PROFIT =energy/carbon

Marrying investment profit with decarbonization

By: Robert Preston

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My objective is to focus attention on where the profit is in energy besides the commodity aspects of energy prices, due to economic waves of supply and demand. Let's first look at energy in its pure form as the probabilistic electrical photon, in the stored electron orbit of a chemical or the nucleus of the atom. With decarbonization occurring for over 300 years, this monotonic trend could suggest what's most likely in next business cycle.

Energy or hydrogen is in almost everything we see: trees, building materials, water and so on. The difficulty is to get a photon to bombard a chemical molecule to release its hydrogen so we can use its orbiting electron. All materials have this stored hydrogen as this is what bonds nature. Our best energy sources of hydrogen have bonded with carbon molecules. For example, there are 10 molecules of carbon for every one of hydrogen in wood. Coal has a 2 to 1 ratio. Oil is 1 to 2 and natural gas is written as "CH_4" or 1 carbon to every 4 hydrogen molecule.

Most everyone likes a wood fire, but it offers a low "income-to-effort" payoff where we can only get one hydrogen molecule for every 10 carbon molecules. As we look at some major resources for energy we can see that the path to higher hydrogen leads from wood, to coal, to oil and then to gas where we get—relative to wood—40 times more bang for our buck, or a lot less carbon.

Spatial density is one of the primary reasons energy systems have evolved to meet the growing demands of the consuming end user. Coal was easier to store than cords of wood. Oil was cleaner to burn in cities suffering from the black fog of coal. Gas can be shipped to your home by pipe instead of oil by truck delivery. A wire is smaller than a pipe. Energy density has been one primary driver of the fuels we use.

As our primary energy sources have gone from wood, to coal, to oil, to gas two related changes have occurred. First, the output per energy source has increased. Second, the carbon content per British thermal unit (Btu) has dropped. If we extrapolate this 300-year period into a straight line it may hit minuscule carbon levels by 2100. But will we ever get to a point where all Btus are, say, renewable and carbonless; in other words, a solar/nuclear economy? Is it possible to safely derive the enormous power of the atom? There may be no better predictor of the future than the past and many people believe we eventually will be carbonless. The varied opinion is when.

South Korea recently announced its intent to rid itself of all fossil fuels by 2050. That country will drastically reduce its carbon content in energy sources and accelerate decarbonization. Others suggest decarbonization will rise, but at a decreasing rate that will never reach zero.

Carbon Intensity vs. Economic Growth

Jesse Ausubel of Rockefeller University has compiled the numbers behind decarbonization and claims that since 1860 the reduction in carbon intensity of the world economy—historically about 1.3 percent a year—has been overwhelmed by growth in economic output of roughly 3 percent a year. The difference—1.7 percentage points—parallels the annual increase in CO_2 emissions, implying another doubling before 2030. So even if we continue on track, we could have excessive CO_2 emissions, which may result in climatic changes, such as the snow melting off Mt. Kilimanjaro.

But I believe we are using energy such that we are getting more gross domestic product per Btu. In other words, we are getting more out of any given energy source. I believe we will continue to improve the efficiency of energy and this has proven to be a profitable exercise that can also be incorporated in managing equity portfolios.

Consider that we have two energy economies: stationary and transportation. For stationary applications, weight does not matter as much as in the transportation sector. Liquid hydrocarbons

(oil) deliver instantly accessible energy with less weight than just about any other fuel. So transportation is where oil is a must.

Other, cheaper non-oil fuels dominate stationary demand, like coal. We have vast amounts of coal and uranium. We have and will continue to evolve a highly integrated fuel system that uses the right form of energy for the most appropriate application. For example, someone once said that using natural gas to produce electricity is like taking a shower in Evian water. That may be why T. Boone Pickens has advocated using more natural gas as a fuel and not for stationary applications or for electricity. Simply shifting the mix toward coal, nuclear and renewable energy and away from natural gas for electricity production would reduce our demand for oil as natural gas begins to power heavy trucks, delivery vehicles and buses which currently burn oil.

It is possible natural gas may come off the grid in the form of base load electricity and not compete with grid electricity for commercial and residential heating. But if we increase our dependence on coal for grid electricity then we might expect the decarbonization line to level out. On the other hand, if we think natural gas and hybrids will begin to replace oil in the transportation sector (and if we expect nuclear and renewable resources to take up the slack on the grid) then we may see acceleration along the decarbonization curve. In that case, we may conclude that investment opportunities may also come from these energy areas.

We could increase our production of ethanol tenfold and grow carbohydrates allowing farmers and engineers to convert them into hydrocarbons. And on top of all those new corn fields (say, around 40 million acres in the Midwest) we could construct wind turbines to increase our current wind capacity to 200,000 MW, or one-fifth total U.S. demand. The point here is to understand how the energy landscape could best develop and where the investment opportunities might present themselves.

Carbon-based organic molecules are a source of chemical energy in nature and with 1,000 square miles of trees you can only run a 1,000 MW power plant. The best fossil fuel with low carbon—gasoline—can move a 2,000 pound car 30 miles on one gallon. This represents a 35-times more efficient energy source spatially than wood. Uranium or thorium, on the other hand, amazingly has 2 million times the spatial energy of wood and carries no carbon. Thorium, a fuel expected to be used in a number of proposed nuclear power plants in India, is said to have—relative to uranium—little proliferation risk (no bombs) less radiation waste and is three times as abundant. (Plus, as a kid, I always liked those Thor comic books.)

Of course, best guess may be a combination of all of these scenarios supported by the history that the decarbonization vector will not deviate significantly. Through tattered clouds the stars resume their endless path.

Nature's Currency

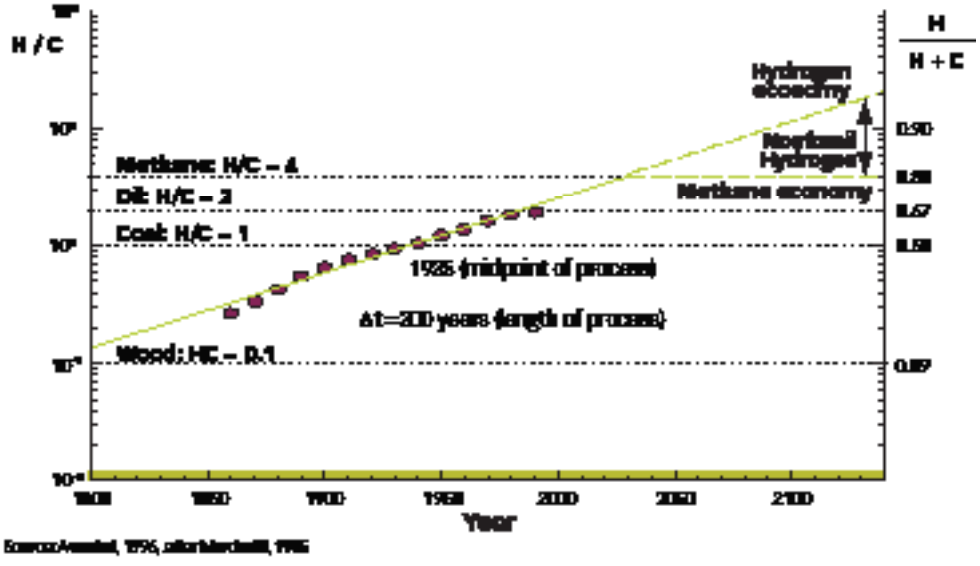
We may not use all of the oil and never fully develop Alberta's oil sands because of the emergence of new technologies. As natural gas supplies also peak, the next decarbonized energy carrier may be hydrogen from nonfossil sources of electricity. Hydrogen may result from splitting water with thorium and eventually from the sun. Clearly, the events along this decarbonization trend line will impact markets.

The stock market peaked in October 2007 seven to eight months before the price of oil peaked in mid-2008 before bottoming at around $35 late last year. Given its impact on the world's economies we should consider energy as the currency of nature. If we can understand energy, then we can improve our productivity. The point is, energy may be the most important metric for global economic harmony.

Can this energy-oriented approach be a competitive way to invest? I believe it can be. Historically, the investment implication of decarbonization (using energy with less carbon) has produced top quintile returns in stock portfolios over the last 10 years.

The investment implications are clearly marked. Decarbonization is a trend that will improve productivity and profits. How we get there can sometimes be volatile. As we know today, timing is important. But I am confident that the choices we make will be natural.

Decarbonization: Evolution of the ratio of hydrogen (H) to carbon (C) in the World Primary Fuel mix



Author: Robert Preston is Portfolio Manager PIA Program at Merrill Lynch for the Craigmillar Equity Fund. The Fund's investments are concentrated in companies whose technologies and processes support clean technologies and energy delivery efficiencies.