Reducing the Energy Demand

By R. Stephen Berry

CHICAGO — While industry and government search for ways to increase energy supply, policies for reducing energy demand lag sadly. Our reluctance arises partly from fear of the consequences of reduced energy use, which is due in turn to a lack of understanding of how reductions in energy demand can be achieved.

Whether we contemplate complete independence of imported oil or a more balanced way of responding to energy scarcity, reducing energy demand must be part of our energy program. Higher fuel prices alone make this a logical necessity, even with new energy sources.

Energy from new sources will cost more than what we formerly paid for oil or what we now pay for energy from coal and natural gas. The policy question is not whether per-capita energy demand will diminish—it will. The questions are how might we reduce energy demand, how our choices will affect the way we all live, and whether some options deserve extra stimulation by government.

We can identify and evaluate long lists of possibilities for energy savings using a tool called an engineering production function or more generally, energy analysis. This tells us how our energy requirements—and all other resource requirements—would change if we switched from one practice to another.

We now know one fact for sure: No single change will make a very large dent in the so-called national energy budget — that is, the annual total consumption of primary energy (fossil and nuclear fuel and hydroelectric energy). The aggregated data are compiled by the Bureau of the Census in its censuses of manufacturers, mineral industries and the general population.

We get a feeling for the largest possible effect an alteration could have, if pushed to its theoretical limit, by evaluating the example of doubling the average number of passengers in automobiles from 1.5 to 3.

This is illustrative because transportation is such a large factor in the national energy budget—about 25 per cent — with passenger automobiles contributing about half of that. Doubling the load would reduce the total budget by just over 6 percent. This then would represent a large reduction in the budget, probably more than we dare expect from a single change. Doubling the average gasoline mileage would accomplish the same saving, so long as we use cars as we do now. This could happen, but only over the ten years required to retire the present fleet.

Fortunately, there are many other ways to reduce energy demand. Recycling all the steel cans used each year would save nearly 0.15 percent of the budget—not much, it seems, until we translate that saving into eight 500-megawatt power plants that we would not need (based on the estimated 1975 national energy budget).

Recycling all the paper used each year could, in principle, save about 0.3 percent of the budget annually, equivalent to sixteen 500-megawatt plants. Recycling all the cars retired each year would reduce the budget almost twice that much, about 0.56 percent. And these figures include the energy required to collect and reprocess the used materials. Recycling plastics could offer significant savings, but only if each kind of plastic is separated from the rest — and the technology to do this is only now being developed.

Occasionally recycling is not a useful way to reduce energy demand. Glass containers offer significant savings by *reuse*, but only small payoffs by recycling. Figures from the University of Illinois imply that reusing all the glass bottles and jars in America about six times would reduce the national energy budget about 0.2 percent, equivalent to nine power plants.

But *recycling* those glass containers would save only the energy required to make the caustic soda used in manufacture of new glass, netting only about one-tenth as much. Recycling glass might be a good thing, but not because of its impact on the budget.

By making manufactured goods last longer, we can reduce energy demand. In the unlikely event that we make the average car last three times the present 10-year average, we would reduce the budget by about 1.1 percent (after including the energy required for replacement parts), equivalent to about 46 500-megawatt power plants.

We can reduce the demand for primary fuels by using waste paper and plastic (but not polyvinyl chloride) in place of coal or oil, as fuel. After all, paper and plastic, like coal and oil, contain trapped solar energy that can be released by combustion. If we used all our waste paper and plastic as fuel to generate heat and power, we would diminish the budget by about 0.23 percent. More important, this substitution could supply almost 3 percent of the budget.

If all the cement in the United States were made by the dry process, instead of some by dry and some by the wet process, the net reduction in the budget would be 0.12 percent. This change is feasible but exemplifies the problem of a long phase-out time that retards the change-over.

Supplying water would demand more energy. To compensate declining availability, we should reduce demand, use more energy-intensive processes to obtain "new" water and reuse that water more than before. Providing for our water needs now requires about 4 percent of the budget. If we are forced to desalinate on a large scale, supplying water will become one of the energy-intensive sectors of the economy, demanding 10 percent or more of the budget.

Thus, apart from problem sectors such as water, we see many areas where energy savings could be made, and the upper limits to the savings that could be achieved. Most are tenths of a percent of the budget. But we are finding hundreds of such savings in all the major energy-using sectors. And a 100 tenths of a percent is 10 percent. In other words, it is within our grasp to achieve a significant reduction in energy demand, easily more than 10 percent of the national energy budget, by small adjustments that only slightly affect our way of living.

R. Stephen Berry is professor in the department of chemistry and the James Franck Institute and a Fellow of the Center for Policy Study of the University of Chicago.