

10 Simple Things That Don't Really Do Much

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Presented by: Michael Blasnik, M. Blasnik & Associates
michael.blasnik@verizon.net

1

Free Energy Advice...Overpriced?

- Major National Energy Group with technical expertise:
 - Seal air leaks... around exterior windows and doors
 - get the most "bang for the buck" by hiring a professional to tune up their furnace, repairing ductwork, and investing in a high-efficiency furnace fan.
 - right-sized heating equipment
- Major National Green Group with technical expertise:
 - When ... at home, keep the thermostat at ... 62°F or lower in the winter.
 - Common leaks occur around windows, doors, and other wall penetrations. Plugging those leaks with weather stripping and caulk can be a simple task for anyone! Savings: Reduce your energy bill by \$100 per year or more!
 - Tune Up Your Heating and Cooling (HVAC) System: Have a checkup for your HVAC system every 2 years to make sure it is running efficiently. Be sure to clean the filter monthly during times of peak usage; a dirty filter can significantly reduce the efficiency of your HVAC. Savings: Reduce your energy bill by \$100 per year or more!
 - Air Filters (costing about \$30 a year) could save you about \$100 a year if you change them every three months, according to the XXXXX (found in national new org. web site -- expertise spreads)
 - No mention of Insulation in their list for greening your home

2

More Free Advice...

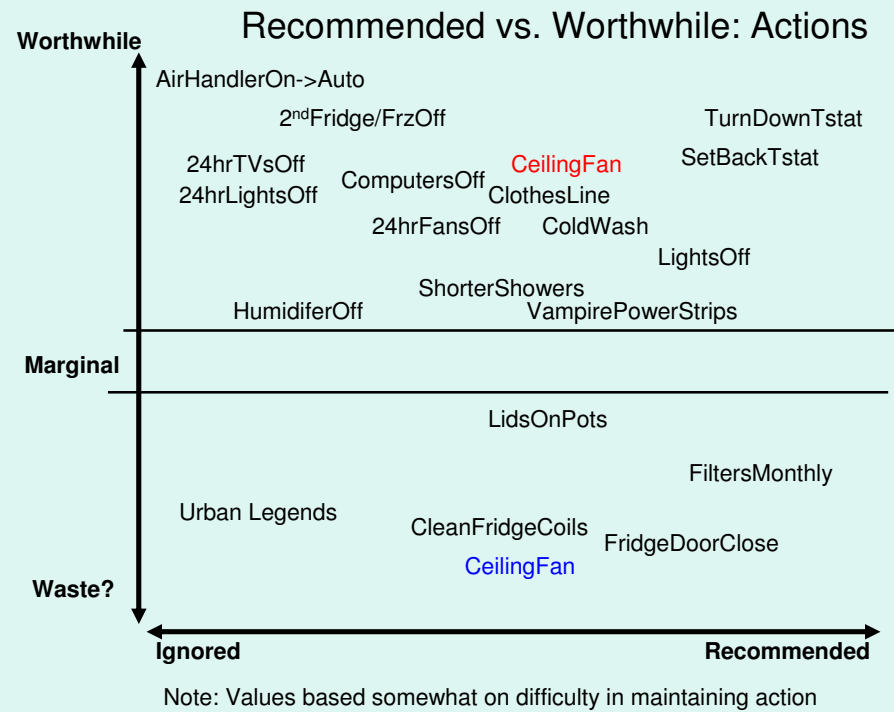
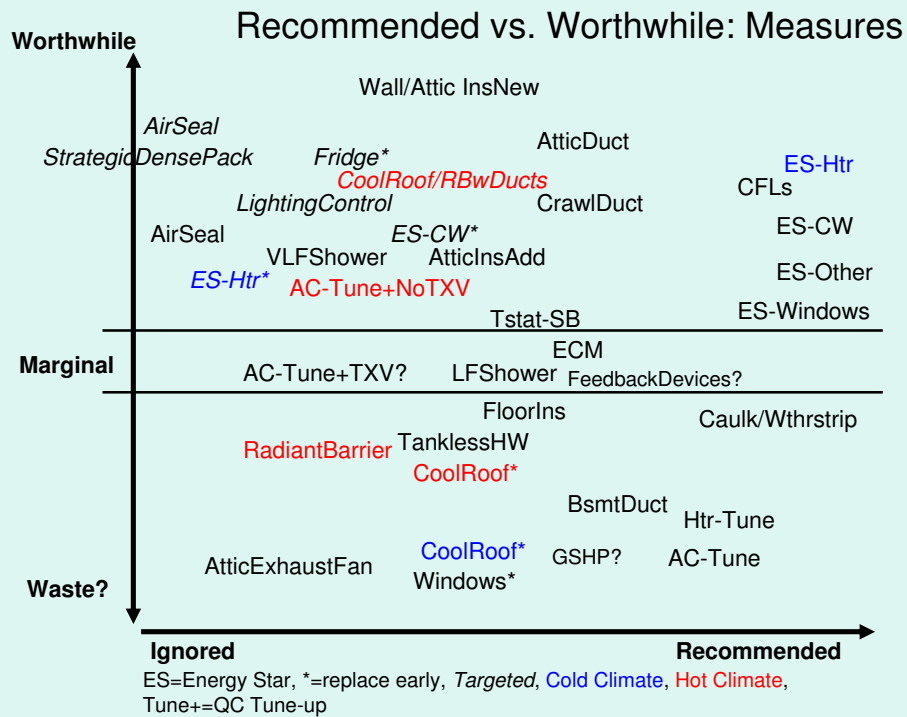
- Utility Companies
 - professional "tune-up" of your heating system should be part of your household's annual check list.
 - especially important to caulk windows and weatherstrip around door frames.
 - Seal leaks in air ducts : save between \$116 - \$194 per year.
 - Install low-flow showerheads : save between \$60 -\$100 per year
- Other energy savers touted:
 - High efficiency furnaces with ECMs
 - Tankless water heaters
 - Cool Roofs
 - Energy Star Window Replacement
 - "Energy Education": clean refrigerator coils, cook with lids on pots, close fridge door quickly
 - Energy saving ceramic paint! (Parade Magazine Sep 15, 2007)

3

Some Key Questions

- Actual Energy Savings?
 - Program Evaluation Often Limited/Poor
 - Projected/Deemed Savings
 - overstate savings unless adjusted with measured results
 - useless for learning about program or technology
 - Measured Pre/Post Usage Analysis
 - w/ comparison group and many homes, not just econometrics
- How Applicable to Target Audience?
 - Problem: doing what **can** work, where it doesn't
 - Climate, usage, existing conditions or behaviors
 - Rare savings opportunities need clear caveats
- There is a Cost...even for "free" behaviors
 - People make trade-offs in picking what to do
 - Prioritize, or people cook with lids, but keep 2nd fridge
 - People get skeptical if advice doesn't produce results

5



Furnace Tune-ups

- Few studies have measured savings
 - ORNL found no clear increase in SSE from tune-ups
 - *“The approach of tuning-up all units as a standard practice or for liability reasons is costly, probably unnecessary, and likely does not produce energy savings in many units.”*
 - Ohio 1994 WAP found no savings
 - savings= -4±12 th/yr, cost ~\$200/unit
 - N.E. Oil tune-up program: -13 gallons/yr
 - appeared to do better if unit hadn't been regularly cleaned
 - Cost ~\$110/unit
- Systems with savings potential apparently too rare to make it worthwhile as general advice
- Maybe tune-up every 4 or 5 years, unless problem?
- Still need safety check if retrofitting homes

Air Conditioner Tune-ups

- Generic Tune-up: no evidence of savings
 - Researchers have found more problems in regularly serviced units
 - Most HVAC technicians don't know how to measure air flow or charge
- High Quality Tune-ups: show promise
 - Average savings of ~10% of HVAC may be feasible if charge and air flow adjusted based on careful measurements
 - May not be worthwhile if TXV system (many new models)
 - recent study in cool climate found no EER change of TXV units but 8% average increase in non-TXV. A few large improvements have big impact
- Only recommend if
 - High quality well-trained contractors (and QC) available, and
 - Cooling use high enough to be cost-effective (or known problems)
 - and, perhaps only for non-TXV systems
- Still.. most people will achieve little, if any, savings

Furnace Filters

- Replacing furnace filters frequently?
 - No measured savings, but often included in tune-ups, which haven't been shown to save energy
 - Dirty filter reduces fan kWh some (except if ECM)
 - recent study found many small ACs (2 ton) have too much air flow and reducing flow improves efficiency
 - Dirty filter works better at cleaning air
 - **Very** dirty filter can cause cycling on limit (heating) and could reduce efficiency of air conditioner
 - more a problem if air flow is poor to begin with
- Replace once or twice per season OK?

11

Basement Duct Sealing

- Duct Sealing: record of 8%-15% savings
 - Found in places with attic and/or crawlspace ducts
- Basement duct sealing savings just 0%-3%
 - Studies in OH, PA, etc.: heating savings <3%
 - may be worthwhile if costs low or targeted to big leaks
- Why low savings? Basements are “inside”
 - Large living space connection, waste heat from equipment
 - Acts as pre-heater for infiltration
 - Occupants don't want them cold (laundry, playroom, etc)
- Recommendations
 - Don't bother trying to measure leakage
 - Only fix disconnects and big leaks
 - Look harder if the basement is warmest room in winter
 - Fix return leakage if negative pressure in basement

13

Save on A/C by Cooling Your Attic?

- Attic Exhaust Fans, Radiant Barriers, “Cool Roofs”
 - If attic is well insulated, save little energy...
 - Unless ducts are in attic, then may save ~15% of cooling load
- Powered Attic Ventilators
 - Can increase usage by sucking house air into attic, safety?
- Radiant Barriers
 - Great if attic ducts, OK as low cost DIY project in hot climate
- Cool Roofs
 - If R-30 attic, save 1¢/ft²/yr in Pittsburgh, 6¢ in Miami (using ORNL DOE calculator)
 - Payback as retrofit is likely longer than measure life
 - Cool roof lasts longer, esp. white coatings on flat roofs
 - If roofing anyway, cool roofs are a good idea in hot climates

15

Floor Insulation

- Savings from Wx evaluations
 - Savings (th/yr): OH=0, IA=6, NJ=21, CO=39
 - Most results from mobile home crawlspaces
 - except Ohio: basements saved least, non-mobile home crawlspaces may have decent savings but cost are high
- Why?
 - Basements – similar to ducts
 - Basement is “inside”, heat loss regained
 - Crawlspaces – similar reasons
 - Living space connections often large
 - Ducts losses can be large, but help condition space
 - Vents not very leaky, infiltration pre-heater
 - Fairly high cost makes not very cost-effective (perimeter insulation cheaper with same savings?)
 - Most worthwhile if well vented, minimal duct losses, cold climate

16

Caulking & Weatherstripping

- Why do we still see this listed? By leading energy and green organizations?
- Repeat after me....
 - Attics, basements, crawlspaces, garages and details are the real air leakage problem areas
 - Routine weatherstripping and caulking is likely to reduce leakage by <10% and save <3%
 - Canadian study fixing “leaky” windows found 6 CFM50/window reduction (worth ~½ th/yr savings)
 - Savings will be unnoticeable in most homes
 - Effective air sealing using a blower door is ignored -- due to infrastructure or ignorance?

18

Window Replacement

- Fortunately, most reputable sources recognize that replacement isn't cost-effective...
- Savings still often overestimated
 - Heating: reduced solar gain offsets about half savings
 - Savings ~0.2 th/ft², similar to wall insulation, costs 50x more
 - Savings higher if true single pane no storm (or jalousie windows), but too expensive for energy payback
 - Cooling: windows often half the load, good savings,
 - But still not cost-effective, try solar screens or window films?
- Window replacement: home improvement that may save energy, not energy retrofit

19

Tankless Water Heaters

- Reduces Standby Losses
 - Gas ~60 th/yr or electric ~500 kWh/yr, but expensive
 - some of losses may be useful gain in winter, opposite in summer
- Can Increase Water Usage
 - Takes longer for hot water to reach end use
 - Allows for “endless” showers (teenagers...)
 - Minimum activation flow can lead to odd waste
 - must run sink to get showerhead to activate water heater?
- Efficiency (EF) may be overstated
 - EF test method uses large water draws, but small draws lead to lower efficiency due to cold starts
 - True tankless EF may be ~9% lower than rated
 - But regular EF is overstated if water usage << 64 gal/day

21

ECM Furnace Motors

- Savings depend on operating conditions
 - High static pressure reduces PSC watts, increases ECM watts
 - Fan waste heat is useful in winter, harmful in summer
 - Real world has higher pressures, lower savings than ratings
 - “the total electricity savings are significantly less than projected using the DOE test procedure conditions” (Lutz et al, LBNL study)
 - WI study ~465 kWh/yr savings, but ECMs used ~2x rated kWh
 - ECMs may encourage fan “ON”, increasing usage
 - Contractors tout “so efficient, leave the fan on”, so more people do
 - WI Survey found ~20% of buyers switched to fan “ON” with ECM
 - If Fan ON really required, then ECM savings are huge (3000 kWh)
- True incremental costs hard to determine
 - ECMs usually only available on new high end 2-stage furnaces
 - Not clear if full upgrade is cost-effective (vs. 92% AFUE system)

23

Energy Feedback Devices

- 10%-15% savings often touted..
 - Major evaluation problems
 - studies often include other interventions (pre-pay meters, audits)
 - self-selection problems are common
 - some studies found no savings, dismissed as bad approaches
 - HydroOne (2006)
 - 382 homes (+42 control), often cited as “7% to 10%” savings
 - actual study claims 6.5% savings
 - questionable econometric approach yields: 1% if electric heat, 17% if elec. HW, 5% if just baseload? Key coefficient not significant.
 - FSEC Study (2008)
 - 17 homes, self-selected sample, 7.4% savings (\pm 5.7%)
 - detailed end use audit and energy education in each home
 - motivated households with high usage produced most savings
- Real savings unknown, but may be cost-effective even if savings much lower

25

Actions: Many Trivial

- Change furnace filters monthly
- Use ceiling fans in winter?
 - drafts vs. stratification: no evidence of benefit
- Close drapes winter nights
 - if no seals, may enhance convection currents and losses
- Close refrigerator door quickly
 - total use from **all** door openings <50 kWh/yr
 - Put bottles of water in fridge? <0.1 kWh/yr
- Clean refrigerator coils
 - RGE 1989: avg. savings = -50 kWh/yr
 - 27 fridges, avg. 16 yrs, 10 clean, 12 dirty, 5 plugged (2 big savers)
- Cook with lids on pots
 - 10 kBtu burner x 4 min/pot x 2 pots/day ~ 5 th/yr
- Some people may do small impact things...but,
 - prioritize advice for most people or there are poor choices, frustration

27

Closing Registers to Unused Rooms

- *Register Closing Effects on Forced Air Heating System Performance*, I.S. Walker, LBNL 54005, 2003.
 - “The results of this study showed that **register closing led to increased energy use** for a typical California house over a wide combination of climate, duct leakage and number of closed registers. The reduction in building thermal loads due to conditioning only a part of the house was offset by increased duct system losses; mostly due to increased duct leakage. Therefore, the register closing technique is not recommended as a viable energy saving strategy for California houses with ducts located outside conditioned space.”

29

Some Useful Advice?

- Insulating uninsulated walls or attics
- Insulating poorly insulated attics if combined with air sealing
- Air sealing with blower door (and infra-red)
 - Strategic dense-pack may be especially useful on complicated older homes with kneewalls, split levels, porches, bays, cantilevers, etc
- Sealing ducts when in attics, crawlspaces and garages
- CFL lighting wherever feasible and accepted
- High efficiency appliances & systems
 - Replacing old inefficient equipment when usage is high: refrigerators, heating systems, clothes washers, air conditioners?
 - Selecting high efficiency when replacing anyway: heating systems, ACs (hot climates), clothes washers, dishwashers, dehumidifiers
- Actions
 - Lower thermostat, setback heat when not home
 - Get rid of unneeded end uses: second fridges, freezers
 - Turn off 24x7 things: air handler (huge savings), computers, fans

30