The most decisive actions of our life - I mean those that are most likely to decide the whole course of our future - are, more often than not, unconsidered.

Andre Gide

French critic, essayist, & novelist (1869 - 1951)

Building Diagnostics Newsletter

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Welcome to the newsletter. Since I have accepted that this will be a somewhat unevenly scheduled publication I am changing the way they are designated. I was going to a formal volume/issue format but it struck me as a bit pretentious. OK for Time, not for me. The format is simply going to be the year followed by the issue number and the month of publication. This way everyone will see how far behind I am in my goal of 12 annual issues.

This month I am venturing, with some trepidation, back into the world of math. Like it or not it's hard to live in this world without engaging in the occasional bit of addition.

I'm going to take a look at why electric heat may be the future (again) and why we should go through our cupboards and increase the amount of stuff in our landfills.

This Month's Topics: #1: The math and non math of uneven insulation

I like to peruse the energy related message boards on Linkedin and occasionally chime in. I particularly recommend the RESNET/BPI and the Building Science Community groups for a fairly high level of discussion.

One frequent contributor is Allison Bailes, founder of Energy Vanguard. His blog is recommended reading, not just for the quality of Mr. Bailes writing but often the comments are valuable and insightful as well.

Not too long ago the blog title was *Flat or Lumpy - How Would You Like Your Insulation?* Allison did a great job of explaining the math in a way that is clear and useful for those of us who find comfort and pleasure in an equation with properly placed parentheses.

Unfortunately I often find myself trying to explain this to people who like simpler mathematics. Like those of you who wrote me after my past forays into mathematical nirvana. Leading them through the process step by step might get some folks up to speed, but most are going to go into a deep MEGO condition.

I mentioned before that I'm on a constant search for simpler and catchier ways to explain some of the concepts we need to get across to building owners. I even try making them up occasionally, so I'm working on one for this. It is very rough and needs feedback for improvement or even abandonment. Join in with your response, I hope to have some improvements to share in a future issue. Here is the essence of my idea.

Let's say that there are two oil dealers in a city and each serves one half the city. Dealer R1 sells oil for $1.00 per gallon (sorry, this is pure fantasy) and dealer R10 sells oil for $10.00 per gallon. What's the average price of oil in the city?

*Well, 1 + 10 = 11, divide by two and the average price is $5.50 right? OK, except that for every gallon of oil that dealer R10 sells for $10.00 dealer R1 sells 10 gallons at $1.00. That means that for every 11 gallons of oil sold in the city the cost is $20.00. If I divide 20 by 11 I get an average price of $1.82 (*I rounded, hold your fire*). So ten times as much goes through R1 as goes through R10.*

Some questions for you: Is this any clearer than doing the math? Am I on the right track but need to clean it up? How? Change the analogy all together? Move to a monastery and cease inflicting myself upon the world?

As I mentioned before, anything useful that comes out of any of these exercises is "open source" available to all to modify and improve on.

Topic #2: What's Old is New Again, Electric Heat

I believe that I've mentioned before that I think energy modeling is an inherently risky proposition. But sometimes it can open your eyes to things that are counterintuitive. Like electric heat being cheaper than oil.

Recently I've run a few models that make the case pretty convincingly. My first thought was, naturally, that I had made a mistake. Amazingly that wasn't the case. So I had to look a little closer, my tool of choice was a spreadsheet.

Before I go on why don't you go down load the spreadsheet. It will illustrate my point and you might even find it useful.

You clever folks have probably figured out that that the electric heat I'm talking about comes from a heat pump. The electric utilities have been pushing heat pumps for several years now. Super high COP numbers make the delivered cost per btu really reasonable.

But the systems that have been encouraged here in New England have been ground source heat pumps. I've long had a basic philosophical aversion to gshp for one simple reason. They cost too gosh darn much (please note and appreciate the self censorship).

I've seen too many of these systems put into buildings with mediocre insulation and being called green. Sorry, give me the money that goes into the water side of the system (including the well!) I'll put it into an insulation/air sealing package that will out last two or three gshp systems. Here's a basic truism for you, insulation doesn't wear out.

Ok, gshp systems are out (wasn't that simple?) so what will work in our 7,000 – 8,500 heating degree day climate? Air source heat pumps of course. Lower initial cost, acceptable operating cost and the ability to provide heat to well below zero. Perfect! Er, not quite, there are still problems.

There are two basic approaches to this technology. The more traditional style using an exterior unit to feed a coil in an inside air handler to deliver hot or cold air via ducts. I am only aware of one company in that sector and they seem to be recently defunct. They had a good idea but seemed unable to get a handle on quality control. It's too bad because they

were a New England company and it would have been nice to have an American made product competing in the market. The better (IMHO) approach used by the likes of Mitsubishi, Daikin and others is the mini-split design which **eliminates ducts**. You have no idea how much I like that fact.

What are the drawbacks? The most obvious is that the heat output declines with the temperature. This requires careful design and equally important a high performance building enclosure. I won't make you suffer the math, but as you improve the insulation and airsealing the heating load and the AC load converge.

You still need to think about the need for supplemental heat, those couple of 20-30 degree below zero nights will make you mighty uncomfortable. There are some very good options, depending on your needs, wants and comfort level. You could look at wood, probably as a stove with external air supply. A natural gas or propane insert type fireplace might work. I don't like their efficiency but most models have the option of operating without electricity which makes them suitable for backup. If you're confident in your electric supply baseboard heat is economical to install and can easily supply enough supplemental heat in a high performance building.

The other major drawback is poor installation. High performance equipment requires high performance installation. I am frankly getting a bit sick of hearing installers complain about problems with high performance equipment when the problem is their own low performance. One successful installer told me that it wasn't that these systems are harder to install, it's just that you have to do everything correctly. Need I say more on that?

The final major drawback is cost. These things are less than geothermal but still pricey. It is especially frustrating because we in North America seem to be paying more for these systems than Europe and the far east. Skip Hayden of Canmet frequently talks about his relatives in Greece who sell basic systems, installed, for the equivalent of less than $1,500.00. I'm not an expert in global economics but something seems wrong with this picture. I'm confident that some trade official will discover the inequity and prices in Greece will rise.

The bottom line is that these systems make sense here in New England and even in colder climates. I understand that Scandinavia uses a lot of them. If someone would like to fund a research trip I would love to be able to supply first hand information.

The other reason I think these will help our future is because most renewable energy is going to be delivered in the form of electricity. Whether wind, concentrated solar, biomass co-generation or hydro the most practical way to get that energy from generation to use is through the electric grid.

So now we have another way of thinking about the way we deliver comfort into our buildings.

NOTE: I also know that the mention of hydro triggers thought in New Hampshire of the Northern Pass project. I will be discussing that soon. The opposition to the project is growing and I think there are a lot of legitimate questions about the 1.1 billion dollar cost and the environmental consequences. The interesting question is why is this project so important to the the parties involved. That will be a topic in the next newsletter. One of the bad guys in that story might be us.

Topic #3: Put the incandescent down and back away.

This comes under the heading of DUH! Some things are so blatantly obvious that they are easy to look right past.

For years when talking to people about switching from incandescents to CFL's people would say things like "I have all these old bulbs around, it's a shame to waste them. When these burn out I will, cross my heart, replace them with CFL's." I let this statement go by me for years without ever really thinking about it. Then I did. Double DUH!

The statement is dumb, but I was dumber for not even taking a surface look at it. If you have a product that, by it's use, causes waste and pollution AND there is a reasonable alternative, *throw it away!*

Yes my yankee frugality cringes at the idea, but disposal is the best alternative. In the example above the light bulbs had already been made and purchased. They are destined for the land fill anyway, if you run energy through them before you toss them you are adding to the pollution load on the planet. Don't buy them to throw away, but if you've got em, toss em.

If you can't stand the idea of disposal here's one more idea. Several years ago at a Christmas craft fair there was a young woman selling incandescent bulbs painted and dressed as various holiday characters. Again, don't buy new ones, but stealing them from friends fixtures and replacing them with CFL's might be OK.

Blatantly Commercial Content:

I do have to justify the time spent on this effort, so I am charging myself an exorbitant fee to sponsor this newsletter. I get one ad per newsletter and free coffee refills in the kitchen.

Business update: I continue to do a mix of residential and commercial energy consulting work; I'm looking for more of both. Please visit my website, http://www.buildingdiagnosticsnh.com/ for information on my capabilities and background.

I'm still always on the lookout for a good stinker of a building. Actually when someone calls and says "My building smells bad" I really get interested. So whether a bad smell or just too much energy use, give me a call.

Closing thoughts:

As mentioned above, I need feedback for this little venture to succeed. I would like to include notices for events that relate to energy, the environment and community building, so if you have any announcements please send them in to newsletters@buildingdiagnosticsnh.com. I also welcome rebuttals and amplifications for anything I write.

Please forward this to anyone who you think would like it, if you don't like it use the email address above to unsubscribe.

Thank you, I'll see you soon.