Ratepayer Panel
Home Energy Evaluations

NFAT

April 24, 2014

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What form can a home energy evaluation take?

- Online or print questionnaires completed by homeowner
- Phone or in person interviews
- In-home reviews/inspections by energy advisors
- + detailed data collection and energy modelling
- + blower door (airtightness) testing
- + infrared cameras, other diagnostic tools

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What are we evaluating?

A home energy evaluation may review (and sometimes rate) the energy efficiency of a home taking into consideration:

1. Building envelope

2. Mechanicals

3. Base loads (electricity for lights, appliances, phantom loads, etc)

4. Occupant Behaviour

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Potential range of objectives of a home energy evaluation

- Rate or compare house performance to similar housing stock
- Mandatory ratings for existing or new homes
- Identify/prioritize energy saving opportunities
- Quantify energy saving opportunities (ROI, payback, etc)
- Identify components eligible for rebates, grants or special programs
- Solve specific problems related to home performance (high energy bills, IAQ, comfort, durability)
- Size heating and cooling equipment

Important: A home energy evaluation is NOT a home inspection!

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ERS ("Energuide Rating System") Evaluation

- An energy evaluation program developed by Natural Resources Canada
- Helps homeowners understand their current energy use
- Identifies ways to make homes more comfortable and energy efficient
- Quantifies and prioritizes energy saving opportunities
- Includes a report and label that provides the energy efficiency rating of the house (EnerGuide Rating)

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ERS Evaluation (continued)

1. Energy Advisor walks through entire house, data collection (insulation levels, windows, mechanicals, assembly dimensions)

2. Blower door test to measure (and locate) air leakage in home

3. Computer modelling of home “Base Case” in HOT2000 software

4. Modelling of potential upgrades based on identified opportunities and “House as a System” principles

5. Creation of Homeowner report and EnerGuide label

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ERS Evaluation (continued)

Compares house performance, not occupant behaviour

Standard operating conditions:

- Four occupants (2 adults and 2 children) present in the house 50 % of the time
- Temperature set-point of 21 ^{o}C for the main floors,19 ^{o}C for the basement and 15 ^{o}C for heated crawl spaces
- Consumption of 225 litres of DHW per day
- Electrical consumption (lights and appliances) of 24 kWh per day
- Total minimum monthly ventilation rate of 0.30 ACH during the heating season (October through April), including both natural and mechanical ventilation
- Regional weather data averaged over last 30 years

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ERS Evaluation (continued)

"House as a system"

ERS Evaluation recommendations based on "house as a system" approach – 30 years+ of Canadian building science expertise (e.g. IAQ), 15+ years of housing energy evaluation data collection

All the individual components of the house are interlinked, and a change to one component may affect the operation of the other components and the whole system.

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ERS Evaluation (continued)

A Certified Energy Advisor (CEA):

- Is certified by NrCan Classroom and field training, mentorship, exam
- Is familiar with regional building practices and challenges
- Understands building science principles and “House as a System” fundamentals
- Is neutral: not favouring or selling any fuel source, technology or product;
- Carries out ERS evaluation to serve/protect home and homeowner/occupants and
- Makes recommendations in the house, homeowner, and occupant’s best interest.

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Ratepayer Panel Homes

We performed ERS evaluations on three homes at the request of CAC Manitoba and the MMF.

1. A 1912, 570 s ft2 bungalow on a dug-out basement in Winnipeg's Weston neighbourhood with one occupant. Emergency/temporary electric heat with electric DHW, no ventilation.

2. A 1998, 1450 ft2 bungalow on a conditioned (heated) crawlspace in community of Cross Lake. Electric forced air furnace heat with electric DHW, HRV ventilation.

3. A 1970+, 1220 ft2 bungalow on an unconditioned (unheated) crawlspace in Duck Bay. Combined wood and electric heat with electric DHW, no ventilation.

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Weston Residence

ENVELOPE

Intermediate attic insulation (~R32)
~R10 mineral fibre insulation in wall cavities
Uninsulated crawlspace
Older original wood windows with metal storms
VERY high air leakage ~ 29 ACH @ 50 pa , 253 square inches of equivalent leakage area.

MECHANICALS

Electric space heaters being used throughout home in lieu of forced air natural gas furnace. Space heaters left on 24/7 in basement to protect pipes from freezing
Electric hot water tank in (very cold) dug out basement
No ventilation

BASE LOADS

Two very old, very inefficient fridges
Minimal lighting and other electronics/appliance loads

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Weston Residence recommendations, opportunities and challenges

1. Manitoba Hydro's AEP would cover costs of insulation upgrades in basement and attic, complete/with significant air sealing outcomes.

2. Under AEP, fuel switch to condensing NG forced air furnace $9.50/month x 5 years – cost almost certainly covered by energy savings

3. Structural issues in dugout basement need to be rectified before energy upgrades can be carried out. Home may need some other urgent repairs to ductwork and/or electrical to make these upgrades feasible. (HRAP?)

4. Replace older fridge(s) with Energy Star model(s).

5. Install bathroom exhaust fan

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Weston Residence analysis

EnerGuide Rating = 62
Upgrade Potential = 75

ERS modelling predicted annual energy bill ~$2840
ERS model predicted modelled upgrades would result in 32% reduction in energy use, $1210.00 annual savings

Actual energy bill January 2013- January 2014 = $1594.00

Entire home was not being heated to 21 C – homeowner reported much lower temperatures probably 10-15 C and only in occupied rooms; One occupant, low base loads, low DHW consumption

Reconciled non-ERS run predicts slightly more energy use (but transfer to NG), 15-20% $$ savings (but house now safe, comfortable) at 21C.

~ $200.00 yr or ~15% savings at today's energy rates.
Electrical portion of energy bill drops from ~$1600 to ~$500

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Cross Lake Residence

ENVELOPE

R40 Attic
R20 walls
R20 PWF crawlspace
Triple glazed wood windows
Airtight (1.82 ACH @ 50)

MECHANICALS

Electric forced air furnace
Electric DHW tank
Heat Recovery Ventilator

BASE LOADS

~16 yr old fridge,
High occupancy
Higher electrical loads (electronics, lighting?)

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Cross Lake Residence recommendations, opportunities and challenges

1. Repair/replace and commission HRV, review operation and maintenance with homeowner or band council
2. Repair/replace OSB header/exterior sheathing as required
3. Ensure crawlspace floor poly cover is in good condition and sealed
4. Air seal and insulate crawlspace header to minimum R20
5. WES installs?

7. Cold climate air source Heat pump?

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Cross Lake Residence Analysis

Energuide Rating = 73
ERS model predicted annual consumption of 43760 kwh, $3226/yr
Predicted savings = 14% or ~$430/year

Actual consumption April 2013 – March 2014 = 56253 kwh, $3821/yr

Higher occupancy, more electrical baseloads, much higher DHW consumption, and perhaps open windows in winter due to no ventilation may explain why actual consumption is higher than predicted.

No functional ventilation in home (HRV not operating due to no maintenance) causing risk to building and to occupants (IAQ, mold and mildew, high humidity, asthma)

Evidence of building envelope damage in crawlspace header (rotten, wet, disintegrating OSB). High RH in home (measured at 65%) , deterioration of wood windows.

CCASHP: Reduce heating loads by ~40%, ~$850 savings

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Duck Bay Residence

ENVELOPE

R20 attic insulation

2x4 R12 walls (recently re-sided)

Uninsulated crawlspace, unheated

New, vinyl, dual-glazed windows

Moderately leaky, 8.69 ACH @ 50 pa, 148.5 in2 equivalent leakage area

MECHANICALS

2 wood stoves (one newer, one older) + supplemental electric space heaters used.

Electric hot water tank

No ventilation system

BASE LOADS

Two large, older chest freezers, newer fridge

Modest lighting and other electrical loads

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Duck Bay Residence recommendations, opportunities and challenges

Although house not considered very airtight, high relative humidity in house from unprotected crawlspace, high occupancy, disconnected dryer vent, and absence of ventilation systems, coupled with colder surfaces (ie low insulation levels) = higher indoor RH, mould, poor IAQ

1. Seal crawlspace floor, air seal and insulate crawlspace (AEP?)
2. Air seal and insulate attic from R20 to R50 (AEP?)
3. OPTIONAL: Exterior Insulation (HIP). Opportunity to add rigid insulation missed when exterior retrofit was recently performed, may still be worthwhile as a durability (mould resistance) and comfort measure.
4. Replace 2 freezers with Energy Star freezer(s)
5. AEP/WES Installs (showerheads, CFLs, etc)
6. Re-connect dryer duct to outdoors
7. Upgrade older wood stove to airtight, EPA certified wood appliance (if wood heat)
8. Add a balanced mechanical ventilation system (HRV) to maintain IAQ

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Duck Bay Residence Analysis

Difficult to model and guesstimate energy usage (type/output and cost of wood, level and fluctuation of house temperatures, frequency of woodstove use).

Energuide rating = 48, predicts annual operating cost ~$2960, (with ~$2000/yr for electricity)

Potential annual energy savings with R10 exterior insulation: 37%
Potential annual $$ savings with exterior insulation $1067 (~60% of total savings being electricity)

Potential annual energy savings without exterior insulation 27%
Potential annual $$ savings without exterior insulation $772 (~60% of total savings being electricity)

IAQ and durability improvements considerable!

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