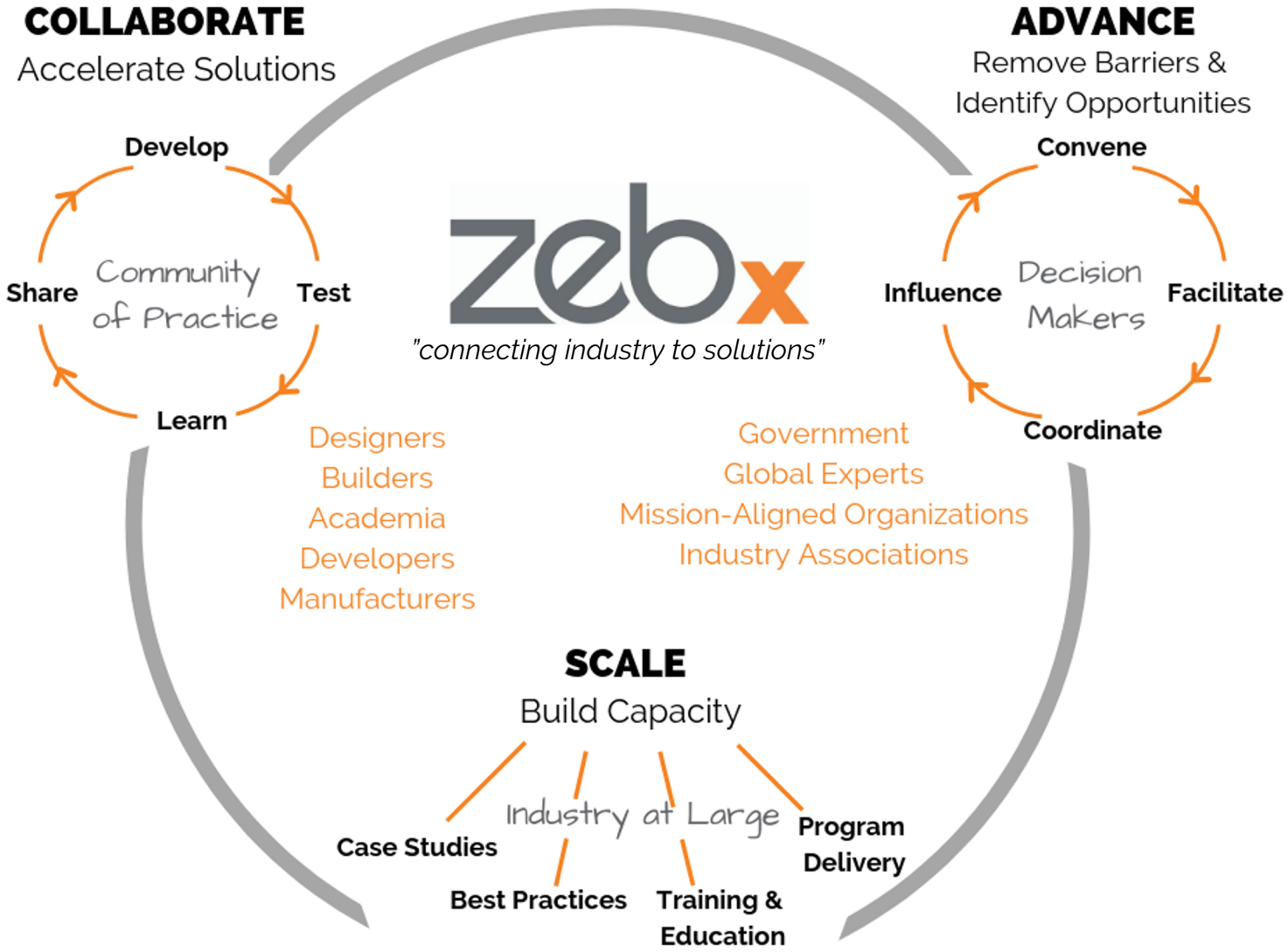
Song: I Do it for the Music – spring gang

WELCOME!

ROBERTO PECORA, DIRECTOR OF PROGRAMS


COLLABORATE
Accelerate Solutions
Develop
Test
Learn
Share
Community of Practice
ADVANCE
Remove Barriers & Identify Opportunities
Convene
Facilitate
Coordinate
Influence
Decision Makers
zebx
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Global Experts
Mission-Aligned Organizations
Industry Associations
SCALE
Build Capacity
Industry at Large
Case Studies
Best Practices
Training & Education
Program Delivery

CASE STUDY

Carrington View

Net-Zero Energy-Ready Challenge Winners Series

May 2021

zebx

cleanBC BETTER BUILDINGS

NET-ZERO ENERGY-READY CHALLENGE

WINNERS SERIES

Supporting, promoting and celebrating the design and construction of net-zero energy-ready buildings

www.zebx.org

cleanBC BETTER BUILDINGS

NET-ZERO ENERGY-READY CHALLENGE

PLAYBOOK SERIES

- Ventilation Strategies for High-Performance MURBs
- Planning Airtight Buildings
- LCA Practice to Estimate Embodied Carbon
- Thermal Bridging
- Low-Carbon Energy Systems
- Planning High-Performance Buildings

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POLL 1

Tell us about yourself!

Three-part poll

zebx

HAVAN

Cost Benefit Analysis Tool

C.B.A.T.

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

HAVAN

Homebuilders Association Vancouver

havan.ca | elearn.havan.ca | @HAVANofficial

About HAVAN

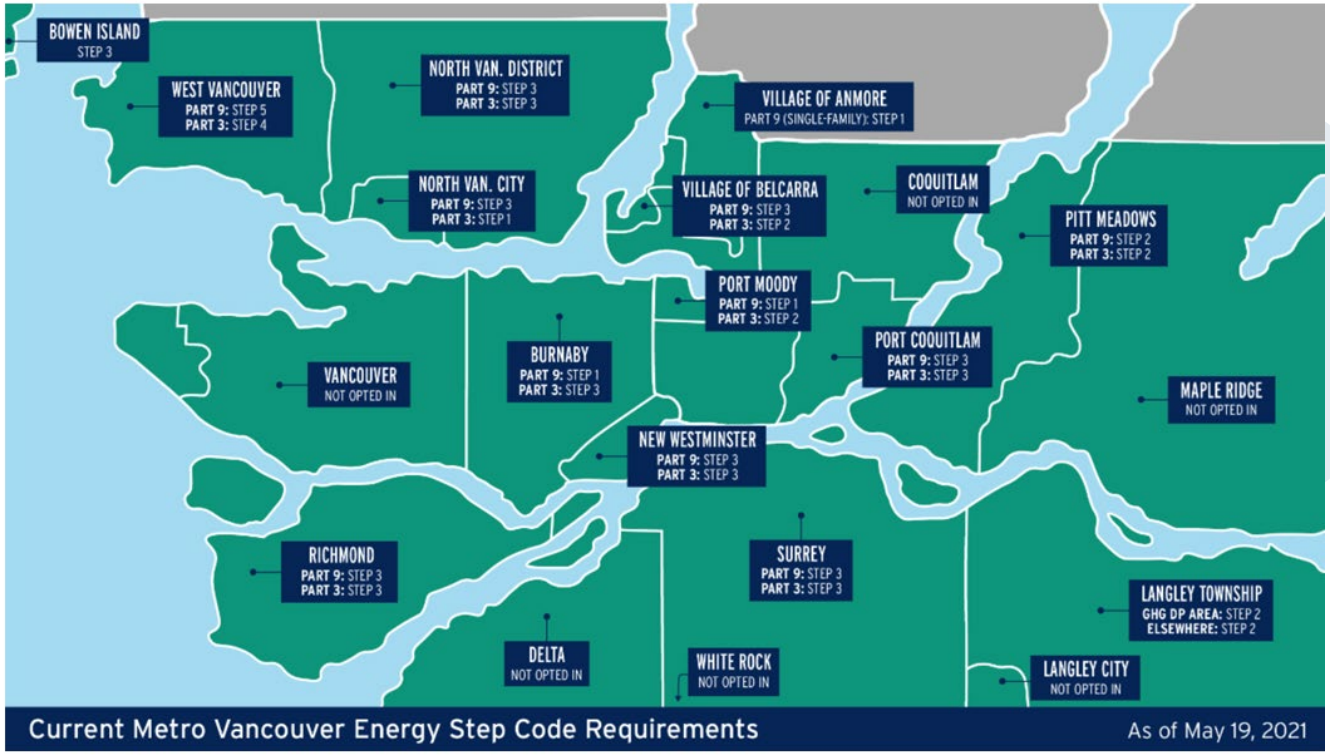
- Voice of the Residential Construction Industry in G.V. since 1974.
- 1,100+ members build 65%+ of housing in Metro Vancouver.
- Members: builders, developers, renovators, suppliers, subtrades, manufacturers and professional service providers.
- Part of a three-tiered organization, including CHBA BC and CHBA National.
- Connection between the industry and consumers.

HAVAN Resources

- Government relations, advocacy, education, B2B events,B2C events, and much more
- Communications:
  - Weekly Newsletters
  - HAVAN.ca
  - elearn.havan.ca (COVID-19 resources page on website)
  - @havanofficial
- Podcast *Measure Twice Cut Once*
- HAVAN Awards for Housing Excellence
- Committees and Councils

HAVAN Q2 GR Report:
Step Code Implementation Across the Region

- Released yesterday
- Identifies stages of region's 21 municipalities' adoption of BC Step Code, listing Part 9 and Part 3 with associated target adoption dates for BCESC.
- https://havan.ca/about-us/what-we-do/government-relations/



HAVAN

HAVAN Education

- In-person/virtual and on-demand
- Monthly Builders' Breakfast Series focuses on high-performance building, construction technology and building science.
  - 2 CPDs (BC Housing); 2 hours of informal learning
  - Open to HAVAN members and non-members
- eLearn launched offers more than 65 on-demand sessions.
  - Topics range from Builders Lien Act to Marketing High-Performance Homes and builder case studies (Passive House and Net Zero Ready).
- Learn more at **havan.ca/industry-education** or **elearn.havan.ca**

elearn.havan.ca

All Courses

About CPDs and Licensing FAQ Submit a Course Sign In

2.0 CPDs — Utilizing AI to Build Better Cost-Effective Step Code Homes

Members	Non-Members
$89.25	$146.95

Tax Incl.

1.0 CPDs — COVID-19 Economic Outlook: Housing Market Impact and Recovery

Members	Non-Members
Free	Free

0 CPDs — Strategies to Help Your Business Survive COVID-19

Members	Non-Members
Free	Free

Natural Resources Canada | Ressources naturelles Canada

Building a High-Performance Home: Does it Cost More?

ZEBx, Decarb Lunch – May 28th, 2020

Lucas Coletta, NRCan LEEP Team

lucas.coletta@canada.ca

Canada

Cost Benefit Analysis Tool

Presentation outline

01 Codes and Design Decisions

02 CBAT in Industry

03 Costing + Energy Modeling

04 Optimizing Build Costs

zebx ZERO EMISSIONS BUILDING EXCHANGE

HAVAN

Natural Resources Canada | Ressources naturelles Canada

CanmetENERGY *Leadership in ecoInnovation*

LEEP LOCAL ENERGY EFFICIENCY PARTNERSHIPS

Transitioning to High-Performance

Higher performance targets require changes to business as usual.

Change = risk

- Constructability
- Trades
- Scheduling
- Material costs and availability

What components of the home affect energy most?
What do we need to change to meet new code?
How do I know which design is right for me?
How much will it cost?

Impacts on performance and efficiency

NZ House

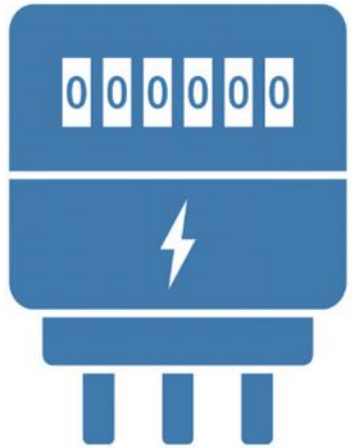
- **Solar PV:** 6.2-11.2 kW
- **Attic:** R-50 to R-80
- **Air-tightness:** 0.4-1.5 ACH
- **Windows:** U-0.85 to U-1.1
- **Walls:** R-30 to R-40
- **Heating:** Heat Pumps, COPs from 2.5 to 3
- **Foundation:** R-12 to R-37
- **Under slab:** R-10 to R-20

CODE House

- **Attic:** R-40 to R-60
- **Air-tightness:** ~2.5 ACH
- **Windows:** U-1.4 to U-1.8
- **Walls:** R-16 to R-18
- **Heating:** 94% eff. furnace
- **Foundation:** R-11 to R-17
- **Under slab:** NA

Performance Specs - What options do we have?

We need to ask ourselves…



Cost Benefit Analysis Tool

C.B.A.T.

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


KENT
OUR TEAM MISSION • Notre mission d'équipe
LEEP Casting Workshop
LEEP

Moncton, NB

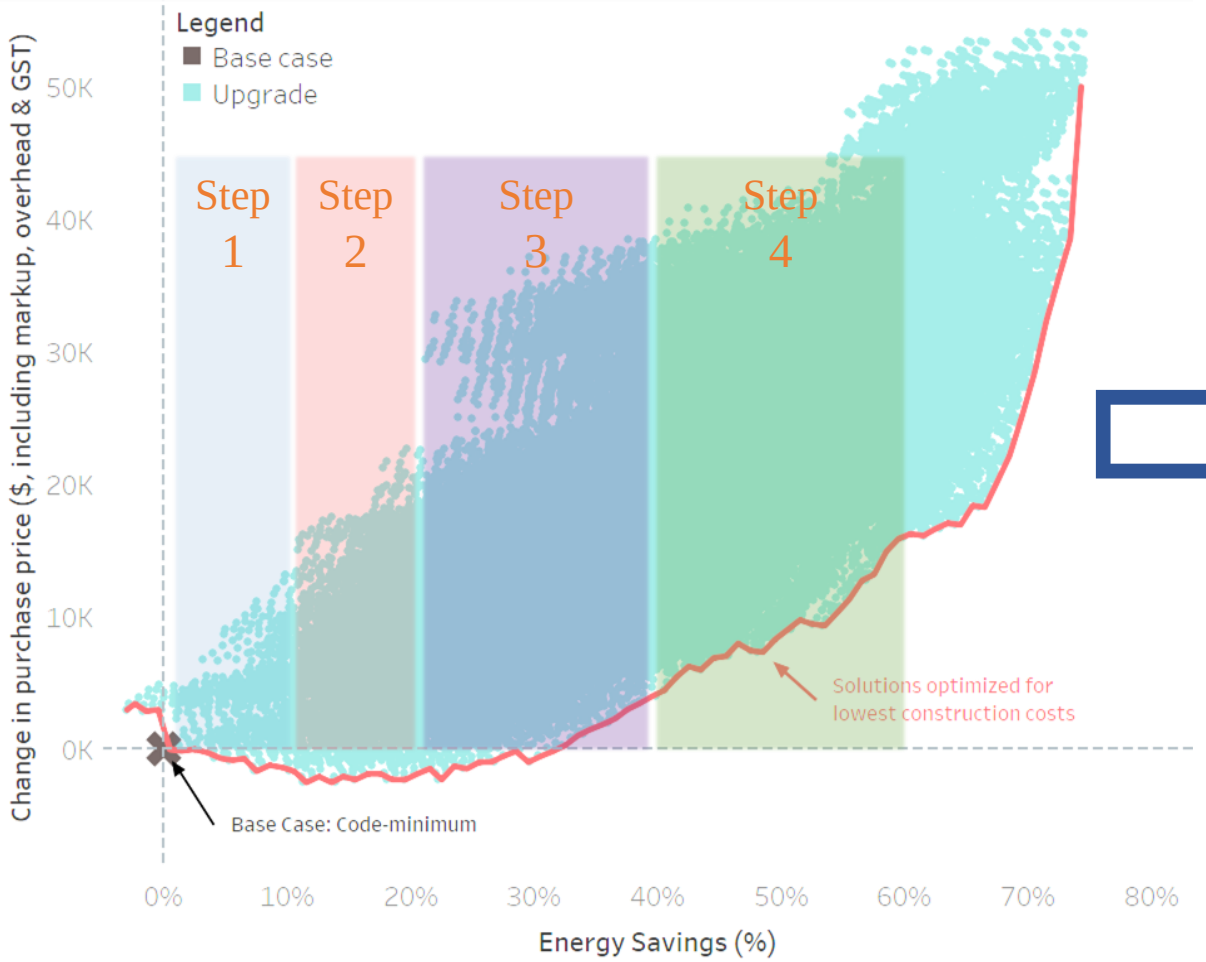

Prince George, BC


Burnaby, BC

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	Library of technologies and performance specifications	Allows EAs & builders to customize pricing and estimate construction costs

Optimizing Build Costs

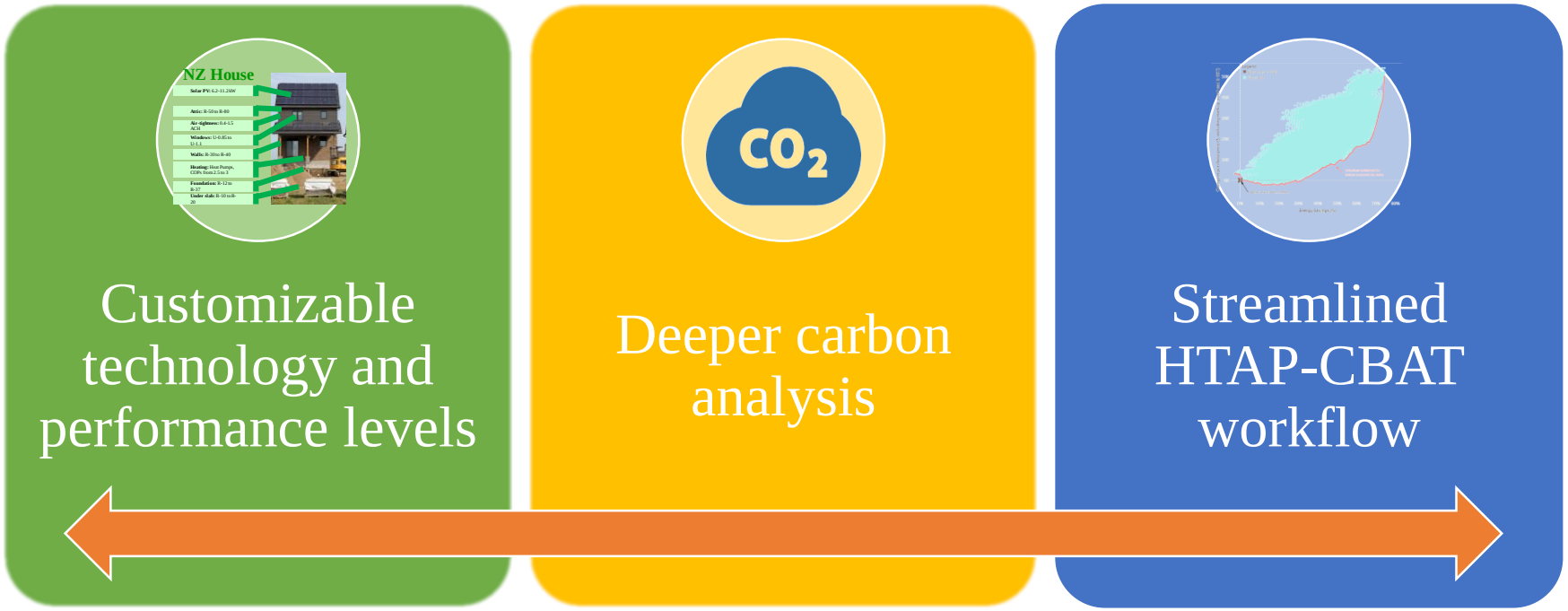


Performance Spec	BC ESC Step 3 Optimized for: Construction Cost
Airtightness @ 50 Pa	1.0 ACH
Ceiling R-Value	R-60 Fiberglass Blow-in
Wall R-Value	R-26 Effective, Fiberglass Batt, Exterior Insulation
Window Type	Double Glazed, U=1.65, SHGC= 0.19
Below Grade Wall R-Value	R-22 Effective, Fiberglass Batt, 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

Looking ahead

Builders and industry have provided feedback and suggestions for future development around functionality and accessibility. In response, updates are being made to CBAT to include:



Clean Air Partnership

Meeting Registration

Topic	CBAT Training Webinar
Description	This webinar will have Lucas Coletta from NRCan providing training for how to use the Cost-Benefit Analysis Tool (CBAT) Training for low rise/townhomes archetypes and the data that is available to understand the costs associated with higher building performance.
Time	Jun 9, 2021 01:00 PM in Eastern Time (US and Canada)

Register here: https://us02web.zoom.us/meeting/register/tZUoc--urTsoEtMt9ww5BmO0CNhUzMvz6bVW

CBAT download and supporting material

For CBAT download and supporting material, please send your request to:

technicalresearch@bchousing.org

Making CBAT Work for You

ZEBx Decarb Lunch- May 28, 2021

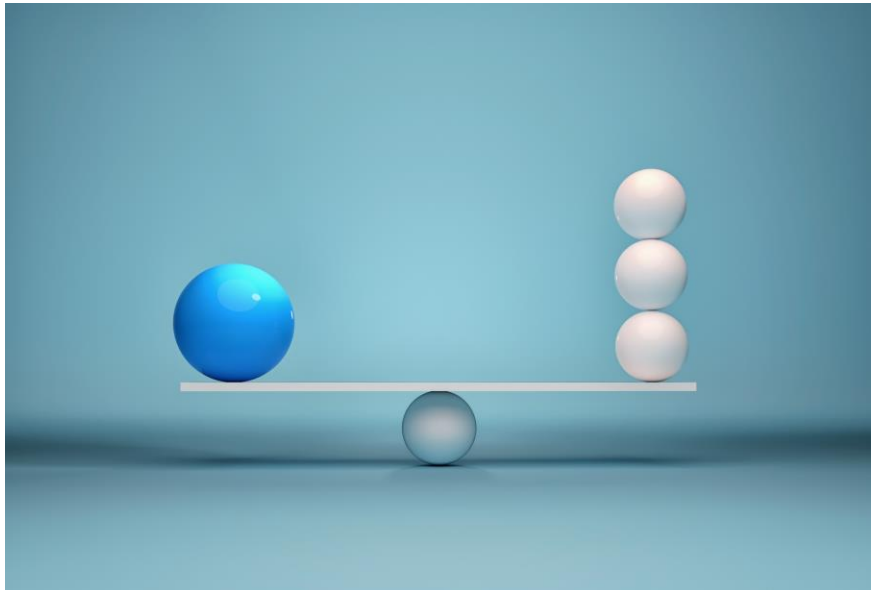
Ways to use CBAT- with/without EA:

- CBAT is a (somewhat complicated) Excel spreadsheet
- Builders *can* use it on their own- with Archetypes
- More effective to work with your Energy Advisor
- EA provides custom energy model and knowledge of CBAT
- Builder provides costing info: material, labour, time
- Combined effort makes CBAT more accurate/useful.

Ways to use CBAT:

Result:

- cost-benefit analysis specific to <u>your</u> house, and specific to <u>your</u> costs.



Choose an Archetype:

ARCHETYPE INFO		
Preloaded Archetype	Large 2-Storey	1) Click Load Archetype
Base Base	NBC 9.36 - Zone 4	2) Click to Customize Base Case
Location	VANCOUVER	Click to Import Run Data
Climate Zone	Zone 4	
Heating Degree Days	2825	

ARCHITECTURAL TAKEOFFS		
ABOVE GRADE WALLS	**Area (sq.m)**	**Area (sq.ft.)**
Above Grade	312	3,362
Foundation Wall - Above Grade (if applicabl	68	736
Header Area	0	0
Total Wall Area	334	3,597
BELOW GRADE WALLS		
Total Foundation Wall Area	57	613
ROOF		
Total Insulated Attic Area	133	1,429
WINDOWS		
Below Grade	12	129
Above Grade	35	373
Total Window Area	47	502
FLOOR AREAS		
Below grade	104	1,118
Above grade	133	1,429
Total Heated Floor Area	237	2,548

AVAILABLE ARCHETYPES

Small 2-Storey

Courtesy of Crocachamor

Approx 2,500 sq ft on three floors, including walk-out basement

Rowhouse

Courtesy of Brady Developments

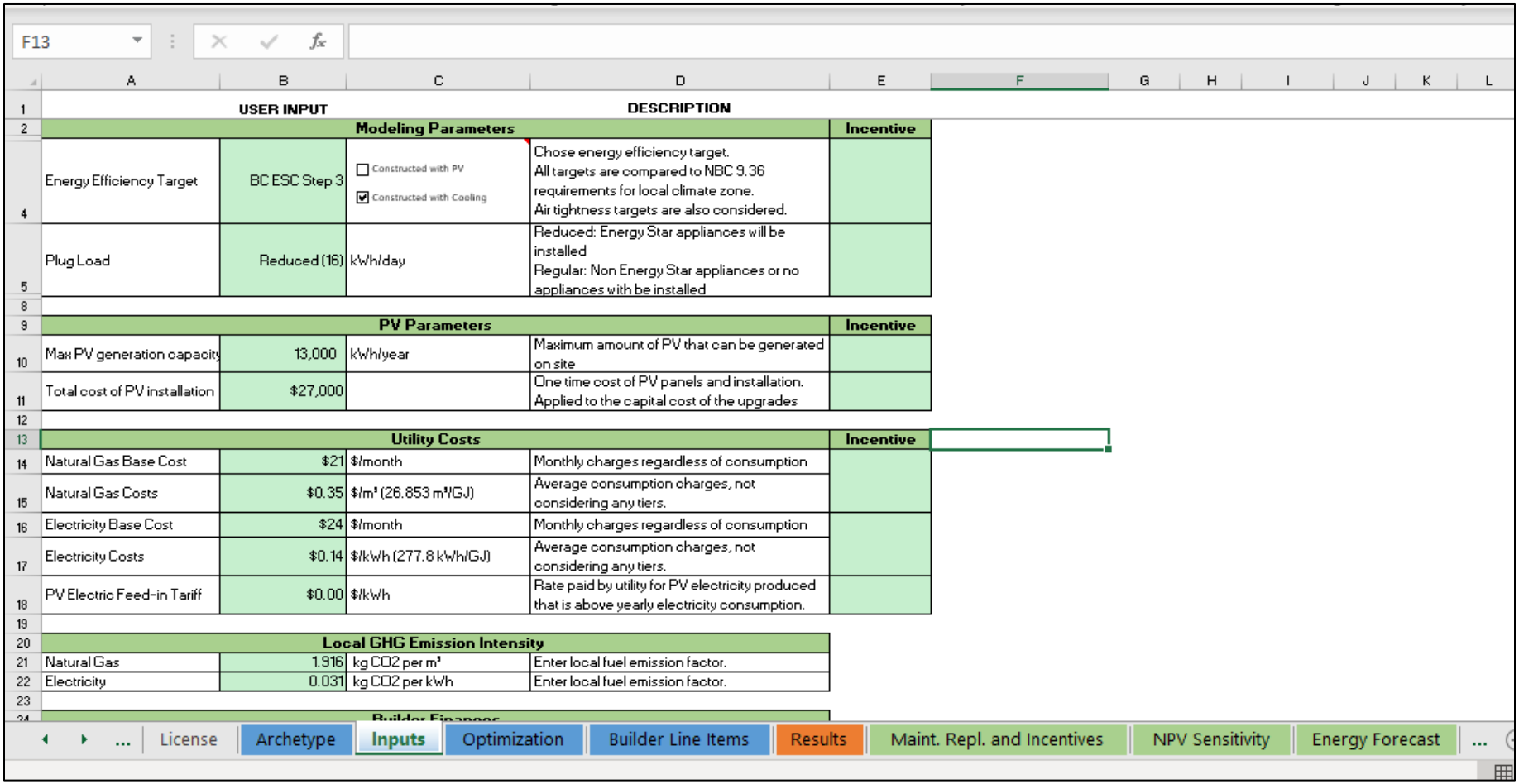
Approx 1400 ft² of livable space, no basement

Large 2-Storey

Courtesy of Odezra Group

License | Archetype | Inputs | Optimization | Builder Line Items | Results | Maint. Repl. and Incentives | NPV Sensitivity | Energy Fo

Choose a Target:

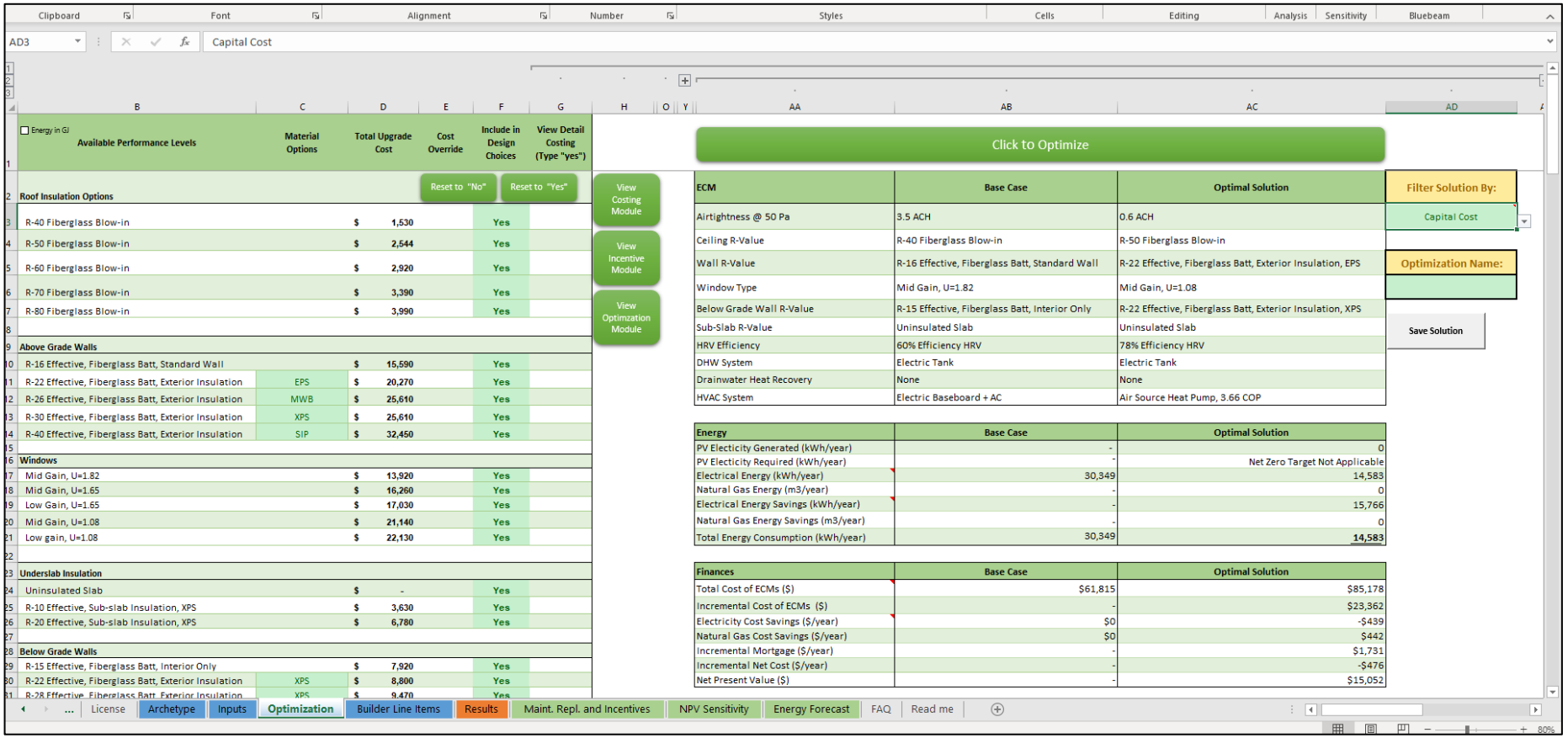


F13

	A	B	C	D	E
1		USER INPUT		DESCRIPTION	
2	**Modeling Parameters**				**Incentive**
4	Energy Efficiency Target	BC ESC Step 3	☐ Constructed with PV ☑ Constructed with Cooling	Chose energy efficiency target. All targets are compared to NBC 9.36 requirements for local climate zone. Air tightness targets are also considered.	
5	Plug Load	Reduced (16)	kWh/day	Reduced: Energy Star appliances will be installed Regular: Non Energy Star appliances or no appliances with be installed	
8					
9	**PV Parameters**				**Incentive**
10	Max PV generation capacity	13,000	kWh/year	Maximum amount of PV that can be generated on site	
11	Total cost of PV installation	$27,000		One time cost of PV panels and installation. Applied to the capital cost of the upgrades	
12					
13	**Utility Costs**				**Incentive**
14	Natural Gas Base Cost	$21	$/month	Monthly charges regardless of consumption	
15	Natural Gas Costs	$0.35	$/m³ (26.853 m³/GJ)	Average consumption charges, not considering any tiers.	
16	Electricity Base Cost	$24	$/month	Monthly charges regardless of consumption	
17	Electricity Costs	$0.14	$/kWh (277.8 kWh/GJ)	Average consumption charges, not considering any tiers.	
18	PV Electric Feed-in Tariff	$0.00	$/kWh	Rate paid by utility for PV electricity produced that is above yearly electricity consumption.	
19					
20	**Local GHG Emission Intensity**				
21	Natural Gas	1.916	kg CO2 per m³	Enter local fuel emission factor.	
22	Electricity	0.031	kg CO2 per kWh	Enter local fuel emission factor.	
23					
24	**Builder Finances**				

... License | Archetype | Inputs | Optimization | Builder Line Items | Results | Maint. Repl. and Incentives | NPV Sensitivity | Energy Forecast ...

Choose your Filter:



Energy in GJ — Available Performance Levels	Material Options	Total Upgrade Cost	Cost Override	Include in Design Choices	View Detail Costing (Type "yes")
Roof Insulation Options			Reset to "No"	Reset to "Yes"	
R-40 Fiberglass Blow-in		$ 1,530		Yes	
R-50 Fiberglass Blow-in		$ 2,544		Yes	
R-60 Fiberglass Blow-in		$ 2,920		Yes	
R-70 Fiberglass Blow-in		$ 3,390		Yes	
R-80 Fiberglass Blow-in		$ 3,990		Yes	
Above Grade Walls					
R-16 Effective, Fiberglass Batt, Standard Wall		$ 15,590		Yes	
R-22 Effective, Fiberglass Batt, Exterior Insulation	EPS	$ 20,270		Yes	
R-26 Effective, Fiberglass Batt, Exterior Insulation	MWB	$ 25,610		Yes	
R-30 Effective, Fiberglass Batt, Exterior Insulation	XPS	$ 25,610		Yes	
R-40 Effective, Fiberglass Batt, Exterior Insulation	SIP	$ 32,450		Yes	
Windows					
Mid Gain, U=1.82		$ 13,920		Yes	
Mid Gain, U=1.65		$ 16,260		Yes	
Low Gain, U=1.65		$ 17,030		Yes	
Mid Gain, U=1.08		$ 21,140		Yes	
Low gain, U=1.08		$ 22,130		Yes	
Underslab Insulation					
Uninsulated Slab		$ -		Yes	
R-10 Effective, Sub-slab Insulation, XPS		$ 3,630		Yes	
R-20 Effective, Sub-slab Insulation, XPS		$ 6,780		Yes	
Below Grade Walls					
R-15 Effective, Fiberglass Batt, Interior Only		$ 7,920		Yes	
R-22 Effective, Fiberglass Batt, Exterior Insulation	XPS	$ 8,800		Yes	
R-28 Effective, Fiberglass Batt, Exterior Insulation	XPS	$ 9,470		Yes	

View Costing Module

View Incentive Module

View Optimization Module

Click to Optimize

ECM	Base Case	Optimal Solution
Airtightness @ 50 Pa	3.5 ACH	0.6 ACH
Ceiling R-Value	R-40 Fiberglass Blow-in	R-50 Fiberglass Blow-in
Wall R-Value	R-16 Effective, Fiberglass Batt, Standard Wall	R-22 Effective, Fiberglass Batt, Exterior Insulation, EPS
Window Type	Mid Gain, U=1.82	Mid Gain, U=1.08
Below Grade Wall R-Value	R-15 Effective, Fiberglass Batt, Interior Only	R-22 Effective, Fiberglass Batt, Exterior Insulation, XPS
Sub-Slab R-Value	Uninsulated Slab	Uninsulated Slab
HRV Efficiency	60% Efficiency HRV	78% Efficiency HRV
DHW System	Electric Tank	Electric Tank
Drainwater Heat Recovery	None	None
HVAC System	Electric Baseboard + AC	Air Source Heat Pump, 3.66 COP

Filter Solution By: Capital Cost

Optimization Name:

Save Solution

Energy	Base Case	Optimal Solution
PV Electicity Generated (kWh/year)	-	0
PV Electicity Required (kWh/year)	-	Net Zero Target Not Applicable
Electrical Energy (kWh/year)	30,349	14,583
Natural Gas Energy (m3/year)	-	0
Electrical Energy Savings (kWh/year)	-	15,766
Natural Gas Energy Savings (m3/year)	-	0
Total Energy Consumption (kWh/year)	30,349	14,583

Finances	Base Case	Optimal Solution
Total Cost of ECMs ($)	$61,815	$85,178
Incremental Cost of ECMs ($)	-	$23,362
Electricity Cost Savings ($/year)	$0	-$439
Natural Gas Cost Savings ($/year)	$0	$442
Incremental Mortgage ($/year)	-	$1,731
Incremental Net Cost ($/year)	-	-$476
Net Present Value ($)	-	$15,052

Work with your EA:

Energy Advisor	Energy Advisor	Builder & Energy Advisor
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	Library of technologies and performance specifications	Allows EAs & builders to customize costs

Recommendation:

- work with your Energy Advisor to make best use of CBAT
- maximize benefits of CBAT, minimize your time to learn it, and improve accuracy.