

Requirements (1)



**Building envelope
must be 25%
better than NBC
(9.36) and local
code**



Requirements (2)

Purchased Energy
- Exported energy
0 GJ

**Biomass & renewably
sourced electricity
still count as purchased
energy**



Requirements (3)



Show you don't need AC

— or —

**Add enough PV to ensure
Homeowners can still
meet NZE when they
install AC later.**



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Requirements (4)



Equipment certified and tested
to recognized performance
/ installation standards

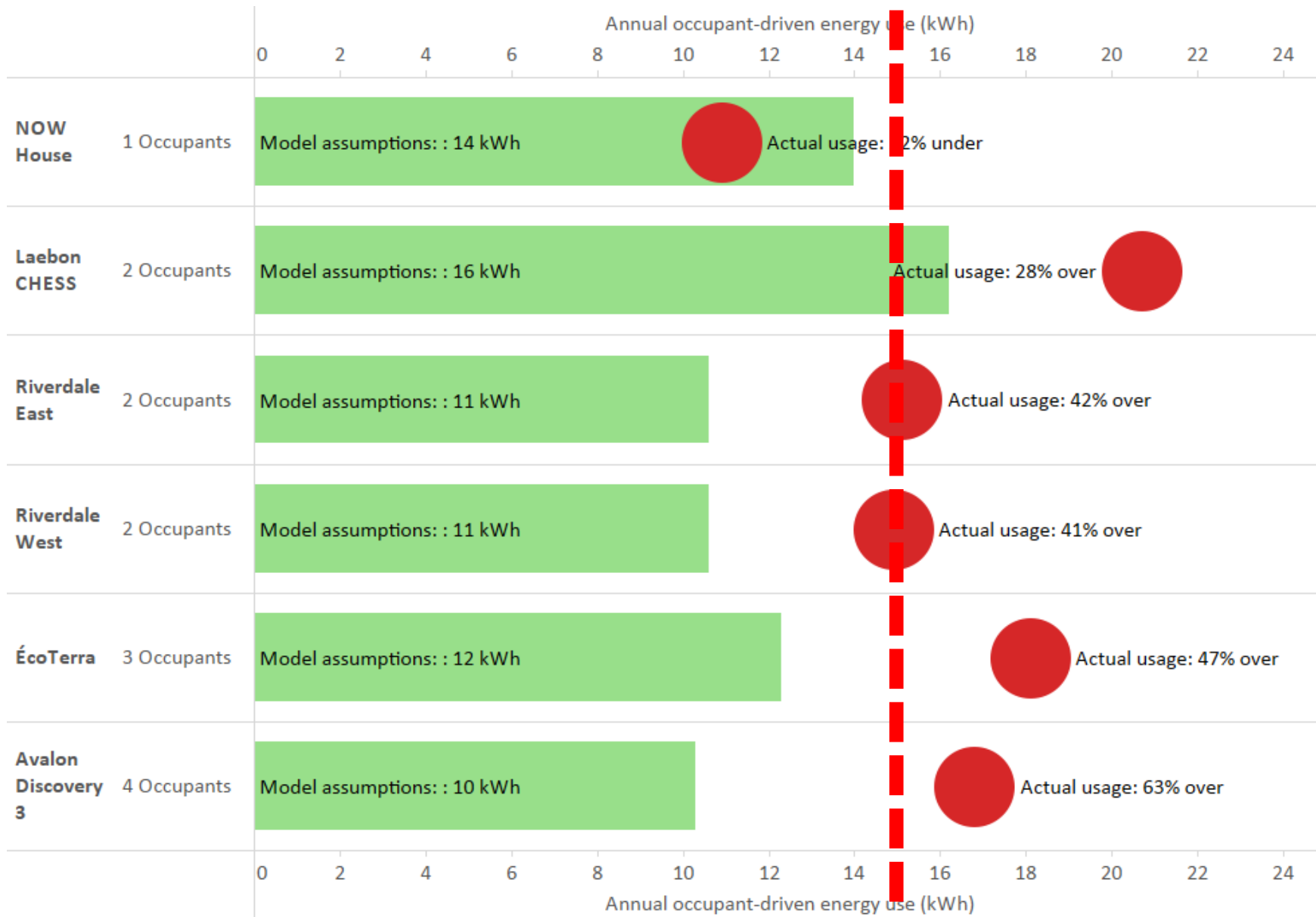


Performance evaluated using
HOT2000 & NRCan-approved
work-arounds



Plug loads:

New requirements are more stringent

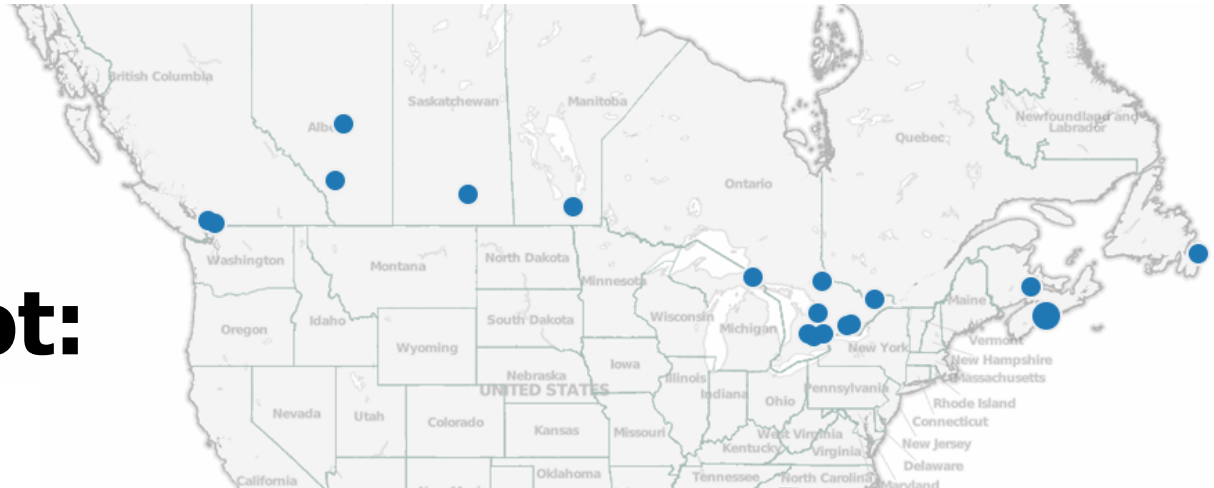


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NRCan NZEH-Pilot: 19 Applicants



ecoEII Innovation NZEH 5 participants, 25 homes



INNOVATIONS FOR LIVING



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#4 What barriers are keeping Net-Zero out of mainstream home production?



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Sustainable Housing Technology Roadmap for Canada

[Home](#) | [Download the Roadmap](#) | [Steering Committee](#) | [Links](#) | [Contact](#) |

A shared vision for an industry
led collaborative
initiative to build affordable
sustainable housing



See <http://shtrm.ca/>



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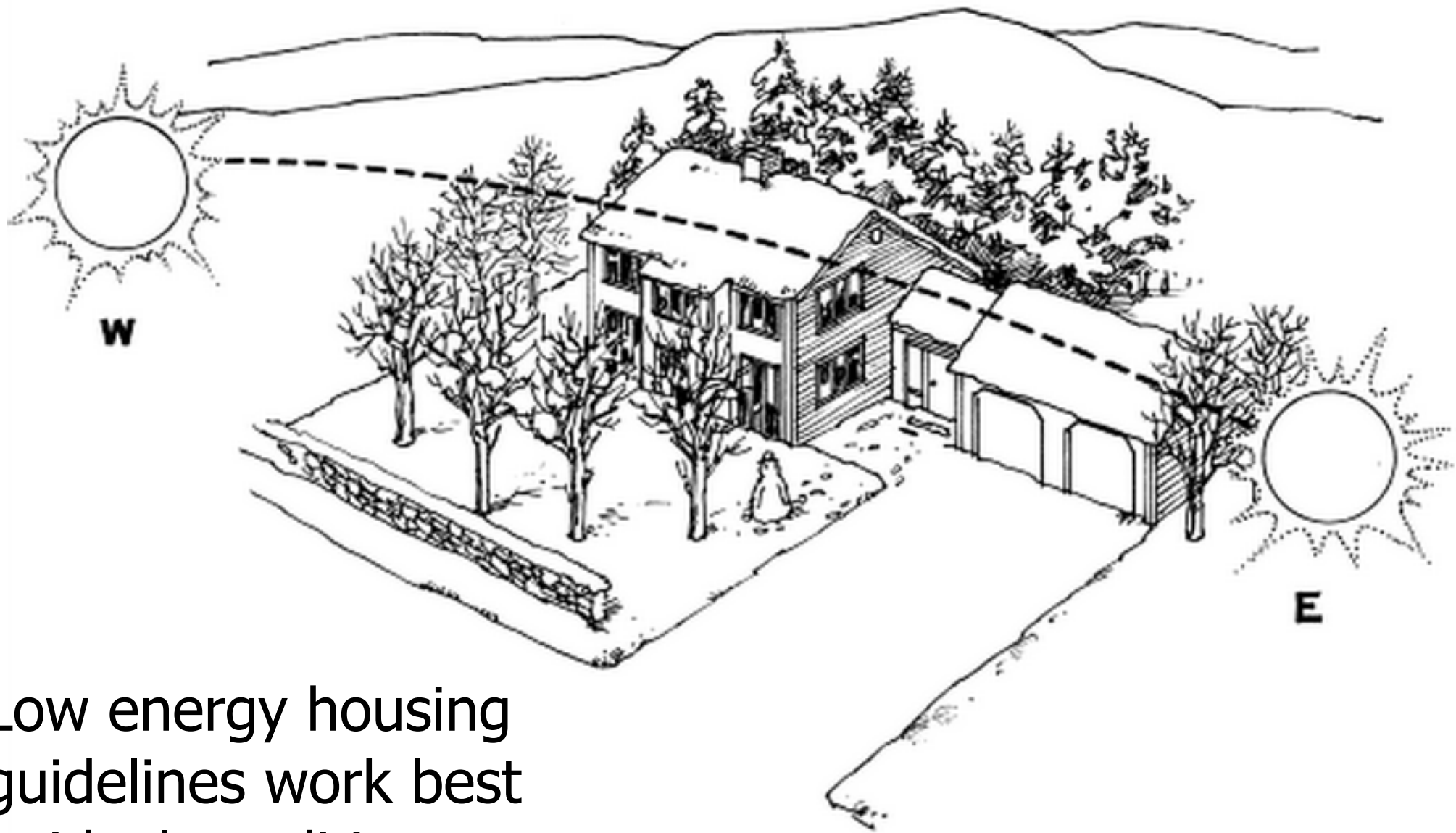
Barrier # 1: Cost



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Low energy housing guidelines work best in ideal conditions

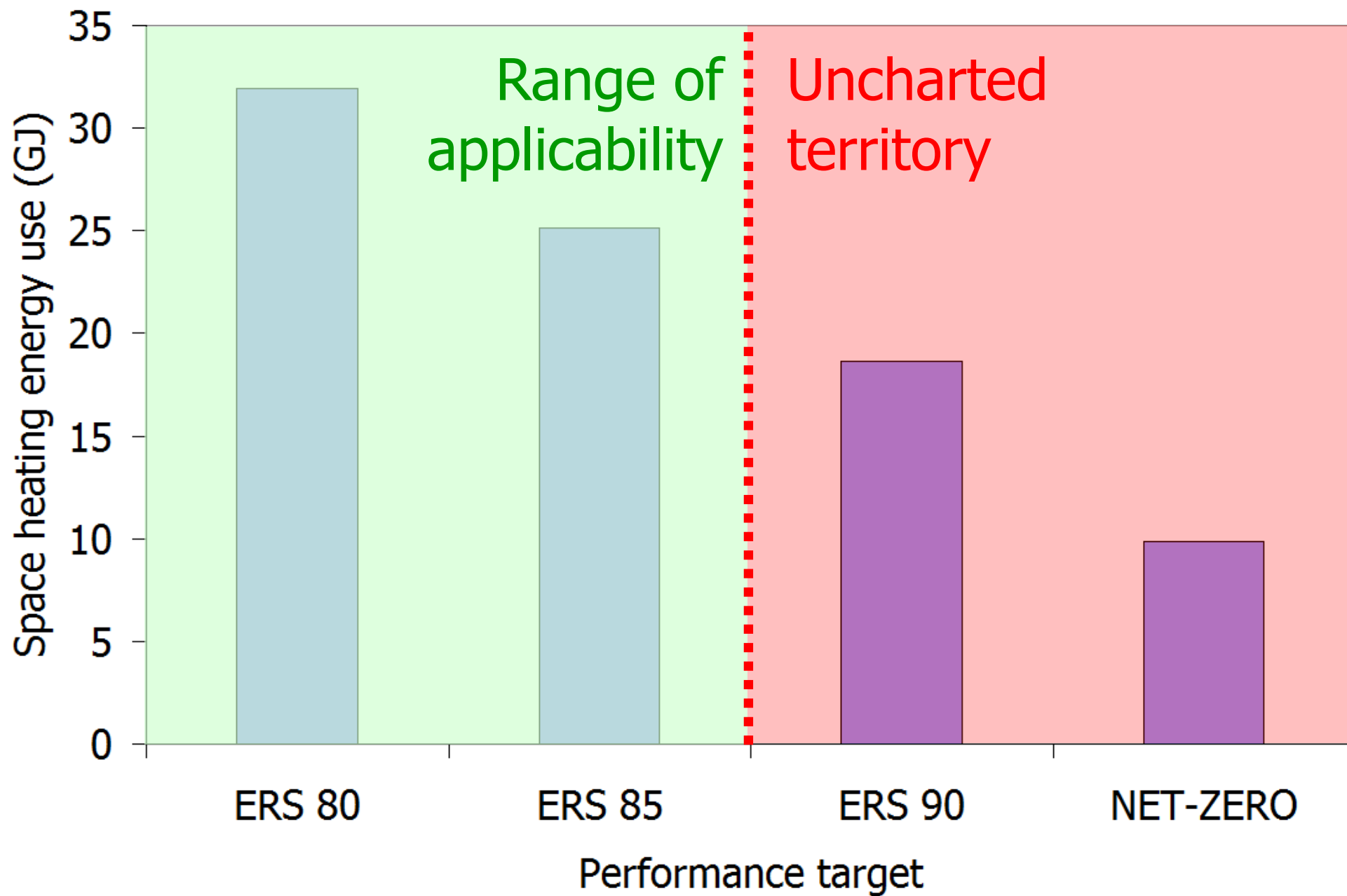
[Image excerpted from J. Kachadorian 1997, The passive solar house]

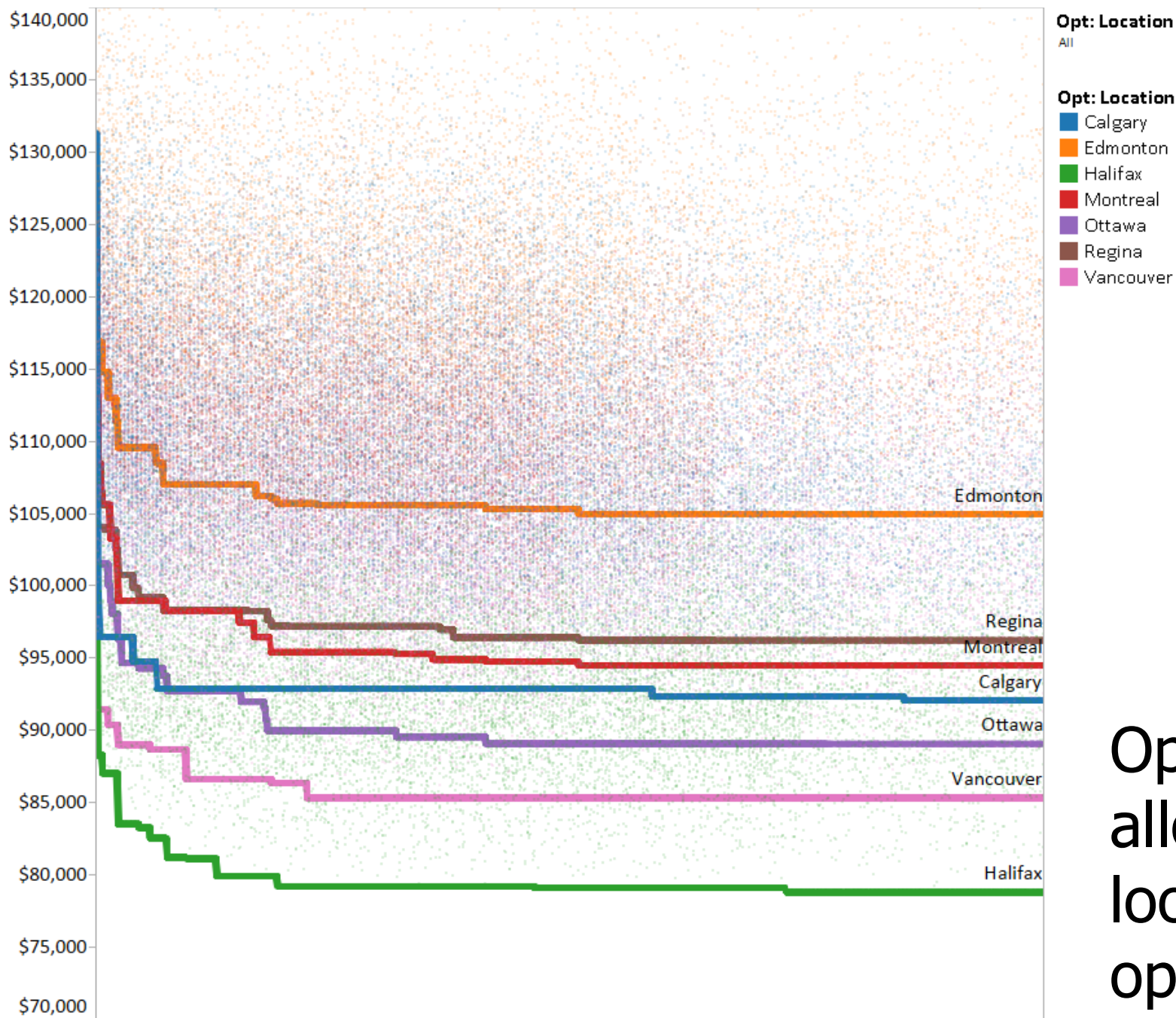


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Optimization
allows us to
look at all the
options

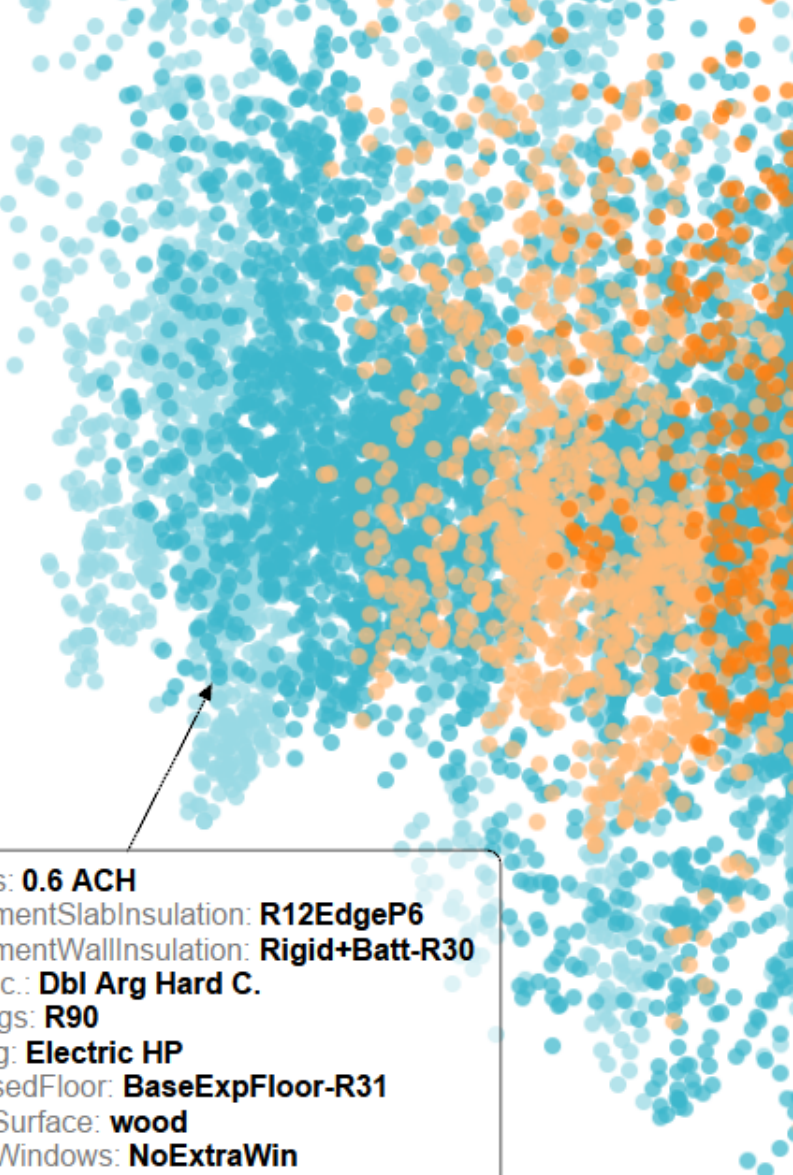


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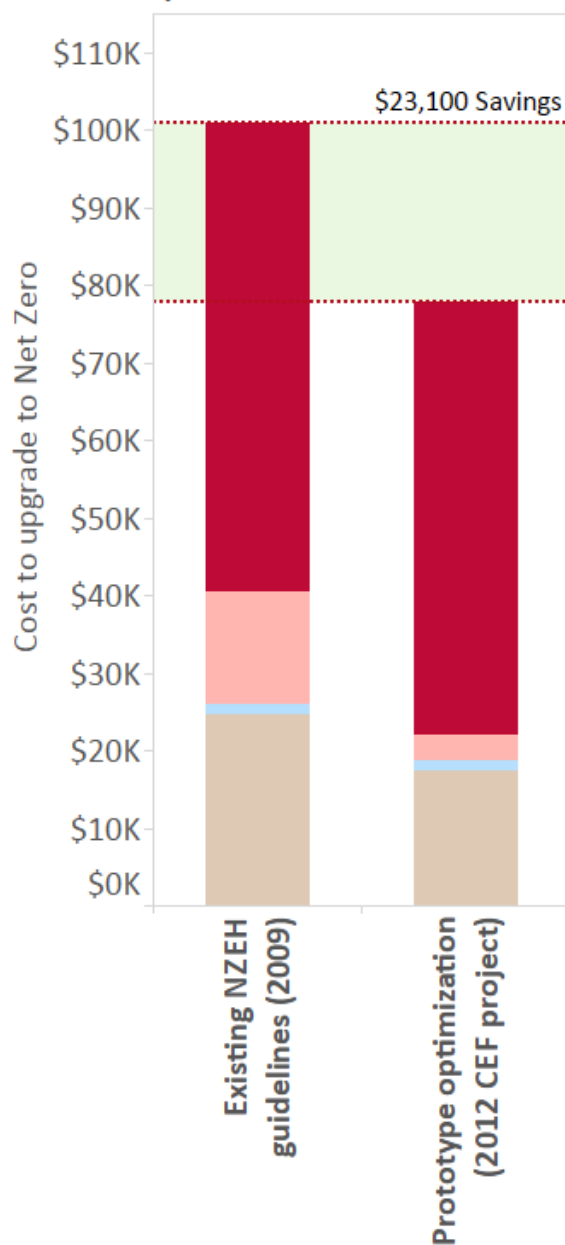
Evidence from optimization points to lower cost solutions that meet builder needs



Opt: Air Tightness: **0.6 ACH**
GTag: Opt-BasementSlabInsulation: **R12EdgeP6**
GTag: Opt-BasementWallInsulation: **Rigid+Batt-R30**
Opt: Window Spec.: **DbI Arg Hard C.**
GTag: Opt-Ceilings: **R90**
Opt: DHW heating: **Electric HP**
GTag: Opt-ExposedFloor: **BaseExpFloor-R31**
GTag: Opt-FloorSurface: **wood**
GTag: Opt-FrontWindows: **NoExtraWin**
Opt: Heating/Cooling: **Furnace + AC**
Opt: Location: **Ottawa**
Opt: Main Wall: **DbIStud-R52-Wall**
Solar & DHWR: **1-flat-plate**
UpgradeCost: Total: **\$104,668**
NetUtilityCosts: **-\$446**
PVSizekW: **13.800**



Improvements through optimization: 2011-2012



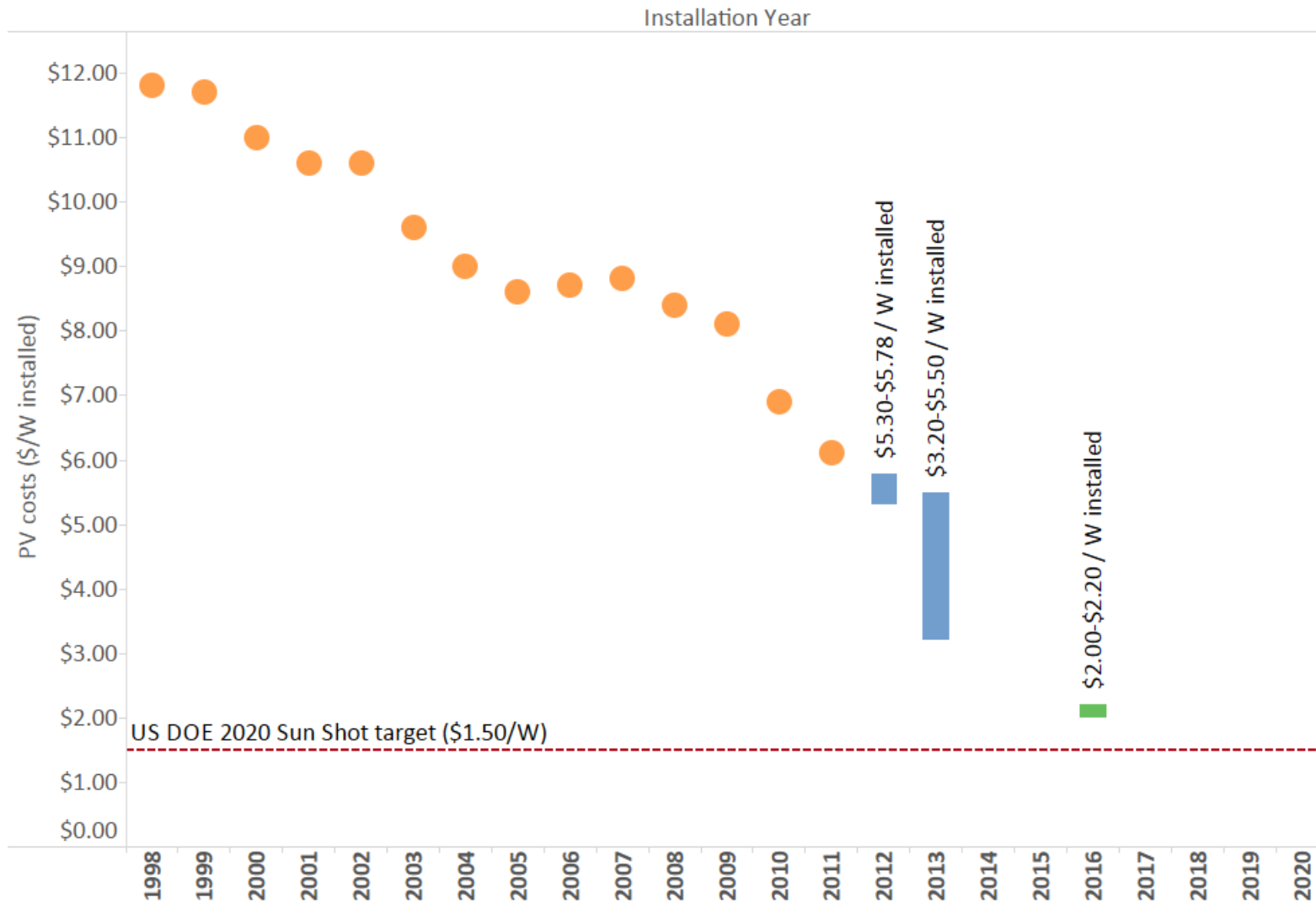
New combinations of existing technology yields 22% savings

(component costs are constant between these scenarios, PV at \$5.80/W)

- PV Costs
- Heating + DHW
- Window costs
- Insulation Costs



PV is now cheaper than we ever imagined



Measure Names

- DOE Historical PV median prices (1998-2011)
- Quotes from Canadian Suppliers (2011-2012)
- Builder target (2016)



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The promise of Panelization:



Can we install PV in the factory?



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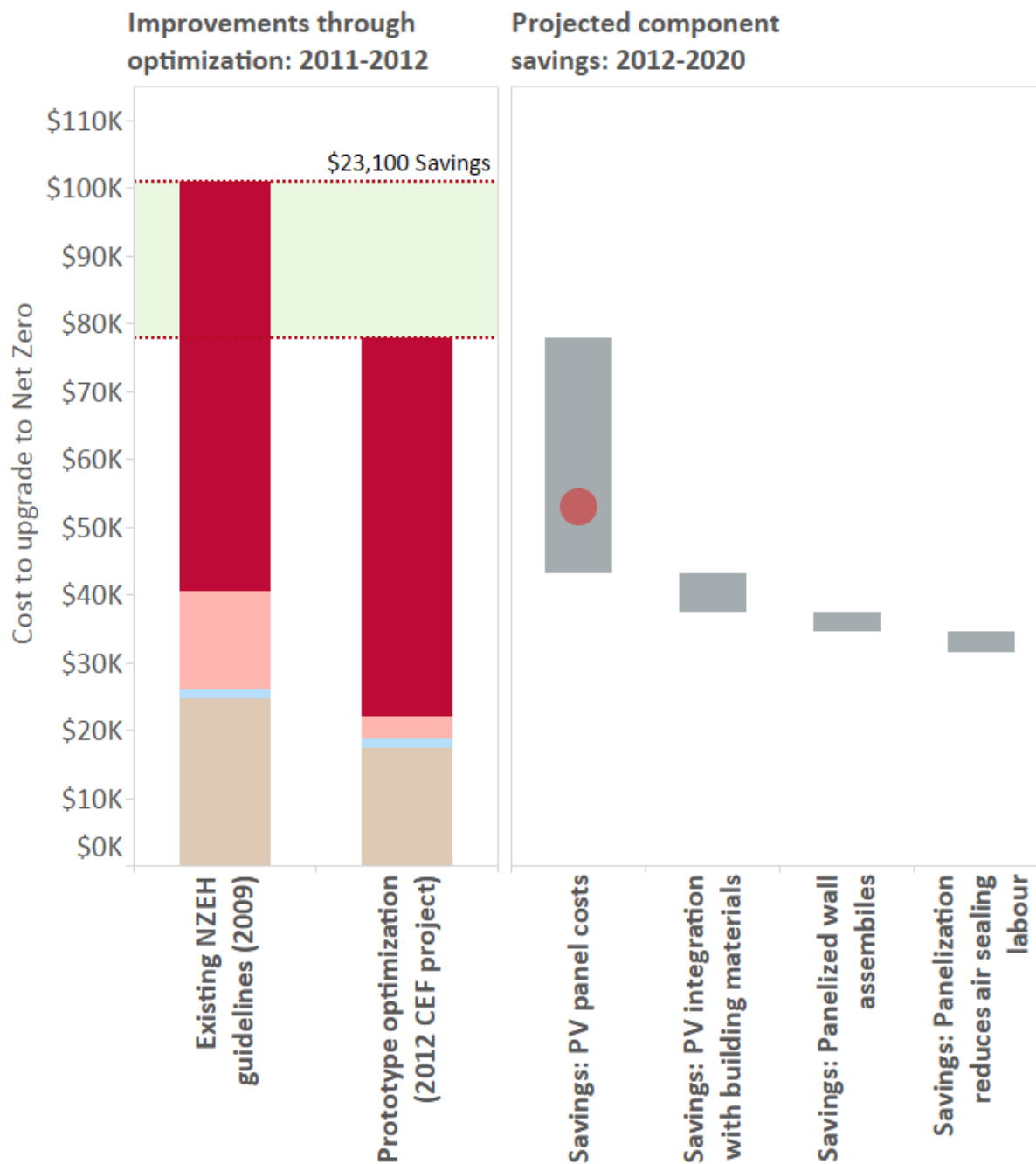
Panelization: reducing insulation & sealing costs



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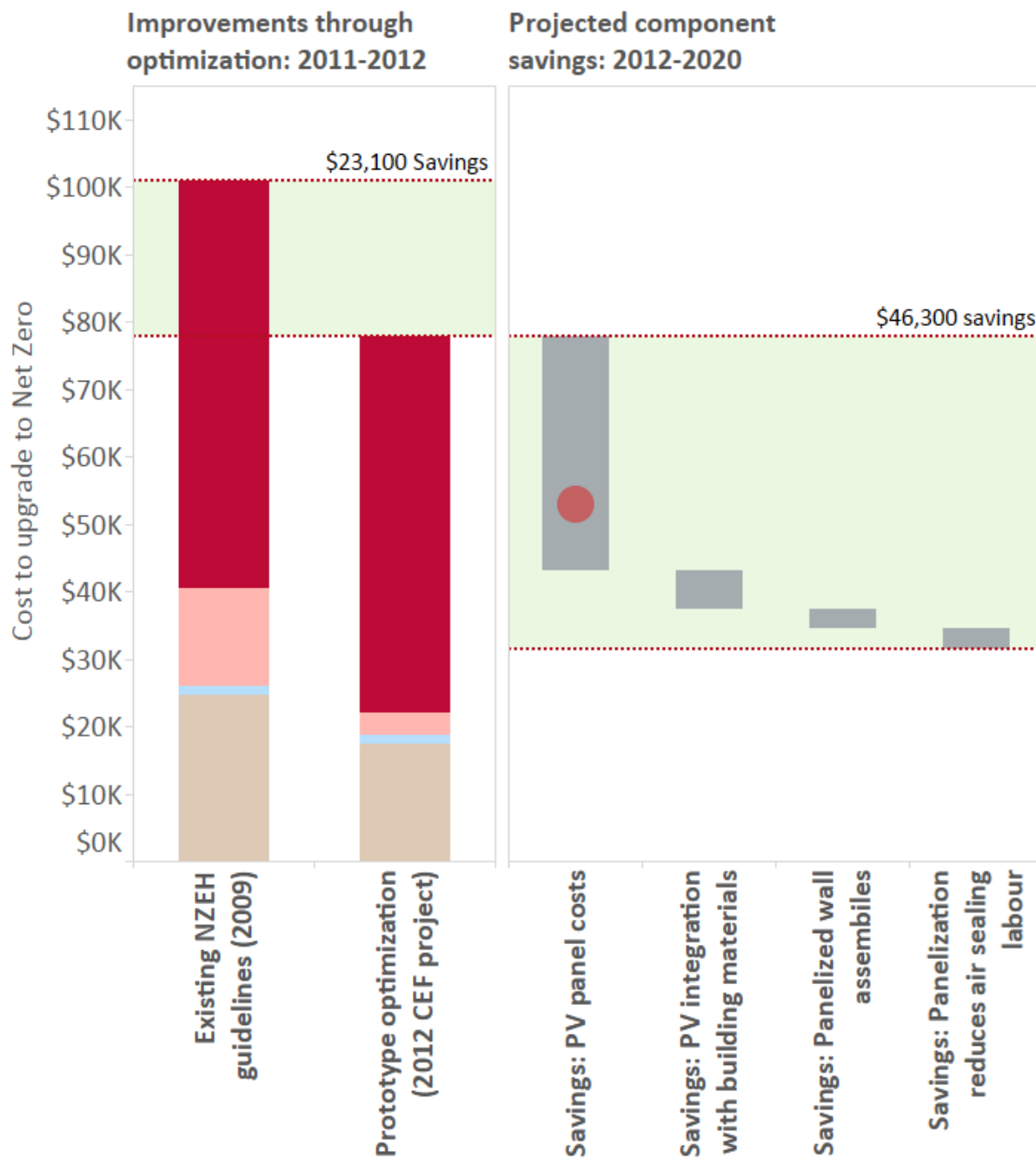
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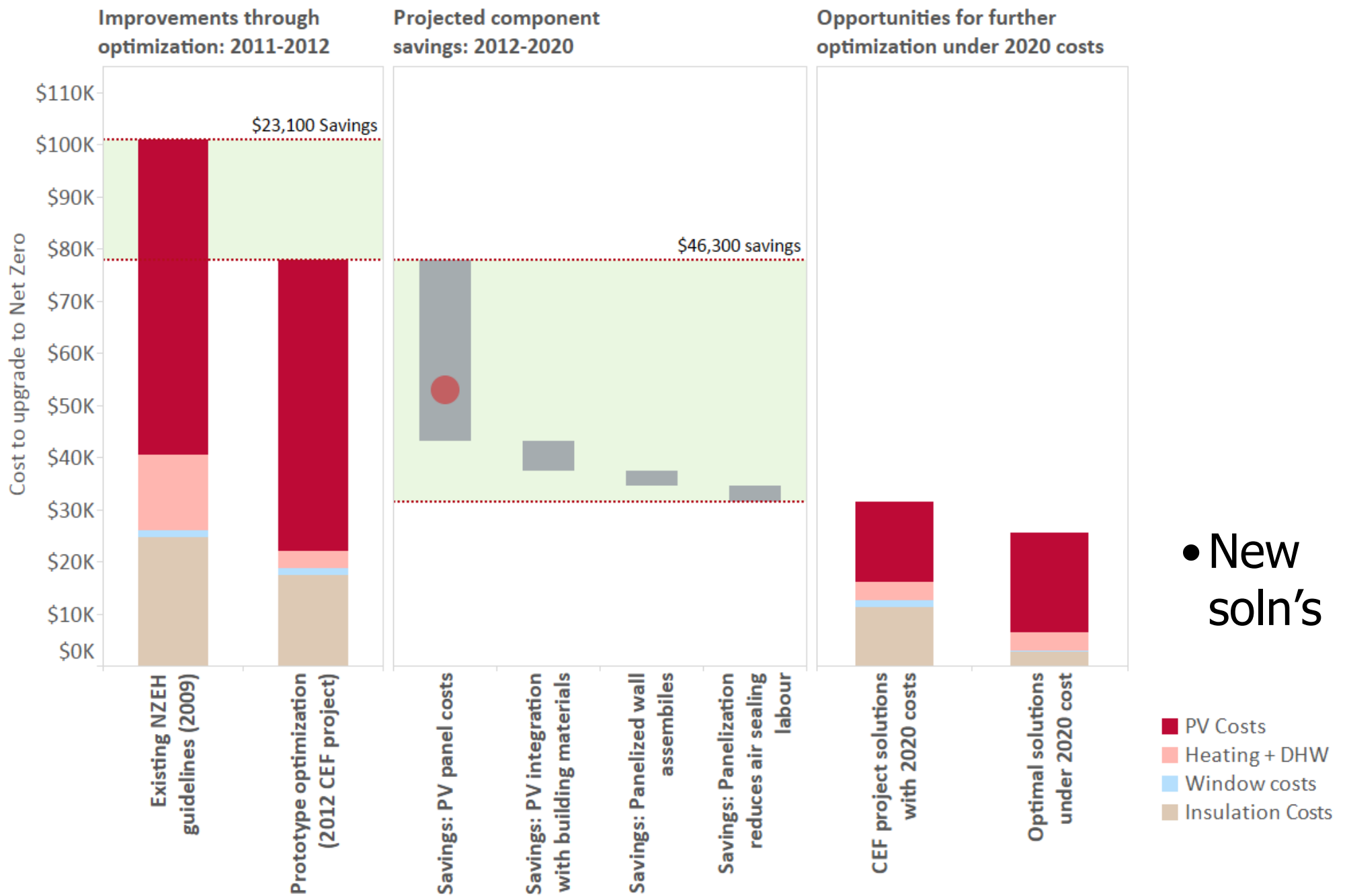
- Conventional PV costs near \$2.20/W
- BIPV incremental costs near \$1.50/W
- Panelization reduces envelope and air-sealing costs





- Conventional PV costs near \$2.20/W
- BIPV incremental costs near \$1.50/W
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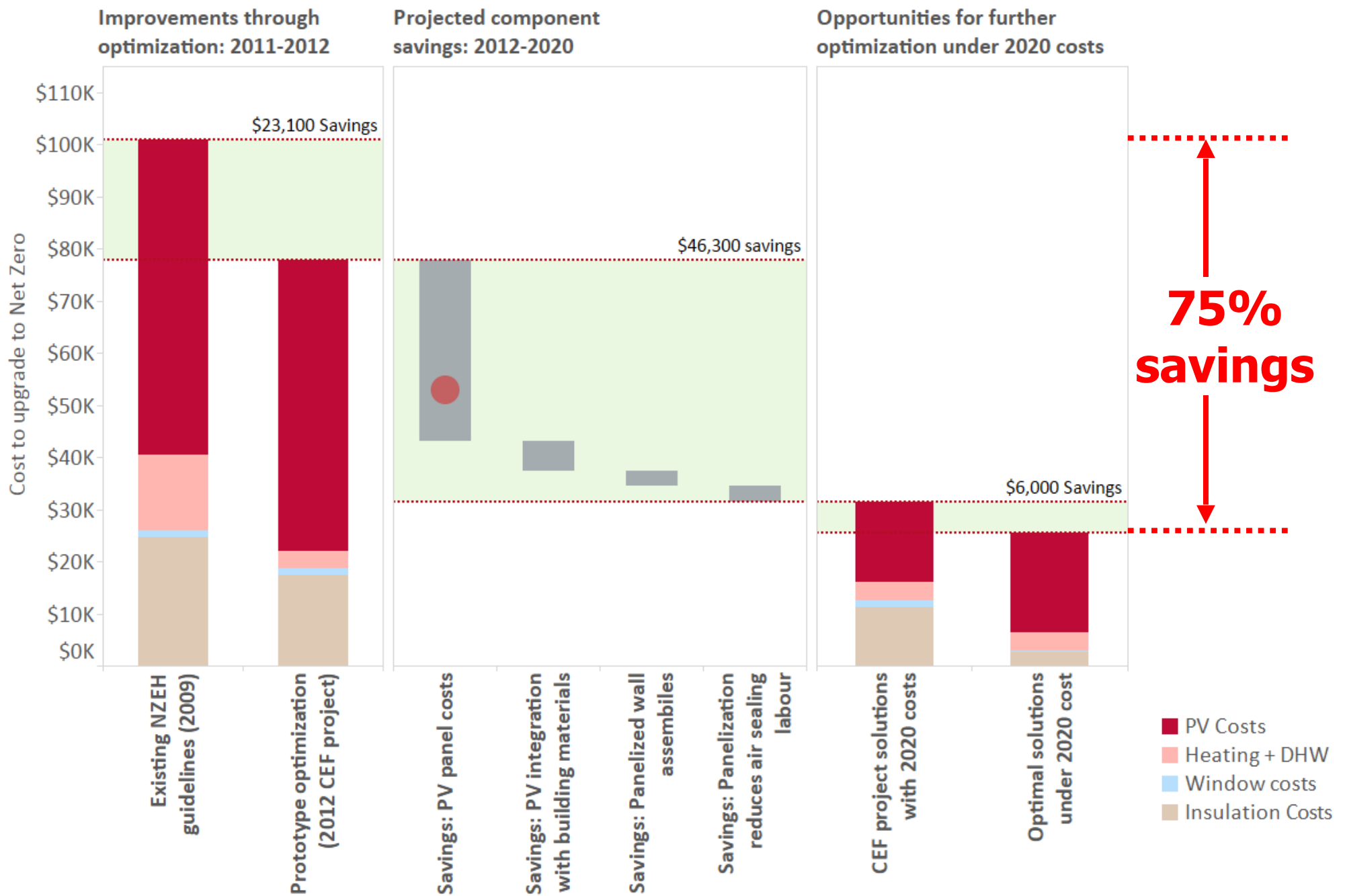
• New soln's



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Barrier # 2: Wall Thickness



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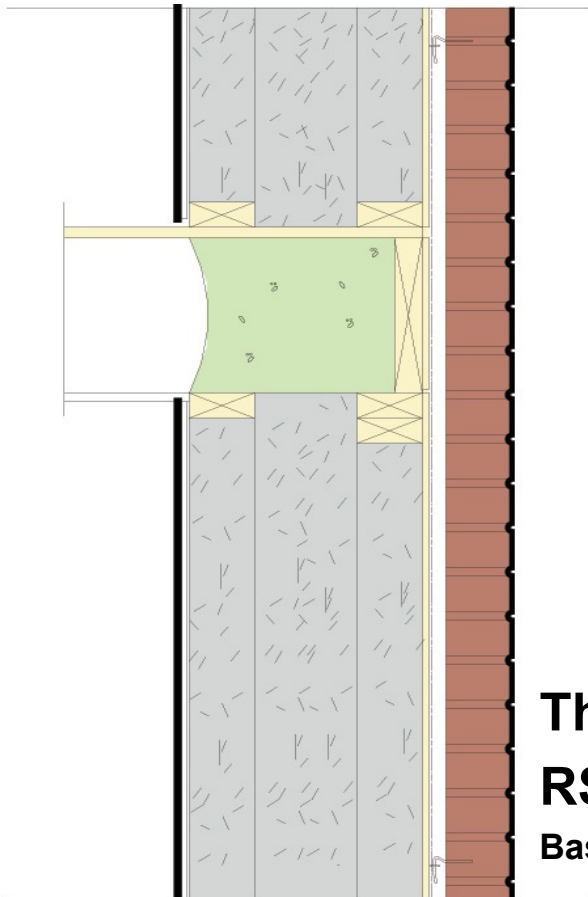
**Everybody
understands the
value of insulation**



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**Double-stud walls are
the housing equivalent
of an arctic parka.**

Thickness: 448mm

RSI: 7.54

Baseline

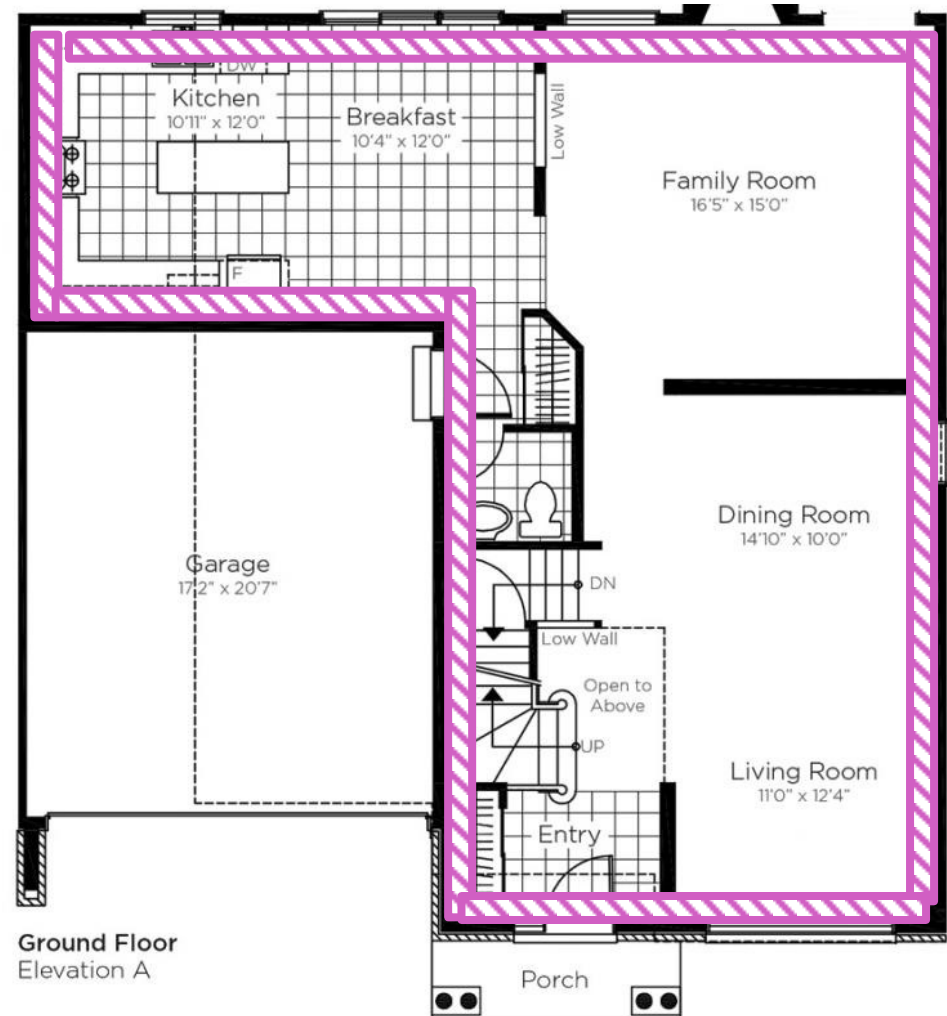


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Bigger walls = Smaller homes



 = Lost floor space (7%)

Source: Minto Group Inc.



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Industry Need:— thin, high-R walls for new construction



**170 ft² in living space is worth
\$25,000 in resale value**



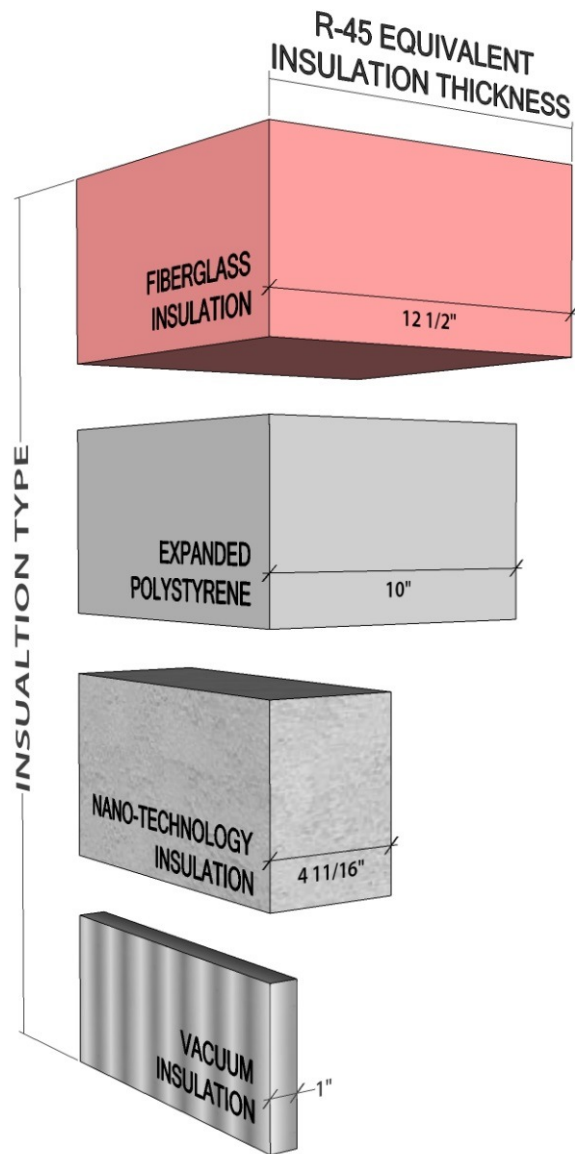
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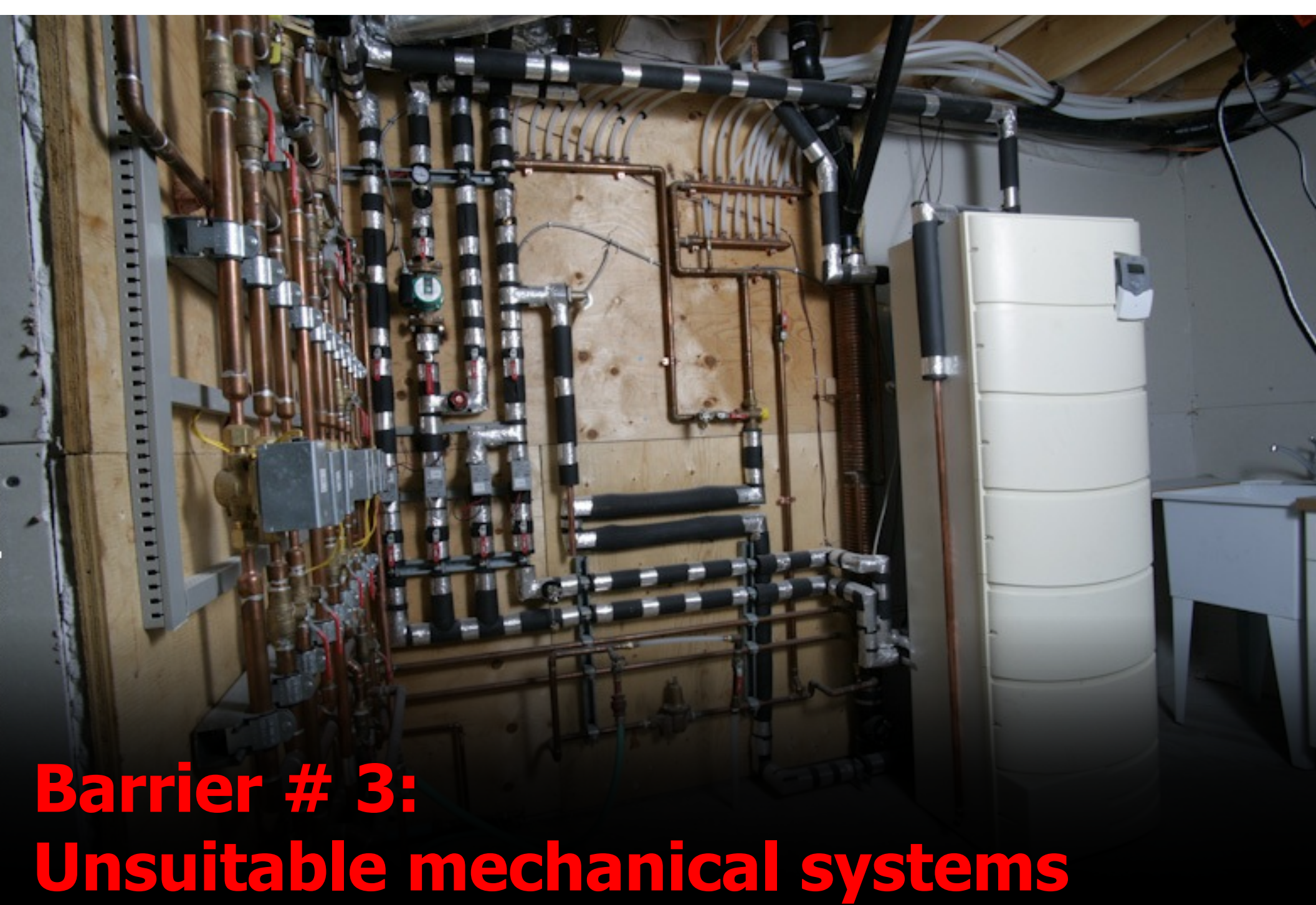
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New materials promise high R-values

But integration remains a challenge





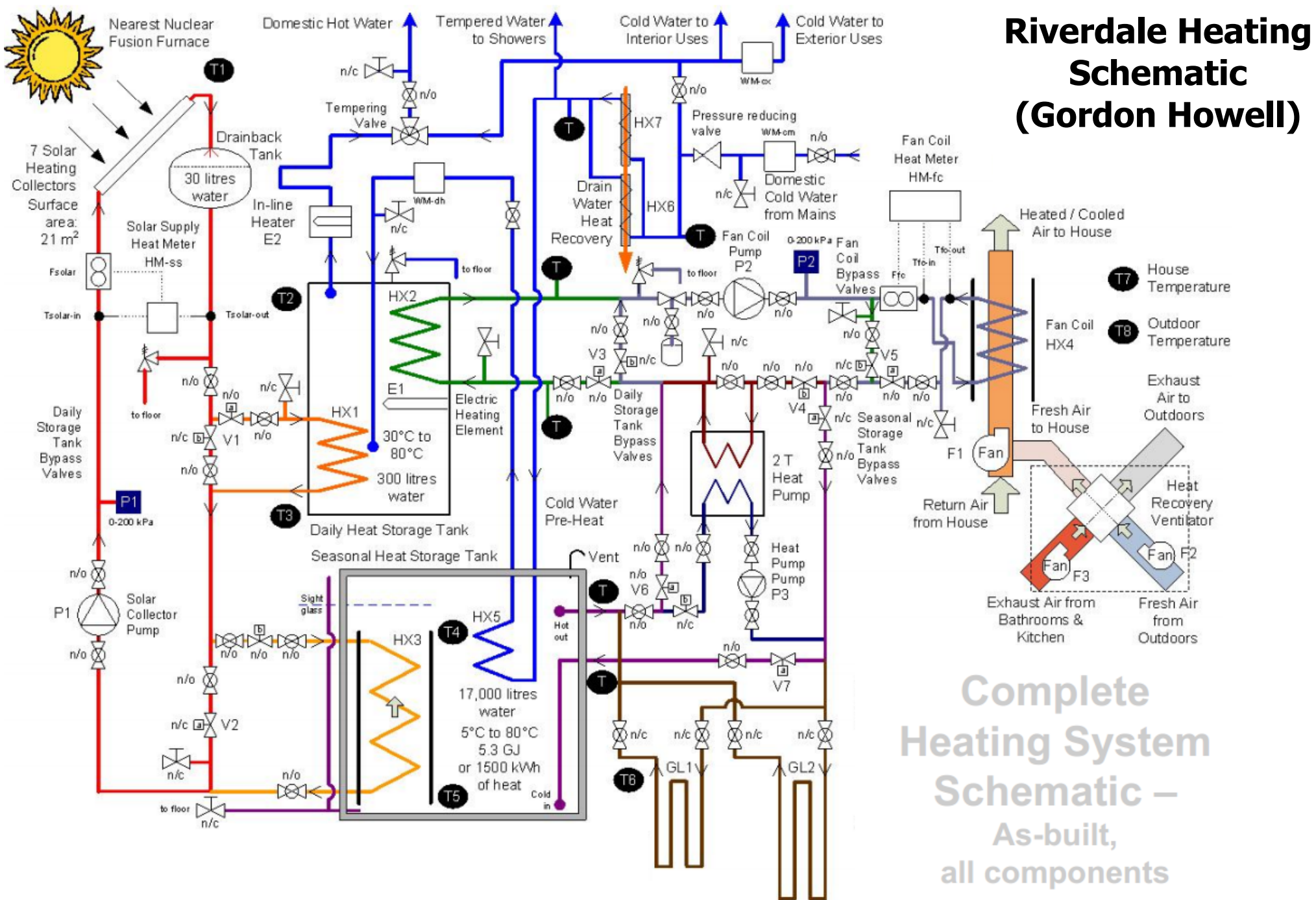
Barrier # 3: Unsuitable mechanical systems



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Potential market, by design load

