What's wrong with energy conservation?

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A correspondent on Twitter has asked me to explain what is wrong with conservation policies, namely, if output stays the same but we use less energy, what's the problem?

The answer has to do with the fact that firms don't just use energy, they also use capital, labour and materials. If we enact policy to force down the firm's use of one input, it can lead to waste in the use of the other inputs.

This is best illustrated with a numerical example. Suppose a firm is going to produce 1,000 widgets, each of which will sell for $1. It will use capital (K), labour (L), energy (E) and materials (M). Suppose the relative costs per unit of each input are $4, $3, $2 and $1, respectively (just for illustration). And suppose there are four processes available, each of which will yield 1,000 widgets:

	K	L	E	M	Cost
1	100	50	50	25	675
2	100	50	25	25	625
3	75	60	30	30	570
4	120	70	20	25	755

Comparing processes 1 and 2, the only difference is that process 1 uses more energy. "Conservation" would tell us to use process 2, save energy, and save money. But economists assume that process 1 would never be considered anyway, or would immediately be ruled out by the firm because it costs more and yields the same output. So it's a trivial and uninteresting comparison. You could not justify a policy to force down energy consumption on the belief that there are lots of process 1's out there and business managers are too dumb to notice that process 2's are also available. Businesses succeed by choosing cost-minimizing strategies, and they put a lot of effort into identifying them. It doesn't mean they don't occasionally fail to notice a process 2, but it does mean that it is unlikely that such situations arise often enough to require government intervention, or that governments are good at identifying genuine option 2's from far away.

Now compare options 2 and 3. Option 3 uses less capital, but more labour, energy and materials. Overall it costs less. So the firm would prefer it to option 2. Would the rest of society agree with that preference? If the prices in the example are set competitively, then yes we would. Those prices indicate relative scarcity. In this case, it's an economy in which capital is scarce relative to energy. Capital ultimately comes from the pool of savings, and if that is in short supply, we are better off having the firm use a bit more of everything else and free up capital for other firms.

Now compare options 3 and 4. Option 4 uses relatively little energy—in fact the least of all the cases. But it uses a lot of capital (and labour). If the conservationist decides to force the firm to use

this option, it is true that the energy per unit of output is minimized, but it is actually the least efficient process overall because it costs the most. This problem wouldn't be fixed by paying the firm a $200 subsidy so the cost is reduced to $555, making it the "cheapest" for the firm. In fact that just exacerbates the distortion by increasing the cost on everyone else, to pay for a policy that wastes capital and labour, all for the sake of reducing energy consumption a little bit.

But the alert reader is probably unsatisfied with the idea that the prices are indicators of relative social value. OK, suppose power production and consumption create external costs. In the Canadian context, this is often stated rather glibly without recognizing how much we have spent to develop nuclear and hydro generating assets that don't create air emissions, and to reduce emissions from other power plants and the motor vehicle fleet since the 1960s.[1] Policies to reduce emissions associated with energy use *undermine* the rationale for energy efficiency rules or other conservation policies by making them that much more redundant. We end up paying twice for the same thing.

Nevertheless, let's say that energy is under-priced due to various air emissions. In other words we have a *pricing* problem. This will not be fixed by trying to manipulate energy consumption, but by correcting the price signal. Advocates for price measures (such as a carbon tax), if they are intellectually honest, must recognize that once we have fixed the pricing problem, the outcome may remain the same as before, and if so, we have to agree that that is OK.

So in our example, let's add a 50% tax on energy to correct the pricing problem. The table now becomes

	K	L	E	M	Cost
1	100	50	50	25	725
2	100	50	25	25	650
3	75	60	30	30	600
4	120	70	20	25	775

Option 3 remains the best one, even though it uses the most energy.

Of course this is just a numerical example, and could have been rigged to yield a different outcome. But the overall point is to answer the question about why conservation policies are unsound. The answer has two components:

1) Once firms have selected the cost-minimizing mix of inputs, forcing them to change that mix in order to reduce one particular input increases their overall costs, which means it is an inefficient use of society's resources overall.

2) If the problem is price signals are inaccurate, then we should fix the price signals. Conservation policies don't do that. And once we have done it, then once again conservation policies can only lead to inefficient outcomes.

[1] The improvements in Canadian air quality and reductions in air emissions can clearly be seen at yourenvironment.ca, which publishes official Canadian air quality records for communities across the country.