

Cut your Carbon Footprint by **85%**
and be Happier than Ever

April 19, 2018



Dedication

Ben and Nate:

May you see the year 2100 and smile.



The Times They Are A-Changin'

Come gather 'round people
Wherever you roam
*And admit that the waters
Around you have grown*
And accept it that soon
You'll be drenched to the bone
If your time to you is worth savin'
Then you better start swimmin' or you'll sink like a stone
For the times they are a-changin'.

Bob Dylan



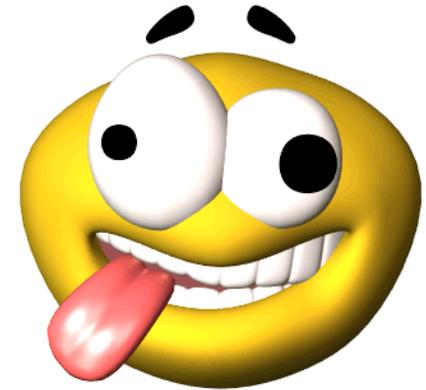
Why Cut Carbon Footprint 85%?

- ▶ Climate scientists: ↓ CO₂ emissions 80% by 2050, w/ sharp cuts soon, to keep temperature rise < 3.6°F.
- ▶ Temperature rise > 3.6° F: devastating.
- ▶ Americans must ↓ CO₂ >80%
 - poor nations can't ↓ as much.
 - world population to grow 2+ billion.
- ▶ I believe the science. I want to do my part--and still be happy.



The Definition of Crazy

Most strategies I use to cut fossil fuel use are “sensible.” Some might seem crazy.



But what's crazy???

- A 58° home in winter, wearing 6 layers of thermals?
Or...
- Letting our world fall apart?



My Own Experience

↓ fossil fuel use 83% between
1995 and 2016.

This chart shows my progress, in gallons of oil.



	<u>1995</u>	<u>2016</u>
Gasoline	1030	140
Oil for Heat	450	131
Oil for Hot Water	275	34
Electricity*	<u>63</u>	<u>0</u>
TOTAL	1818	305

*equivalent



Considerations

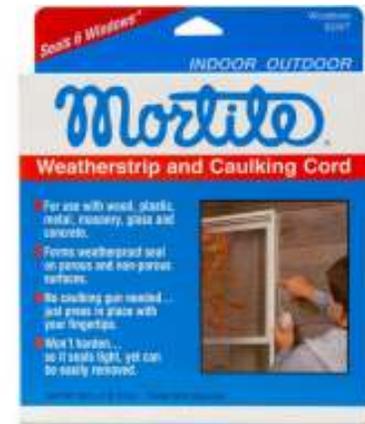
- ▶ I'm not an ascetic: I drive, live in 6-room condo.
- ▶ My point: we can sharply ↓ fossil fuel and still live well.
- ▶ Your circumstances call for similar and different strategies than mine.
- ▶ Below: strategies I use to cut carbon 85%.
- ▶ Handout provides more detail.



↓ Energy for Home Heating, 1

Air seal my home—over and over again

- Energy audits w/ blower door and infrared tests.
- ↓ air inflow: some professionally, some myself.
- Fireplace damper (!) and area around fireplace.
- Stove, dryer, bathroom vents.
- Doors: sweeps and weather-stripping.
- Windows: professional window restoration; putty; seal air pockets in winter.



↓ Energy for Home Heating, 2

▶ Air seal the home (continued)

- Recessed lights.
- Sealed off inner spaces of home—the space between the drywall.
- Rim joists.
- Floor perimeter.
- Pipe penetrations.
- Electrical outlets.
- Etc. etc. etc.



▶ Insulate

- Ceiling: R-50 insulation in the area I can access.
- Walls.
- Basement hot water pipes.
- Fireplace damper.
- Double pane windows for doors and basement.



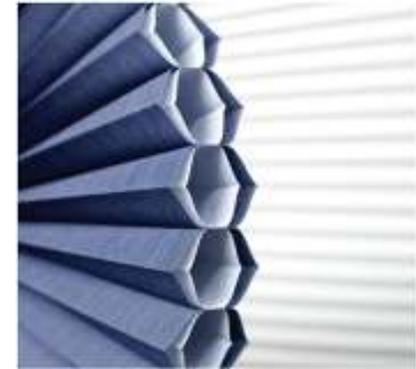
↓ Energy for Home Heating, 3

- ▶ Dial down in winter
 - Outfit: base layer: Under Armour 4.0 thermals; on top of that: other thermals; pile jacket and pile pants.
 - Daytime: starts at 62°; can drift down to 54° or lower.
 - Overnight: can go down to 48°.
 - 65° for guests.
 - I'm uncomfortable ~2% of time. I can live with that.
- ▶ Turn heat down further when I'm away.
- ▶ Programmable thermostat.



↓ Energy for Home Heating, 4

- ▶ Oil boiler: annual tune-up.
- ▶ Insulated honeycomb window shades that rest on sill; plastic on some windows, too.
- ▶ Aluminum heat reflectors behind radiators.



Energy Audits

Energy audits in MA: free, important, *mediocre*

- ▶ Auditors aim: identify good projects— not bring home to ideal level.
- ▶ Auditors don't bring best dx tools to initial audits; miss opportunities.
- ▶ My advice: get a 2nd and maybe a 3rd audit in subsequent years. Or pay for a thorough audit.



↓ Energy for Hot Water, 1

- ▶ I don't have hot water 24/7/365.
- ▶ I turn on boiler briefly 2–3x/wk to shower. (Not feasible for all boilers. Check w/ technician.)
- ▶ I often hand-wash instead of showering and hand-wash dishes in cold water. I run dishwasher ~ once every two weeks.



↓ Energy for Hot Water, 2

- ▶ Set water at 120°--must turn shower handle to extreme for sufficient temperature for hot shower.
- ▶ Don't let hot water run unnecessarily.
- ▶ Low flow showerhead.
- ▶ Faucet aerator.



↓ Electricity, 1

- ▶ Wind power from Mass Energy!
- ▶ Replaced old refrigerator (\$14/mo) w/ Energy Star refrigerator (\$4/mo). Let hot food cool before refrigerating it.
- ▶ Energy Star computer and monitor.
- ▶ Converted to fluorescents and LED's. From now on, only LED's.



↓ Electricity, 2

- ▶ Small Energy Star TV.
- ▶ Heat only amount of water needed for tea, pasta. Keep lid on pot.
- ▶ No a/c. Keep cool in summer by directing fan on me. Ceiling fan for guests.
- ▶ Lights and appliances: turned off when not needed.



↓ Gasoline

- ▶ Changed jobs. Commute went from 25,000 to 1,000 miles/year.
- ▶ Carpool more often.
- ▶ Driving dropped from 36,000 to 7,000 miles/year.
- ▶ Switched from Corolla (35 mpg) to Prius (50 mpg).
- ▶ Hypermiling ↑ mpg by 7%.
- ▶ Check tires 2x/month; fill them 4 lbs. > standard.
- ▶ Drive like a bicyclist.



↓ Energy Use in Other Areas

- ▶ Food: little red meat; ↓ cheese; ↓ milk; ↑ vegan meals.
- ▶ Airplane trips: carbon offsets
 - One year, I gave LED's to friends to offset my plane flights
- ▶ Fertilizer, pesticides emit nitrous oxide, a potent GHG; persuaded condo to eliminate pesticides.
- ▶ Reduce, reuse, recycle, compost.



Do These Changes Save Money?

Hell Yes!!!

- ▶ 1500 gallons/year x \$2.75/gallon
= \$4,125/year.
- ▶ Most energy efficiency investments: quick or reasonable (< 5 years) paybacks.
- ▶ Some projects won't fully pay me back, but I did them anyway: Prius, professional window restoration, insulated window shades, renewable energy.



Next Steps

- ▶ When Prius dies, buy plug-in car that gets ~100 mpg, or new Prius that gets ~60 mpg (with hypermiling).
- ▶ When oil-fired boiler needs replacement, buy a more efficient one or a heat pump. If I use a heat pump, and buy renewable energy, my heating will be carbon free.
- ▶ Best strategy I haven't taken: move to smaller home or get a housemate.



Lessons Learned, 1

My most important actions, in priority order:

- ↓ commute.
- Air sealed house.
- Insulated house.
- Turn off boiler most of the time / use less hot water.
- Replaced Corolla with a Prius.
- Dial down in winter.
- Eat little red meat, cheese and milk.
- Buy renewable electricity.



Lessons Learned, 2

- ▶ Measuring fossil fuel use spurs reduction.
What gets measured gets done!
- ▶ Thinking outside box led to ↓ hot water use.
- ▶ Energy efficiency tech gets better every year: cars, lights, appliances, heating, cooling, solar, wind.



Lessons Learned, 3

- ▶ Air sealing not done until ideal level achieved (for me: 1200 cfm); energy professionals don't plug every leak on 1st or 2nd try; do much myself.
- ▶ Every year I find new opportunities. One is never done cutting energy use!
- ▶ Changes haven't harmed quality of life. Some improved it:
 - work from home.
 - save \$.
 - fewer trips to gas station.
 - ↑ ceiling insulation, air sealing = ↓ ice dams.
 - less drafty house.
 - lights don't burn out.



Lessons Learned, 4

We can only reach 85% if we question our lifestyle.

We must turn “I can’t” to “I can.”

Some “I cant’s” I changed to “I can’s”:



- I need a clothes dryer.
- I won't spend more for renewable energy, Prius, etc.
- I need hot water available 24/7/365.
- I can't turn temperature down 1° more.



What About You?

How will you cut fossil fuel use by another 10%?

How will you get to 85%?

Let's start swimmin' so we don't sink like a stone!

Questions?



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