



INVESTMENT STRATEGY UPDATE

March 28, 2007

GLOBAL WARMING

What changes are taking place? Who will benefit? So begins our sector/theme-based investment approach. Given this orientation, we are well aware of the controversies surrounding global warming and of the long-emerging technologies of cleaner-burning alternative fuels. With changing weather patterns and drowning polar bears in the news, an Academy Award winning movie, and a U.S. president from the oil patch touting the virtues of ethanol, the discussions and rhetoric about global warming have been gaining momentum.

So we take the opportunity provided by this quarter's *Investment Strategy Update* to pass along our thoughts on the subject of global warming and, in the process, reinforce our query into how we might benefit as investors, and as private citizens. And, given the recent rise in stock market volatility, we conclude with a brief update on our financial market outlook.

The Facts

Global warming is a tough issue. While there is much agreement on its existence and causes, there is little agreement on its consequences or on who should foot the bill. Simply put, global warming is the observed increase in Earth's average temperature resulting from the excessive and growing concentration of greenhouse gases ("GHG"s) in the atmosphere. GHGs, it must be said, are both normal and necessary and include both water vapor and the carbon dioxide we all exhale. These GHGs act as a thermal layer, trapping some of the solar energy that penetrates Earth's atmosphere. A system in balance keeps Earth's environment hospitable. But as GHG levels rise, the global climate falls out of balance; and that, presumably, can lead to problems.

At this stage in the debate on global warming there are few who would dispute the following assertions: 1) the Earth's temperature rises in lockstep with carbon dioxide levels in the air, 2) atmospheric carbon dioxide levels are higher than they've been in 650,000 years, and 3) it seems that the trend of global warming is accelerating (GHG emissions grew four times as fast in the five year period ended 2005 as they did in the preceding twenty years).

Yet even if we all agree that the Earth is warming, by no means do we all agree about what problems this presents. The "law of unintended consequences" will certainly wreak havoc with many of the scenarios put forth, no matter how fancy the computer simulation. Earth's environment is so complex and there are so many variables to consider, it is impossible to

predict the exact impact of a warmer atmosphere, melting icecaps, and increased water evaporation. But let's assume for a moment that global temperatures continue to warm and do cause ocean levels to rise, thus swamping low-lying land around the world. That would certainly be bad for the people who live there. Unfortunately, they aren't necessarily the same people who emit most of the GHGs. Lehman Brothers has cited studies that show minimal negative economic impact on China and the U.S. from global warming. UBS even cites a study that projects that global warming could be a net positive for high latitude nations such as Russia and Canada. As permafrost melts, more land becomes arable and, ironically, as ice sheets recede, polar fossil fuel deposits become more accessible.

In economic terms GHGs are a "negative externality," something detrimental to society, but for which the cost is not reflected in the expenses of the entity that causes it. As long as carbon dioxide and the other GHGs have no *economic* cost to the emitter, emissions will continue to increase. This means that Al Gore is right when he calls global warming a moral issue. It also means that the problem isn't going to be fixed in the near term unless the issue is forced. So far, efforts to curb global warming have accomplished little. The Kyoto Protocol of 1997 calls for reductions in GHG emissions over time, and many nations have ratified it. The U.S. has been lambasted for not agreeing to abide by the Protocol, but one can understand our government's reluctance when considering that China, now the world's largest emitter of GHGs, need not do so because of its status as a developing economy. It is forecast that the increase in GHG emissions from China's use of coal over the next 25 years will be more than 5 times the reduction targeted by the Protocol. So even if the current signatories can achieve their goals, nothing will really be accomplished until both China and the U.S. take action.

Sources of Greenhouse Gas Emissions

Before the problem can be fixed though, its source must be clearly determined. As mentioned, water vapor is a GHG. And frankly, there's little that can be done to impact its level. So when scientists or activists talk about GHGs, they are mainly referring to the carbon dioxide that makes up 77% of non-water GHGs, the methane that makes up 14%, the nitrous oxide that makes up 8%, and the various larger molecules that constitute the rest. But again, if we humans exhale carbon dioxide and plants need it to grow, how much is too much? After all, isn't there only so much carbon and oxygen, etc. in the global system? Yes, but not all of it naturally finds its way into the atmosphere.

The key to global warming is the distinction between carbon that's free in the atmosphere and carbon that's "sequestered" on Earth. When plants grow, they take in carbon dioxide, but only when they decay or burn is the carbon released. Sequestering is the process of trapping the carbon, naturally or otherwise. As long as a tree lives, it acts as a "carbon sink" that traps or sequesters the carbon. If a tree is cut down for lumber, but not burned, the carbon remains sequestered. Similarly, plant matter that has been buried and, over time, has become petroleum, is sequestered inside the Earth. The root of our current problem is that over the past 150 years, a huge amount of sequestered carbon has been mined or pumped out, burned up, and spewed into the atmosphere.

It's probably no surprise that the largest source of net GHG emissions (24.6%) is electric power plants. What may be surprising, however, is that the next largest source of net GHGs (18.2%) is deforestation, because burning plant matter releases carbon dioxide into the air and the smaller remaining forests simply act as a smaller carbon sink. All forms of transportation generate 13.5% of GHG emissions, the same amount as agricultural activities, while industry generates another 10.4%. Looking at the details brings out some unexpected conclusions. For example, all of the cars, trucks and buses in the world cause only slightly more net GHGs than the deforestation taking place in Indonesia and Brazil, alone.

The Future is... *Algae?*

Based on the major GHG sources noted above, logic dictates that when considering how to stem the global warming trend, one must start with power plants. Coal-fired plants are the largest source of power worldwide, and these plants tend to be not only highly inefficient, but also the dirtiest, as coal emits nearly twice the carbon per unit of energy produced as does natural gas.

The good news is that there are plenty of ways to generate electricity from alternative, renewable sources. The bad news is that each seems to come with a catch that limits broad adoption. Hydroelectric power, for instance, is renewable and clean but requires building dams, and the most obvious locations have already been exploited. Nuclear power emits no GHGs and works well for France (which derives 80% of its electricity from nuclear plants), but doesn't go over as well in the U.S. and elsewhere due to memories of Three Mile Island and Chernobyl, and the troublesome issue of storing the spent fuel rods for the next 100,000 years. Wind power has been heavily adopted in Germany and Denmark, and has proven itself viable in the U.S., but you can't always count on a windy day – even in Chicago. Similarly, solar energy is a free and inexhaustible source of energy that can be captured by rooftop photo-voltaic panels or huge arrays of parabolic mirrors, but its application is effectively limited to certain climates, and then only when the sun is actually shining.

For the foreseeable future, then, coal will continue to be a primary provider of cheap and reliable electricity. One way to mitigate its effects on the environment, though, is to improve plant efficiency through “coal gasification.” This is a process whereby coal is mixed with oxygen at high pressure and temperature, generating combustible gases that are cleaner than the coal itself. These gases are then burned in a gas turbine, while the “waste” heat generated is subsequently recycled into a steam turbine – thus the moniker “combined cycle.” The coal gasification process improves thermal efficiency from 33% to 50% *and* makes it easier to capture some of the emitted carbon dioxide before it enters the atmosphere. Regardless of the type of power plant, captured carbon dioxide can be channeled into enclosed pools of algae. While this may sound a bit far-fetched, an Arizona utility is currently ramping up production of algae fed by the sun and the smokestack emissions of a large gas-fired plant. The intent is that the algae will use that carbon dioxide to grow so they can ultimately be harvested to produce, believe it or not, biofuels.

Biofuels are simply fuels generated from organic matter. Their attraction is that they replace standard gasoline and diesel, making the world less reliant on petroleum products. And because they are produced from renewable sources like fast-growing vegetation (rather than sequestered hydrocarbons), they add no net carbon dioxide to the atmosphere. Most of the talk about biofuels in America lately, including that coming from Washington, D.C., has been focused on ethanol. Ethanol is produced through a distillation process that turns sugar into alcohol, which is then mixed with gasoline for retail sale. It has some good qualities, to be sure, but also some unfortunate ones. For instance, ethanol is approximately one-third less fuel efficient than gasoline, which means that it takes 1.5 gallons of ethanol to equal one gallon of gas. Also, ethanol cannot be transported via pipeline due to its tendency to absorb water.

Ethanol made from corn, which is the primary focus of current U.S. production, is one of the least attractive options, in our opinion. Its “net energy balance” (the amount of energy generated compared to the amount of energy it takes to produce and distribute it) is an estimated slightly-positive 1.3. By contrast, Brazil, with its hot and humid climate, produces ethanol from sugar cane, which has a reported net energy balance of 8.3. Furthermore, even if the U.S. were to utilize 100% of its corn crop for ethanol production, it would replace less than 10% of our current volume of transportation fuel. So, food concerns aside, other feedstocks or production processes will have to be used. Cellulosic ethanol, which is produced from the entire corn plant (not just the kernels) or from non-food crops such as switchgrass or fast-growing trees, would have a far higher net energy balance. Although not yet commercial, the development of cellulosic ethanol is being aggressively pursued.

The production and utilization of biodiesel is more intriguing than ethanol, in our opinion. Produced through a chemical process that converts natural oils into fuel, biodiesel is quite versatile. It can be mixed with its petroleum-based counterpart in any proportion and thereby reduces fossil fuel use and net carbon dioxide emissions. Biodiesel also increases the lubricity of the now-required ultra-low-sulfur diesel. But perhaps the most compelling fact is that diesel engines are 30 to 40% more efficient than gasoline engines. As such, a gallon of biodiesel delivers approximately twice the mileage of a gallon of ethanol. So, even though sugar cane can produce more gallons of ethanol per acre than, say, palm oil can produce gallons of biodiesel (palm oil is the second most productive biodiesel feedstock), the enhanced mileage benefit makes biodiesel superior. But if palm oil is the second most productive biodiesel feedstock, what is the first? That’s right: algae. Palm oil may produce 50% more energy per acre than sugar cane, but studies show that some types of algae could produce up to 30 *times* as much energy as palm oil. Frankly, it’s in a class by itself, and makes one wonder why anyone bothers with the other crops.

Realistically, we bother with corn and the other crops because the processes are well-known (moonshine has been distilled for generations) and, with the current set of generous subsidies, they are economical at current crop prices. Fuel-oriented algaculture, although still in its infancy, has been well-researched and seems quite promising. The Department of Energy studied algae as a fuel source for years, finding it extremely efficient at

photosynthesis due to its simple cellular structure. Unlike nearly all other biofuel feedstocks, algae require no arable land or even fresh water, so natural resources are not a limitation. In fact, a company in New Zealand recently announced that it had produced biodiesel from “wild” algae growing in sewage-treatment ponds. Presumably, then, the economic viability of biodiesel from algae may be not too far in the future.

We’ve given a lot of space in this report to road transportation fuels, even though they represent only 10% of GHG emissions. The simple reason is that the vehicle fleet turns over several times a generation. Any changes instituted now will be reflected fairly quickly in GHG emissions. Residential housing also generates approximately 10% of global GHG emissions. Though we have the technology to build far more fuel-efficient homes (a house full of Energy Star appliances uses 30% less electricity), the housing stock, unlike vehicles, turns over only once every two or three generations.

Something else can be done that would have a material and immediate impact on GHG emissions: reverse deforestation. Of course, that’s easy for us to say. We don’t have to live on the food we could grow from the next ten acres of slashed-and-burned rainforest. We can plant new trees ourselves and make a great carbon sink, but it may be hard to convince Indonesia and Brazil to do the same. So reforestation remains more of a political issue than a technological one.

The point is that there is no single, universal solution to global warming. Conservation, of course, in the form of more forest land, improved building insulation, more efficient lightbulbs, and higher vehicle mileage are absolutely the best ways of reducing net GHGs in the atmosphere. After that, we have to replace as much sequestered hydrocarbon-based fuel as possible, using whatever works: generating electricity from solar energy in sunny areas and from wind power in windy areas, converting the dirtiest coal plants to gasification and other cleaner technologies, producing biofuels from the most productive feedstocks available in a given area, and otherwise improving the efficiency of the global energy infrastructure. A combination of conservation and aggressive application of all the technologies already at our disposal should make a difference.

The Bottom Line

So let’s cut to the chase. Are any of the concepts we’ve discussed currently investable, or are they still pie-in-the-sky? We wish we could say there are lots of investment opportunities to pursue right now, but the fact is that while effective technologies and processes do currently exist, the companies that apply them are in many cases private, too small, or too speculatively priced to be considered by BTR. Still, while global warming is important to keep in mind when seeking buying opportunities, it is just as important when considering what not to buy. For example, if global warming truly does lead to more violent hurricanes, we will need to consider the impact on insurance and reinsurance companies, as well as on offshore oil drillers – particularly those with exposure in the Gulf of Mexico. If a carbon tax is ever instituted as part of a politically-based global warming solution, we will have to be wary of the impact on the various electrical utilities.

For those investors interested in ethanol, the world's largest ethanol producers are publicly traded. And, the leader in coal gasification technology is none other than GE, which estimates that it will have \$20 billion of revenue from green technologies by 2010. The auto manufacturers that focus on cleaner, more fuel efficient cars, like Honda, should also do well.

As always, we will be keeping our eyes open for opportunities on both the buy and sell side. Global warming seems to be real, and for the moment it is definitely being taken seriously. As such, we will continue to refine our understanding of the issues involved and their consequences, so that we remain ready to act in our clients' best interests.

The Stock Market

For some time now, we have been expecting a stock market correction. After all, the stock market's rise since March 2003 has been the second longest period since 1926 without so much as a 10% pullback. Does the recent drop qualify as that correction or do we think there is further weakness in our future?

We admit to being impressed by the ease with which the global markets have shrugged off concerns about Chinese stock volatility and U.S. sub-prime mortgage woes. At the same time, however, we are bothered by the general complacency that surrounded the recent 6% pullback. We received very few calls from concerned clients and almost all of the strategists we read remained bullish. Typical bull market corrections last two to four months, eventually culminating in an environment of rising investor pessimism. So while stocks have handily rebounded from their mid-March lows, we don't believe we are in the clear yet.

Either way, we remain quite bullish long term. The current difficulties in the sub-prime mortgage market should be manageable, and the underlying stock-market fundamentals are still positive. Interest rates are low, inflation remains contained, the global economy continues to grow, and U.S. corporations are very well positioned to prosper in the environment we foresee. Furthermore, the stock market is reasonably valued and global investment liquidity remains abundant. Thus, it remains our plan to take advantage of a still expected bull-market correction by using the weakness to add to equity holdings.

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