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MARKET BEAT

Light: The Future is Green

BY ELLEN PFEIFER

HUMANS HAVE A FUNDAMENTAL NEED FOR LIGHT. ILLUMINATION IS ESSENTIAL TO OUR PHYSICAL WELL BEING AND TO NEARLY EVERY ENDEAVOR — FROM THE MOST MUNDANE TASKS TO THE MOST EXALTED RELIGIOUS RITUALS. OUR NEED FOR LIGHT IS SO EXTENSIVE THAT WE HAVE LONG SUPPLEMENTED NATURAL SUNLIGHT WITH ARTIFICIAL ILLUMINATION. THAT ADDITIONAL

increment has come at a price; our profligate use of electrically generated light pollutes our planet and depletes its natural resources.

The Light Dawns

There is light at the end of this worrisome ecological tunnel. Consumers are demanding and

foundation in Boulder, Colorado. However that figure rises to 21 - 34 percent if you include the costs of additional air-conditioning needed to offset the waste heat generated by standard incandescent or halogen bulbs.

With half of our electricity consumption generated by commercial buildings, RMI estimates that U.S. businesses could "cost effectively save 70 - 90 percent of the energy used in lighting systems without any loss of function."

Even more impressive, RMI maintains that if "advanced lighting technologies were fully applied in the United States, the resulting electricity savings would negate the need for 120 1,000-megawatt power plants. That would save ratepayers \$30 billion a year just on the cost of operating those plants." It would also "significantly lower the emissions from existing power plants," says Rick Cobello, head of the Lighting Research Center at Rensselaer Polytechnic Institute in Troy, New York.

The Economic Case for Energy Efficient Lighting

Although some businesses and consumers might balk at the upfront costs of lighting upgrades, the investment pays for itself, and

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technology is developing lighting products and designs that conserve energy while increasing illumination. These advances have been particularly striking in the commercial sector, where businesses look to contain energy costs while improving the workplace environment.

The Environmental Case for Energy Efficient Lighting

Lighting directly consumes 20 percent of electricity in the United States, according to The Rocky Mountain Institute (RMI), a research

FEATURED COMPANY

SLI: More Than Just a Better Light Bulb

BY CHANNING PAGE

ANYTOWN, USA — When you turn on your computer, a small green light glows in the lower right-hand corner of the monitor. When you turn the ignition key in your car, the red "check engine" light illuminates...

These are LEDs—light emitting diodes—which for decades have been unremarkable components of consumer goods like alarm clocks, flashlights, and computers. Their daily presence is taken for granted, but the next generation of LEDs is provoking considerable excitement.

Powerful Yet Not Power Hungry

Moving beyond basic silicon construction, these new LEDs are produced using compound semiconductor technology, explains John Lau of Wit Soundview, an electronics industry analyst. "The advantages of compound semiconductor devices over silicon devices include operation at higher speeds, lower power consumption, less noise/distortion, and optoelectronic properties that enable these devices to better emit and detect light."

The result is high-brightness LEDs. According to Robert Soran, the President of Uniroyal Technology Corporation, "High brightness LEDs require only about 10 percent of the power consumption of incandescent

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Declaring Our Energy Independence

BY JACKSON W. ROBINSON

We may have celebrated the first Independence Day of the new century with the usual panoply of fireworks, concerts, parades and barbecues, but underneath the jubilation, Americans were facing the uncomfortable fact that our independence is only partial, at least when it comes to energy. Just ask the angry summer drivers who were paying record-setting prices – \$2 a gallon – at the gasoline pump. Just ask businesses, investors, and consumers who have been nervously watching as the economy slows. Just ask politicians who have been lambasting either the oil companies, the environmentalists, or each other.

A rapid and significant hike in the price of such a vital commodity as oil is economically troublesome, with both negative and positive investment implications. But there is reason to be hopeful. We believe the U.S. is in the early stages of a fundamental secular change to an information-driven, energy-efficient “new” economy, one that would free us of our dependence on oil. Indeed, weaning ourselves from the “old” fossil fuel-based economy could be relatively painless. Our research suggests that we can alleviate the energy cost-crunch by taking steps now to reduce consumer gasoline consumption and thereby force a reduction in price. These steps would serve as an interim solution until permanent change can be brought about by the commercialization of

emerging technologies.

A Different Kind of Energy Crisis

According to data from the Energy Information Administration, crude oil prices are approaching the historic records set in 1981. Gasoline prices, however, have exceeded by 40% their 1981 high of \$1.38 per gallon (see chart). History reminds us that the high crude and gas prices of the early 1980s were induced by OPEC's (Organization of Petroleum Exporting Countries) restriction of supply. By contrast, the current hike in prices is surely due to ever rising demand by U.S. consumers.

If you look carefully at the 1975-2000 price chart for crude oil and gasoline, you will note that both oil and gasoline prices dropped to a 1986 low of \$13.49 a barrel and \$.93 a gallon, respectively. This decline coincided with an increase in the energy efficiency of automobiles stimulated by the energy crisis. Indeed, according to a 1999 study by the U.S. Environmental Protection Agency (EPA), average fuel efficiency of cars reached its peak of 25.9 miles per gallon (mpg) in 1987, but has been dropping ever since to 23.8 mpg in 1999. Coincidence or not, 1987 was a transition year: mpg started declining and gas prices started edging up.

As for the single year price drop for crude and gasoline in 1988, we believe the blip was

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Danby, for the Bangor (Maine) Daily News

due to OPEC's catching the "Asian flu". At that time, Asian economies were in a deep recession thereby reducing global demand for crude.

The lesson: reduce demand, and gasoline prices will follow.

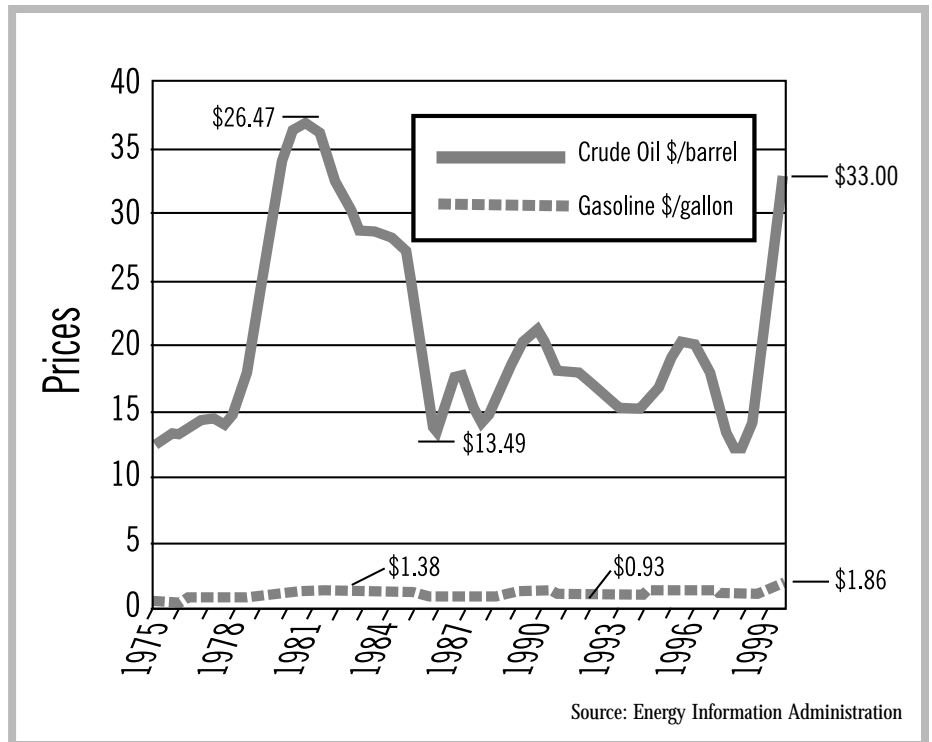
The Mess We've Gotten Ourselves In

What about our current energy crisis? There are several key demand factors driving gasoline prices higher. As a result of longer commutes due to suburban sprawl and inadequate public transportation, Americans are driving more and doing so in fuel-inefficient cars. According to the U.S. Department of Transportation, average annual mileage per vehicle rose from a 1980 low of 9,458 miles to a 1998 high of 12,183 miles, an increase of 29%. Coupled with these longer trips, drivers rekindled their love affair with large cars, becoming particularly infatuated with gas-guzzling Sports Utility Vehicles (SUVs). These ingredients added up to the classic economic recipe for demand-driven price increases.

What We Can Do About It Now

There is no quick fix for sprawl or the public transportation system. However, there is something SUV owners can do today to reduce the price of gasoline: trade in their vehicles for fuel-efficient cars.

The math is easy. According to the U.S. Bureau of Transportation, there are 20 million registered SUVs on the road today. If the owners of these SUVs converted to mid-sized cars, they would improve their average mileage from 18.3 mpg to 25 mpg. Assuming they each




continued to drive an average of 12,000 miles per year, they could reduce their gasoline consumption by 177 gallons, save \$320, and reduce their insurance costs. On an aggregate basis, this fleet conversion would reduce U.S. crude imports by 233,865,434 barrels a day or 2.5%. While relatively small, this reduction in imports would keep a lid on price increases, especially as we transition to alternative energy vehicles.

Equally important, junking those SUVs would have a strong positive effect on the environment by minimizing emissions, reducing smog, and alleviating global warming. Annual

CO2 emissions in the U.S. could be reduced by 71 billion pounds.

While the SUV fleet conversion is taking place, emerging energy technologies will become commercially viable and alternative energy investments will flourish. Some combination of technological advances in batteries, fuel cells, electric engines, solar power, and natural gas automotive products will soon be available and their implementation will permanently reduce our consumption of fossil fuels.

With that accomplished, we should be able to celebrate our energy independence on July 4, 2010. 

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often in a short period of time. What's more, it is not necessary to undergo a major retrofit to take advantage of savings.

"It's an easy decision," says Cobello. "Businesses can make simple changes that are relatively inexpensive and require little effort." He points to the hospital and hospitality industries. "I see hotels with 400 rooms that are generally lit with high wattage incandescent bulbs.

They could save 25% on their energy bills just by switching to more efficient lamps."

More complete lighting overhauls can also be cost effective. According to "Greening the Building and the Bottom Line", an RMI study, lighting retrofits of existing buildings usually show a three-year payback. Indeed, "a retrofit may cut energy use by \$0.50 or more per square foot," quickly reducing the costs of \$1.53 per square foot in typical large office buildings, which otherwise account for 85

percent of the total energy bill.

What is particularly exciting is the unexpected increase in worker productivity that can result from lighting upgrades. In "Greening the Building," co-author William D. Browning presents studies of eight companies that installed energy efficient high-tech lighting and reaped a bonanza. For example, the Main Post Office of Reno, Nevada got a \$300,000 lighting makeover in 1986, realizing energy and maintenance sav-

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lamps and their...lifespan is about 100,000 hours versus 1,500 hours for the conventional bulb... With industry converting to these high-brightness mini-lights and private homes eventually following suit, this breakthrough technology is expected to save untold amounts of oil and nuclear energy."

Manufacturers Can't Produce Them Fast Enough

With so much potential, demand for the new LEDs is high. Strategies Unlimited of California reports "the size of the high-brightness LED (market) was more than \$440 million in 1998, up 87% from \$235 million in 1997, and is projected to grow at a compounded annual growth rate of more than 30% from 1999-2003." So far, however production capacity is low. Seizing the opportunity, several companies are entering the field to fill the gap. Among the players are household names, like General Electric, and lesser known participants, like SLI, Inc. (SLI: NYSE) of Canton, Massachusetts.

Not Just Bulbs and Ballasts

One of the world's largest broadly-integrated lighting suppliers to commercial and consumer markets, SLI produces a full range of lamps and fixtures. It distinguishes itself from

the competition, however, by marketing more than individual components. The company designs and sells full lighting systems.

According to Chairman and CEO Frank Ward, SLI is "the only company with the full mix of disciplines to produce a solid state and low voltage lighting system." His goal is to sell not just light bulbs, but "lighting solutions." Lighting systems provide higher profit margins than components, as reflected in the company's revenues, 85% of which comes from lighting systems, and 15% of which comes from commodity items.

SLI has extended this strategy to its high-brightness LED business. Instead of focusing all of its manufacturing energy on semiconductor wafers, SLI has tapped the resources of established partners to provide the basic building blocks. From these, it can develop full-scale LED systems. For the year 2001, SLI projects that its revenues from all LEDs will be \$120 million, with \$90 million generated by high-brightness LEDs systems, making them a significant player in the LED marketplace.

The company has established a joint venture with Stanley Electric of Japan, the largest manufacturer of LEDs in the world. Stanley buys its wafers from the Nichia Corporation, and then develops them into surface-mount LEDs. Together, SLI and Stanley are retrofitting a Canadian plant to manufacture primarily high-brightness LEDs. The first production line should be operational by February of 2001. Four more lines should be finished by March of 2002, giving the company production capacity of 40 million units per month. SLI will then use its resources as a vertically integrated lighting business to develop LED-based products for the

automotive, telecommunication and instrumentation industries.

Ward's strategy contrasts with the focus of his competitors who, he says, emphasize the highly profitable production of the compound semiconductor wafers. Ward believes that while the current low availability of LEDs keeps today's unit price high, the price will ultimately fall as supply begins to meet demand. When that happens, profit margins will once again come from selling lighting solutions instead of components.

High Tech Lighting Will Be Green

No matter how the story unfolds, the future of high-brightness LEDs and of general lighting technology is good news for energy conservation and the environment. Regular incandescent lighting is being replaced by more efficient systems like fluorescent and metal halide. For example, SLI produces new fluorescent tubes that are 15% more energy efficient, and contain 95% less mercury than their predecessors. It also makes ballasts that reduce the energy used by fluorescents by approximately 40%. Similarly, the company's metal halide lighting consumes 75% less energy than comparable incandescent lamps. Consequently, Ward estimates that 75%-80% of SLI's revenue is related to energy efficient lighting systems.

The results of all this new technology may be invisible to the daily user, unless a keen eye can discern a brighter traffic signal or a more brilliant brake light. But the benefits extend beyond questions of safety to the quality of life and the condition of the environment. The lighting industry has great potential in meeting the demand for environmentally effective solutions.



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Winslow Management announces the appointment of Channing M. Page to our staff. Ms. Page brings extensive knowledge of environmental issues and financial analysis to our work, having served on the boards of the Environmental League of Massachusetts and the School for Field Studies, and having worked in charitable financial planning at The Nature Conservancy, The Wilderness Society, and Harvard University. Having recently received her MBA from the Fuqua School of Business at Duke University, Ms. Page has taken on the role of Research Equity Analyst, with responsibility for reviewing the environmental and financial performance of companies in our portfolio.

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ings of approximately \$50,000 a year. In addition, worker productivity increased six percent in the first year -- a gain worth between \$400,000 to \$500,000 a year.

The Hottest Trends in Energy Efficient Lighting

So what lighting techniques and products are considered state of the art for energy efficiency? Many of these products qualify for EPA's ENERGY STAR label, promoted as "The Mark of Excellence in Energy Performance." And what is in the pipeline for the near future?

T-8 lamps and their electronic ballasts are the way to go today, says Jerry Mix, President of The Watt Stopper in Santa Clara, CA. T-8s are tubular fluorescent lamps 1" in diameter that supply brighter and warmer light than earlier varieties. Called compact fluorescent lamps,

these use one-quarter of the electricity and last ten times longer than incandescents. According to Mr. Mix, "(t)he new ballasts drive the bulbs with fewer heat and efficiency losses and with less flicker than in the past." They can be dimmed and come in many sizes, shapes and wattages, according to the Cornell University's Ecotecture Web site. An even smaller T-5, a 5/8-inch tube, is also under development.

Daylighting. Because natural light is free and stronger than artificial light (RMI reports that a single 3 by 5 foot window in direct sunlight produces more light than 100 60-watt incandescent bulbs), it is an important component in any energy-efficient light design. Environmentally-aware architects are adding natural light to buildings through atria, light walls, interior windows, skylights and clerestories.

"Interaction between natural daylighting and artificial lighting systems," according William Browning, is one of the hottest trends. Lighting designers use a variety of techniques including photosensing devices that detect natural light levels and automatically adjust the level of supplemental artificial light.

Occupancy sensors detect the presence of people and automatically dim or extinguish lights when an area is empty. The Watt Stopper installed these in the non-retail areas of Target stores nationwide and realized savings of five percent in the total electrical bills for the whole chain.

Load shedding. When buildings equipped with these systems reach a peak kilowatt load, light levels begin to dim imperceptibly until energy

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Implications of Various Lighting Technologies

Bulb	Wattage	Life Hours	Cost	Energy	Environment
High Brightness LED <i>Traffic signals, automotive, indoor/outdoor signage</i>	12	100,000	\$120.00 per traffic signal	Consumes 90% less energy than incandescents. In traffic lights, saves 46% of dollar cost over 7-year life span.	Last 50% longer than incandescent bulbs. Safer and easier to work on than neon bulbs. Requires lower voltage than neon bulbs.
Incandescent A-Line	75	750	\$0.41	Incandescents convert only 10% of electricity into light; 90% is lost to heat. 52W saves 10-15% of the energy of a 60W bulb.	52W has a 35% longer life than 60W A-line bulb.
Watt miser	60	1000	\$0.41		
Household bulbs	52	1330	\$0.48 per bulb		
Compact fluorescent <i>Household bulb which fits incandescent sockets</i>	15	10,000	\$14.85 per bulb	Will cost 70-75% less than incandescent bulbs, saving \$44 in electricity costs over 4-year life span.	Recovery and recycling of raw materials. Lasts 13 times longer than 75W A-line.
Fluorescent <i>A glass tube with one electrode at each end.</i>	32	20,000	\$4.16 per bulb	Consumes 80% less energy than a comparable incandescent bulb.	Uses mercury, but can be recovered and recycled. Lasts 18 times longer than an incandescent bulb.
Metal Halide <i>High intensity discharge light used to light roadways or stadiums.</i>	150	10,000	\$32.50 per bulb	Highly efficient. Energy is not lost to heat.	Replaces various incandescent and fluorescent bulbs and produces more light per watt.
Halogen Regular	45	2,500	\$5.25	Produces more light per watt and lasts longer than incandescents. Ultra long life bulbs are 25% more efficient than regular halogen bulbs.	Longer life equates to fewer bulbs over life span of a lamp.
Ultra Long Life	50	3,000	\$10.69 per bulb		

Source: GE, Uniroyal, Consortium for Energy Efficiency

PORTFOLIO UPDATE

S1 (NASDAQ: SONE)

ATLANTA, GEORGIA — The good news is that S1 is doing an excellent job of marketing its software to banks. The bad news is that the banks are having difficulty selling it to their customers.

For example, on June 26, 2000, S1 announced its collaboration with Oversea-Chinese Banking Corporation Ltd. (OCBC Bank). The move will propel Singapore's second largest bank into the leading position in the world's online financial services market. OCBC has an aggressive eCommerce strategy and will use S1's solutions and data center in Singapore to meet its goals. The bank intends to invest \$600 million dollars in eCommerce systems while working closely with S1.

At the same time, however, S1's promising collaboration with Citicorp's CitiF/I unit has stalled. Internal political problems at Citicorp have prevented it from implementing S1's programs and software to build its Internet banking system.

Because of this disappointing performance, First Union Securities lowered its revenue forecast for S1 for fiscal year 2000 to \$265 million from \$270 million and reduced its rating from Strong Buy to Buy. Although analysts have not changed their earnings estimates, they have cut their second-quarter revenue forecasts to \$59.1 million from \$60.3 million and lowered their price target to \$35 from \$150.

Corning (NYSE: GLW)

CORNING, NY — On June 9, 2000, Corning Incorporated opened its new \$30 million environmental technologies production plant in Port Elizabeth, South Africa. The new facility will enable Corning to meet the global demand for

cellular ceramic substrates, a fundamental component of catalytic converters and emissions control technologies.

"Tighter environmental standards and heightened consumer concern about air pollution are driving increased worldwide demand for catalytic converter substrates," said Robert Ackerman, Corning's chairman and CEO.

Sands Brothers analyst Kama Krishna raised his price target for Corning shares from \$270 to \$330. The company's stock has more than tripled in the past year due to the success of its ever-expanding fiber-optic business. The company raised estimates for full-year per-share profit growth from 35% to 45%. Analysts had expected Corning to earn \$2.75 a share in 2000 and are now raising estimates to \$3.00.

Whole Foods & Gaiam

(NASDAQ: WFMI & GAIA)

On June 20, Whole Foods announced it will merge its WholePeople.com web site with Gaiam.com. Amrion, a Whole Foods marketing subsidiary, will own 49.9% of Gaiam.com and Gaiam itself will own 50.1% of the joint venture. While Whole Foods continues to show strong performance in its core retail business, WholePeople.com fell short of expectations.

The expanded relationship between Gaiam and Whole Foods should be advantageous to both companies because of their complementary products and expanded pool of customers. Through the arrangement, Whole Foods will be able to offer its 5 million customers Gaiam products through a "store within a store" model.

Gaiam will incur few expenses in the consolidation and expects a steady increase in profits.

Several Wall Street analysts have since upgraded price targets for Gaiam and Whole Foods.

United Natural Foods

(NASDAQ: UNFI)


DAYVILLE, CONNECTICUT — June 6, 2000, United Natural Foods announced results for the third quarter of fiscal 2000. The company reported earnings of \$2 million, or \$0.11 (excluding charges for the closure of the Chicago facility), in its first profitable quarter since Q2 1999.

Having returned to historic 95% fill rates at all the distribution centers and 98% on-time deliveries, United Natural is showing customers that it can provide quality levels of service, thereby re-establishing lost markets. UNFI's next challenge is volume growth.

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use drops. "The average person can't detect a 30% decrease in lighting if the dimming is gradual," says Jerry Mix.

LEDs. Light-emitting diodes have not yet been utilized for ambient lighting purposes, but are being used in traffic signals and exit signs. (See accompanying story.) However, William Browning believes they are the next frontier in energy efficient lighting. "There will be dramatic gains in the illumination/ power ratio of LEDs," he says. "And because there is nothing to wear out, the devices will allow designers to completely rethink the way we light buildings."

The incandescent light bulb may not be dead yet. Indeed, it may never go away entirely. But the future of lighting appears to be with the new, high-tech alternatives — the energy-efficient, high intensity, products that will make our lives and work more comfortable while sparing the environment. 

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