The Oil Drum: Campfire

Discussions about Energy and Our Future

Weathering the storm: making it through a natural-gas crisis

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The gas situation in a number of places world-wide isn't looking good. Britain especially has storm clouds looming; as production from the North Sea declines and imports fail to make up the difference, something has to give. The island cannot switch back to heating homes with coal; that door was closed some time ago. Cutting industry or commerce can easily make problems worse. If electric power generation loses, everything else collapses. This leaves home heating, but if people get too cold or damp, many will get sick and quite a few will die.

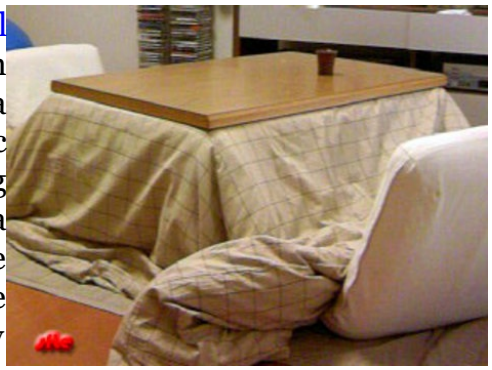
Spot the logical error in that last sentence?

I'll repeat it for those who missed it: "This leaves **home** heating, but if **people** get too cold or damp, many will get sick and quite a few will die."

People need to be kept warm and dry. Heating homes is the favored method in the West, but it's only one way to accomplish this. And having broken through that particular mental box, it's time to explore outside it just a bit.

Lessons from elsewhere

Other cultures have invented many ways of dealing with cold. The Inuit in particular mastered the art of living with dwellings that stayed around freezing at most. Their innovations were primarily in their clothing, which we can do just as well if we try. Polypropylene fleece, Thinsulate and other materials are up to the job of keeping people warm in extreme conditions outdoors, let alone houses heated to a lesser degree than we are currently used to. But I'm not going to suggest that we accept igloo-like conditions in the winter; we can do much better than that.



The Japanese kotatsu is another example. Dating to Imperial Japan, it warms a small area beneath a table and people sit with their legs under the quilted covering. Originally heated by a small hibachi burning charcoal, the modern version uses electric heat. The kotatsu minimizes energy requirements by reducing the area for heat loss; even if the quilt doesn't have a particularly high R-value compared to 6 inches of fiberglass, the area is small enough that little heat is required to keep the people warm while they're sitting still. I gather that heavy robes suffice while moving around and being active.

Kotatsu probably aren't a solution for western societies; people who aren't used to sitting cross-legged on futons will likely not adapt to them well, especially not if they are old and arthritic.

Further, a Western dwelling which is already somewhat insulated and in a wetter winter climate needs more than just heat; it needs reduced humidity, to keep the water vapor produced by occupants and activities from leading to condensation and mold. What could we do about this?

Lessons from our own past

In days past, homes were heated much less than we are used to. Upper floors had low ceilings to keep heat close to the people, and winter bedding was much warmer. People were often less comfortable, but they got by.

Another invention that's fallen by the wayside is the canopy bed. A canopy over the bed helps hold in body heat above the covers, helping to keep the exposed parts of the head warmer as well. Humidity and the need for fresh air limit how well heat can be held, but every bit helps.

What can we do with modern technology?

Suppose that there was broad knowledge, from the grassroots to the top of political leadership, that a natural-gas crisis was not yet here, but coming soon. To keep the economy and electrical grid running, priority would have to be given to those uses. Much of the difference would have to come from home heating. What could be done about it?

Suppose that a 2-bedroom condominium requires 7 GJ of gas per month to heat to 68 F (20 C), but only 3.5 GJ/month to heat to 50 F (10 C). This is sufficient to keep the pipes thawed. The remaining 3.5 GJ/month is 1350 watts of energy, 24/7! What could we do with a fraction of that?

First: *remember the past*. Some advances, like cogenerating furnaces, would take many years to retrofit widely. But how about canopy beds? Heck, how about plain old sweaters? Fingerless gloves? These responses range from inexpensive to close to free.

Second: *deal with people, not dwellings*. Instead of heating a whole house, heat one room. Instead of heating an entire room, just heat the people. If humidity is a problem, dehumidify (and recover the latent heat) but don't add extra heat.

Third: *pick appropriate technologies*. Kotatsu are bound to run into acceptance problems. But how about electric clothing? Widely used by motorcyclists and snowmobilers today, electrically-heated pants and vests can keep people warm even under very severe conditions. Fifty watts is a substantial amount of power for electric clothes, particularly if used indoors. Modern solid-state sensors and electronic controls can provide great flexibility and comfort at very reasonable cost in mass production. Even lower-tech: update the old canopy bed with aluminized Mylar "space blankets" to make it more effective.

Fourth: *address the problems specifically*. If the problem is cold bedrooms, maybe one solution is dropped ceilings with blown-in insulation and vapor barriers. If the problem is condensation on the bedroom windows because of the occupants breathing, maybe the solution is a canopy bed with a dehumidifier under it. Some heat from the condenser coil is required to keep the exhaust above its dew point, but the recovered latent heat could pre-heat air going under the canopy. A 10 pint/day dehumidifier could probably be run on less than 80 watts, using less than

1 kWh/day for the time it's actually in use.

Fifth: *make systems failure-tolerant*. For example, electric clothing that runs on 12 volts can be powered by the lighter jack in the car, a small transformer from the wall, or an emergency battery for power failures; people with electric clothing and a battery might be in better shape during power failures than people with central heat. This is not difficult or expensive to do, it just takes forethought. Failure tolerance makes problems escalate and cascade much more slowly, if at all.

How much would this cost? Probably not too much. A decent set of electric pants and vest appears to be $200-$300. Sweaters are much cheaper, and gloves can be had for under $10; right now I am experimenting with a pair of cutoff gardening gloves which I got for under two bucks. I'm typing this paragraph while wearing them.. Adding canopies to beds and building custom dehumidifiers to work with them (or dehumidifier armoires to dry outdoor clothing like coats and umbrellas) would cost more and require some new design, but 50 pint/day dehumidifiers are selling today for under $200. These measures could probably pay for themselves with the savings in fuel alone in a couple of heating seasons even at today's US prices. Would they be affordable in a nation in the grips of a natural-gas crisis? More to the point, could people afford not to use them? The ultimate "fix" is to retrofit everything to Passivhaus standards, but measures such as these would be a stopgap while the more expensive and time-consuming solutions proceeded as resources permitted.

What could we save? If half of all heating fuel is saved at a power expense of 50 watts per occupant, the hypothetical condominium with 4 occupants would save roughly 43% of its heating energy. If the electricity for the clothing and other equipment came from cogenerators, the savings would be approximately that much; if the electricity came from generating stations, it would be somewhat less. But any improvement in a crisis would help matters.

Conclusion

While there are natural-gas crises looming around the globe, the problems do not appear insurmountable. Our ancestors lived without amenities like central heat, and didn't have the materials or manufacturing capabilities we have today. Taking a few hints from the past to shape our own response, we can probably use cheap countermeasures to get through tight spells while we come up with something that works for the longer term.