ENERGY & CAPITAL
Practical Investment Analysis in the New Energy Economy

Green Building

Special Report

From 1980 to 2003, global energy consumption grew 48 percent, from 283 quadrillion Btus to 421 quadrillion Btus.

And from 2010 to 2030, it's estimated that global energy consumption will climb to 678 quadrillion Btus — representing an additional 28 percent growth.

Now the question is will we be able to generate enough energy to meet these consumption demands?

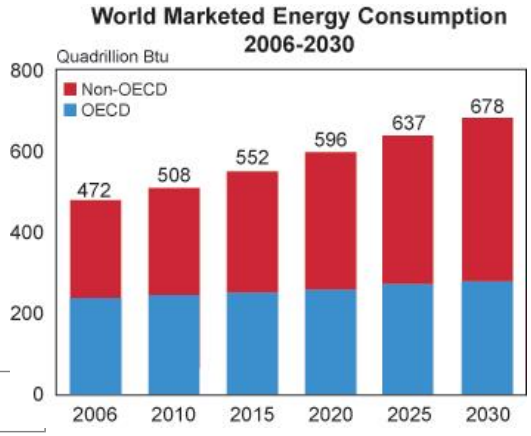
Well, let's see . . .

In 2006, the world generated 472 quadrillion Btus.

But in order to supply consumption demands by 2030, we need to come up with another 206 quadrillion Btus within 21 years. *That's almost double the increase in world energy output over the previous 23 years.*

Meanwhile, these increasing energy demands continue to push electricity prices higher and higher. Talk about a supply and demand reality check!

In just the past four years alone, cost per kWh has risen by nearly 15%.



Fossil "Fools"

The days of cheap and abundant fossil fuels are over.

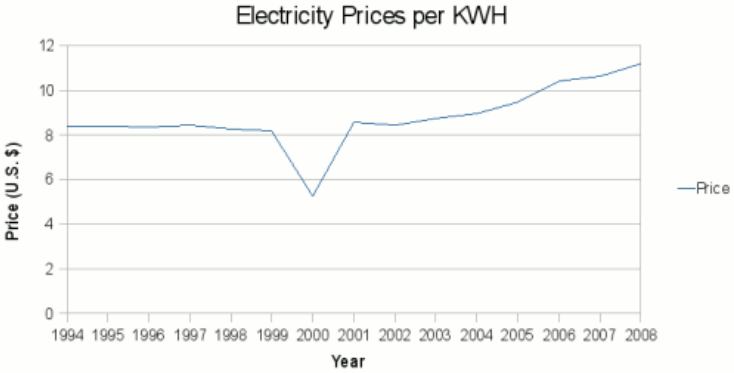
We already know about the oil scenario, but the next great hope - coal - is on the fritz as well. The physical mass of coal left in the world is not the issue. The amount of energy it can produce is.

You see, if you view coal in terms of *tons of oil equivalent* , then U.S. production peaked in 1998. And the U.S. isn't the only country whose coal production is in decline. For the last 20 years, all major coal-producing nations that have updated their reserve numbers have adjusted them downward. In the last 25 years, the total global reserve estimate has been cut by 60%.

And as if that weren't enough, global warming legislation is putting even more pressure on the coal industry.

Whether you're on board or not . . . the global warming debate is over. Now, and especially in the very near future, it's going to be extremely cost-prohibitive to emit CO2 as a byproduct of any production process.

The Kyoto Protocol was the first step. And while it's still up in the air as to how successful any of it will be, there's much more in the works.



Take the EU, for instance.

The European Union has recently agreed to cut greenhouse gas emissions 20% by 2020 and 60% to 80% by 2050. Each country in the union will have different cap levels that average to meet these requirements.

"We have an urgent need to take steps to combat the causes of global warming," Senator Feinstein said. "Safe, energy efficient buildings can be an important part of a comprehensive global warming agenda. This bill will save electricity consumption, reduce greenhouse gas emissions, and streamline existing federal regulations. It is a good first step." Dianne Feinstein (D-Calif.)

And the United States, which refused to sign Kyoto, has begun to take action at the state level . . . where governors are now picking up the slack while bureaucratic palms on the Hill continue to get greased behind press releases calling for "more studies."

Of course, the sea change on Capital Hill is beginning to disrupt the status quo. We'll find out soon enough it anything's going to stick.

Meanwhile, California passed legislation similar to the EU back in 2006, calling for a 25 percent reduction of carbon emissions by 2020.

And eight Northeastern states have joined the action as well. Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, Vermont, and Massachusetts have all signed a memorandum of understanding which provides for the reduction of each state's emissions by 2.5% annually beginning in 2015.

So here we are with dwindling oil and coal supplies, legislative initiatives demanding CO2 reductions and a hefty projected increase in energy demand.

Where to start . . . where to start?!

Building Energy Use

A fast way to improve energy efficiency while reducing emissions is to tackle one of the biggest users of energy: buildings.

Commercial and residential buildings in the U.S. alone use 40 quadrillion Btus of energy annually at a cost of $300 billion. That's 9.5% of total world energy consumption!

Buildings are also responsible for 38% of the nation's CO2 emissions - more than the industrial or transportation sectors.

"As a legislator, I have always stressed the importance of environmental awareness in the creation of new public policy, corporate citizenship, and our every day routines. These green building initiatives will help our Connecticut citizens dually — through short term energy cost cuts, and long term environmental preservation." Joe Lieberman (D-CT)

But a burgeoning green building movement is looking to change all this.

Green building is essentially a combination of updated construction techniques with a sharp eye on energy and water efficiency and conservation.

On average, a green building uses 33% less energy than a conventional building. If green design were fully integrated, you could be looking at a reduction of energy consumption in buildings from 40 to 26.8 quadrillion Btus per year . . . just in the U.S.

Green buildings offer the added benefit of carbon emission reductions.

Applied to the existing green buildings in the US, 1.04 million metric tons of CO2 are avoided annually. That is the equivalent of taking 208,000 cars off the road every single year!

Where's the Water?

Green buildings are huge water savers too!

A certified green building reduces water use by about 30% compared to a conventional building.

This translates to more than one million gallons of water savings per year . . . per building.

This is going to be extremely important in coming years, especially since only 0.2% of the planet's water is accessible fresh water - and only 30% of that is potable.

Even more alarming, buildings use 12% of all potable water, which equates to 15 trillion gallons/year.

"What Centerbrook has done is remind us that what is good for the environment can also be good for business," said Lieberman. "The foundation for a new, clean energy future for America will be built brick by brick and volt by volt at places like green buildings where they pull the plug on Global Warming every time they flip the switch on solar energy." Lieberman

Currently, more than a billion people, a sixth of the world's population, don't even have access to clean drinking water.

And if we continue to use water at current rates, the U.N. predicts half the world population will be living with water shortages in the next 50 years. Some say this could happen by 2025. That means a family of four will only have access to enough water for two people.

But green buildings can help by reducing water consumption in commercial buildings up to 50% with the implementation of several strategies:

- More efficient fixtures
- Waterless urinals
- Gray water reuse
- Electric instantaneous hot water heaters
- Rainwater reuse
- Water-efficient landscaping

One case study in Minnesota showed annual water savings of up to one million gallons annually from gray water systems, a rooftop collection system, and low-flow plumbing fixtures.

Green Building: The Time Has Come

We've been telling you about the benefits of green building for a long time now. But the green building industry has finally reached a financial tipping point that can no longer be ignored.

"Available technology now ensures that the trade-off between environmental protection and economic health is a choice towns don't have to make," said Lieberman.

The fact is it's simply more economical in the long term to build green.

The savings in water and energy alone are enough to slash building operation costs by 50 percent or more. So it's really no surprise to see so many in the industry transitioning to green these days.

Nonetheless, there are still questions that need to be answered.

And as investors, we need accurate data to make wise investment decisions.

Massive Scale, Massive Returns

The construction industry in the United States represents one fifth of the economy. This industry also comprises 14.2% of the $14 trillion U.S. GDP, which equates to roughly $1.98 trillion dollars.

In total, U.S. buildings consume 75% of the nation's electricity and 12% of all potable water.

Plus, construction and demolition produces 136 million tons of debris that needs to be disposed of every year.

I know being confronted with random numbers like these could make it hard to realize just how big an industry we're talking about here. Because really, what does 136 million tons of debris even look like?

To put it in perspective, that much trash equals the weight of 3.7 million tractor trailers. The point is, when dealing with scales this big, minor changes make a huge difference.

It's like getting a dollar from everyone in the U.S. To everyone else it's a buck, but to you it's $300 million.

The same holds true for green building. There is a small upfront cost. But the long-term value is so much greater. In fact, the return on investment can actually be as much as 20:1.

> *By improving the design and energy efficiency of federal buildings, our government will become part of the solution." Senator Frank R. Lautenberg (D-NJ)*

Check it out . . .

Green Schools: A Case Study

Green schools provide the most adequate data to develop a paradigm for green building as a whole. It is this sector of the green building industry that has the best kept records and the most thoroughly analyzed results.

And it should! After all, some 60 million students and staff spend their days in America's schools. That's 20% of the population!

It should be understood that what goes for schools also goes for other buildings - commercial, industrial, and privately owned homes.

The upfront cost is the same and the ensuing benefits are equal - schools just have the most complete dataset.

So let's not beat around the bush here. It does cost more to build green schools. To be exact, it costs 2% more . . . or $3 per square foot. But the economic benefits can be as much as $71 per square foot, as you'll see in just a moment.

> *According to the DOE, commercial buildings account for 35 percent of America's electricity consumption. An upfront investment of 2 percent in green building design, on average, results in life cycle savings of ten times that upfront investment. Ben Cardin (D-MD)*

Schools directly save $11/sq. ft. (that's already almost four times the initial investment) by way of lower energy and water costs and reduced emissions. At that rate, each green-built school could afford to hire an additional full-time employee.

The rest of the savings are passed on to the community in the form of reduced infrastructure costs and lower air and water pollution.

In addition to those benefits, there are unquantifiable advantages, including:

- fewer teacher sick days
- increased power reliability
- increased state competitiveness
- educational enrichment

Now, I know there may be a bit of skepticism. So, let's go through each individual savings piece by piece.

Energy

LEED-NC CERTIFICATION LEVELS

Points	Levels
26-32	Certified
33-38	Silver
39-51	Gold
52-69	Platinum

First off, green buildings use 33% less energy than conventional buildings as a result of:

- energy efficient lighting and daylighting
- efficient heating and cooling
- better insulated roofs

The average school has energy costs totaling $1.15/sq. ft. per annum. That's $138,000 per year for an average 120,000 sq. ft. school.

A green school of that size, with 33% energy savings, has energy costs of $0.77/sq. ft. or $92,400 - a savings of $45,600 annually.

That's a savings of $0.38/sq. ft. annually. Over a 20 year span, adjusted for inflation, those savings add up to $9/sq. ft.

Emissions

The nation's buildings use 45% of our total energy and 75% of our electricity.

And air pollution from burning fossil fuels to generate this power imposes enormous health, environmental and property damage costs.

In fact, demonstrated health costs include tens of thousands of deaths per year and tens of millions of

respiratory ailments.

Reducing electricity and gas usage in buildings can mean lower pollutant emissions. On a per school basis, green schools could account for the reduction of:

- 1,200 pounds of nitrogen oxides (NOx) - a chief component of smog
- 1,300 pounds of sulfur dioxide (SO2) - a principle cause of acid rain
- 585,000 pounds of carbon dioxide (CO2) - primary byproduct of combustion and leading greenhouse gas
- 150 pounds of coarse particulate matter - a leading cause of respiratory illness and contributor to smog

Over twenty years, the value of these reductions is estimated to be $0.53/sq. ft., though this may be a gross underestimate when additional environmental factors are factored in.

These savings amount to $63,600 for a 120,000 sq. ft. school over twenty years.

Water and Wastewater

Green schools have an average water reduction rate of 32%. A reduction rate of that caliber entails direct savings for the school as well as societal benefits in the form of reduced pollution and lower infrastructure costs for water distribution and treatment.

You see, when there's heavy rainfall, wastewater systems can overflow, causing a variety of problems like water pollution, waterborne illnesses, river contamination, and beach closings. The benefits of green building strategies - such as rainwater control systems and green roofs - can dramatically offset these problems.

And that 32% reduction in water costs translates into a $0.84/sq. ft. savings over twenty years.

One Massachusetts city saved $400,000 by avoiding the construction of a storm water detention facility. The savings were a direct result of a green school providing an on-site containment system.

Future Earnings

Green buildings can also help increase productivity by providing comfortable settings for working and learning. One of the leading national centers of expertise on the topic is the Center for Building Performance at Carnegie Mellon University. The Center's Building Investment Decision Support (BIDS) program has reviewed over 1,500 studies that relate technical characteristics of buildings, such as lighting, ventilation and thermal control, to tenant responses, such as productivity or health.

Collectively, these studies demonstrate that better building design correlates with increases in tenant/worker well-being and productivity.

If green schools improve productivity by 26% (the highest known productivity increase in recent studies), any reasonable person can assume that translates to at least a one standard deviation increase in mathematics performance. Are you with me?

Good. Because it has been concluded that a rise in a student's mathematics performance to just the 84th percentile means 12% higher earnings throughout his/her working life.

"You have a choice between a building designed to be healthy and efficient or one that is not. With a 50-year life-cycle investment, green buildings are growing at a rate of 40 to 50 percent each year. As energy pricing increases, the risks of doing conventional design are increasing. The obsolescence risk is becoming a big phenomenon." Greg Kats, principal of Capital E, a Washington, D.C. consultancy focusing on clean energy.

Based on an average salary of $38,000 annually, that translates into an earnings increase of $6,800 per student.

Clearly, this increase in earnings is the single largest cost benefit of green buildings. Building green schools is one of the most economical ways to increase student performance. Especially since green building has an upfront cost of only $3/sq. ft.

Asthma Reduction

American students miss more than 14 million school days each year because of asthma symptoms that are worsened by poor indoor air quality.

These problems have a direct annual healthcare cost of $11.5 billion, with indirect costs - such as lost productivity - of another $4.6 billion.

What's more, healthcare costs are three times higher for children with asthma than children without. At that rate, healthcare costs total $1,650 per child.

A recent review by Carnegie Mellon of five separate studies

"The federal government must lead the way in encouraging the construction and use of safe and efficient buildings. We owe it to our federal workforce and our taxpayers," said Senator Jim Jeffords (I-Vt). "Increasing the use of readily available green building technology, and investing in the development of new technology, makes sense, both economically and

A recent review by Carnegie Mellon of five separate studies evaluating the impact of improved indoor air quality on asthma found an average reduction of 38.5% in asthma in buildings with improved air quality.

But even a conservative estimate of 25% would translate to annual savings of $33,000 for an average sized school.

environmentally. I am proud that Vermont entrepreneurs and researchers, including those at UVM, have often led the way in this important field." (Jim Jeffords)

Over 20 years, those savings work out to $3/sq. ft. That means the cost savings of asthma reduction alone is enough to justify the "greenification" of schools.

Cold and Flu Reduction

Green schools reduce the occurrence of cold/flu by up to 51% as a direct result of improved air quality and ventilation. And since schools contain such a great percentage of the citizenry, that translates into a reduction of these ailments by up to 20% in the general population. That could mean 37 million fewer cases each year.

Allow that to sink in: Just building green schools alone could reduce the number of cases of cold and flu by one fifth in the general population.

Imagine if offices and homes were built this way!

The prevention of one of our nation's most common illnesses would mean a savings - due to reduced healthcare costs, the recovery of lost productivity and wages from staying home with sick children - of $14 million, or $45 per person per year.

In terms of building costs, that translates to $5/sq. ft. That's two dollars more per square foot than it costs to build a green school.

Additional Employment

With a marketplace of this magnitude embracing green building, it's no surprise to find a wealth of new job creation - from design and production to manufacturing, installation and maintenance.

"We don't need hundreds of sustainable buildings in the future; we need thousands," Heinfeld says. "We're not in a situation where we need demonstration projects. Every building needs to use less energy and less water."

Just like the steel industry during the construction of Chicago and New York in the late 19th century. And just like the booming railroad industry during the same period, which saw the completion of the first transcontinental railroad in the U.S.

The point is, as green building tips the scale toward commonplace, the creation of new jobs is inevitable. In fact, a Massachusetts state study recently found that for every $10 million invested in energy efficiency, 160 short-term and 30 long-term jobs are created.

So, if each new green school makes a $200,000 investment in energy efficiency technology, the creation of three short-term jobs and half a long-term position is to be expected.

Over a twenty year period that means an additional $250,000 in in-state salary per averaged-sized school.

In building terms, this equates to $2/sq. ft. for a typical 120,000 sq. ft. school.

"More and more buildings can be built at the LEED-certified level for little or no cost premium. You can easily get at least halfway to certified at a zero-cost premium."

Teacher Retention

This is sort of a bonus prize.

A report in Washington State by Paladino & Company, an internationally recognized building consulting firm, estimates that green schools reduce teacher turnover rate by 5% annually.

And the cost of replacing one teacher can be anywhere from 25% to 200% of an exiting educator's salary.

"We believe that every project, regardless of budget or program, can have a sustainable quotient to it." Dan Heinfeld, President of LPA, Inc.

If we conservatively assume it costs 40% of an average educator's salary with benefits to replace a leaving teacher, then $25,000 would be saved for every one that remained at his/her school.

Plus, a reduction of turnover by just 3% - instead of the estimated 5% - would save $4/sq. ft. over twenty years.

I'm really not even interested in the savings here. I've already shown the financial benefits of greener schools. For me, the benefit of educator retention is ultimately employee happiness which, in turn, means the better education of America's youth.

Additional Benefits

Beyond these quantifiable financial benefits as a result of green building, there are a plethora of others - including environmental and humanistic.

In addition to the creation of jobs, there are other things to consider: reduced sick days, increased productivity, lower maintenance and operations costs, and the reduction of heat trapping and the associated

Green buildings generate significant economic benefits. According to the McGraw-Hill 2006 SmartMarket Report, these things deliver 3.5%

temperature increases in large cities, just to name a few.

higher occupancy rates, 3% higher rent rates, and an average increase of 7.5% in building values; they also improve return on investment by 6.6%, on average

And we can't forget waste reduction, insurance benefits, improved equity, and the general sense of heightened values and educational enrichment that would also be a part of this revolution. The latter two are normally forgotten in a sea of statistics.

Extrapolation

The case outlined for green schools can be applied to buildings in the private and public sectors. All the construction costs and financial benefits of energy efficiency and emissions reduction are the same, with the only difference being in the productivity arena.

You see, while increased productivity in schools has financial implications in the form of future salary, when applied to the business sector the implications are there in the immediate present.

That's because increased productivity in businesses translates to increased revenue. If a company's employees are more productive, then the company itself is more productive - leading to increased revenues, profits, and a general sense of vigor and competition that should be inherent in any healthy company.

Financial Benefits of Green Buildings Summary of Findings (per ft²)

Category	20-year Net Present Value
Energy Savings	$5.80
Emissions Savings	$1.20
Water Savings	$0.50
Operations & Maintanence Savings	$8.50
Productivity & Health Benefits	$36.90 to $55.30
Subtotal	**$52.90 to $71.30**
Average Extra Cost of Building Green	(-3.00-$5.00)
Total 20-year Net Benefit	**$50 to $65**

Of course, even with all these benefits, we still can't avoid the reality that there is a $3/sq. ft. premium on green buildings. But that added price tag won't be around much longer - thanks to advances in technology and increased accessibility of this technology.

In fact, it is possible to offset this cost during construction even now as new technology and building products become price competitive with traditional materials.

For instance, PNC Bank has constructed 27 of a planned 117 LEED-rated bank branches on the East Coast. Each cost $100,000 less to build than a standard bank branch, uses 40% to 50% less energy, and was ready to go in 45 fewer days.

Make no mistake. The financial benefits of green buildings are inarguable. And that's ultimately what it all boils down to for those who build and profit from these things.

So as the green building revolution continues to unfold, we will continue to profit.

For more on green building, and more importantly, the publicly-traded companies profiting from this sector, visit Green Chip Stocks.

Benefits of Increased Health and Productivity

Recent studies confirm that inadequate lighting, temperature control, and poor indoor air quality undoubtedly have financial consequences in the form of health issues and lost productivity.

In fact, the value of lost productivity has been set at up to hundreds of billions of dollars per year. Not surprising, considering that people spend 90% of their time indoors, where the concentration of pollutants is typically higher.

A number of studies have suggested that better air, lighting and temperature control can increase productivity by up to 26%. But what does increased productivity mean in terms of the almighty dollar?

"I believe it has done more to boost productivity than all the bandwidth in the world." William R. Pape, cofounder of VeriFone, Inc.

Well, many of the benefits of green building - mainly increased ventilation, temperature and lighting control and increased daylighting - can significantly improve productivity.

Let's take a conservative estimate of a 1.5% increase in productivity - which equates to only 7 minutes for every working day, or about 30 hours per year.

That small increase is equal to $1,000 per worker per year in increased productivity. So even tiny changes can translate into large financial benefits.

LEEDing the Way

The LEED (Leadership in Energy and Environmental Design) certification standards are designed and maintained by the United States Green Building Council (USGBC). It is a voluntary system used to pinpoint the exact degree of sustainability of new construction and renovations.

In other words, to be considered a green building - at least officially - the project has to be approved by an agent of the USGBC's LEED certification program.

It goes something like this. A building can be approved as having one of four degrees of sustainability: Certified, Silver, Gold, or Platinum. This rating comes from points awarded in a variety of different categories.

New buildings are evaluated in the following categories:

LEED-NC CERTIFICATION LEVELS

Points	*Levels*
26-32	Certified
33-38	Silver
39-51	Gold

- Sustainable Sites - 14 points
- Water Efficiency - 5 points
- Energy and Atmosphere - 17 points
- Materials and Resources - 13 points
- Indoor Environmental Quality - 15 points
- Innovation in Design - up to 5 additional points

52-69	Platinum

The more sustainable and efficient a building is in each category, the more points it is awarded.

— Nick Hodge

Editor, *Green Chip Stocks*

P.S. If you're interested in learning more about green building, renewable energy, and associated opportunities for profit, you may be interested in ***Green Chip Stocks*** .

You can view the HTML version here: Green Building
