



## Road to Carbon Neutral High Rise Residential Buildings

Market Insights, November 30<sup>th</sup>, 2011

### Green Building Goals: meaning what, exactly?



All new buildings to be carbon neutral by 2020

Vancouver Greenest City Action Plan

33% reductions in GHG emissions over 2007 levels by 2020

BC Energy Plan



light house  
Sustainable Building Centre

## Project Objectives

- Translate governments' low-carbon and carbon neutral goals into effective, actionable mechanisms
- Preliminary cost analysis to establish degree of "stretch"
- Describe consistent metrics that are clear, consistent and accountable
- Identify where innovation merits recognition
- Bring together industry-wide team
- Secure world-class expertise



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light house  
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## Introducing Project Team

### Project Team



### Support and Advice



# Introducing INTEP

www.intep.com

The screenshot shows the INTEP website homepage. At the top, the text "Introducing INTEP" and "www.intep.com" is displayed. Below this is the INTEP logo and a navigation menu with links for Home, Impressum, and Deutsch. A search bar is located in the top right corner. The main content area is divided into three columns. The left column contains a vertical menu with links for Company, Practice Areas, Projects, References, Clients, Career, Trends, Locations, and Contact. The middle column is titled "Projects" and features a grid of project images with a map of Canada in the background. The right column is titled "News" and "Downloads" and lists recent news items and available documents.



## Project Funding and Support

“Energy and Carbon Framework for High Rise Residential Buildings in BC”





## Vancouver v Zurich

	Vancouver	Zurich
		
<b>Population</b>	578,041	372,047
<b>Area</b>	115km <sup>2</sup>	92km <sup>2</sup>
<b>Electricity supply</b>	90% hydro, 10% fossil	60% hydro, 40% nuclear
<b>Heating degree days</b>	2,364	2,683
<b>Green Goal</b>	Carbon Neutrality	2,000 Watt Society
<b>Most Livable City 2010</b>	Number 4	Number 2



## US v Swiss Comparisons

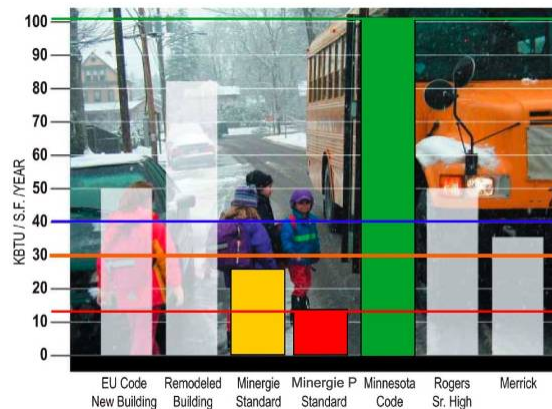
(in this case, schools)

**Today 100%**  
US/MN Energy Code  
315 kWh/m<sup>2</sup>a

**-60%**  
LEED Platinum  
190 kWh/m<sup>2</sup>a

**-70%**  
Switzerland  
Mandatory Code

**-85%**  
Minergie-P Standard  
45 kWh/m<sup>2</sup>a



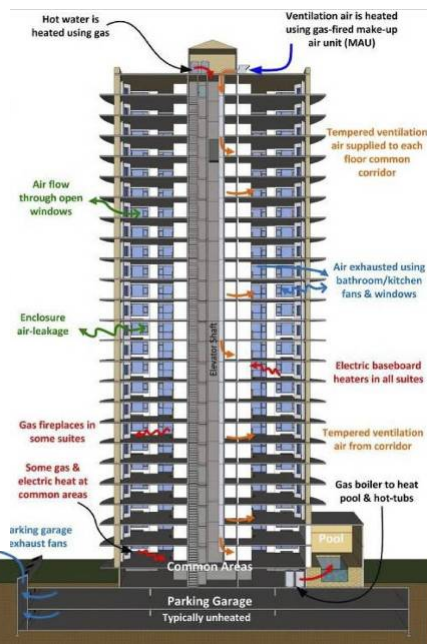
Source: INTEP  
Example,  
State of Minnesota,  
Educational Buildings

## Vancouver MURB Performance To Date

- RDH Engineering Energy Study for CoV (2011):
  - 220kWh/sm/yr
  - R2 walls
  - >50% suite heating from central HVAC
  - Deviation between best and worst x3

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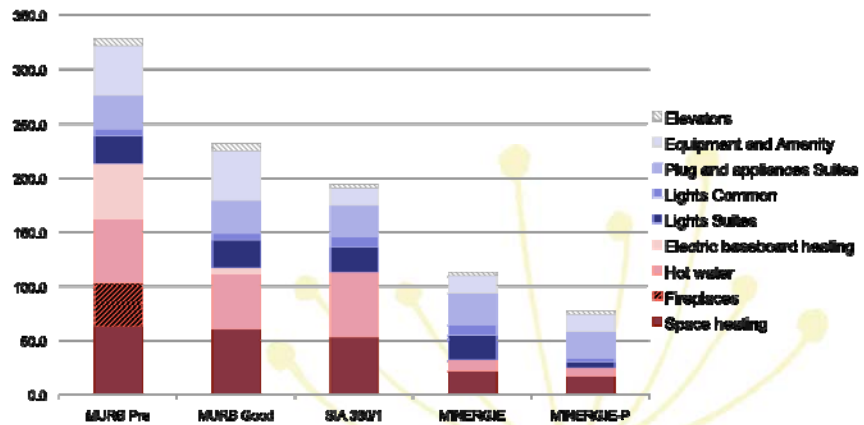
Courtesy RDH Engineering



# WHERE ARE WE GOING?

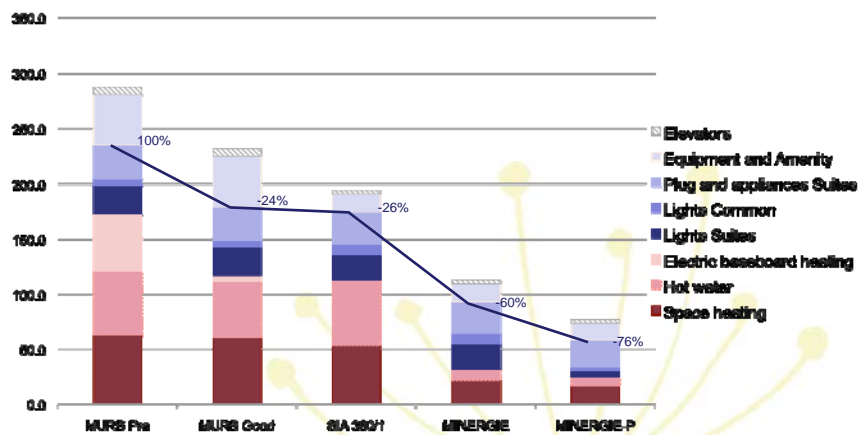
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## Primary energy consumption – Vancouver MURBs (Courtesy INTEP)



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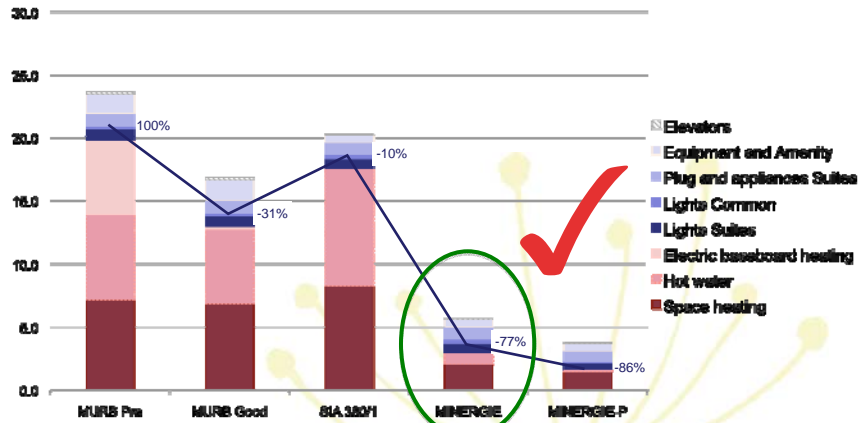
## Starting Point for Roadmap: will this get us there? (Courtesy INTEP)



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# Carbon emission reduction

(Courtesy INTEP)



50% reduction in electricity consumption (BC Hydro carbon neutral by 2020)

150% of heating energy (remainder to be provided by renewables)



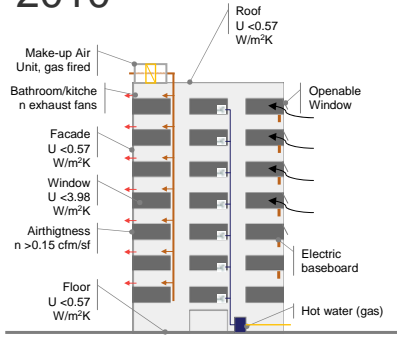
## WHAT WILL IT TAKE TO GET THERE?



# Building solutions 2010 – 2020

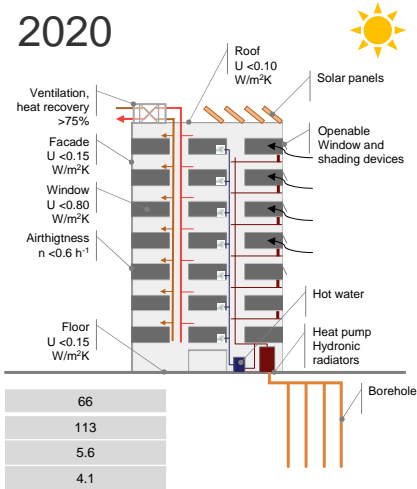
(Courtesy INTEP)

2010



Final Energy	[kWh/m <sup>2</sup> ·yr]	206
Primary Energy	[kWh/m <sup>2</sup> ·yr]	328
CO <sub>2</sub> -Emissions	[kg/m <sup>2</sup> ·yr]	18.3
Energy costs	[CAD \$/m <sup>2</sup> ·yr]	9.6

2020



Final Energy	[kWh/m <sup>2</sup> ·yr]	66
Primary Energy	[kWh/m <sup>2</sup> ·yr]	113
CO <sub>2</sub> -Emissions	[kg/m <sup>2</sup> ·yr]	5.6
Energy costs	[CAD \$/m <sup>2</sup> ·yr]	4.1

## Building envelope and services (INTEP)

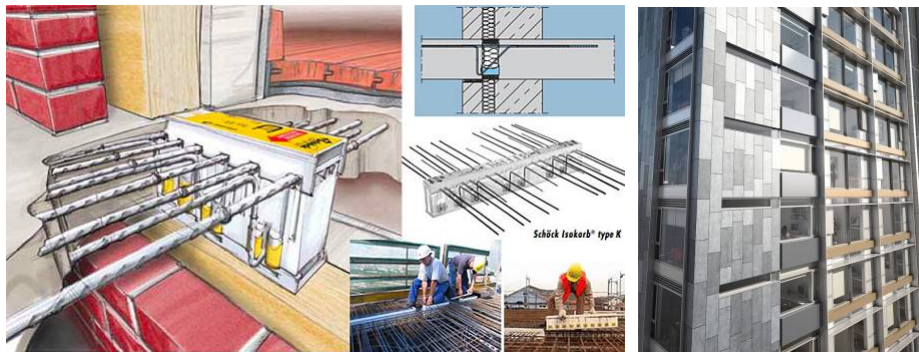
	MURB 2010	Good (Best) MURB	MINERGIE	MINERGIE-P
<b>Wall</b>	R-10 0,57 W/m <sup>2</sup> K	R-18.2 (ASHRAE 189.1) 0,31 W/m <sup>2</sup> K	0.15 W/m <sup>2</sup> K R-37.9	0.15 W/m <sup>2</sup> K R-37.9
<b>Window</b>	0.70 Btu/hrft <sup>2</sup> F 3.98 W/m <sup>2</sup> K	0.45 Btu/hrft <sup>2</sup> F 2.56 W/m <sup>2</sup> K	0,18 Btu/hrft <sup>2</sup> F 1.00 W/m <sup>2</sup> K	0,14 Btu/hrft <sup>2</sup> F 0.80 W/m <sup>2</sup> K
<b>Roof</b>	R-10 0,57 W/m <sup>2</sup> K	R-18.2 (ASHRAE 189.1) 0,31 W/m <sup>2</sup> K	0.15 W/m <sup>2</sup> K R-37.9	0.10 W/m <sup>2</sup> K R-56.8
<b>Air-leakage infiltration</b>	0.15 cfm/sf	0.02 cfm/sf 0.6 h <sup>-1</sup>	?	<0.6 h <sup>-1</sup>
<b>Hot water</b>	Central gas boiler	Central gas boiler and solar collectors	Heat pump and solar collectors	Heat pump and solar collectors
<b>Ventilation</b>	No heat recovery	Central HRV 90% In-suite HRV 80%	Heat recovery	Heat recovery
<b>Heating system</b>	MAU and electric baseboard	?	Hydronic radiators	Air heating system
<b>Lighting</b>	0.80 W/sf 8.6 W/m <sup>2</sup>	0.70 W/sf (ASHRAE 90.1) 7.5 W/m <sup>2</sup>	9.5 W/m <sup>2</sup> 0.88 W/sf	6.5 W/m <sup>2</sup> 0.60 W/sf
<b>Plug and appliances</b>	0.55 W/sf 5.9 W/m <sup>2</sup>	0.52 W/sf 5.6 W/m <sup>2</sup>	A	A++
<b>Elevators</b>	100,000 kWh/yr (?)	50,000 kWh/yr (?)	?	833 kWh/yr*elev.

## 17 New Wakefield St, Manchester



- 33 floors
- Rental and student housing
- BREEAM rating "very good"

## 17 New Wakefield St, Manchester



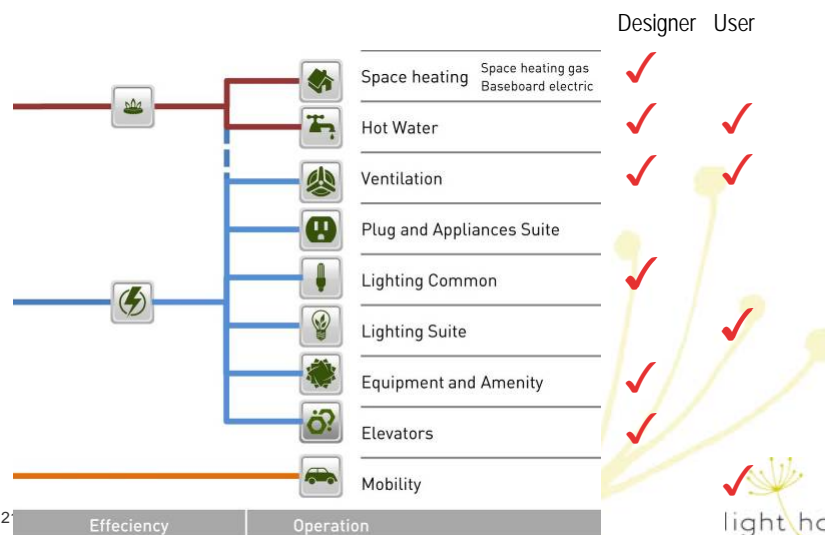
- Thermally broken balconies
- High performance envelope
- Costs need to be "Vancouver-ized"

# HOW WILL WE KNOW THAT WE'VE DONE IT?

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## Energy Consumption Drivers = Accountability Problems



## Rethinking Energy Efficiency Policy Tools (learning from the auto industry)



## Manufacturers Cannot Be Responsible for Users

Efficiency ratings have very little to do with actual performance

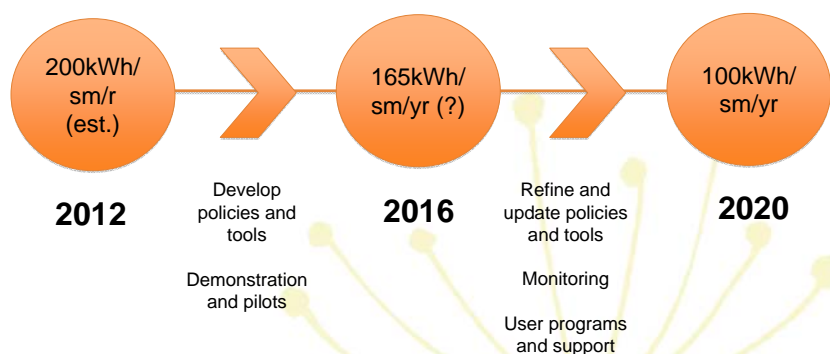


## The Ideal Energy Standard (simply speaking)

- Simple spreadsheet-based calculation
- Pre-agreed standard values for user-defined inputs
- Processed at time of building permit application with on-site compliance checked against drawings
- Air leakage test required
- Focus on envelope
  - Airtightness
  - Insulation
  - Effective whole wall performance
- Focus on systems
  - Heat pumps
  - Heat recovery
  - HRV's and mechanical ventilation

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## Suggested Timeline



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## Next Steps

### Phase 1 Deliverable: February 2012

- Baseline and target metrics described
- Case study models to be developed and cost impacts assessed
- Summarize results in road map 2020 report.
- Study peer review by Pembina and others
- Release findings via Light House Market Insights Quarterly Report (and other places)
- Coordination with ongoing City of Vancouver policy developments.
- Communication Plan, educational materials and support to BC municipalities via Pembina's Green Building Leaders initiative.
  - Phase 2: develop standards, tools and support.
  - Phase 3: other building types?

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Thank you

Questions or Comments?

Tracy Casavant, Executive Director, Light House

T: 604 677 3126 | E: [tracy@lhsbc.com](mailto:tracy@lhsbc.com)

or

Helen Goodland, Brantwood Consulting

T: 604 837 0383 | E: [helen@brantwoodreci.com](mailto:helen@brantwoodreci.com)

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