

## Running on Empty Part II

Is there really energy crunch in America, or is it contrived? What are the real reasons why the price of fuel is rising? Is the situation getting worse? Is gasoline going to continue to be in short supply this winter? How high will prices go? This is the first of a four-part series that will explore the subject of gasoline and energy sources in general. It's based on a radio series "Running on Empty" that's currently being broadcast on public radio stations. (Please contact your local station for broadcast times)

### WHERE ARE WE NOW?

The symptoms of our current energy crisis are rolling blackouts in California, enormous home heating bills and soaring gasoline prices. Is there a relationship between these three? The issues involved with energy are so integrated within our culture and economy, and so complex, that it is difficult for the public, and experts alike, to make any sense out of them.

Dr. Don Kash, Professor of Public Policy at George Mason University in Virginia and author of several books on energy says, "The public simply can't get its head around this complex energy system. I make that comment with absolute confidence because I can't get my head around it. I mean, I still don't know anybody who can keep BTUs and calories and gallons and barrels and cubic feet and kilowatt hours and so on, all in their head in one way or another. And you know, I've sort of looked at this stuff for 30 years."

### TWO BASIC COMPONENTS OF OUR ENERGY SYSTEM

1. Resources—fossil fuels (natural gas, oil and coal) —and other natural resources used to produce energy.
2. Infrastructure. For a definition of this component, we quote Margie Tatro, Director of the Energy and Transportation Security Center at Sandia National Laboratories. "We describe domestic infrastructure as all of those systems in place to deliver goods and services to people in this country. The domestic energy infrastructure is that full suite of energy supply, production, delivery, and consumption components that exist in the United States in order to get energy to a point where people can use it for commercial or economic or personal gain."

Our nation's energy infrastructure is vast. For electricity, the infrastructure includes everything from extracting the fuels, to the power plants and transmission lines, to the billing system. For natural gas it's pipelines to pumping stations to the pipes that deliver the gas to your meter. And for oil it's the wells and production equipment, the super tankers, gigantic pipelines and refineries, and the trucks that deliver the gas and diesel fuel to filling stations. For coal it's the mines and mining equipment, and the coal trains delivering the coal to the power plants. It includes scientists, engineers, business people and technicians that run the systems, and even the educational system that trains them.

### HOW MUCH ENERGY DO WE USE?

Dr. Howard Stephens, a chemist involved in energy research for over 30 years, has the answer, "There are a lot of numbers here. But it takes a lot of numbers to describe the enormous amount of energy we use. 39% of our energy comes from oil. Americans now consume 7 billion barrels a year, and half of that is imported. 2/3 of our oil goes to transportation--cars, trucks, planes, trains and ships. Only 3% of the oil we consume goes into the production of electricity. The rest is used by industry.

"22% of our energy comes from coal. That's a billion tons of coal a year. If that amount of coal were on one train, it would wrap around the earth three times. 90% of that coal goes to generate electricity. Over half of the electricity we generate comes from coal. We produce all the coal we use, and even export some.

"Natural gas is the other major source of fossil fuel--about 23% of the energy pie. Each year that's 22 trillion cubic feet of natural gas. A quarter of our natural gas goes to generating electricity, and the rest for home, commercial and industrial uses. Until the late 1980s, we produced enough natural gas to meet all of our needs. However, now we have to import 16% of our natural gas.

"Energy from fossil fuels makes up 84% of the pie. The remaining energy we consume is made up from nuclear energy at 8%, and renewable energy—spread among hydroelectric at 3.5%, biomass—that's wood and waste also at 3.5%, and solar, wind and geothermal energy combined at 1%."

“Let’s put America’s total energy consumption on a more personal basis. We can calculate the energy equivalence of any fuel or energy source in terms of any other. Looking at our energy consumption in this way, on the average, a family of four would use 10,000 gallons of oil every year.” That’s the equivalent of using 27 gallons of gas in your car every day for a whole year.”

#### THE DILEMMA

Americans consume a huge amount of energy each year, ¼ of the world’s energy consumption. And we have the biggest, most reliable energy infrastructure in the world, or do we? Actually, the energy dilemma we face has to do with a mismatch of resources with consumption patterns, an infrastructure that can’t keep up with the intense demand. The symptoms of our current energy crisis are rolling blackouts in California, enormous home heating bills and soaring gasoline prices.

First let’s look at electricity. When someone turns on a switch, the power isn’t sitting somewhere out along the power line. The power has to be produced at that instant it is needed. To get some insight into how electricity works, we turn to Kurt Yeager, president and CEO of the Electric Power Research Institute in Palo Alto, California, who describes it like this “When we say instantaneous, we mean instantaneous in speed of light terms, microseconds and even smaller. That is... that’s the real challenge in electricity.”

“Electricity, by its nature, must be in absolute supply- demand equivalence every instant of time constantly. When it isn’t, the system collapses. And so maintaining absolute supply-demand equivalence at all times, and there’s no storage capability in effect in electricity so it isn’t a matter you can put stuff on the shelf and then kind of fill up the shelves periodically or fill up the tank. You have to produce it and use it instantaneously, at the same time.

Dr. Karl Stahlkoph, Vice President of Power Delivery for the Electric Power Research Institute says, “One of the things that many people probably don’t realize is that the electricity system in the United States from generation to transmission to distribution, is really the largest single machine, and probably the most complex, that man has ever made. It’s a single machine that delivers electricity all the way from British Columbia and Canada, down to Baja, Mexico and everything west of the Rocky Mountains is on one single, gigantic, electricity machine made up of generators, transmission lines, distribution lines and millions and millions of customers. And unfortunately we have neglected to keep the infrastructure of that machine up.”

Actually, California hasn’t built a new generating facility in 15 years, and most run on natural gas. And until recently, has been able economically import electricity from neighboring states.

Debbie Reed, the spokeswoman for the National Environmental Trust, says, “Natural gas supply is part of the crisis. What happened [is they] went through an extended period of time where natural gas prices were so low and demand was so low, that drilling for gas pretty much came to a very slow halt.” Suddenly there wasn’t enough natural gas supply to keep up with the demand.

Dr. Leonard Graham, director of the Strategic Center for Natural Gas at the National Energy Technology Laboratory in Morgantown West Virginia, says, “We had stopped drilling for a year or so, and the demand increased very rapidly. In fact, the new natural gas generators in a power system and electricity demand just continued to increase at a very high rate. There was very high demand, particularly in several regions of California, and they ran into a shortage of supply.”

“[Gas] drilling has really picked up. The problem is it takes about 18 months to two years before a field gets developed and you start to see that gas in the supply, throughout the country. Our proved reserves we have about in the neighborhood of 160 to 180 trillion cubic feet of natural gas. We have eight to ten years of proved reserves but that is also at a very low price.”

“That number was given at a price when gas was around three dollars. If you allow gas prices to rise to four, five or six dollars, then we believe that we can produce at anywhere from 12 hundred to 15 hundred trillion cubic feet of natural gas which then tells us that we can have something like 50 or 60 years of gas at the current rate of use.”

#### USE MORE COAL?

Decades of Department of Energy funded R&D has made coal much cleaner. Dr. Tom Sarkus, a Senior Technical Analyst for the Clean Coal Program of the Department of Energy's National Energy Technology Laboratory in Pittsburgh, says, "We are making coal cleaner, much cleaner than ever before, and we're continuing to make it clean. If you look at the statistics, total US emissions of sulfur dioxide have decreased by 11 million tons, or 35%, since the Clean Air Act was established in 1970, despite the fact that we consume nearly twice as much coal as we did then."

Cheap natural gas supplies have become scarce, leaving about our coal reserve as a natural alternative. Dr. Michael Karmis, Director of the Virginia Center for Coal and Energy Research at Virginia Tech University in Blacksburg, says, "The reserve is about 275 billion tons, with an overall coal resource estimate of something in order of 500 billion tons."

At our current rate of consumption of 1.1 billion tons a year, our coal will last for 250 to 450 years. The US has ¼ of the world's coal reserve, more than any other single country. With coal representing 95% of our proven fossil fuel energy reserves, with natural gas and oil, combined, a distant 5%!

#### THE FOUR-HUNDRED POUND GORILLA

Oil requires a complex infrastructure to deliver transportation fuel and other products. Our failure to couple our environmental policies with energy policies has resulted in no economic incentive to improve our infrastructure—which has been badly neglected. Proof is how, after stable fuel prices for 15 years, we're seeing gasoline prices increase dramatically.

In 1999 the average retail price of gasoline was \$1.22 a gallon. In 2000 it was 21% higher at \$1.48. At the end of April 2001, the price was \$1.63, 33% higher than in 1999. Geoff Sundstrom, AAA's spokesman, has tracked gasoline prices for AAA for ten years, says, "I think the most important thing is to look at what some of the constituent costs are of a gallon of gasoline. A significant part of the cost of is federal, state, and local taxes—about 30% on average. The cost of the crude oil might be another 40% or so.

Gas costing \$1.63 a gallon is made up from \$.65 for crude oil, \$.49 for refining, marketing and distribution, and \$.49 cents goes for taxes to the government.

"We all tend to watch the price of crude oil and immediately feel that if it goes up, the price of gasoline will quickly follow. That isn't always necessarily the case. The high gas prices we had last summer were certainly caused in part by higher crude oil prices, but our own environmental policies played a big factor as well."

#### BOUTIQUE FUELS

Dr. Dexter Sutterfield, Associate Director of the DOE's National Petroleum Technology Office, says that local blending adds more to the cost. "A boutique fuel is one that's designed for a specific area of the country, usually one city or one location. There are over 50 such fuels throughout the United States and these all require certain specifications that are different from the other specifications, or from national specifications. They result from that city or that state or that locality, agreeing with the EPA that this is what they will do to avoid being put on the dirty air list."

Cities that are required by the EPA to pump boutique fuels all have higher prices. Fuels are a commodity affected by supply and demand. When supplies are reduced by any breakdown of the infrastructure such as — small refining capacities and localized delivery to the filling stations—as in the case of boutique fuels—there's an increase in price. This explains why in many places you can cross the state line and see drop of more than \$.10 a gallon in gasoline price.

#### REFINERY CAPACITY

Dr. Sutterfield says, "Our capacity for fuels is just barely supplied by the refineries that we have. In fact, we are dependent on some imports, because there hasn't been a new refinery built in this country since 1978. So we're running essentially at all out capacity in our refineries today. We had a good picture of what happens when a refinery goes down, a couple of years ago, there was a couple of fires in California and they had to shut down about 150,000 barrels a day of capacity. California saw a 50 cent a gallon increase in their gasoline prices, until these refineries could get back online."

“The oil production within the United States has been declining at a fairly steady rate. At the rate that we use oil, about 20 million barrels a day, our crude oil within this country would last about 30 years—if we could produce all of it. Unfortunately we can’t produce all of it.”

“The US proven reserves of oil is on the order of 2% to 3% of the world’s proven reserves. The world demand is about 77 million barrels a day. And basically we produce, throughout the world, about 77 million barrels a day. If we lost 10 million barrels a day of production capacity for whatever reason, whether it’s OPEC shutting down or a war in some region or someone deciding to just close the spigots, I would estimate that it would be on the order of 75 cents a gallon at the pump.”

Remember the gas lines of the 1970s? Remember the war in the Middle East when OPEC turned off the oil spigot? Back then we imported only 35%. Now we import over 50%! But, what about our emergency supply—the Strategic Petroleum Reserve? According to Dr. Sutterfield, “The strategic petroleum reserve will make a very small impact on our fuel supply if we have to use it because we don’t have excess refining capacity to add fuel to the mix just because we get more crude oil.”

Dr. Dexter says, “By 2020 we expect that consumption to be about 117 million barrels a day. The biggest increase will be in developing countries like China, Africa, South America, places that are developing and have a lot of the resource. We will be hard pressed in the United States. We need to become more efficient. [Developing countries are] going to use their own resources. And so running on empty is a real term here. When there’s a demand for us and demand for the country where the crude oil’s being produced, I have an idea that we will be the ones that wind up on empty.”

***Running on Empty*** is available as a four-part series on 2 CDs, for \$29 from Vision Trust (a non-profit organization), PO Box 10423, Albuquerque, NM 87184