Cost Benefit Analysis Tool

C.B.A.T.

Putting powerful analytical capabilities into the hands of Canada’s housing industry

Cost Benefit Analysis Tool

Presentation outline

01 What questions does CBAT answer?

02 Costing + Energy Modeling

03 Under the hood of CBAT

04 CBAT in industry

Natural Resources Canada Ressources naturelles Canada
CanmetENERGY Leadership in ecoInnovation
LEEP LOCAL ENERGY EFFICIENCY PARTNERSHIPS

How do we reduce energy and GHGs affordably?

A need was identified, by industry, to develop resources and tools to support them in:

- Adopting innovative technologies and practises
- Achieving the desired level of home energy performance for the lowest cost
- Optimizing build costs
- **Delivering affordable and energy efficient houses**

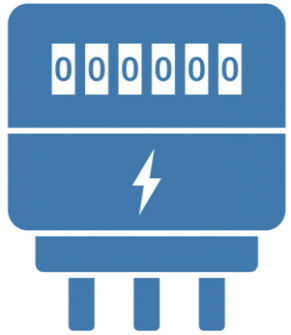
Optimal Solution - 40% Savings above NBC
1.0 ACH
R-50 Fiberglass Blow-in
R-22 Effective, Fiberglass Batt, Exterior Insulation, XPS
Mid Gain, U=1.08
R-22 Effective, Fiberglass Batt, Exterior Insulation, XPS
Uninsulated Slab
60% Efficiency HRV
Natural Gas, Condensing Tankless, 0.95 Eff
None
Cold Climate Air Source Heat Pump, 3.5 COP

Total Cost of ($)	$70,461
Incremental Cost ($)	$12,778
Electricity Cost Savings ($/year)	-$611
Natural Gas Cost Savings ($/year)	$703
Incremental Mortgage ($/year)	$947
Incremental Net Cost ($/year)	$855
Net Present Value ($)	$7,297

01 What questions can CBAT answer?

Builders and Energy Advisors are making energy efficiency more affordable by using CBAT to answer questions such as:

- What technologies can I use to build energy efficient homes?
- What is the cost of energy efficiency**,** using **my prices**?
- How can I be sure my energy efficient house is cost-effective?
  - For the Builder
  - For the Homeowner
- What energy efficiency or low-carbon programs can I target with a fixed budget?



Energy efficiency codes and programs

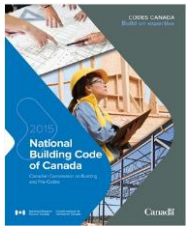
CBAT energy simulation data aligns with HOT2000 and provides analysis for achieving various levels of energy efficiency and code compliance.

CBAT includes performance levels for:

- EnergySTAR
- R-2000
- NetZero ready, NetZero
- BC ESC 2020
- NBC 2015
- % better than code

NBC reference house and base case for every climate zone

- Electric, Natural Gas
- Custom



CBAT Workshop
Burnaby, B.C.
January 2020

Einar Halbig, REA
E3 Eco Group

02 Combining Costing and Energy Modeling

HOT2000	HTAP Housing Technology Assessment Platform	CBAT Cost Benefit Analysis Tool
Supports Energuide, ENERGY STAR & CHBA Net Zero programs	Used in research, program & code design	Excel tool to help builders find cost-optimal pathways
Evaluates upgrade scenarios one-at-a-time	Automates HOT2000 simulations; runs 100,000's of scenarios at once	Searches through databases of HTAP results for best pathways
No support for costing or optimization	Includes costing data, Requires additional software for optimization or cost customization	Allows EAs & builders to customize and optimize costs

The CBAT workflow

Download CBAT for your climate zone

→

Choose preloaded archetype

→

Choose reference house and costing base case

↓

Choose energy efficiency target
or
Specify budget

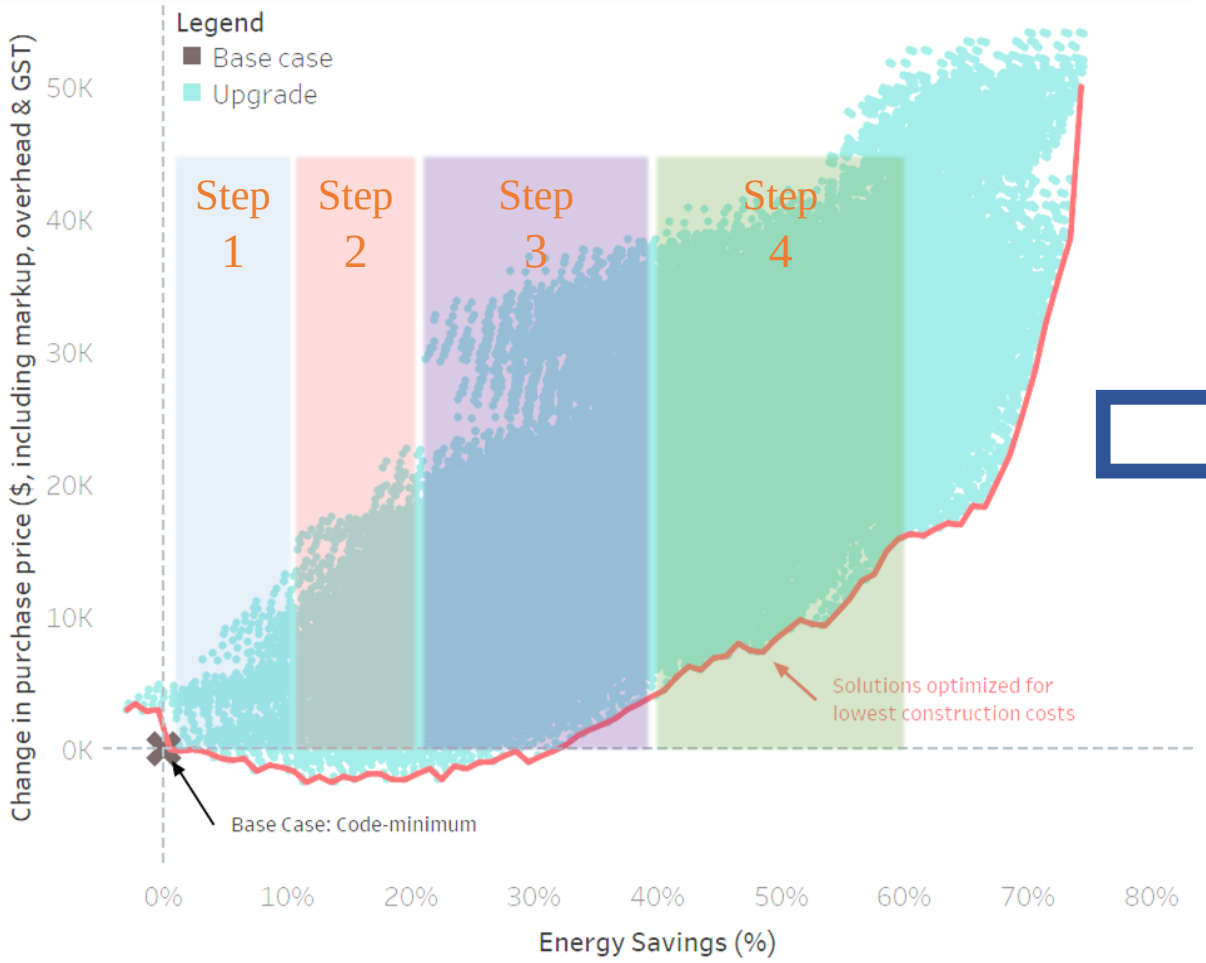
→

Customize costs and upgrades

→

Optimize your upgrade package!

Optimizing Build Costs



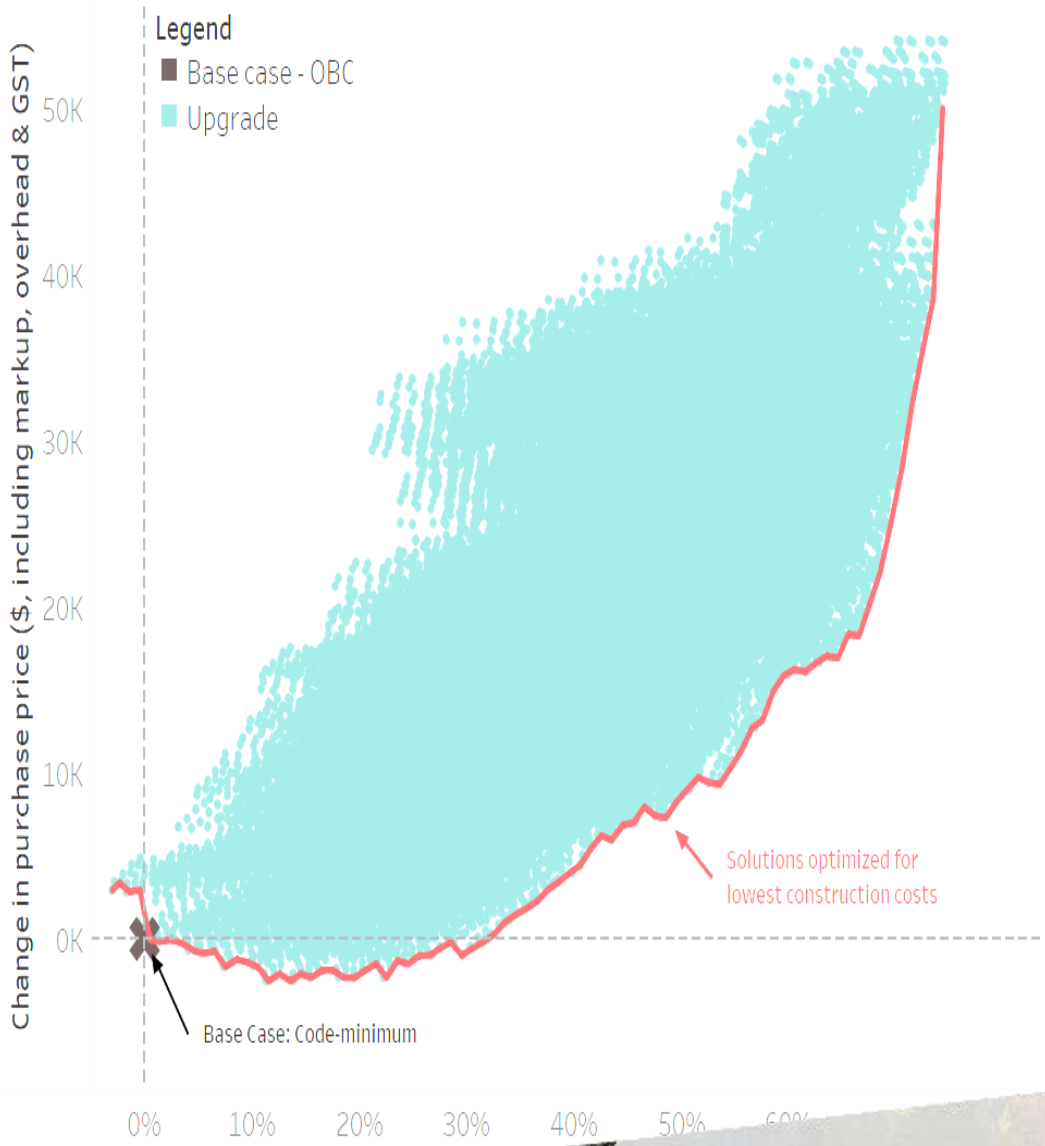
Performance Spec	BC ESC Step 3 Optimized for: Construction Cost
Airtightness @ 50 Pa	1.0 ACH
Ceiling R-Value	R-60 Fiberglass Blow-in
Wall R-Value	R-26 Effective, Fiberglass Batt, Exterior Insulation
Window Type	Double Glazed, U=1.65, SHGC= 0.19
Below Grade Wall R-Value	R-22 Effective, Fiberglass Batt, Exterior Insulation, XPS
Sub-Slab R-Value	R-10 Effective, Sub-slab Insulation, XPS
HRV Efficiency	60% Efficiency HRV
DHW System	Electric Tank
Drainwater Heat Recovery	None
HVAC System	Air Source Heat Pump, 3.66 COP

Finances	Cost
Construction Cost of ECMs ($)	$ 35,000
Incremental Cost of ECMs ($)	$ 8,000
Cost of ECMs for Buyer ($)	$ 45,000
Total Cost of Ownership ($)	$ 105,000

03 Under the hood of CBAT

CBAT supplements the analytical capabilities of HOT2000 by leveraging parametric runs from HTAP, and allowing users to customize costing data.

- 4 archetypes, 16 cities, all climate zones
- 90,000 HOT2000 runs, per archetype, per climate zone
- Preloaded costing database
- Financial calculations and Energy reporting
  - Construction cost
  - Net cost to buyer
  - Net present value
  - Total cost of ownership
  - Lowest annual energy consumption
  - Lowest operating carbon



CBAT download and supporting material

CBAT Download link:

https://drive.google.com/drive/folders/1lFn461x54EA4o1OHtOfOMCG-QkD_gVb-?usp=sharing

Please contact Lucas Coletta if you have any questions about CBAT or want to learn how to use it.

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