



# CONGRESSMAN'S REPORT

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House Office Building, Washington, D.C. 20515

Volume XII, No. 7  
February 14, 1974

*"Yes, we have no bananas, steaks, eggs, blue jeans, candles, gas, tennis balls, freezers, wheat, leather, air conditioners, fuel oil, pajamas, floor covering, sardines, chicken, paper, hot water bottles. . . "*

--National Association of Manufacturers poster

## Enter, An Age of Scarcity

As winter 1974 becomes spring, my days are dominated by this new dilemma that has come into all of our lives: the energy crisis.

Every day my demands are on many levels:

- \* Complaints that a growing Arizona is being asked to absorb more than its fair share of shortages.
- \* Pleas to end apparent discrimination against smaller Arizona communities such as Bisbee and Douglas.
- \* Requests for help by individual businessmen.
- \* The whole flood of mail with moods ranging from bitter and despairing to, occasionally, optimistic.

I spend long days on legislation seeking solutions to these problems -- for the short range, such as changes in gasoline allocation patterns; in the intermediate range, such as the strip mining bill which will set ground rules so coal production can expand and get us into the 1980s, and the long-term future, such as a \$20 billion energy research and development proposal, already passed by the Senate, which my Environment Subcommittee is working on now.

In all this whirl of activity, there's been little time for philosophizing or looking back. But we can't really deal intelligently with the future unless we grasp what happened these last 20 or 30 years and see how we got where we are.

Most often in my busy rounds, I'm asked two related questions: (1) Is the energy crisis real, and more importantly, (2) If it is real, how could this drastic shortage explode on us so suddenly and with such little notice?

Where, I am asked, were the economists, the oil company hotshots and our government leaders? Surely this couldn't happen overnight. Why didn't someone tell us it was coming?

Well, I think I did send up some clear warning signals in my speeches and newsletters over the last five years.\*

But to really answer these questions: is it real (and I believe it is) and why didn't we have more warning, I want to make three major points:

- (1) It happened so quickly because of something called "exponential growth."
- (2) It's sending shockwaves through the whole intricate, complicated, trillion-dollar machine we call the U.S. economy for a reason related to exponential growth: that is, in any complex mechanism, as ecologists have been telling us about nature, everything is connected to everything else. And when a complex machine gets overloaded, the breakdowns quickly feed through the whole system causing more and more breakdowns, one on top of each other.
- (3) These answers will lead to my final point: we should have learned from the sudden eruption of the energy crisis that there is a new and related one bearing down on us. It's called the "materials crisis." It is also real. And we should start getting better prepared to deal with it than we did with the energy crisis.

## **TWO KINDS OF GROWTH**

Let's see what we mean by exponential growth. Suppose, for example, that a small town has 1,000 homes. One hundred new homes are built each year, so in 10 years we will have built 1,000 new homes for a total of 2,000.

In most cases, this kind of growth can be handled. It is what we call "straight line growth." But let's contrast it with exponential growth.

We start with the same town and again we add 100

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\* "The Midwest oil shortage in a mild 1972 winter was not a one-shot accident, but rather, in all probability, a minor preview of the years ahead. For unless I miss my guess, gasoline shortages and electric blackouts will be our regular companions for the rest of the 1970s." - [May 4, 1973](#).

\* "If all the people of the world suddenly began using the same amount of petroleum products used by each American, all the known petroleum reserves would be gone in about six years." - [June 30, 1969](#).

homes the first year, 10 per cent of the total we started with. But this time, each year we add 10 per cent of the new base and get these results:

	Straight line growth		Exponential growth	
	Total	Added	Total	Added
Start	1,000		1,000	
1st year	1,100	100	1,100	100
2nd year	1,200	100	1,210	110
3rd year	1,300	100	1,331	121
4th year	1,400	100	1,464	133
5th year	1,500	100	1,610	146

So after the second year, the town would be growing faster than it would with straight line growth. Chances are, though, that the town could handle any problems the increased population caused. But if the population continued to grow at that rate, see what would happen later. By the 40th year, the annual increase would exceed 4,000 homes and the total would be more than 45,000, nine times what the town would have had with straight line growth. This rate of increase could give any city severe problems.

	Straight line growth		Exponential growth	
	Total	Added (each yr)	Total	Added (each yr)
10th year	2,000	100	2,593	236
20th year	3,000	100	6,725	611
30th year	4,000	100	17,444	1,586
40th year	5,000	100	45,244	4,113

The Greater Tucson area has grown at an astonishing rate. When I first saw it 40 years ago, Pima County had a population of only about 50,000. It more than doubled to 141,000 by 1950 and we managed that with very little difficulty. By 1960, we had gone to 265,000. There were some strains but we could handle them.

.But then the population went to over 400,000 by 1973, setting loose all kinds of deep conflicts and changes in our lives. Now we are told it will go to 800,000 by 1990. Thus, in the next 15 years, this unchecked growth rate will bring eight times more people into the Tucson Valley than were added in the first 200 years of its existence.

### WRONG ASSUMPTIONS ABOUT OIL

The same principle of exponential growth tells a lot about our current problems with oil. American cities were built and our economy over the last two generations was based on two assumptions:

- \* That we had an inexhaustible supply of oil.
- \* That it would always be cheap.

On the principles of straight line growth, these assumptions were justified. But add the new math of exponential growth and we have a whole new ball game for we live on a limited planet with limited resources.

In 1971, the U.S. produced from its own oil fields at a rate of 11 million barrels of oil a day. There is more oil to be found in the contiguous 48 states, new wells will be drilled in Alaska and more oil will be found off shore, but at the same time old wells will dry up. So the very likely prospect is that the 11 million barrel a day figure is the most we'll ever be able to produce. There's been some slight decline already.

We needed only five million barrels a day when we fought World War II, which was no problem. Our potential was much greater than that. But by the early 1960s, we had gone to 10 million barrels a day and were nearing U.S. production capacity. We passed that level of capacity in 1967, but Venezuela, Canada and the Arab countries were only too happy to sell us oil at low prices.

However, then projections showed that our consumption rate would go to 20 million barrels a day by the mid-1970s, 30 million by 1985 and 40 million by sometime in the 1990s. The entire increase in supply would have to come from Arab oil reserves and, sooner or later, we would be at their mercy.

From basic economics we know what happens next: supplies get scarce and what supplies we have get more expensive. Thus, the two assumptions upon which we based our economy -- abundant oil and cheap oil -- have popped like a bubble.

### **SHORTAGES ALL OVER**

But if that isn't bad enough, then we get into the problems of interconnections in our economy of which I spoke earlier.

One area where we can see this relationship clearly is electricity. For the most part, electric generators run on oil. Without oil, we would be faced with blackouts and brownouts. Without sufficient electricity, factories which produce basic commodities such as steel might have to close or severely curtail production and thousands of steelworkers would be unemployed or underemployed. Without steel, the building industry would be shut down and thousands more would be out of work. Finally, with all of this unemployment, stores would have fewer customers and thousands of sales clerks would have to be let go.

Relationships become even more complex in the case of the petrochemical industry which, in turn, weaves its way through a dizzying assortment of manufacturing processes and retail products -- everything from glue to transistor radio parts to antifreeze to plastic beach balls.

A related problem is the "substitution effect." Unable to get one type of energy, companies naturally turn to another -- and create more shortages.

One example right at home is the Tucson Gas & Electric Company. For years, TG&E has generated most of its electricity from natural gas. But natural gas supplies have been scarce lately so the company was forced to switch to fuel oil. However, now fuel oil is scarce, and the added demand that companies like TG&E have had to make has strained the supplies of oil even more.

### **ANOTHER STORM IS COMING**

The energy crisis would be enough of a challenge in itself. But as I mentioned earlier, there's another one on the horizon -- the materials crisis. And, as in the case of the energy crisis, it was brought about by exponential growth and the interlocking nature of the economy.

Already we can see symptoms of this crisis developing:

- \* Home builders are finding lumber harder to get.
- \* Shortages of wool, cotton and synthetic fibers are causing clothing prices to go up.
- \* There's even talk of rationing blue jeans.

At the same time, every day we're becoming more and more dependent on other countries for our supplies of basic commodities needed for the manufacture of industrial products.

Of the 13 minerals identified by the Department of the Interior as the most important, we are already more than 50 per cent dependent upon imports in six of them -- aluminum, manganese, nickel, tin, zinc and chromium. According to Interior Department projections, iron, lead and tungsten will be added to the list by 1985, and copper, sulfur and potassium by 2000. The only exception will be phosphate.

In addition, we're already more than 50 per cent import dependent on a number of other vital minerals -- mica, platinum, strontium, cobalt, tantalum, fluorine, titanium, asbestos, tin, bismuth, columbium, antimony, gold and mercury.

Actually, we do not absolutely have to import so much of these minerals. Of the 13 basic minerals, we have sufficient untapped reserves in 10 of them -- all but chromium, tin and tungsten -- to carry us well past 2000. The problem is that many of these reserves are difficult and expensive to get at. If we tried to extract these resources, prices would surely rise.

Even more disturbing is the thought that one of these "materials" in short supply may in the future be food, especially basic foods.

Why all this? Again, there is exponential growth. Not too long ago, the world's population was not large compared to the size of the earth. Standards of living were generally low, growth rates small, resources plentiful.

Then worldwide population began growing and the world became more crowded.

In addition, standards of living have increased. More and more of the world's population is unwilling to live at a subsistence level. This is what we call the "revolution of rising expectations" -- people see that life can be better and they want better lives for themselves. Therefore, demand for everything has gone up.

### **LIMITS TO SUPPLY -- INCLUDING FOOD**

Meanwhile, there is a limit to the potential growth of supply, the other side of the economists' charts. There may be ways to increase utilization of natural resources, but there's no way the resources themselves can be increased. The result will be, and already is, more people fighting for slices of the same pie. And the inevitable consequence is more shortages and higher prices.

We've already seen this process begin to work in the case of food. A few years ago we were talking about the "green revolution" and ever since childhood I've been hearing about the "limitless bounty of the sea." Both were supposed to end the threat of famine and ensure unlimited food supplies for all.

That's not what has happened. The green revolution has increased the supply of crops, but these increases are threatened by rises in population and the purchasing power of the population. We've also found out that the bounty of the sea has limits. It's already clear we're reaching the limits of harvesting fish from the sea with some species already disappearing and nations fighting over the best fishing grounds. Examples are the controversy between Britain and Iceland over cod and between the U.S. and Peru over tuna.

The food situation was brought home to us a year and a half ago when President Nixon made his disastrous wheat deal with the Russians. Not many years earlier, our farm states had thousands of silos full of excess wheat and other grains and the government was paying farmers not to grow any more.

But when the agreement was signed, suddenly there was a vast increase in demand, supplies dwindled and prices shot up. And it wasn't just the price of bread at your nearby supermarket that went up either. The excess demand for grains also created a decrease in the amount of feed grains available for raising cattle, so the price of meat went up too.

### **THE BIDDERS INCREASE**

Similar effects are occurring in other commodities. Up until now, getting imports of most minerals was no problem. Only the U.S. and a few European nations had high enough standards of living to be able to bid for vital commodities and there were plenty to go around.

But as in the case of wheat, there are now more customers. One notable customer is Japan, which has risen in less than 30 years from a beaten nation at the end of World War II to one of the world's industrial giants. However, the Japanese have few resources of their own and must import almost everything. (One example is cotton, much of it imported from Arizona.)

To a lesser degree, the same is true of a large number of other developing nations which are now competing in the world marketplace for basic commodities.

Up until now, purchasers of raw materials were in the driver's seat. The supplying nations were dependent upon them and had to cater to them. But because of increased worldwide demand, the situation has changed. The suppliers now will be able to call the shots.

So far, only the oil producing nations have used this situation as a weapon. The Middle Eastern states may have originally begun their oil boycott in order to bring pressure to bear against Israel to give up territory gained in the 1967 war. But the oil suppliers are using the scarcity to raise their prices, thus increasing profits and guaranteeing that they will have that much more oil still in the ground to sell for that much longer.

Will nations supplying other vital commodities follow suit, even nations which don't have external political priorities in common such as the Middle Eastern states? Already there are signs that they may do so.

One of the first cases may be bauxite, the basic ingredient in the manufacture of aluminum. The chief suppliers are Guinea, Surinam, Australia, Guyana and Jamaica. Recently Guinea invited the others to a conference. If they should decide, for example, that consuming nations should pay twice as much for bauxite, aluminum factories all over the world could be threatened.

The same situation could occur with other metals. If so, supplies would be scarcer and prices higher. And if we were forced to use our own mineral reserves, prices would go higher still.

Once shortages occur, we again have the problems of the interlocking economy and the substitution effect.

If bauxite is in short supply, for instance, we would have far more problems than just a shortage of aluminum foil. Can manufacturers would have to switch from aluminum back to tin. But if tin is also in short supply, there would be a shortage of cans and canned food companies would have a hard time getting food to consumers. In addition, plants would have to shut down or slow down and more people would be out of work.

### **NEEDED: AN AGE OF CONSERVATION**

All of this sounds pretty bleak and it is true we face serious problems ahead. But the situation is not hopeless. There are things we can do for now and for the future to alleviate the energy and materials crises and, in the end, actually turn them to our advantage.

I've already alluded to some of the things we should be doing, such as smoothing out fuel allocation patterns and finding new sources of power while safeguarding the environment at the same time.

But above all, we need to adopt a new ethic -- an ethic of conservation, of saving, of using everything to the maximum. We must realize that the resources of our tiny planet are finite. We must make every bit count. This will mean an end to the ethic of waste, the "throwaway economy," that we had for so many years when we thought our resources were never ending.

There are many ways we can conserve:

- \* We can "think small" -- small cars, small homes, small families, less consumption of resources and recycling wherever possible. We can turn away from bigness for the sake of bigness, growth for the sake of growth.
- \* We can plan our communities so that residential areas, shopping centers and public facilities, such as schools, parks, airports and sewage treatment plants, are placed where they can do the most good for the most people. One example of the maximization of our facilities is the development of mass transit to replace the private automobile as much as possible. One bus or one train car carrying 50 passengers is far more efficient than 50 automobiles with one passenger each. We've already started diverting monies originally earmarked for unneeded highway construction to mass transit construction instead. This trend should be accelerated.
- \* We can make maximum use of our resources, particularly agriculture. Once the sick man of our economy, it can now help save us. Farmers should be turned loose to produce as much as they can.

Such an ethic of conservation may sound impossible, but it isn't. Some families -- ordinary people like you and me -- are already making their own national conservation policy without the government telling them to. They're taking the bus to work instead of driving, trading in their big gas guzzler on a compact car, buying soft drinks in returnable bottles instead of throwaway cans, turning down their thermostats and agreeing to limit the size of their family.

The days ahead will not be easy ones, but if we resolve to adopt a new way of thinking and a new way of life, we can solve the problems we're all going to face.

A handwritten signature in black ink, reading "Mo Udall". The signature is written in a cursive, flowing style with a long, sweeping tail on the final letter.