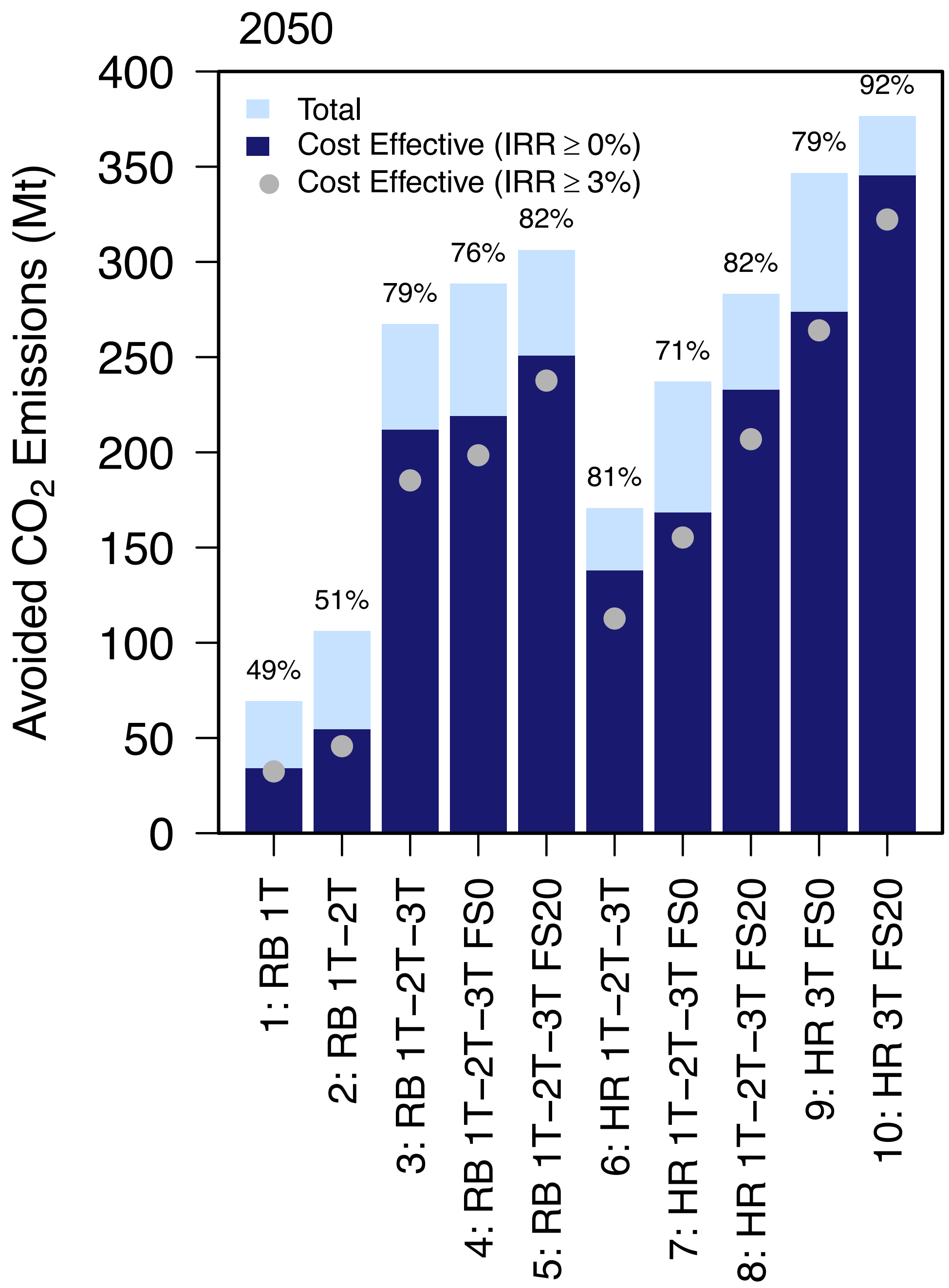
* Envelope includes both opaque envelope and windows technologies.



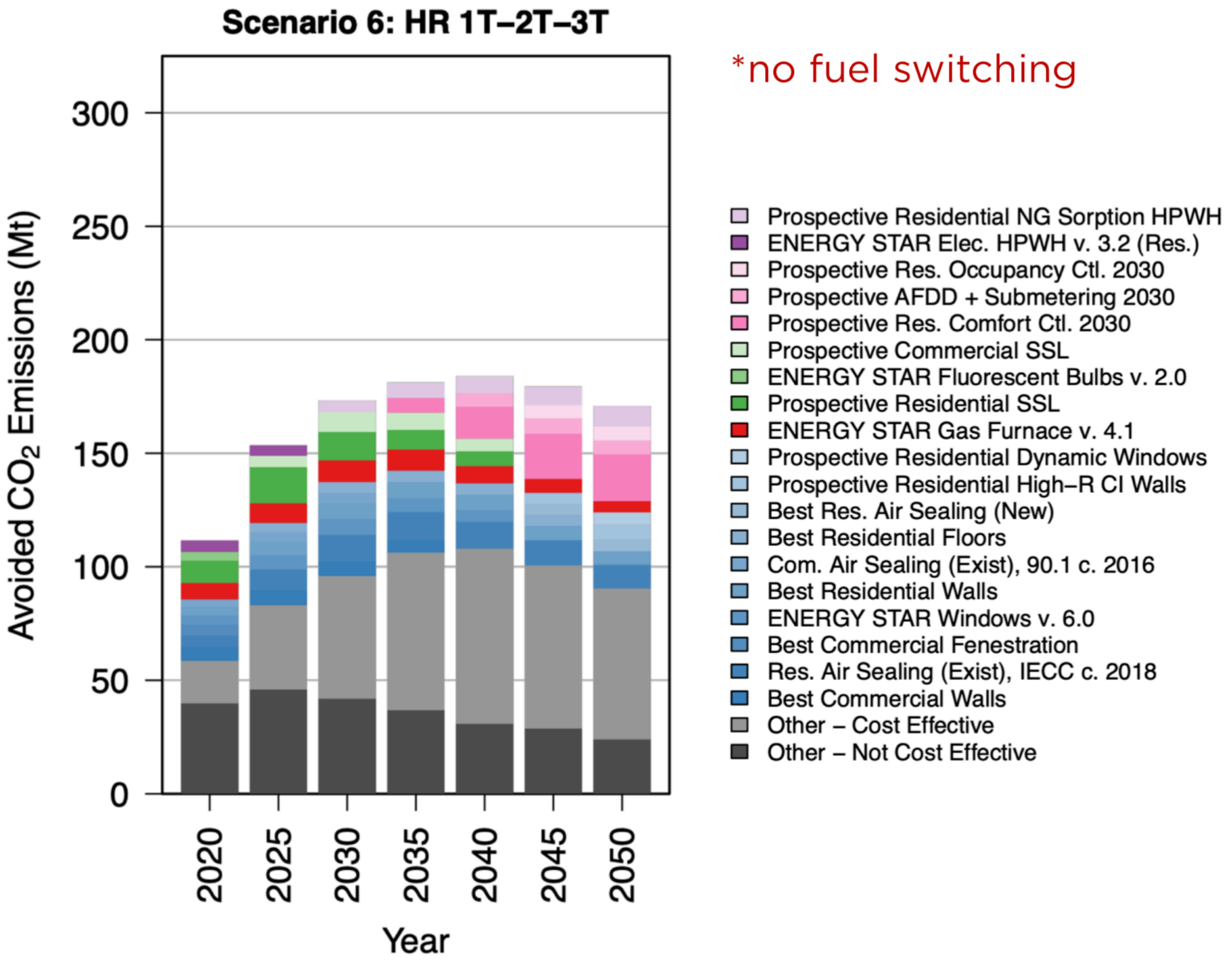
Building energy-related $CO_2$ emissions reductions are led by reductions from existing residential buildings.



Scenarios that deploy prospective technologies with aggressive price and performance levels and incentivize electrification achieve highly cost-effective $CO_2$ emissions reductions.

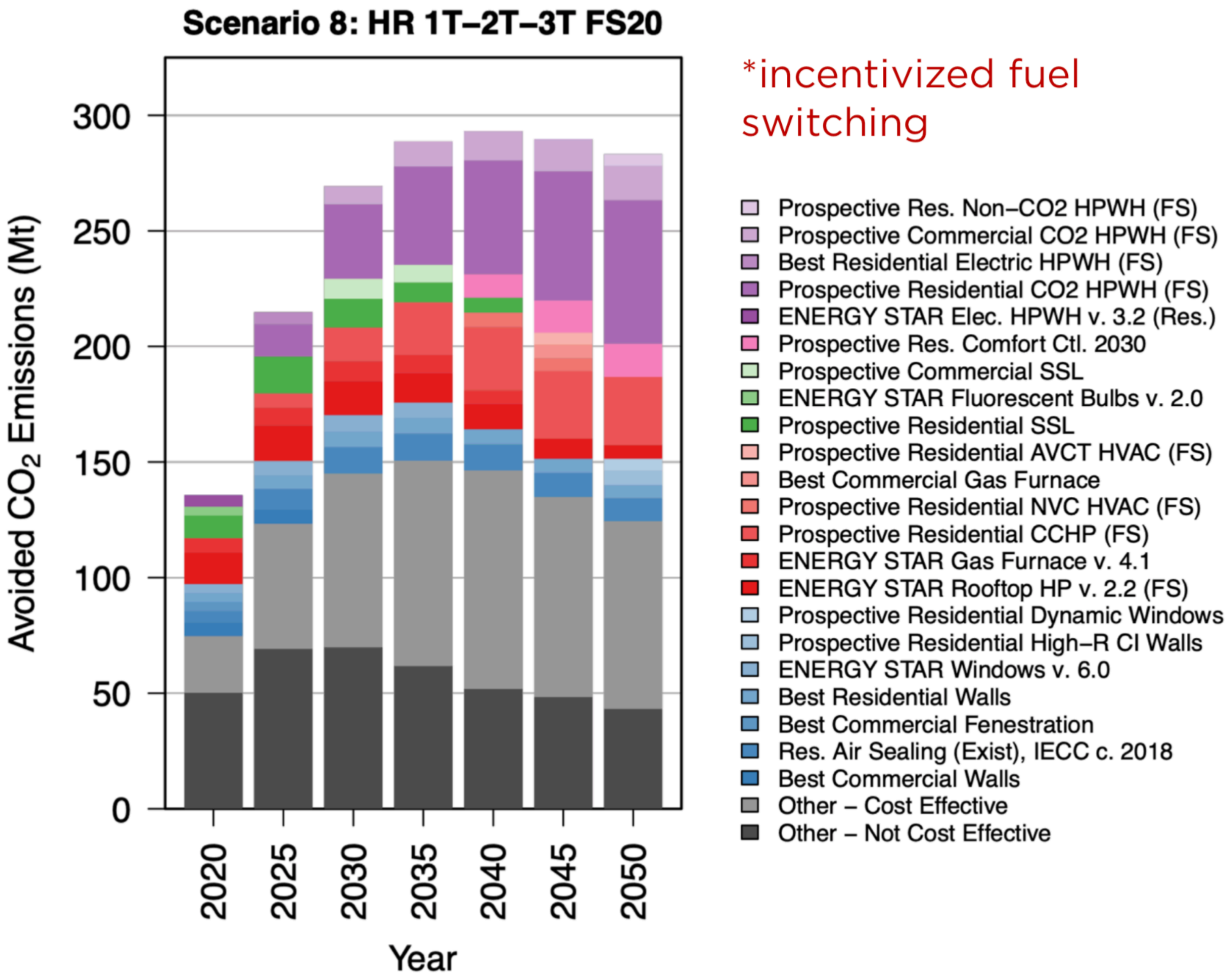


Prospective envelope and controls technologies, and heating and water heating electrification (with prospective performance), achieve the largest cost-effective $CO_2$ emissions reductions.




*no fuel switching

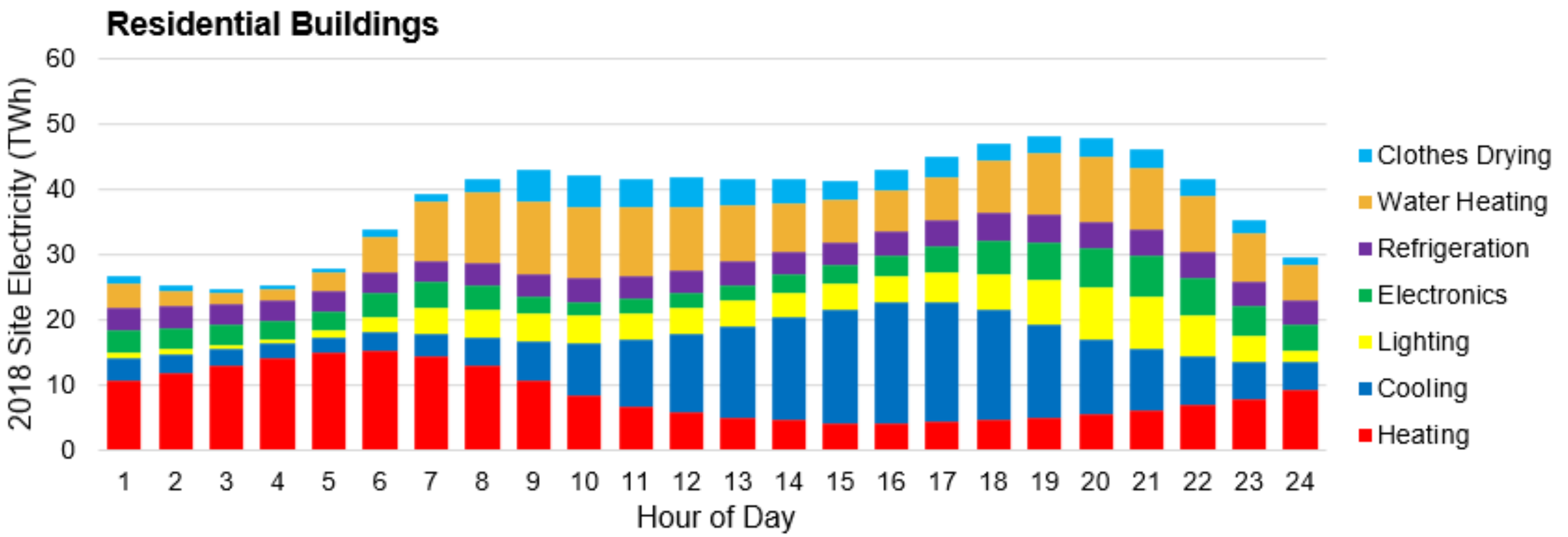
Prospective envelope and controls technologies, and heating and water heating electrification (with prospective performance), achieve the largest cost-effective $CO_2$ emissions reductions.

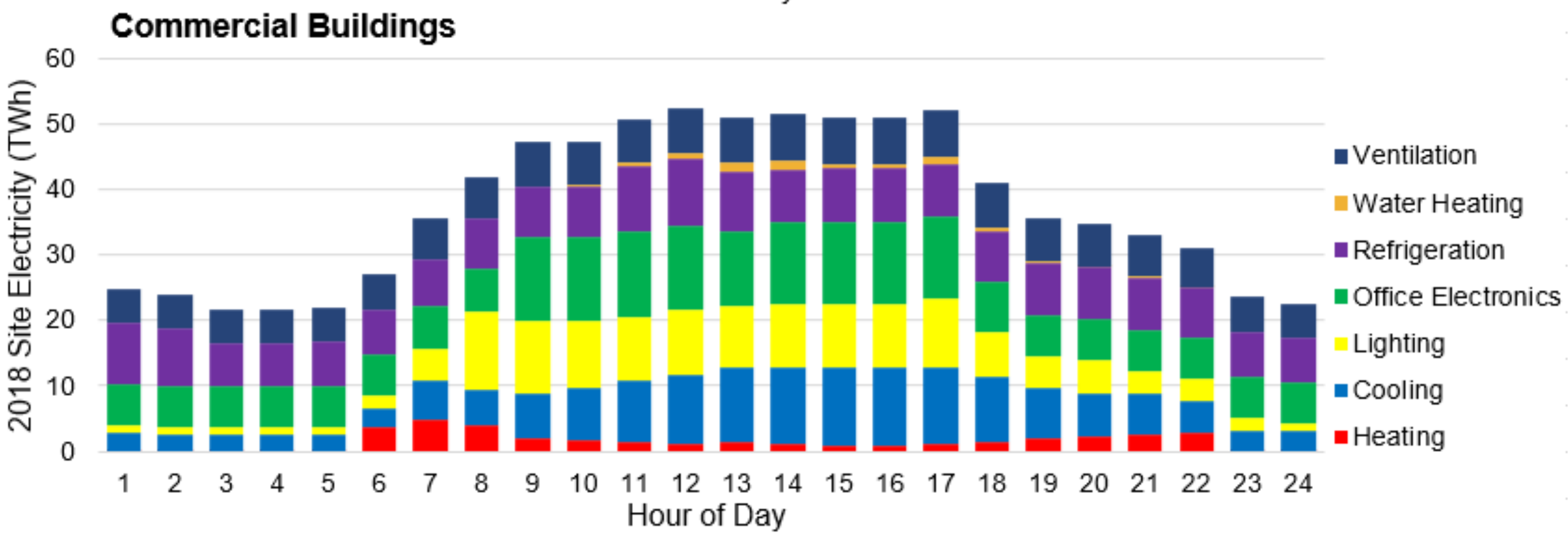


# Summary of findings

- Position buildings as a flexibility resource to improve renewable penetration
- Maintain aggressive leading-edge technology goals (price, performance)
- Remove low-performing technologies, increase retrofit rates to combat lock-in effects
- Address headwinds against fuel switching (economic, non-economic)

# The timing of electricity use is also important




energy.gov/eere/buildings/grid-interactive-efficient-buildings

Scout ECM definitions and results for the scenarios used in this analysis are updated annually, along with Scout's baseline data.

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March 12, 2020

Dataset Open Access

# Scout Core Measures Scenario Analysis

Jared Langevin; Chioke B. Harris; Janet L. Reyna

These data underpin a scenario analysis of U.S. building energy use, emissions, and costs out to 2050 using Scout (scout.energy.gov), a reproducible and granular model of U.S. building energy use developed by the U.S. national labs for the U.S. Department of Energy's Building Technologies Office.

The scenario analysis explores uncertainty in the progression of both U.S. energy demand- and supply-side conditions that affect U.S. building energy use and $CO_2$ emissions out to 2050. For electric power supply, we consider two levels: one corresponding to the 2019 AEO reference case ("RB"), and another corresponding to the 2018 AEO $25 carbon allowance fee side case ("HR"), which achieves a high level of renewable electricity penetration---approximately 45% of total power generation by 2050. Three different sets of energy conservation measures (ECMs) are considered across the scenarios. The performance guidelines ECM set ("1T") includes currently available technologies that meet existing codes and/or voluntary recognition programs (e.g., ENERGY STAR). The best available ECM package ("2T") includes the most efficient commercially-available technologies per EIA data and other sources. The prospective ECM package ("3T") includes research-grade technologies that could be released over the next decade as outlined by the U.S. Department of Energy's Building Technologies Office Multi-Year Program Plan. Finally, we explore two levels of technology switching from on-site fossil fuels to electricity: the basic level ("FS0") introduces fuel switching without any incentives; and the incentivized level ("FS20") reduces the installed cost of fuel switching measures by 20%.

Version 1: doi.org/10.5281/zenodo.3706923
Version 2: doi.org/10.5281/zenodo.3158930

# Thank You

Chioke Harris
chioke.harris@nrel.gov

Visit scout.energy.gov

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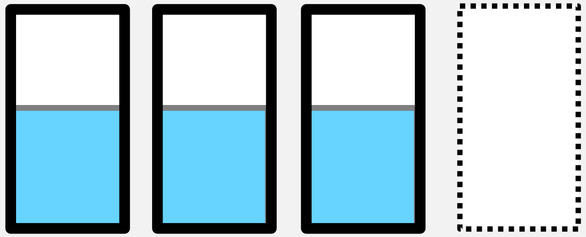
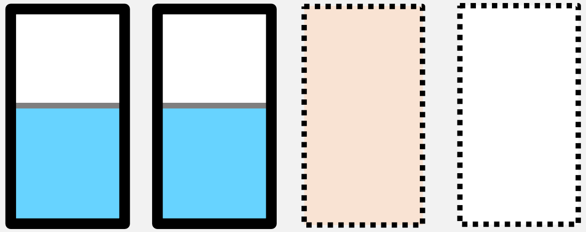
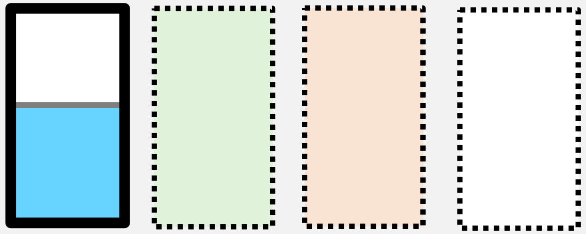
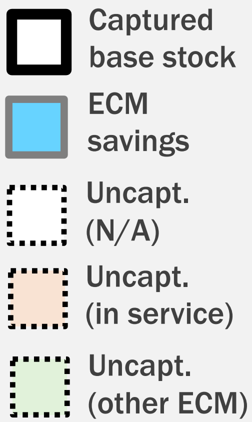
# More on baselines, stock turnover, and ECM competition

| Calculation Step | High-Level Equations | Annual Savings Outcome |
|---|---|---|
| Set baseline, estimate technical potential impact | $\Delta M_y = \sum_{c=1}^{C}\sum_{b=1}^{B}\sum_{f=1}^{F_b}\sum_{u=1}^{U_{b,f}}\sum_{t=1}^{T_{b,f,u}}\sum_{v=1}^{V}(M_{base})_{X,y} - (M_{ecm})_{X,y}$ <br> Where $\Delta \boldsymbol{M}$ = Tech. potential ECM impact on metric $\boldsymbol{M}$ (energy, $CO_2$, cost); $\boldsymbol{M_{base}}$=Total AEO baseline value for metric $\boldsymbol{M}$; $\boldsymbol{M_{ecm}}$ = total value for metric $\boldsymbol{M}$ after application of ECM; $\boldsymbol{c, b, f, u, t, v, y}$=AEO climate zone, building type, fuel type, end use, tech. type, bldg. vintage, and year, respectively; $\boldsymbol{X}$=$c, b, f, u, t, v$ |  |
| Add stock and flow dynamics | $(\Delta M_{sf})_{X,y} = (\Delta M)_{X,y} * (\lambda_n + \lambda_r + \lambda_{re})_{X,y}$ <br> Where $(\Delta \boldsymbol{M_{sf}})_{X,y}$= Potential ECM impact on metric $\boldsymbol{M}$ (energy, $CO_2$, cost) in baseline segment $\boldsymbol{X}$ and year $\boldsymbol{y}$ after technology stock and flow adjustment; $\boldsymbol{\lambda_n, \lambda_r, \lambda_{re}}$ = tech. stock addition rate (from AEO), stock replacement rate (1/base life) and retrofit rate (0.01) for AEO baseline segment $\boldsymbol{X}$ |  |
| Add ECM competition | $(\Delta M_{sf,c})_{X,y} = (\Delta M_{sf})_{X,y} * a_{X,y,C}$, <br> $a_{X,y,C} = f((c_{cap})_y, (c_{op})_y, b)$ <br> Where $(\Delta \boldsymbol{M_{sf,c}})_{X,y}$= Potential impact on metric $\boldsymbol{M}$ (energy, $CO_2$, cost) in baseline segment $\boldsymbol{X}$ and year $\boldsymbol{y}$ after technology stock/flow AND competition adjustment; $\boldsymbol{a_{X,C}}$= competition adj. fraction for baseline segment $\boldsymbol{X}$, year $\boldsymbol{y}$, and competing ECM set $\boldsymbol{C}$ |  |



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# Webinar – Energy Star Products for an All Electric New Home

## Air Source Heat Pump Sizing and Selection Guide

October 28th 2020

Jeremy Sager, HVAC & Renewables Research Engineer,
CanmetENERGY-Ottawa

CanmetENERGY
*Leadership in ecoInnovation*

Canada

# CanmetENERGY laboratories across Canada


- Oil sands & heavy oil

## Devon

- Minerals and metals

## Hamilton

- Buildings & Communities
- Clean Fossil Fuels
- Industrial Processes
- Renewables (wind, marine, solar thermal, bioenergy)
- Transportation

## Ottawa

- Buildings
- Industrial process integration
- Smart grids
- Solar PV
- RETScreen International

## Varennes

# Why Does ASHP Sizing & Selection Matter?

- Under-sizing can lead to insufficient cooling or heating
- Over-sizing will result in poor performance (cycling & comfort swings)

**= unhappy homeowners**
**= call backs to contractor**
**= unhappy Builders**

} **Bad Reputation for ASHPs**

**The industry trend is towards right-sizing to improve occupant comfort**

# Current Sizing Approach (in Canada) – NEEDS CHANGING

**According to HRAI RASD:**

**Heat pumps sized for heating and cooling applications**

- Sizing Criteria: Nominal Cooling Capacity
- Correctly Sized if: Heat Pump Nominal Cooling Capacity > 80% AND < 125% of Design Heat Gain

**Heat pumps sized for heating only applications**

- Sizing Criteria: Nominal Heating Capacity
- Correctly Sized if: Heat Pump Nominal Capacity > Heat Loss at 35F and < Heat Loss at 17F

# Sizing and Selection Guidance for Air Source Heat Pumps



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# New ASHP Sizing and Selection Guide

- Builds on current HRAI Residential Air Systems Design (RASD) Guidance
- Provides selection guidance to retrofit and new applications
- Covers centrally ducted, ductless mini-splits, multi-splits and mini-ducted
- Guidance specific to single stage, two stage, multi-stage and variable capacity equipment
- Intended as a Learning Tool specifically for ASHPs to be used by HVAC trades, designers and contractors who have taken HRAI Training
  - It is NOT a project feasibility tool like Retscreen
  - It is NOT a simulation tool like Hot2000 or EnergyPlus

# New ASHP Sizing and Selection Guide

**Trying to address situations like these:**

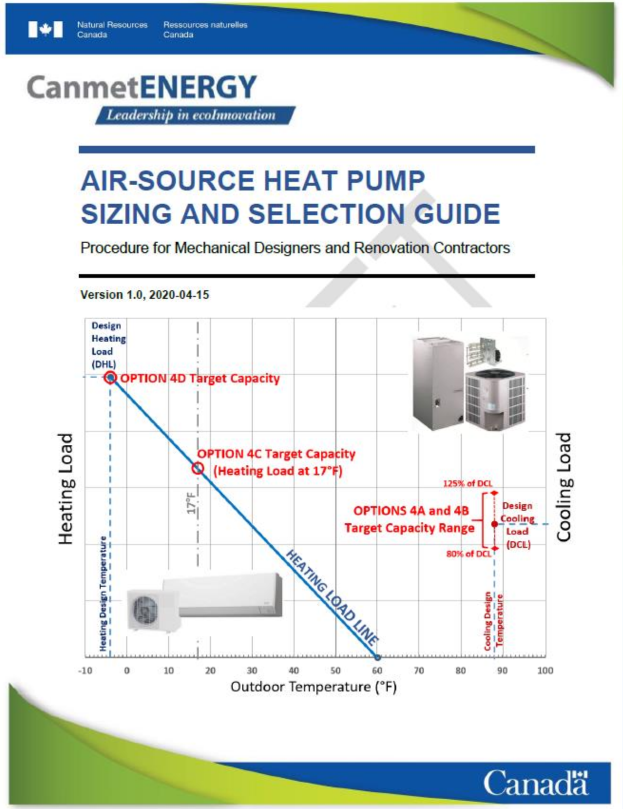
- My client is looking for mini-splits to displace some of the heating & provide cooling. Which mini-split is right for the zone load?
- I'm installing a hybrid system that combines a gas furnace with a variable capacity air source heat pump. Is a cold climate heat pump appropriate for this application? Does a two-stage or single stage heat pump make sense?
- My client has a condensing gas furnace with EC motor and needs a new A/C. Is there an upsell opportunity to offer a heat pump instead of a standard A/C? How do I select the right heat pump? Does the t-stat support the heat pump?

# New ASHP Sizing and Selection Guide

**Trying to address situations like these:**

- My client is looking for a cold climate air source heat pump to cover the whole heating load. Should I size at the design load, or size for a little less and cover the coldest conditions with electric backup? What happens in cooling?
- I live in a region with time-of-use rates for electricity, what's the appropriate switch over temperature from heat pump to furnace?

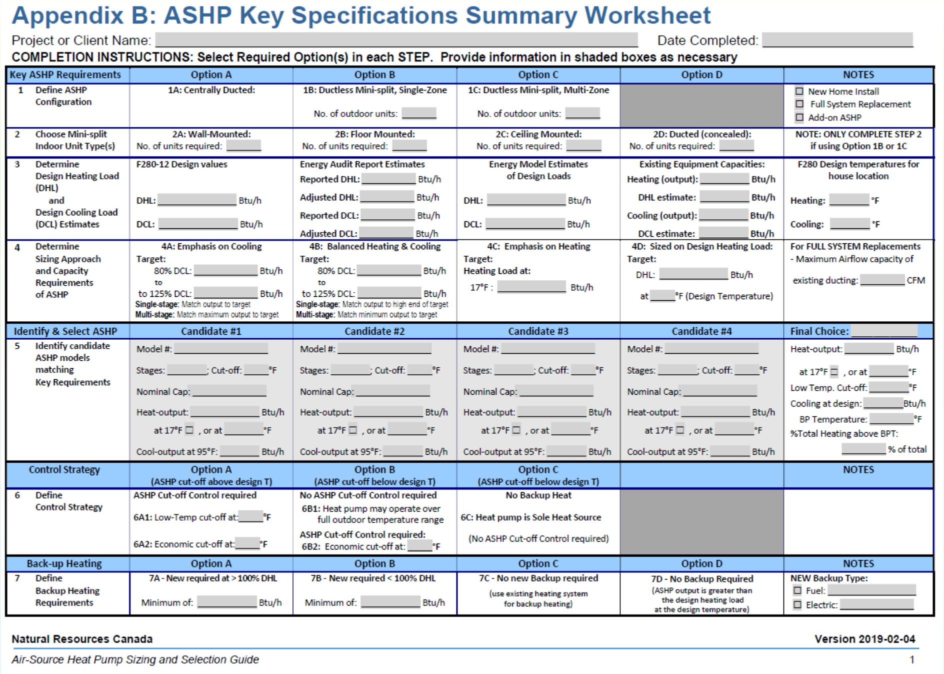
# New ASHP Sizing and Selection Guide




Delivered as 4 Components:

1. ASHP Sizing and Selection Guide

# New ASHP Sizing and Selection Guide



## Appendix B: ASHP Key Specifications Summary Worksheet

Project or Client Name: ______ Date Completed: ______

**COMPLETION INSTRUCTIONS: Select Required Option(s) in each STEP. Provide information in shaded boxes as necessary**

| Key ASHP Requirements | Option A | Option B | Option C | Option D | NOTES |
|---|---|---|---|---|---|
| 1 Define ASHP Configuration | 1A: Centrally Ducted: | 1B: Ductless Mini-split, Single-Zone<br>No. of outdoor units: ____ | 1C: Ductless Mini-split, Multi-Zone<br>No. of outdoor units: ____ | | ☐ New Home Install<br>☐ Full System Replacement<br>☐ Add-on ASHP |
| 2 Choose Mini-split Indoor Unit Type(s) | 2A: Wall-Mounted:<br>No. of units required: ____ | 2B: Floor Mounted:<br>No. of units required: ____ | 2C: Ceiling Mounted:<br>No. of units required: ____ | 2D: Ducted (concealed):<br>No. of units required: ____ | NOTE: ONLY COMPLETE STEP 2 if using Option 1B or 1C |
| 3 Determine Design Heating Load (DHL) and Design Cooling Load (DCL) Estimates | F280-12 Design values<br>DHL: ____ Btu/h<br>DCL: ____ Btu/h | Energy Audit Report Estimates<br>Reported DHL: ____ Btu/h<br>Adjusted DHL: ____ Btu/h<br>Reported DCL: ____ Btu/h<br>Adjusted DCL: ____ Btu/h | Energy Model Estimates of Design Loads<br>DHL: ____ Btu/h<br>DCL: ____ Btu/h | Existing Equipment Capacities:<br>Heating (output): ____ Btu/h<br>DHL estimate: ____ Btu/h<br>Cooling (output): ____ Btu/h<br>DCL estimate: ____ Btu/h | F280 Design temperatures for house location<br>Heating: ____ °F<br>Cooling: ____ °F |
| 4 Determine Sizing Approach and Capacity Requirements of ASHP | 4A: Emphasis on Cooling<br>Target:<br>80% DCL: ____ Btu/h<br>to<br>to 125% DCL: ____ Btu/h<br>**Single-stage:** Match output to target<br>**Multi-stage:** Match maximum output to target | 4B: Balanced Heating & Cooling<br>Target:<br>80% DCL: ____ Btu/h<br>to<br>to 125% DCL: ____ Btu/h<br>**Single-stage:** Match output to high end of target<br>**Multi-stage:** Match minimum output to target | 4C: Emphasis on Heating<br>Target:<br>Heating Load at:<br>17°F : ____ Btu/h | 4D: Sized on Design Heating Load:<br>Target:<br>DHL: ____ Btu/h<br>at ____°F (Design Temperature) | For FULL SYSTEM Replacements - Maximum Airflow capacity of existing ducting: ____ CFM |
| **Identify & Select ASHP** | **Candidate #1** | **Candidate #2** | **Candidate #3** | **Candidate #4** | **Final Choice:** ____ |
| 5 Identify candidate ASHP models matching Key Requirements | Model #: ____<br>Stages: ____; Cut-off: ____°F<br>Nominal Cap: ____<br>Heat-output: ____ Btu/h<br>at 17°F ☐ , or at ____°F<br>Cool-output at 95°F: ____ Btu/h | Model #: ____<br>Stages: ____; Cut-off: ____°F<br>Nominal Cap: ____<br>Heat-output: ____ Btu/h<br>at 17°F ☐ , or at ____°F<br>Cool-output at 95°F: ____ Btu/h | Model #: ____<br>Stages: ____; Cut-off: ____°F<br>Nominal Cap: ____<br>Heat-output: ____ Btu/h<br>at 17°F ☐ , or at ____°F<br>Cool-output at 95°F: ____ Btu/h | Model #: ____<br>Stages: ____; Cut-off: ____°F<br>Nominal Cap: ____<br>Heat-output: ____ Btu/h<br>at 17°F ☐ , or at ____°F<br>Cool-output at 95°F: ____ Btu/h | Heat-output: ____ Btu/h<br>at 17°F ☐ , or at ____°F<br>Low Temp. Cut-off: ____°F<br>Cooling at design: ____Btu/h<br>BP Temperature: ____°F<br>%Total Heating above BPT: ____ % of total |
| **Control Strategy** | **Option A (ASHP cut-off above design T)** | **Option B (ASHP cut-off below design T)** | **Option C (ASHP cut-off below design T)** | | **NOTES** |
| 6 Define Control Strategy | ASHP Cut-off Control required<br>6A1: Low-Temp cut-off at:____°F<br>6A2: Economic cut-off at:____°F | No ASHP Cut-off Control required<br>6B1: Heat pump may operate over full outdoor temperature range<br>ASHP Cut-off Control required:<br>6B2: Economic cut-off at: ____°F | No Backup Heat<br>6C: Heat pump is Sole Heat Source<br>(No ASHP Cut-off Control required) | | |
| **Back-up Heating** | **Option A** | **Option B** | **Option C** | **Option D** | **NOTES** |
| 7 Define Backup Heating Requirements | 7A - New required at > 100% DHL<br>Minimum of: ____ Btu/h | 7B - New required < 100% DHL<br>Minimum of: ____ Btu/h | 7C - No new Backup required<br>(use existing heating system for backup heating) | 7D - No Backup Required<br>(ASHP output is greater than the design heating load at the design temperature) | NEW Backup Type:<br>☐ Fuel: ____<br>☐ Electric: ____ |

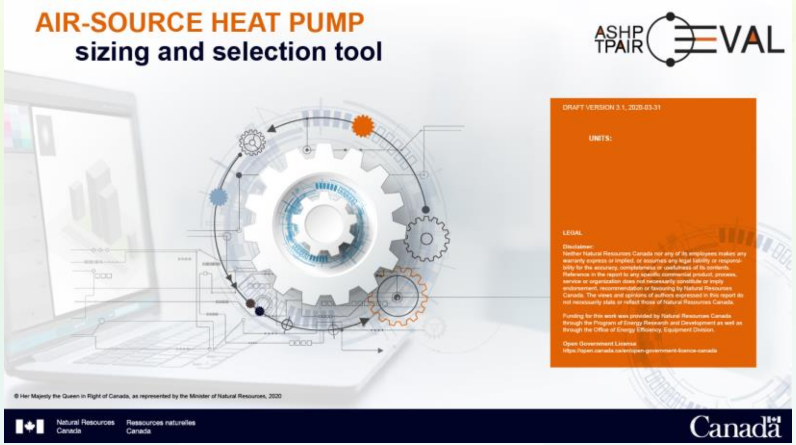
**Natural Resources Canada** **Version 2019-02-04**

*Air-Source Heat Pump Sizing and Selection Guide* 1

Delivered as 4 Components:

1. ASHP Sizing and Selection Guide
2. ASHP Sizing and Selection 1-page Summary Worksheet

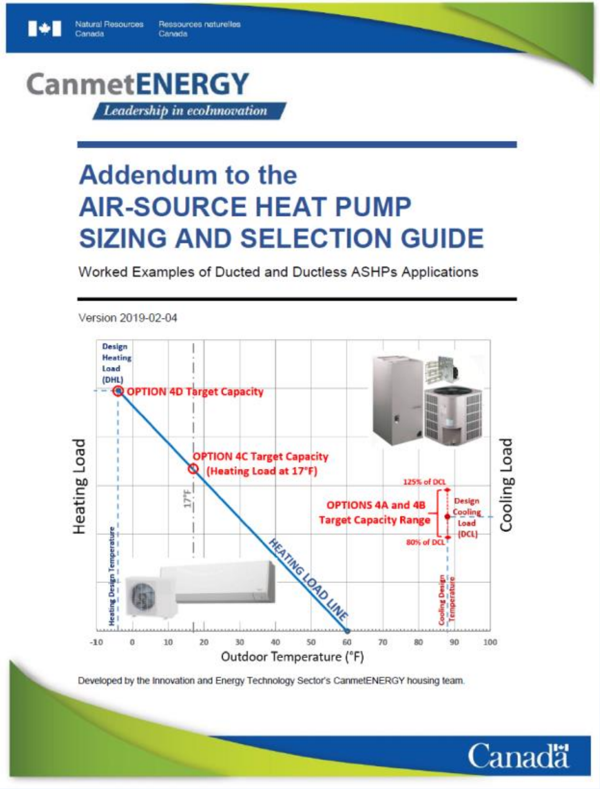
# New ASHP Sizing and Selection Guide




Delivered as 4 Components:

1. ASHP Sizing and Selection Guide
2. ASHP Sizing and Selection 1-page Summary Worksheet
3. ASHP Sizing and Selection Tool

# New ASHP Sizing and Selection Guide




Delivered as 4 Components:

1. ASHP Sizing and Selection Guide
2. ASHP Sizing and Selection 1-page Summary Worksheet
3. ASHP Sizing and Selection Spreadsheet Tool
4. ASHP Addendum of Worked Examples

# ASHP Sizing and Selection Procedure

STEP 1: Define ASHP configuration

STEP 2: If required, choose mini-split indoor unit types

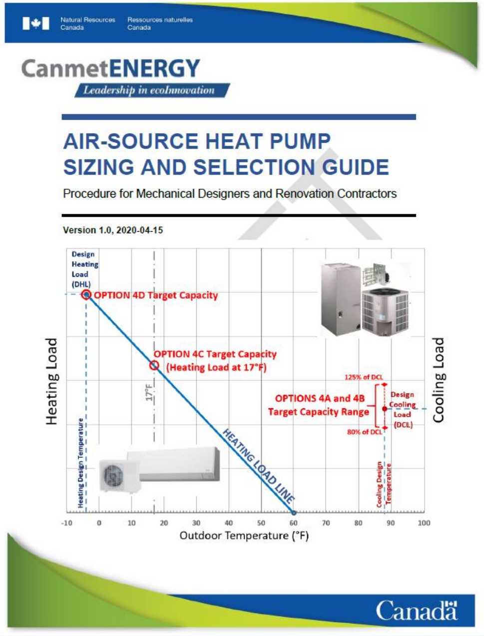
STEP 3: Determine design heating and cooling loads

STEP 4: Determine sizing approach and ASHP target capacity requirements

STEP 5: Identify candidate ASHPs matching key requirements, and make final ASHP choice

STEP 6: Define system control strategy

STEP 7: Define back-up heating requirements



# Acknowledgements


## Project Partners

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## NRCan, CanmetENERGY-Ottawa Team

**Jeremy Sager:** Guide development lead & overall project management

**Alexandre Bouchard:** Co-op student, engineering support

## NRCan, CanmetENERGY-Varennes Team

**Justin Tamasauskas:** Tool development lead

**Erin Gaucher-Lokst:** Co-op student, engineering support

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# Thank you for your attention
# Questions

**Jeremy Sager**
E: Jeremy.sager@Canada.ca
Tel: 613-404-4060

**Justin Tamasauskas**
E: Justin.tamasauskas@Canada.ca

# INDUCTION COOKTOPS

*Ali Cafferty*

October 2020

## Alicia Cafferty (Ali)

*Cooking on my Thermador Induction Cooktop in my Southern California kitchen for 8 years.*

# B/S/H/ Home Appliances Corporation

https://www.bsh-group.com/us/


BOSCH

GAGGENAU

Thermador

# Induction… the most efficient, consistent, heating for cooking

**Gas** → **Electric** → **Electric Induction**

*Heat lost in kitchen, harder to get the right flame height*

*Heat lost in the glass, slow response*

*Minimal heat loss, very responsive, very consistent*

# INDUCTION / Fact or Fiction?

**BOILING WATER IS FASTEST with Induction…**

TRUE!
Induction cooking is so efficient, water reaches boiling temp faster than gas or electric

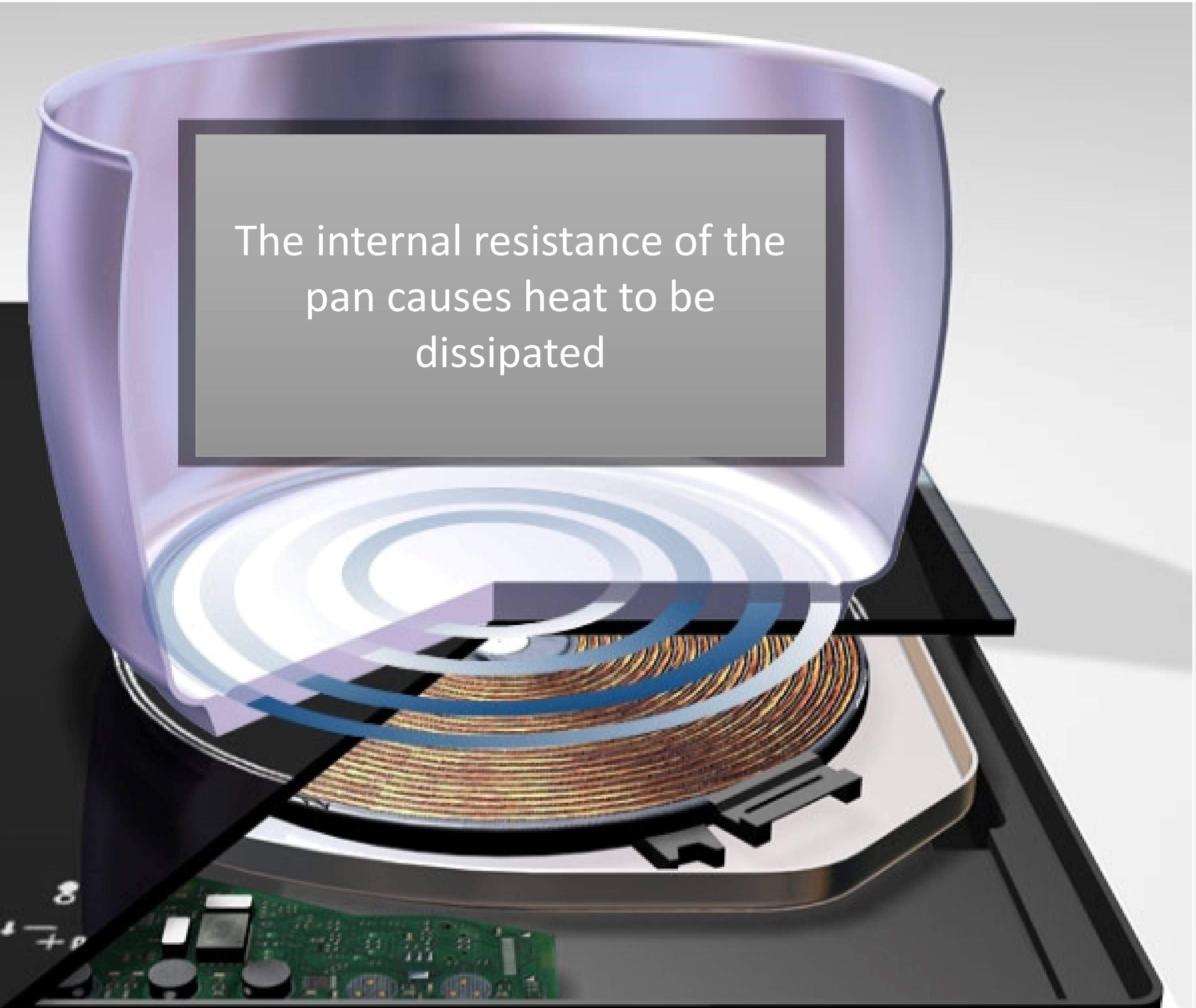
**The GLASS SURFACE stays COOLER with Induction…**

TRUE!
Induction is heating the pan (not the glass), so the glass surface stays cooler.  SO…easy to clean and no more burnt-on food

# *WHAT DOES INDUCTION COOKING OFFER?*

- Responsiveness of gas cooking
- High-precision control at simmer up to high
- Energy-efficiency
- Quicker boiling times
- Cooler kitchens and surrounding worksurfaces


INDUCTION / How does it work?



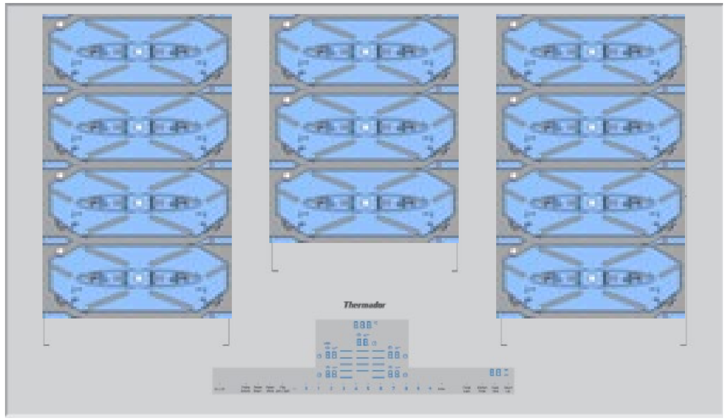

- Alternating current in the coil produces a magnetic field
- Magnetic field (eddy currents) cause heating effect
- Heat is dissipated across the core of the pan
- The food inside the pan is heated

- >80% of applied energy is being used
- Cooler surfaces are easy to clean
- Food prep near cooking area is possible
- Cooler kitchens spaces
- Ventilation (exhaust hoods):  lower CFM

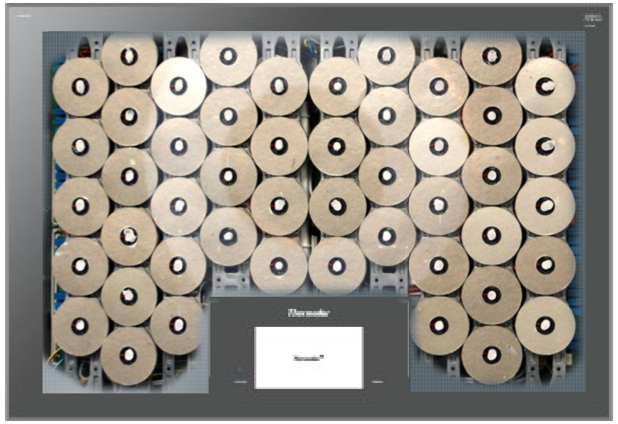
# *More Pans, More Color Choices, More Sensors+Smart Electronics =Controlled Cooking!*

*Useable Cooking Surface*


**7 Standard Inductors**

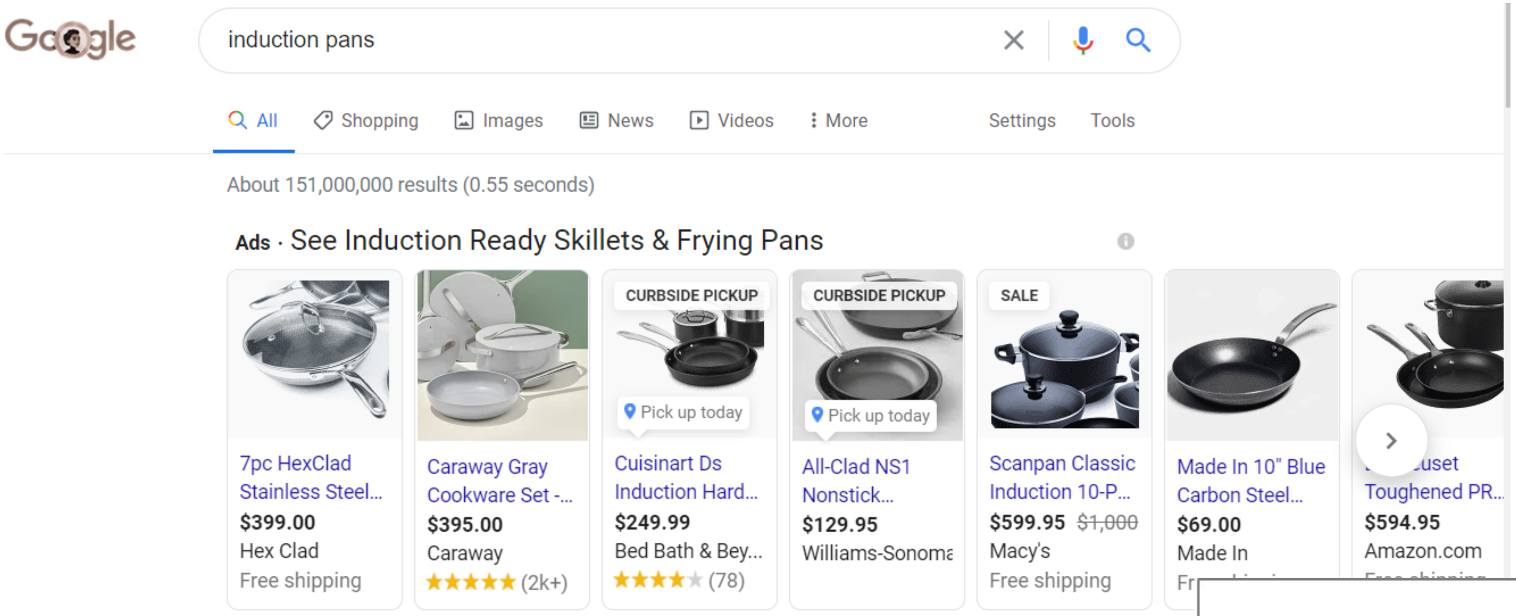


**11 Oval Inductors**



**48 Inductors 30"/56 Inductors 36"**

# The Evolution of Induction Cookware




# *Connectivity: Hood Control and More…*

- Automatic Start
- Speed Selection
- Automatic Mode
- Light Control
- Clean Filter Notification

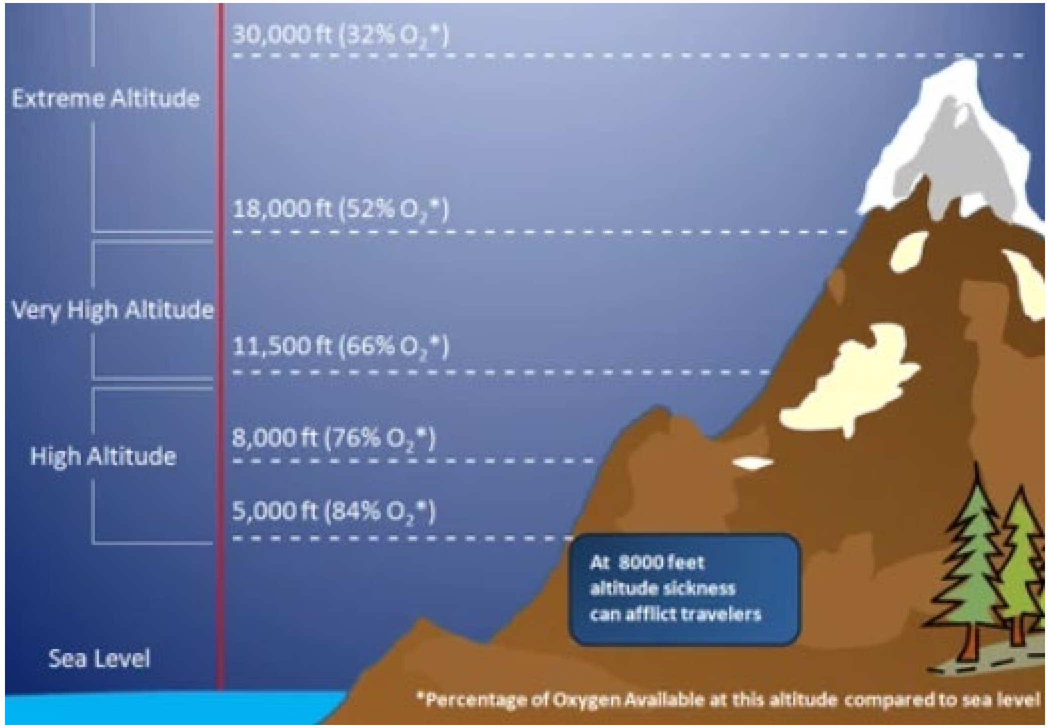
Cooktop Hood Sync

Thermador Connected Experience
by HomeConnect™

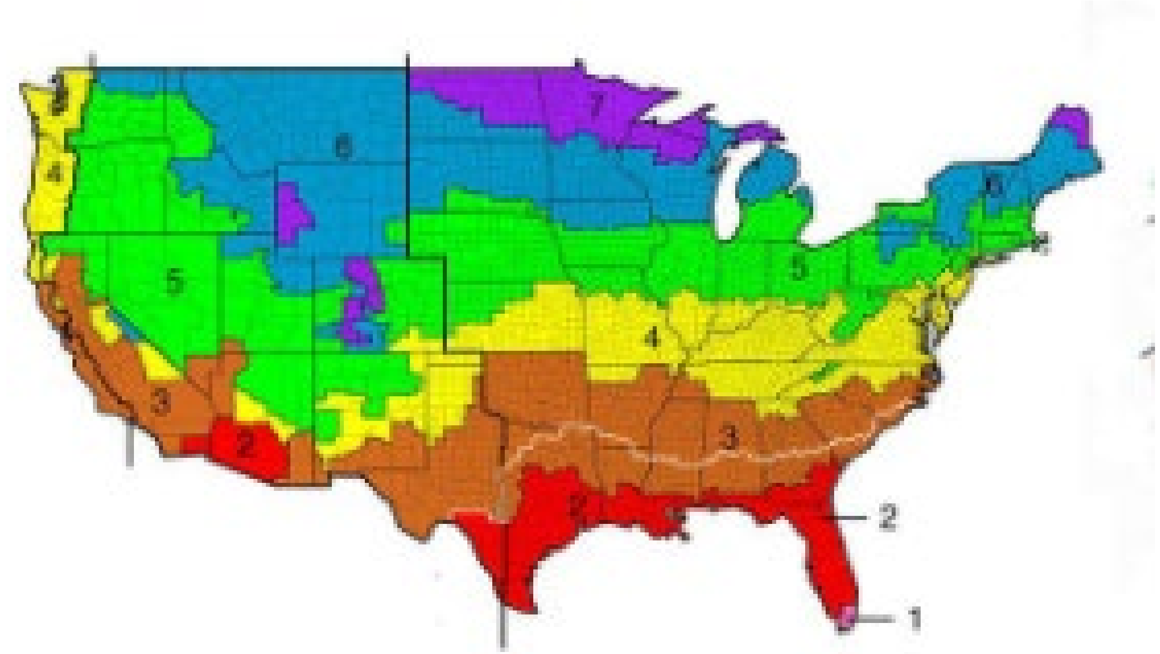
Home Connect

# INDUCTION / Planning to Buy and Install

# Ideal Conditions to Consider Induction




Substitute NG or Liquid Propane (LP) at High Altitude




High Temp Climate Zones where you are trying to keep your home cool year-round.

# 30”-36” Cooktop Approximate Market Prices*

Gas

$650 - >$2,500

Electric

$750 - >$2,500

Electric Induction

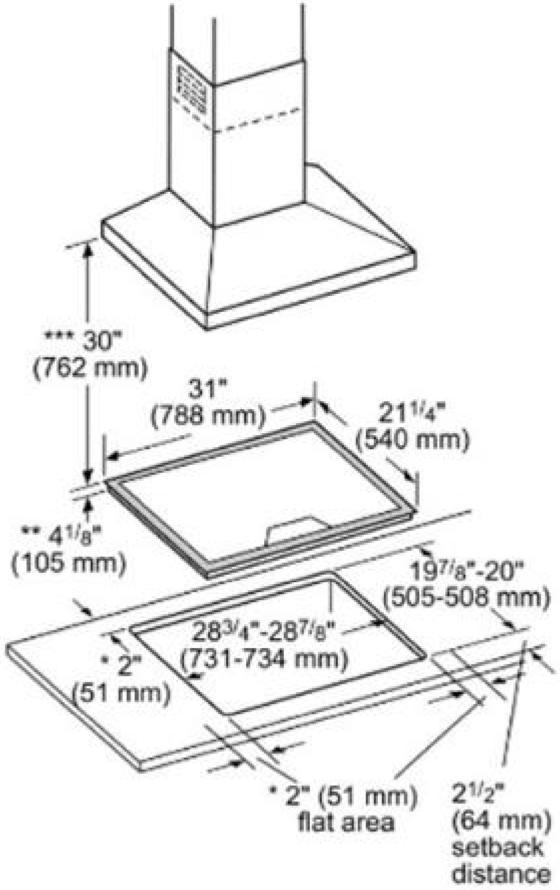
$1,500 - $5,400

*May not represent the entire range of pricing available in your local market. Pricing represents cooktop pricing and does not reflect pricing of Free-Standing Ranges with these types of cooking surfaces.

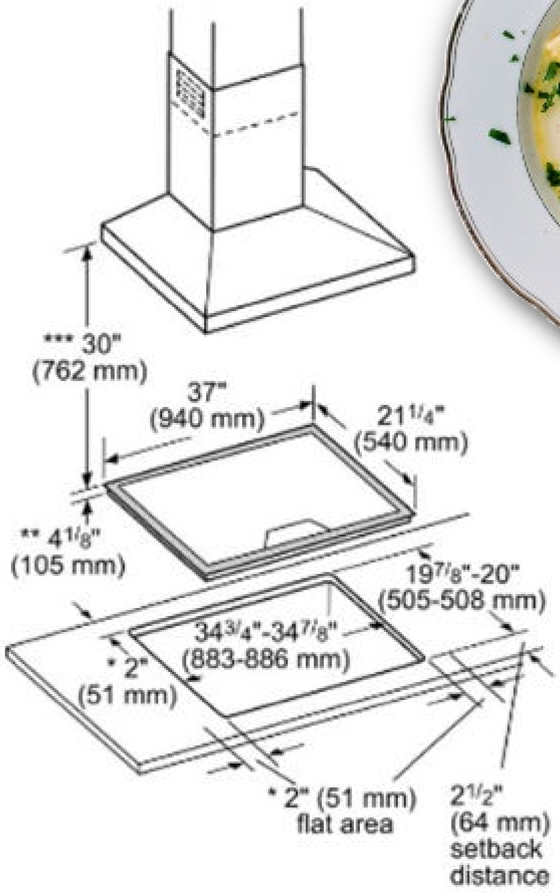
# COOKTOP SPECIFICATIONS:  240V; 60Hz

*Flexibility in Amperage:*

- *Only **30 amps** are required for certain models 30” and 36” cooktops;*
- *Also offer models requiring **40 amps***
- *Industry generally requires **50 amp***




30” Cooktop




36” Cooktops


INDUCTION: INTUITIVE. INTELLIGENT. INCREDIBLE.

# Thank You


Alicia.Cafferty@BSHG.com

BSH Home Appliances Corporation

Bosch

Thermador

Gaggenau