Capitalizing on Solutions That Can Make Ecological and Economic Sense: *The WilderHill Clean Energy Index (ECO)*

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"Ideas are keystone. They leave their mark on the landscape just as surely as chainsaws and bulldozers. Machines, after all, are only the agents of ethical precepts sanctioned by the members of a particular society."

—*Roderick F. Nash*

"An ounce of prevention is worth a pound of cure."

—*A Proverb*

Alternative energy solutions are coming to be regarded as genuine options. No longer dismissed as blue-sky or cost-prohibitive, wind power for instance has come down in price dramatically. Solar power is coming down too, while biofuels, complex power management, and gasoline/electric hybrid vehicles are becoming more commonplace. Even those once solely-academic, theoretical discussions of a "Hydrogen Economy" are increasingly relevant—with a Hydrogen Highway vetted by California's governor (Jarrell et al. [2004]) and a series recently in *Science* on practical issues potentially faced building a Hydrogen Economy over the long run (see Science, 13 August [2004]).

"Green" energy including major renewables such as wind, solar, and biofuels, advanced clean energy storage and conversion, improved power transmission, and efficiency are all arguably here to stay; certainly they're growing as their associated costs are driven down with improving technology. At the same time as distributed clean power sources grow relatively more attractive with rising costs of dirty fossil fuels, so too is their non-susceptibility to supply interruptions, and near freedom from carbon and other pollution becoming desirable. This article will outline an innovative "WilderHill Clean Energy Index" now available with the symbol ECO, describe its origins, and cover the thinking behind pollution prevention and the precautionary principle. It will underscore a philosophy on equities that examines financially energy solutions that do not harm to the environment.

Interestingly, it was as an academic five years ago that I first co-conceived a test index based on hydrogen, fuel cells, and "de-carbonizing" our energy portrait. After selecting a group of technically relevant companies in renewably-made hydrogen and fuel cells and analyzing them from "green" as well as business perspectives, we laid out what we deemed appropriate weightings to arrive at a simple working first index unlike any other. That initial test index has since provided many useful lessons that are incorporated in the newer WilderHill Clean Energy Index (ECO) calculating on AMEX.

Uniquely, the criteria for selecting equities included in that first test index included whether their core technologies were desirably zero/low-carbon, and notably reflect pollution prevention and the precautionary principle. A hypothesis was that applied solutions could be found that made ecological and economic sense (R. Wilder [1999, 2004]). To my mind, new energy technologies could be identified that might robustly serve to conserve biodiversity and ecosystems structure—and (notably at times for those same reasons) also be a reasonable place to invest. We hypothesized that selecting specifically for "green equities" in an innovative energy index could work well, and for a divergent host of reasons.

That initial index served its purpose well. Created at low cost and truly fueled by the personal passion of just a few people, it's still available on a website to further thinking about the topic, to provide education, and as a public service at www.h2fuelcells.org. Importantly the theoretically-useful index gathered much interest over time, regularly seeing some 100,000 "hits" per month and eliciting inquiries globally about our methodology. With this impetus, we increasingly considered over the years what a broadened, robust, and more formalized "WilderHill Clean Energy Index" should look like. There were many reasons for evolving from a mainly hydrogen and fuel cells index to the WilderHill Clean Energy Index broadly conceived, and now calculating precisely on AMEX.

One is that there were attractive, cost-effective clean energy solutions including wind power available already. For wind, the equities could include not only makers of wind turbines and critical components, but also select greener utilities placing heavy emphasis on wind power. Wind power surely warrants a strong place in the Index; one concern of course was there are few pure-plays in wind where price movement reflects the valuation or capitalization changes in the sector. Solar too clearly has to be in the Index (this article was written using solar power), and coming initiatives to expand its use are compelling. Nonetheless, not wanting to have the fossil fuel conglomerates so common in solar and wind, the selection of equities here involved art as well as science.

Another reason to expand inclusiveness was that hydrogen and fuel cell technology remained prohibitively expensive, too far off for investment-backed expectations in equities to be sensibly met by share appreciation. Companies in this sector would go through brief periods of exuberance, but they seemed unlikely to remain "sticky" at such high levels until genuine profitability here can be shown. In the meantime occasional valuation spikes here were in my opinion excessively driven by press releases, rather than by actual advances in technology or in intellectual property that were core to our analysis. We were looking for the advances that could lead to truly broadening applications.

Another basic reason is that hydrogen itself is only an energy carrier—how it's made is crucial. Put aside for a moment high temperature molten carbonate techniques, or useful direct methanol approaches and the like (those have important roles to play). For fuel cells to be truly green and not just efficient, they should eventually use hydrogen created via greener methods such as wind power or solar power that in turn splits water, or by (experimental) biochemical means now being examined, etc. Hydrogen can be used as well in internal combustion engines, but with the caveat that hydrogen should still be made cleanly. Hence, the way reactive hydrogen is released from its strong chemical bonds remains a fundamental concern. To do it right, practical wind power, solar power, and other cleaner energy should be developed before a large hydrogen infrastructure.

Emphasizing the proper green technologies is key, as is allocating them properly in the ECO Index with optimum sector weightings. While this process is rather unique within the financial sector, we feel that making pollution prevention—as well as science, technology, and policy for low-carbon energy sources—the basis for an Index has a strong chance of success. The bottom line will continue to be overall bottom-line performance and Index tracking; if successful, it may set a stage for future new efforts. Before looking ahead, however, one should first get an idea of the policy and philosophy behind pollution prevention and the precautionary principle—since these are important concepts and they're starting to help guide analysis and policymakers in international settings as well.

POLLUTION PREVENTION AND THE PRECAUTIONARY PRINCIPLE

In place of traditional end-of-pipe pollution control efforts that rely upon the earth's assimilative capacity to dilute contaminants, an emerging view holds it is cheaper, easier, and more practical to *prevent pollution* from occurring in the first place than to try to clean contaminated systems later on (see R. Wilder [1994]). Two closely related concepts at the core of this reasoning are the precautionary principle and pollution prevention. Both seek to refute mainstream thinking by their emphasis on *preventing* environmental harm in the first place. In unprecedented fashion they lift the "burden of proof" off the environment and instead rest it on potentially harmful activities (see Thorne-Miller [1994]). A chief aim is to emphasize clean production strategies as a robust paradigm for better environmental thinking (see Dethlefsen et al. [1993]).

America is fairly brimming with opportunities for pollution prevention—in energy, and otherwise in broader contexts. Options range from moving to cleaner sources of energy, to greener substitutes for the products found in everyday household use, to replacing toxics with benign substances in manufacturing (for a case study in finding reductions in household toxics, see D. Wilder [1994]). A utility in pursuing source reduction is clear. Equally pressing, however, is the need to reassess some of the main assumptions underlying the present environmental regime. Consider that if a key aim behind environmental policy is to protect natural ecosystems, then many if not most existing policies are proving ineffectual. Emissions overall for a wide variety of pollutants are increasing or dropping modestly if at all, while pollution, greenhouse gas emissions, and loss of ecosystem health continues (see Commoner [1992]). Neither land, sea, nor air have been saved in any real sense. Despite a few hopeful exceptions to the contrary, we are at best in something of a holding pattern in a war against ecological declines, or in addressing global warming (ibid.).

Significantly, a fatal flaw in regulatory efforts has been ubiquitous reliance on end-of-pipe pollution controls only. Environmental efforts have so far refrained from aggressive pursuit of pollution prevention because a belief dominates that dilution of pollution is the best strategy to avoid ecological degradation. Control strategies abound. They are seen in common tactics relying on the supposedly vast assimilative capacity of environmental media—such as by releasing waste into coastal oceans or burning toxins and other materials for dilution in the air (ibid.). Controls are necessary—but to depend on end-of-pipe solutions alone to the exclusion of easily achieved pollution prevention is folly.

Think of catalytic converters for cars. These tail-pipe controls filter much of the pollution arising over every mile driven. However, gains won by controlling pollutants are more than offset by the vast growing reliance on cars running inefficiently on oil (Gordon [1991]; R. Wilder [1993]). Rather than invest in cleaner transportation technologies as done by Japanese companies and now serving up a nice profit to Toyota for its Prius (and again for this technology licensed to Ford), pollution strategies look instead to Sisyphean controls (see Lovins [1990]). This is just a newer version of the "taller smokestacks" thinking seen in an earlier, and dirtier, era. Arguably we have grown too satisfied with monitoring harms, followed by remediation.

The same lack of vision holds true for energy use. For instance, when a smart idea was offered by a company that could allow new plant designs to operate using 30% less electricity, and hence reduce capital costs and pollution, only a few companies made the switch (see *The Economist* [1994]). The company that invented this useful energy-saving technology encountered great difficulty selling its new idea. Why the resistance? As observed by *The Economist*, "to understand why the (energy-saving) technology has spread relatively slowly despite promising such huge savings, think in terms of work psychology. Big companies are conservative; engineers are hard-put to believe that their traditional approach to design can be bettered so easily." Plant designers are still too often captured by the idea that if an alternative technology were cheaper, we would all be doing it by now.

INSTITUTIONALIZED RESISTANCE TO POLLUTION PREVENTION

Reasons for a decidedly hands-off philosophy, whether regarding upstream decisions about energy choices or about other industrial activities decisions, are not hard to discern. No matter how ecologically and even economically rational prevention might be, it faces a real uphill struggle: transposing environmental standards upstream is considered within American society as taboo. Instead, control solutions rely on the assimilative capacity of the earth. The very notion of prevention raises a spectre of inefficient command and control economies. Yet in this instance, where ecological thinking would be an engine for greater efficiencies, such fear of source reduction is ironic. This is because environmentally-driven efforts can actually bring economic benefit. Hidden subsidies troublingly occur when, as at present, burdens of pollution are treated as mere externalities (see Commoner [1992]; some of the shortcomings of traditional economic theories are discussed in Percival et al. [1992] and Norse [1993]). Distortions of externalization arise because environmental insults are now too often seen as costless, especially when the harm is out of sight, out of mind.

Neglecting opportunities to eliminate waste upstream shifts a burden of ecologically-harmful decisions from polluter to public—and to future generations. Creating lean manufacturing and incentives for greener consumption is a wiser choice. A rough analogy exists in the health field: a good diet and exercise is always preferable to later surgery for a diseased heart. The crux of the matter is, prevention is better than cure. Green energy is one good approach to address the distortions brought by externalities—and relatively high costs of fossil fuels—and more stringent environmental regulations in some industrialized nations are beginning this transition, such as wind power in Europe.

Consider then ways a closely related precautionary principle can assist in achieving prevention. Precaution stems from a recent recognition that our understanding of ecosystem processes is made exceptionally difficult by a host of factors, including innumerable effects of human activities and the uncertainties introduced by chaotic population dynamics (MacGarvin [1994]). Given lack of scientific certainty when attempting to set safe levels of pollution, precaution urges restraint. It is validated by the fact that in the few successful cases where a certain pollutant has been removed—as with airborne lead, mercury in surface waters, and radioactive fallout from atomic bomb tests—each success is owed to eliminating the offending substance/activity upstream, at its source (Commoner [1992]).

Thus precautionary thinking looks upstream to avoid (as through substitution) the use of dirty fossil fuels or problematic substances like organochlorines. In a similar vein precaution seeks to eliminate creation of pollutants and rejects industrial strategies that perpetuate more ecologically damaging methods than necessary (see Jackson [1993]; for recent action against organochlorines, see *Seventh Biennial Report on Great Lakes Water Quality* [1994]). The basic policy choice is either to eliminate the substance/activity causing pollution—or to build pollution controls that merely reduce the release of pollution without changing the offending substance/activity. Over the long run, prevention is the better option. Concepts of prevention are not intended to replace control efforts, but are a smarter, useful way to build better environmental protection. This is necessary if environmental policies are to be more clever than simply shift pollutants from one medium (i.e., land) to another (air).

Implementing pollution prevention and precautionary action would mean marked changes in ways we think about our relationship with nature. Much effort now goes into end-of-pipe pollution controls—followed by costly campaigns to clean environments befouled under this paradigm. Strategically speaking such pollution control efforts are a losing battle. They offer a false sense of security and often lead to even greater use of the offending activity while toxic residues captured and concentrated by pollution control devices create disposal problems of their own. Substances suspected of being harmful are banned only after their deleterious effects have been scientifically "proven."

As new alternatives, prevention and precaution are intended to inform our thinking and so not bring change overnight. The precautionary principle is but hortatory soft policy and even the greenest of nations will think twice before being unilaterally bound by its necessarily vague restrictions. Moreover precaution has been widely criticized. Opponents charge this precautionary concept is too imprecise to have binding legal application; others claim the principle, if taken to extremes, could shut down all industrial development (Bodansky [1991]; Costanza and Cornwell [1992]). Such complaints raise useful points. However, they arguably underestimate the value a rule of reason could have when implementing this concept (for a good discussion of the rationale behind precaution, see Stairs and Taylor [1992]). In time, the ideas bound up in pollution prevention and precaution could be better fleshed out (Young [1993] usefully addresses some approaches to application; for a critical view stressing the need for a rule of reason in precautionary action, see Broadus [1992]). If forcefully applied, they could spawn services built on the efficiencies of source reduction, and will surely gain converts as disposal grows yet more expensive (Jackson [1993]). Though difficult to imagine at present, environmental thinking in the 21st century is sure to be as different from the 20th century as this century was from the previous one. If the future course is wisely chosen, the next advance in environmental protection will be the second-generation paradigm found in precautionary action and pollution prevention.

In sum, the advent of clean energy is hardly surprising. Given the price for this energy depends mainly on costs of technology and these costs are only dropping, clean energy now contrasts sharply with trends seen globally in fossil fuels. Compare clean energy against unwanted fossil fuel price hikes, environmental impacts, and supply vulnerability, and it seems likely that green energy will only grow in significance ahead. There are fundamental reasons why clean energy can be expected to gain market share.

There are also reasons based on what might be perceived looking to the future of environmental policy. Here the precautionary principle and pollution prevention may gain in significance. An ability to prevent greenhouse gas emissions may be significant, as well as an ability to store renewables as firm power, perhaps even more cheaply than fossil fuels. Unlike being exposed to oil supply disruptions, the wind that renewably blows across America's Midwest and solar energy landing on countless roofs is free. The technologies that allow for hybrid vehicles once unleashed cannot be relinquished, and the feeling a nation gets from energy independence and wisdom cannot be easily forgotten. Should the emerging green energy sector grow, the WilderHill Clean Energy Index is intended to be a means of benchmarking that performance in a robust way.

REFERENCES

Bodansky, D. "Scientific Uncertainty and the Precautionary Principle." *Environment*, Vol. 33, No. 7 (1991), p. 4.

Broadus, J.M. "Creature Feature Too: Principium Precautionarium." *Oceanus*, Spring 1992, pp. 6-7.

Commoner, B. M*aking Peace with the Planet*, New York: The New Press, 1992.

Costanza, R., and L. Cornwell. "The 4P Approach to Dealing with Scientific Uncertainty." *Environment*, Vol. 34, No. 9 (1992), p. 12.

Gordon, D. S*teering a New Course: Transportation, Energy and the Environment*. Covelo, CA: Island Press, 1991.

Dethlefsen, V., T. Jackson, and P. Taylor, "The Precautionary Principle—Towards Anticipatory Environmental Management." In T. Jackson, ed., *Clean Production Strategies: Developing Preventive Environmental Management in the Industrial Economy*. Boca Raton, FL: Lewis Press, 1993, pp. 41-62.

Jackson, T. "Principles of Clean Production—Developing an Operational Approach to the Preventive Paradigm." In T. Jackson, ed., *Clean Production Strategies: Developing Preventive Environmental Management in the Industrial Economy*. Boca Raton, FL: Lewis Press, 1993.

Jarrell, C., R. Wilder, J. Chirazi, and B. Shull. "Hitting the Hydrogen Highway." *Power & Energy Continuity* (2004), pp. 111-112.

Lovins, A. "The Role of Energy Efficiency." In J. Leggett, ed., *Global Warming: The Greenpeace Report*. New York: Oxford University Press, 1990.

MacGarvin, M. "The Implications of the Precautionary Principle for Biological Monitoring." *Helgoländer Meeresunter*, 49 (1994).

Norse, E.A., ed. *Global Marine Biological Diversity*. Washington, DC: Island Press, 1993.

Percival, R., A. Miller, C. Schroeder, and J. Leape. *Environmental Regulation: Law, Science, and Policy.* Boston: Little, Brown & Co., 1992.

Seventh Biennial Report on Great Lakes Water Quality. International Joint Commission (United States-Canada), 1994.

Stairs, K., and P. Taylor. "Non-Governmental Organizations and the Legal Protection of the Oceans: A Case Study." In A. Hurrell and B. Kingsbury, eds., *The International Politics of the Environment.* New York: Oxford University Press, 1992, pp. 110-141.

The Economist. "Energy Efficiency—Feeling the Pinch." August 20, 1994, p. 66.

Thorne-Miller, B. "The Precautionary Principle/Approach in International Agreements on the Marine Environment." In Biliana Cicin-Sain and Lori Denno, eds., *Moving Ahead on Ocean Governance.* Ocean Governance Study Group, 1994.

Wilder, D. "Save the Bay's 'Toxic Diet' Project." *Small Flows Journal*, Vol. 1, No.1 (1994): p. 3.

Wilder, R. "Conceiving Smarter Technology and Policy for the Sea." *Sea Technology Journal,* 45 (2004), p. 81.

——. "Develop Eco-Industrial Parks." *Engineering News-Record*, 242 (1999), p. 59.

——. "Prevention Rather Than Cure." *Nature*, 369 (1994), p. 700.

——. "Sea-Change from Bush to Clinton: Setting a New Course for Offshore Oil Development and U.S. Energy Policy." *UCLA Journal of Environmental Law and Policy*, 11 (1993), pp. 170-173.

Young, M.D. "For Our Children's Children: Some Practical Implications of Inter-Generational Equity and the Precautionary Principle." Occasional Paper #6, CSIRO Division of Wildlife and Ecology, Canberra, Australia, 1993.