



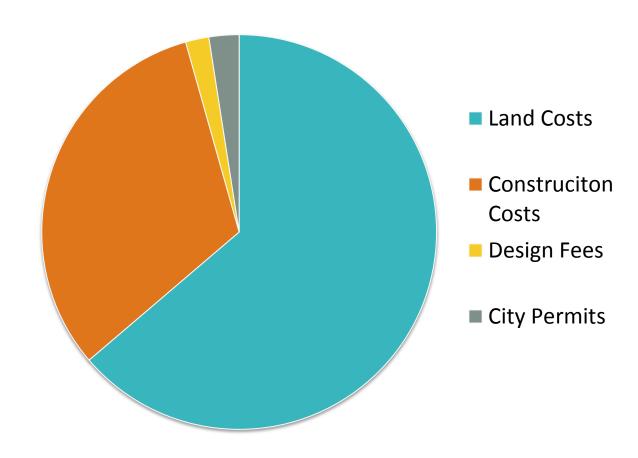
Dave Ramslie, Principal Integral Group LLC Costing Preview, BC Housing

# Background: Scope of Study

### Costing Study

- •The focus of this study is construction costs
- What's included in 'costs'?
  - Labour
  - Materials
- ■What's **not** included in 'cost'?
  - Design Fees
  - Land costs
  - Permit Fees

Lower Mainland: New Home



# Background

## Costing Study: Methods

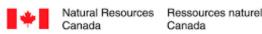
Largest energy modelling exercise for a building code in Canada

Costs were extensively vetted by industry

A different type of analysis for a different type of code



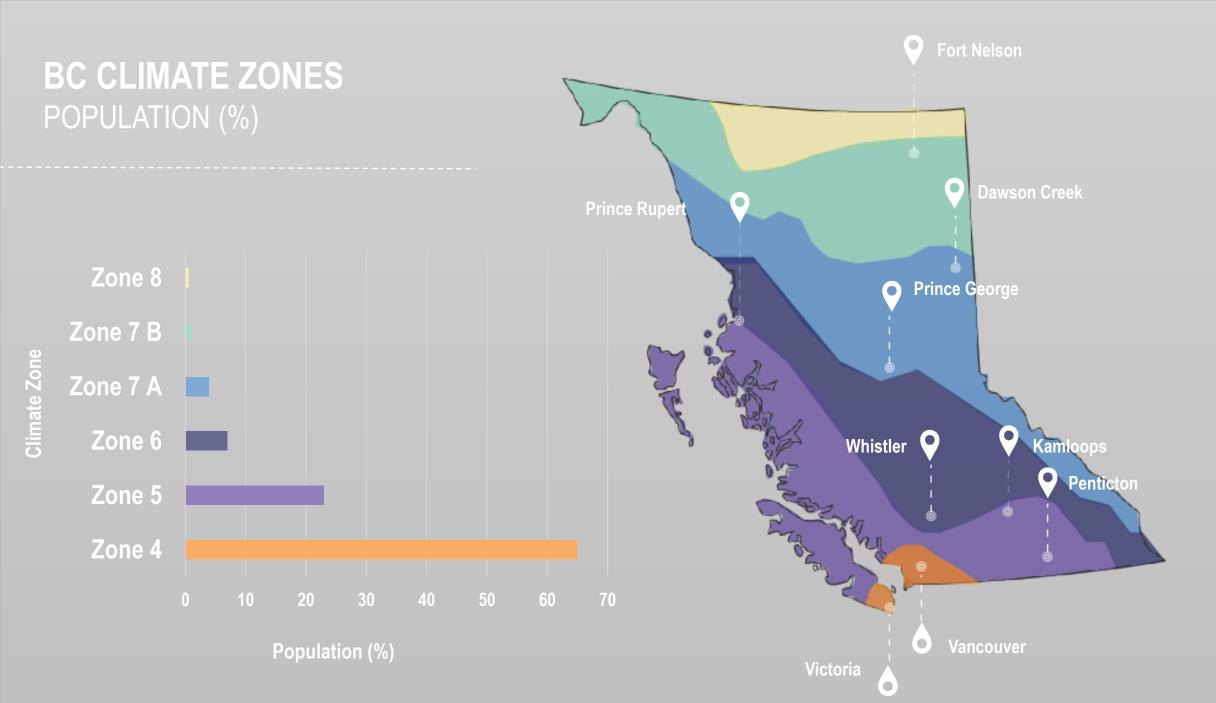












# Methods

#### **ENERGY CONSERVATION MEASURES: Part 9**

| Component          | ECM Options*                                 | # of choices |
|--------------------|--|--------------|
| Walls              | R16, R18, R22, R24, R30, R40, R50, R60       | 6            |
| Windows            | 3 double, 4 triple (U-1.8 to U-0.8)          | 7            |
| Foundation walls   | R11.3, R17, R20, R25                         | 4            |
| Under-slab ins.    | R0, R11, R15, R20                            | 4            |
| Exposed floors     | R26.5, R29, R35, R40                         | 4            |
| Attic              | R40, R50, R60, R70, R80, R100                | 6            |
| Air sealing target | 3.5 ACH, 2.5 ACH, 1.5 ACH, 1.0 ACH, 0.6 ACH  | 5            |
| DHW heating        | Electric & gas tank, 2 x tankless, heat pump | 5            |
| Space heating      | 92% & 95% AFUE, combo, CCASHP                | 4            |
| Drain water HR     | None, 30%, 42%, 55%                          | 4            |
| HRV                | None, 60%, 70%, 75% & 84% SRE                | 5            |
|                    | Total number of possibilities                | 129,024,000  |

# Background

## **Costing Study**

- We tested 15 different Archetypes in both Part 9 and Part 3 in all climate zones
- Our focus was to measure the potential impact of the policy on affordability and practicality
- Empirical data to help inform implementation
- •Archetypes in this presentation are:









# Context: How to use this study?

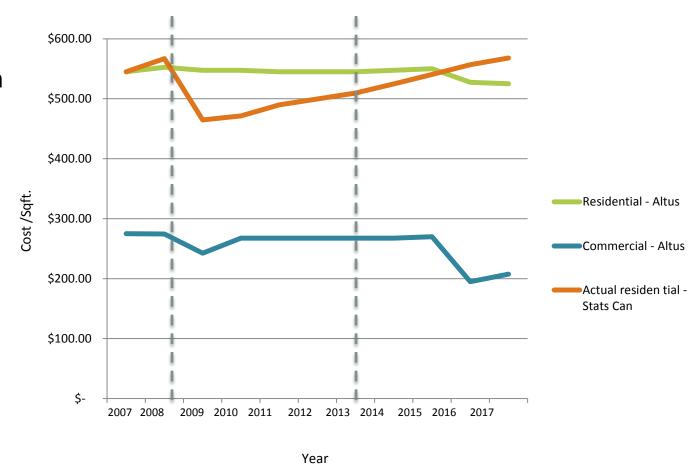
Does the building code impact construction costs?

The construction impacts of the BC Energy Codes\* were expected to be:

BCBC 2008: Est.: 2%

BCBC 2012: Est.: 2.2%

- In all cases projected construction costs went down after energy code adoption or held constant.
- Actual costs either reduced or escalated more slowly.



<sup>\*</sup>For Part 3 Buildings

# Background

#### How do we put these costs into context?

• <1% Industry preferred level of intervention of step code

<1%

 1-2% Typical cost incremental for last two code updates, demonstrated to have no measurable impact

1-2%

• 2-5% May require some short term incentives

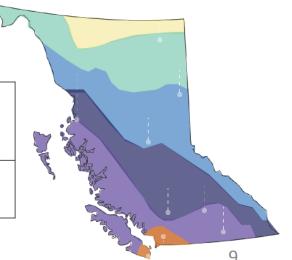
>2%

# Medium SFD

| Step | Lower<br>Mainland | Okanagan | S. Interior | N. Interior | Peace River | The North |
|------|-------------------|----------|-------------|-------------|-------------|-----------|
| 1    | <0.1%             | <0.1%    | <0.1%       | <0.1%       | <0.1%       | <0.1%     |
| 2    | 0.3%              | -0.30%   | -0.40%      | 0.60%       | 1.10%       | 1.60%     |
| 3    | 1.40%             | <0.1%    | 0.10%       | 1.00%       | 1.80%       | 2.70%     |



| Airtightness<br>ACH | Foundation R-<br>Value | Under slab<br>R-Value | Floor R-<br>Value | Wall R-Value | Roof R-Value | Window<br>USI | Space<br>Heating | DHW<br>System | Vent. Heat<br>Recovery (%) | Drain water<br>Heat Recovery<br>(%) | GHG's<br>Saved |
|---------------------|------------------------|-----------------------|-------------------|--------------|--------------|---------------|------------------|---------------|----------------------------|-------------------------------------|----------------|
| 2.5                 | 16                     | 0                     | n/a               | 16           | 40           | 1.6           | Furnace<br>92%   | HP COP2.3     | 70                         | None                                | 1.5            |

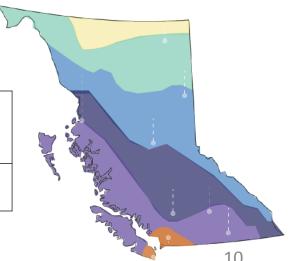


# Market Rowhouse

| Step | Lower<br>Mainland | Okanagan | S. Interior | N. Interior | Peace River | The North |
|------|-------------------|----------|-------------|-------------|-------------|-----------|
| 1    | <0.1%             | <0.1%    | <0.1%       | <0.1%       | <0.1%       | <0.1%     |
| 2    | 0.40%             | 0.08%    | 0.30%       | 0.20%       | 0.50%       | 1.10%     |
| 3    | 1.10%             | 0.80%    | -0.60%      | 0.70%       | 1.20%       | 1.80%     |



|     | Foundatio<br>n R-Value | Under slab<br>R-Value | Floor R-<br>Value | Wall R-<br>Value | Roof R-Value | Window<br>USI | Space<br>Heating | DHW<br>System | Vent. Heat<br>Recovery (%) | Drain water<br>Heat Recovery<br>(%) | GHG's<br>Saved |
|-----|------------------------|-----------------------|-------------------|------------------|--------------|---------------|------------------|---------------|----------------------------|-------------------------------------|----------------|
| 2.5 | 11.3                   | 11                    | 27                | 16               | 40           | 1.8           | Furnace<br>92%   | HP COP2.3     | 60                         | None                                | 5.1            |

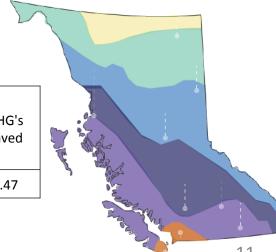


# Midrise Wood Construction

| Step | Lower Mainland | Okanagan | S. Interior | N. Interior |
|------|----------------|----------|-------------|-------------|
| 1    | <0.1%          | <0.1%    | <0.1%       | <0.1%       |
| 2    | 0.50%          | 0.50%    | 0.40%       | 1.40%       |
| 3    | 0.60%          | 2.40%    | 1.00%       | 1.60%       |



| Airtightness<br>ACH | Foundation<br>R-Value | Under slab<br>R-Value | Floor R-<br>Value | Wall R-<br>Value | Roof R-Value | Window<br>USI | Space<br>Heating | DHW<br>System | Vent. Heat<br>Recovery (%) | Drain water<br>Heat Recovery<br>(%) | GHG's<br>Saved |
|---------------------|-----------------------|-----------------------|-------------------|------------------|--------------|---------------|------------------|---------------|----------------------------|-------------------------------------|----------------|
| 2.5                 | 11                    | 15                    | 27                | 24               | 80           | 1.8           | Elec. BB         | Elec. 94%     | 60                         | None                                | 5.47           |

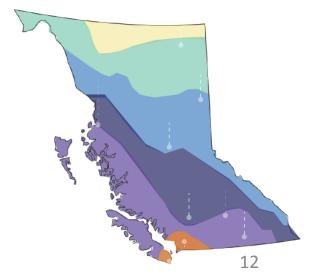


# High-rise MURB Construction

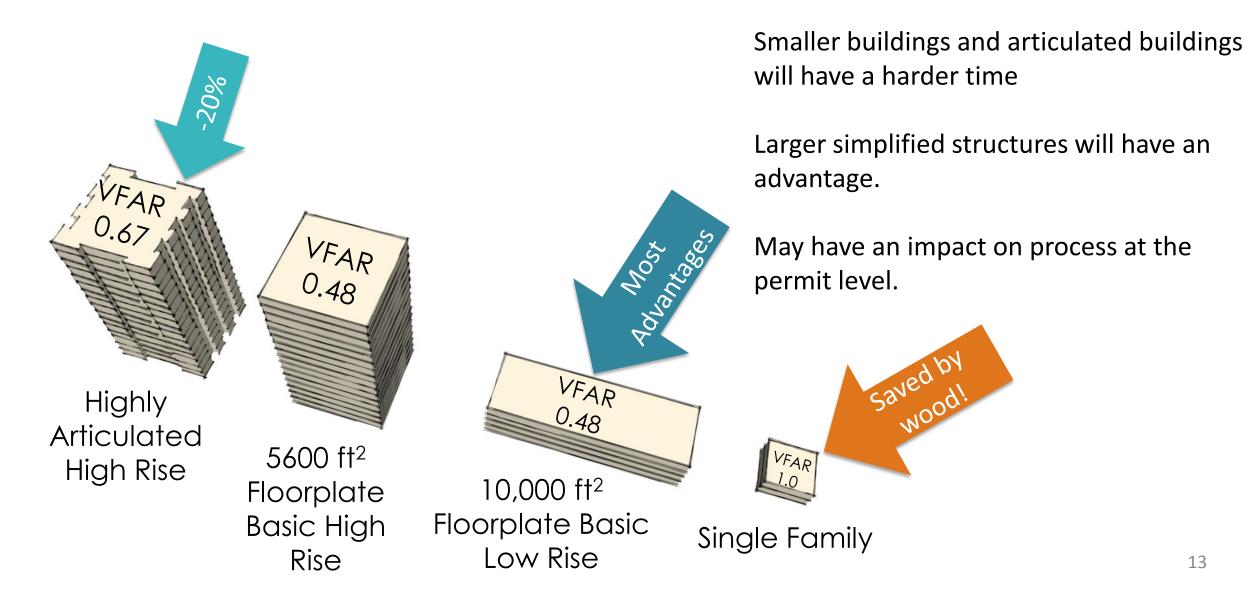
| Step | Lower Mainland | Okanagan | S. Interior | N. Interior |
|------|----------------|----------|-------------|-------------|
| 1    | <0.1%          | <0.1%    | <0.1%       | <0.1%       |
| 2    | 0.40%          | 1.00%    | 1.30%       | 2.00%       |
| 3    | 0.80%          | 2.40%    | 1.80%       | 2.30%       |



| Airtightness ACH | Wall R-Value | Roof R-Value | Window USI | Space<br>Heating | Heating Efficiency                      | DHW Savings | Vent. Heat<br>Recovery (%) | GHG's Saved |
|------------------|--------------|--------------|------------|------------------|---|-------------|----------------------------|-------------|
| Improved         | 10           | 20           | 2.5        | Elec. BB         | Condensing Chiller<br>92% Seasonal Eff. | 20%         | 80%                        | 136.8       |



# Form Factor Matters



# Findings

- All actions pass the feasibility test
- Architectural details and building articulation (form factor) matter
- No exotic technology required to meet targets
- Most urban affordable units have the best results



Source: Marken Design+ Consulting

#### Recommendations:

# What does the costing mean for implementation?

- Consistent with the Provincial Energy Step Code Policy Guide, Step 3 could reasonably be introduced as base code from a costing perspective
- Incentives should be used for higher levels of performance (Upper Steps – costing results – Fall 2018)
- Some smaller projects may be disproportionately impacted by methodology.



Source: Tim Ryce





Thank You! dramslie@integralgroup.com