

Update on Research Relating to Energy Consumption by Duncan Hill, Canada Mortgage and Housing Corporation

Synopsis

Global concerns over energy costs, availability and security has placed a renewed and strengthened focus on energy efficiency across all sectors of the economy. CMHC and other organizations are responding by realigning their research to promote knowledge and understanding of the order-of-magnitude reductions in energy consumption that are possible through innovative design and construction coupled with on-site renewable energy sources. Duncan Hill will highlight where CMHC is directing its research efforts and provide an update on the CMHC EQUilibrium Sustainable Housing Demonstration Initiative. Progress of the participating teams will be covered along with some of the key strategies developed to build net zero energy Healthy Housing. Challenges and opportunities that some of the teams have faced will also be discussed.

Equilibrium
HEALTHY HOUSING
FOR A HEALTHY ENVIRONMENT

Energizing the Industry
BCBEC Conference
September 26, 2008
Duncan Hill
Manager, Sustainable Housing Policy and Research

www.cmhc.ca

Equilibrium Presentation Overview

- Context
- The EQUilibrium Initiative
- Features of the EQUilibrium Home
- The 12 Demonstration Projects
- What we're Learning
- Future Directions

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Equilibrium Presentation Overview

Confluence of Factors

- Climate change
- Climate related disasters
- Urban sprawl
- Pollution
- Rise in energy costs


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CMHC's Equilibrium Initiative – Context

We could do better

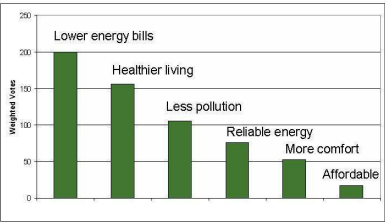
We can do better

We need to demonstrate how




CMHC's Equilibrium Initiative – Context

In 2006, CMHC market research established housing preferences:




Category	Weighted Votes (approx.)
Lower energy bills	200
Healthier living	150
Less pollution	110
Reliable energy	80
More comfort	70
Affordable	30




CMHC's Equilibrium Initiative

Equilibrium is a national residential design-build-demonstration initiative developed by CMHC that :



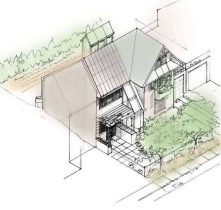
- brings the private and public sectors together; and,
- provides a vision for sustainable housing and communities.



CMHC's EQUilibrium Initiative

The EQUilibrium Initiative is developed around six core performance objectives:

- occupant health and comfort;
- renewable energy production;
- energy efficiency;
- resource conservation;
- reduced environmental impact; and,
- affordability.



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CMHC's EQUilibrium Initiative

Costs for an EQUilibrium house are expected to be more initially but are:

- partially offset by reduced operating costs (?);
- reflected in an increased resale value (??); and,
- expected to decrease as demand for EQUilibrium housing increases (?).



Riverdale NetZero Project
Edmonton, AB



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CMHC's EQUilibrium Initiative – The Energy Strategy

Using readily available commercially proven techniques and technologies, the EQUilibrium Initiative will develop housing choices that :

- Reduce the homeowner's energy needs to a minimum
- Produce as much energy as it consumes
- Can be applied to a variety of housing models
- Grid connected.



Inspiration: The Minto EcoHome
Ottawa, ON



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Features of an EQUilibrium House

An EQUilibrium house incorporates:

- climate-specific design;
- Passive solar design for space heating and natural daylighting;
- energy and resource-efficient construction methods, materials and appliances; and,
- integrated renewable energy systems.



EcoTerra™
Eastman, QC

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EQUilibrium Demonstration: Key Features

Passive Solar Design

- Windows designed and located to optimize passive solar heating - 35-40% of total heating energy and natural daylighting
- Thermal mass to store heat, even out temperature
- Site and building features control solar gains in summer
- House orientation optimized on the site

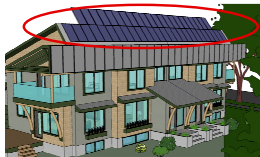
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EQUilibrium Demonstration: Key Features

Solar Photovoltaic (PV) system

- Grid-interconnected; no battery storage
- Meet most household needs
- Can sell or deliver excess electricity back to grid



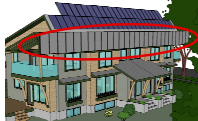
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Equilibrium Demonstration: Key Features

Active Solar Water & Space Heating System

- very efficient flat-plate or evacuated tube solar thermal collectors
- Vertical tilt optimized for location
 - eliminate winter snow cover
 - maximize winter gain and reflected snow
- Water storage
- Back-up heat supply



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Equilibrium Demonstration: Key Features

High Performance Building Envelope

- Air tight building envelope
- (0.5 AC/H at 50 Pa.)
- R-24 under slab insulation
- R-100 ceiling insulation
- R-56 double walls



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Equilibrium Demonstration: Key Features

Natural and Recycled Materials

- Materials chosen with:
 - Low embodied energy
 - Cleanly manufactured, sustainably harvested
 - Low transportation factor
 - High recycled content and recyclable
 - High durability

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Equilibrium Demonstration: Key Features

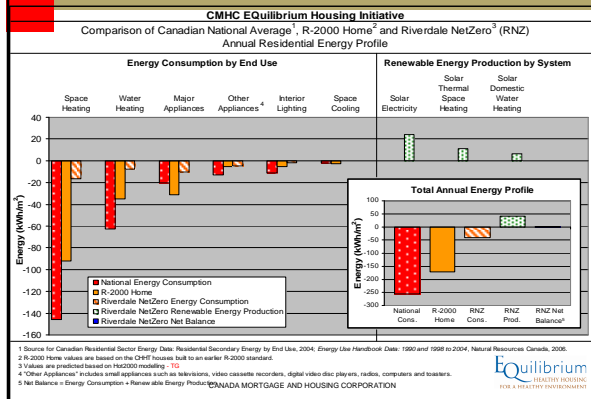
Healthy Indoor Environment

- Heat Recovery Ventilation
- Reduction/elimination of pollutant emissions
- Natural lighting
- Provisions for occupant comfort

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Equilibrium Demonstration: Riverdale NetZero



Benefits

For a homeowner, the benefits of an Equilibrium home are:

- low monthly utility bills;
- healthier space;
- Opportunity for reliable supply of uninterrupted power;
- resilient housing
- greener choice for the environment; and,
- a sound investment.



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Benefits

For a builder, an Equilibrium home is an opportunity to establish a reputation for building affordable, premium homes.



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Benefits

For a community, the benefits of an Equilibrium development are:

- Reduction of infrastructure
- Reduction of costs
- Healthy & liveable communities
- Land, water and habitat conservation
- Protection of existing ecosystems



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The 12 Demonstration Projects

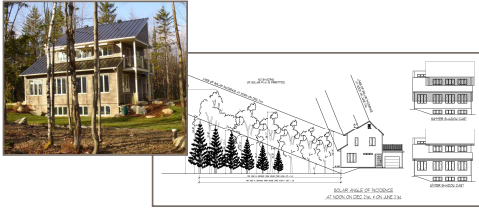


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The 12 Demonstration Projects

ÉcoTerra™: A two-storey detached home Eastman, QC



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Equilibrium Demonstration: ÉcoTerra

Factory Integrated, Modern, Modular Construction

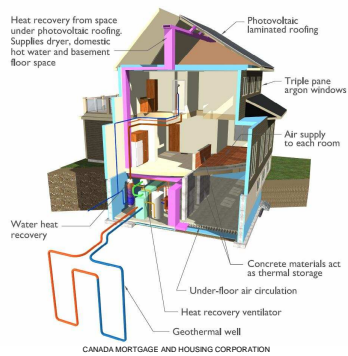
- Six modules, including a technical "pod" in the basement and a PV/Thermal solar roof module



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Equilibrium Demonstration: ÉcoTerra



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The 12 Demonstration Projects

Inspiration - The Minto EcoHome:
A single family home
Ottawa, ON



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The 12 Demonstration Projects

Inspiration - The Minto EcoHome:

Envelope Insulation

Roof R-60
Walls R-44
Basement Walls R40
Basement Flr

Airtightness 1 ACH@50Pa



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The 12 Demonstration Projects

Inspiration - The Minto EcoHome:



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The 12 Demonstration Projects

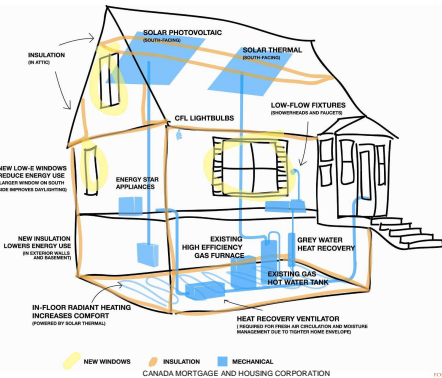
The Now House™: A retrofitted 60 years old wartime house Toronto, ON



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The 12 Demonstration Projects



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The 12 Demonstration Projects



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The 12 Demonstration Projects

The Now House™:
A retrofitted 60 years old wartime house
Toronto, ON



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The 12 Demonstration Projects

Riverdale NetZero Project:
An energy-efficient duplex
Downtown Edmonton, AB

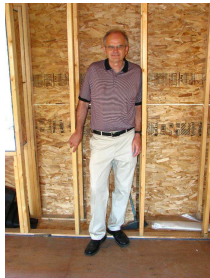


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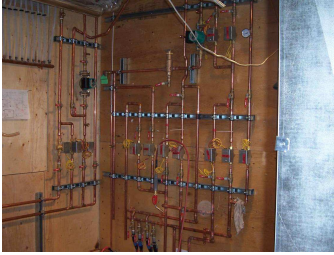


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The 12 Demonstration Projects

Riverdale NetZero Project:
An energy-efficient duplex
Downtown Edmonton, AB



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The 12 Demonstration Projects

Avalon Discovery 3:
A single family home
Red Deer, AB



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The 12 Demonstration Projects

Avalon Discovery 3:
A single family home
Red Deer, AB



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The 12 Demonstration Projects

The Laebon CHES Project:
An energy-efficient bungalow
Red Deer, AB



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The 12 Demonstration Projects

The Laebon CHES Project:
An energy-efficient bungalow
Red Deer, AB



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The 12 Demonstration Projects

Top of the Annex TownHomes:
Three energy-efficient townhomes
Downtown Toronto, ON

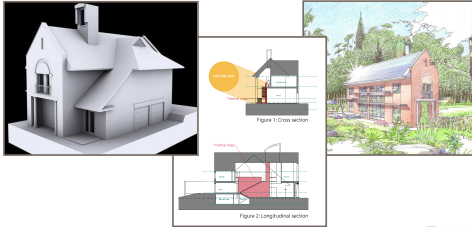


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The 12 Demonstration Projects

Alstonvale Net Zero House:
A single-family detached house
Hudson, QC

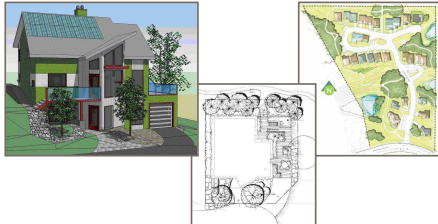


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The 12 Demonstration Projects

Echo Haven:
A complete community of 25 healthy, low-impact homes
Calgary, AB



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The 12 Demonstration Projects

Abondance le Soleil:
An energy and resource-efficient triplex

Verdun, QC



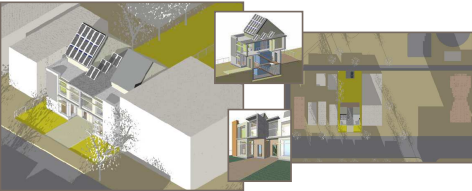
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The 12 Demonstration Projects

Urban Ecology:
An infill project

Winnipeg, MB



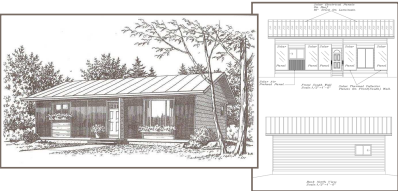
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The 12 Demonstration Projects

YIPI! Net Zero Footprint Housing:
A durable infill-ready house

Prince Albert, SK




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Construction – Demonstration - Monitoring

- Builders will continue to build their projects
- Demonstrations – up to one year
- Performance Monitoring by CMHC
 - Energy
 - Water
 - Indoor Air Quality
 - Occupant and Builder Survey
- Reporting


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Challenges in Delivering EQUilibrium Housing

- Lack of technical support for design, construction and systems integration
- Lack of skilled trades – renewable energy and advanced construction techniques
- Regulatory hurdles – PV interconnection, water reuse
- Cost


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Opportunities in Delivering EQUilibrium Housing

- Heightened attention on rising energy costs/energy security
- Consumer reaction has been promising
- Builder interest is growing
- Governments at all levels recognizing the need to address residential energy consumption


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Future Directions

Community (or clusters) approach

- to extend the vision/scope of sustainable housing
- to capitalize on economies of scale to reduce cost
- to amplify the impact of household level achievements
- to centralize operating and maintenance
- to remove element of risk from the household level



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Future Directions


Near Net Zero Energy Homes?


Focus on building capacity to deliver mass sustainable housing

More collaboration to make it happen

Follow our progress at www.cmhc.ca

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