



THE SUSTAINABILITY EQUATION

How Green Can You Get?

In today's economic climate, professionals from contractors to government officials are throwing around the word "sustainability," but do they really know what it means? Many do not. In fact, if you ask consultants, architects, builders, or university professors, you'll probably get a different definition every time.

Even when a definition can be agreed to, even most experts remain unaware of all approaches necessary to attain it. The road to sustainability is not a single-lane highway, but requires a complete, strategic system that brings all factors into play in order to attain the greatest amount of sustainability with the least cost and effort.

In order to clarify the definition of what sustainability really means and how to attain it, as well as to dismiss much of the confusion and misinformation surrounding the topic, I have created an equation that explains sustainability as it relates to the entire "Green Movement." This is the Sustainability Equation.

The formula is simple at first glance but is actually quite complex and in depth. The formula:

$$S = B + ESP + EM + EEP + RE + CE$$

As you can probably decipher, S stands for Sustainability: an ongoing balance between use and preservation, which is the ultimate goal of the green movement. If we can't "have our cake and eat it, too," we must eat some tonight, save some for breakfast, and make sure we can replenish the flour and other ingredients to bake another one later.

To further refine the Sustainability Equation for specific cases, each factor in the equation may be assigned a multiplier to indicate its relative significance. Further details of multipliers and an example will be supplied after each factor has been fully explained.

B is for Behaviors

Behavior is the first and best-known part of the equation. This is the factor that most of us were raised with. You probably remember your mother reminding you to "Turn off the lights when

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you leave!” “Don’t stand there with the refrigerator door open!” or “Close the door – do you think we’re trying to heat the entire neighborhood?”

Long before the green movement began, most of us were taught to do certain things to reduce energy consumption. Refining these behaviors can make a significant impact on protecting the environment and improving a company’s bottom line.

Turn off the lights

It seems like a simple statement, yet it remains as important as when your mother told you as a child. If a room is empty, the lights should be turned off. No brainer? Apparently not too many people. Walk through any commercial building, look through the windows, and see how many rooms are vacant yet the lights remain on. Lighting can make up as much as 50% to 70% of a company’s utility bill.¹

Turning off the lights in vacant rooms accomplishes more than merely reducing electricity consumption. It creates a domino effect.

Most lights produce a significant amount of heat. In hot climates and seasons, this additional heat requires that the HVAC system works overtime to cool the building. This means that additional energy is needed to offset the heat energy created. Even when it’s sufficiently cool outside to make air conditioning unnecessary, heating a building with lighting is an extremely wasteful strategy.

In any case, when lights are on, they draw energy. Unless you have specifically contracted with the power company to use only “green” energy or if you are completely ‘off the grid’, that energy comes from electrical companies. In many cases that means particularly harmful coal-generated electricity. When more electricity is required than the utility company’s primary systems can produce, secondary systems come on line to prevent a drop in current. Since much of our aging electrical transmission infrastructure utilizes older substation condenser systems that are significantly less efficient and potentially harmful to the environment, this in turn creates even more waste, when they come on line to produce power.

It seems like such a small thing, but turning off unnecessary lights is one way to help prevent the dominoes from falling.

Unplug

How many electronics do you use on a daily basis? Probably dozens and many of them are DC powered. If you don’t know how to tell, follow the wire to where you plug it in. Is there a big

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and bulky “box” anywhere along the wire or on the plug itself? Such boxes are drop-down transformers. They drop the electrical current from the wall to the required voltage to power the electronic device.

Many of these transformers draw 30% of their electrical rating whenever they are plugged in, even while the electronic device is turned off or unattached. Even those that drop to a trickle charge (if used for charging a battery) still consume electricity. This ‘ghost’ power draw can add up to a significant amount of electricity.

Here’s a simple way to get this under control. Rather than running around plugging and unplugging dozens of devices multiple times a day, a simple alternative is to plug collections of devices into power strips and turn the strip off when not in use. Even better, when the devices provide power to computer peripherals, plug the computer into the strip as well. That way you can shut down your computer and then hit the strip, and reverse the steps when powering up. This means that everything will be operational when your computer turns on.

Getting your ‘ghost’ power use under control is another way to reduce power consumption and help avoid toppling the dominoes.

Recycle

Recycling is another common method whereby citizens and companies regularly lessen our impact on the environment. It saves trees, reduces the plastics that clog landfills and waterways, and decreases toxins in our soils. Depending on the facilities available in your area, recycling may not be difficult, but it does take effort.

Think “Efficiency”

By planning out your errands beforehand, you can reduce the miles you must drive, and thus reduce oil and hydrocarbon consumption. Car pooling also accomplishes these goals, reduces traffic congestion, lets you eat, talk on the phone and perform other tasks more safely (if you’re the passenger), and may even earn you a spot in the carpool lane, shaving additional time from your commute.

Thinking efficiently in your home may mean adjusting the temperature on your water heater, installing a smart thermostat, opening or closing blinds to control solar heat, or adding insulation to the attic.



Are Behaviors the Best Solution?

All of the behaviors mentioned above are important parts of the Sustainability Equation and have an enormous impact on our neighborhoods, nation, world and future. Much more than mere behaviors are required, however, to create the significant change in our economy and environment which we so desperately need.

If fact, in most cases, even our best behaviors can't compete with the potential positive impact of other factors of the Sustainability Equation. The center part of the equation is the most important. It consists of three areas that will have the greatest impact and where the majority of our focus must be centered if we hope to become truly sustainable.

ESP - Do you have it?

Environmentally Safe Products are becoming increasingly accessible but are not yet commonplace. Petroleum sprays for instance disperse hydrocarbons, contaminate the earth, and contribute to urban and agricultural runoff. Environmentally-safe, food-safe, and child-safe alternatives are available.

Organizations around the world use harmful chemicals to clean and maintain their buildings. In many instances the foam fire suppression system can be hazardous to those in the area of effect. For all of these areas in the commercial and industrial markets there are ESP's that do as good and sometimes a better job than products currently in use.

A common misperception regarding environmentally-safe cleaning, polishing, and lubricating products is that they are not as effective as those that are hazardous. While occasionally true, recent breakthroughs have largely invalidated this point of view. There are many products that will not contaminate water and food or otherwise cause harm that are proven effective, and eliminate the hazard risks associated with products used in the past.

Another myth is that ESP's are too expensive. The fact is, some are and some aren't, but almost all are far less expensive in the long view. Some research may be necessary to find these products; but in the final tally, such efforts are well worth it for everyone involved and the environment.



Though ESP's have their place in the important middle of the Sustainability Equation, the next factor could have by far the most dramatic impact on the energy-use reduction and the world economy.

EEP – The Big Key

General Electric recognizes it. Jim Rogers, CEO of Duke Energy, knows it. Thomas Friedman even writes about it in his latest book. So, if Energy Efficiency Products are the most important key to energy consumption reduction, why don't we see more focus here than any other area of the Sustainability Equation?

I'll tell you why: ignorance and misinformation.

Legislators and business leaders do not understand that if we reduce consumption by employing available proven technologies, we will attain results far exceeding anything proposed by most energy advisors.

Most consultants, who push the aspect of behaviors as the answer, are careful not to recommend a product solution. I strongly disagree with this approach. As I have stated, behaviors are important but they are not a real solution to our problems. EEP's are the major solution. EEP's can create 10x the savings – both in terms of energy and cost – regardless of behaviors. Here are a few examples:

LED Lighting

LED's (light-emitting diodes) are one of the most significant advances in energy conservation of our day. They create light far more efficiently than filament-based and even fluorescent lights, without their down sides.

For example, quality LED tube light replacement bulbs now exist that produce equal to or greater lighting at the same color temperatures desired at less than half the energy consumption of their fluorescent counterparts. They carry NRTL, CE, ROHS, and Energy Star ratings. Furthermore, the lifetime of LED's far exceeds that of other bulbs, and they do not have any harmful elements to poison the environment when disposed of, and they can be found at a reasonable price. If all direct and indirect costs are taken into account when switching to LED's from fluorescent tubes, the savings are far greater than what is seen from other means of energy reduction.



Until recently, LED replacement bulbs were not true replacements. They created less light, required huge heat sinks that meant they required much higher costs, hardwired socket replacements and even additional structural support. This is no longer the case. Recent advances have made most LED bulbs compatible with existing sockets.

Industrial Motor Controllers

An often-overlooked opportunity to reduce energy consumption applies to industrial and manufacturing plants that use a large number of electric motors. Many electric motors are rarely used at their full potential yet draw the same amount of electricity as if they were. Large industrial motors used for manufacturing, processing, and moving items on conveyors are much like the small motor that can be found in a household electric dryer.

Imagine doing laundry at home. In a traditional clothes dryer, the motor in that dryer does not react to whether you place one item or several items in the drum. It spins at the same consistent speed and draws the same amount of energy regardless of load size. This means that you use the same amount of electricity if you're drying an entire load or just one sock.

With Industrial Motor Controllers, the amount of energy needed is based on load. Referring back to our dryer example, when a controller, or variable-speed motor, is used, only the amount of energy needed to turn that one item is used. For industrial applications, Motor Controllers come with basic settings, and software enables a user to adjust settings for best results. These systems have been shown to greatly reduce energy consumption and extend the life of electric motors.

Even newer, advanced motors with flexible energy consumption requirements are limited in comparison to what advanced controllers offer.

Spray Foam

Spray foam has become a very popular and effective way to maximize building efficiency and protection from the elements. Modern architects and building owners are becoming more creative with their designs, especially the roofs. Spray foam can be used to cover roofs and walls to not only improve insulation, but also add a pleasing look to the structure.

Spray foam roofing (SPF) with its added coating, reflects 85% or more of the sun's rays to reduce cooling needs, and prevent heat loss in colder environments. In short, the HVAC system works less, instantly decreasing energy consumption.

Spray foam is also perfect for tight spaces. Wherever a pipe goes through a wall, for example, a hole is left that must be sealed. Foam is also perfect for insulating walls and crawl spaces. After

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being sprayed, it hardens and can be shaped by cutting or sanding. This simplicity, effectiveness and cost effectiveness make foam more practical than other options.

Detractors point out that foam is a urethane and therefore not a good sustainable choice, but a closer look shows the opposite. Today's foams come in a variety of compounds. Many are naturally biodegradable, and those that aren't can be recycled to be used as dry spray insulation or broken down through an enzyme solution to make it eco friendly.

In fact, spray foam is often used as an underpinning in many "green" roofs. All in all, there are more positives than negatives associated with today's spray foams.

Nano Particle Technology

Nano Particle Technology has made leaps and bounds in development and application, yet remains relatively unknown to many proponents of sustainability.

Nano particles can penetrate and bond with various materials or otherwise permanently change their composition. One exciting area where this technology is used is for friction-reduction products. Any metal-to-metal moving parts create friction, which can be significantly reduced using nano particle technology. Common applications include engines, differentials, gear boxes, and other types of machinery where a reduction in friction provides efficiency.

Reduced surface friction also resists wear, which reduces maintenance and extends the working lifetime of the machine.

The hype surrounding this relatively new area of science has created one unfortunate problem – difficulty of differentiation between products. When selecting nano particle technology products, beware of manufacturers who have adopted the name but whose products are less effective.

Fuel Efficiency

Trucking firms, carrier fleets, locomotives, marine vessels, public transport and school busses, generators and boilers; in both the public and private sectors, all burn fuel and produce harmful hydrocarbons.

All it takes is a glance at the sky during rush hour to see the impact on air quality in your city. A recent study at the University of Maryland discovered that airborne pollution has dimmed the sky by blocking sunlight since the mid-1970's. All you need is a fill up at the pump to point out the percentage of your budget allotted for fuel alone. A glance at the newspaper headlines reminds you of the impact on world unrest generated by our need for this scarce product.

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Even if driving less, or driving smaller vehicles, is not an option, you can still reduce both fuel consumption and emissions without giving up power.

Not only that, you can do something without having to go out and buy a hybrid or electric car! An excellent way to improve your mileage and emissions is to atomize the fuel molecules. Fuel molecules tend to stick together forming globs. When these globs of molecules are sprayed into engine cylinders, only the exterior of those globules fully burn. This is especially true with diesels. It is much like a folded newspaper being tossed into a fire then pulled out. What was burned? Only the exterior of the paper is burned. However, if you were to take the same newspaper and separate the pages it would all burn and it would burn faster and hotter with less waste.

Many physical attachments and chemical additives may be implemented without affecting manufacturer's warranty, but as with other new technologies, there's a lot of smoke and mirrors to see through when researching products. Many products make big claims but few really do reduce fuel consumption.

Battery Life

Many organizations rely on electric-powered vehicles such as fork and scissor lifts and electric carts. Many of these vehicles have unsealed industrial batteries that must be continually recharged after use. These batteries are expensive and typically last about five years. Constant charging and discharging can overheat and swell the batteries, which make charging more difficult and less efficient. The charging systems can draw up to two and three times the energy needed to charge a new battery after just a year or two of usage.

This problem also has an easy and effective solution. Of the many claims of extending battery life and reduce strain on an electrical system that I've heard about, I've only found one that works. The concept is simple. When a battery is new, a chemical is added to the battery. This attaches itself to the battery plates and prevents the naturally-occurring sulfur build up that reduces charging efficiency, time per use before charge, and working life of batteries.

With the reduction of sulfur buildup, these industrial batteries last longer between charges, charge more efficiently, and the life of a new battery can be extended by twice the previous expectancy.



EM – Work Smarter, Not Harder

As much as we'd like to believe that humans can be trained to perfectly apply sustainable behaviors, the fact is that people will frequently forget to unplug something, to flick a switch or they won't care enough to do anything. Many times people simply don't understand why they should care. Even when they do care, learning what makes a difference with energy and resource consumption is often more complex than they have time to deal with

That's where Energy Management steps in. Smart systems, as they're sometimes called, can monitor electricity, control lights and security systems, meter water usage, and control circuits or individual receptacles. Don't spend time and money trying to teach and enforce behaviors when a smart system can do it for you. There are few reasons not to have a Building Energy Management System installed in any organization.

RE – Free for the Taking

Imagine what you could accomplish if an unlimited energy source was free for the taking. In a way, that's true of Renewable Energy. The sun isn't scheduled to quit shining anytime soon, and last time I checked, wind continues to blow around the globe. Anything that moves on its own is a potential source of energy. The question is whether the energy returns justify the capital expenditure.

Synthesis Gas

What if you could solve three issues at one time? There is a way. The system creates a synthetic gas that is hydrogen rich. This gas is used to power a micro turbine which creates electricity and the exhaust creates heat that is used to create steam. There is a zero carbon output and when used to create steam and electricity is 80% efficient. There is nothing else that can come close to that in any other renewable energy technology.

“It is a unique electrical discharge plasma reactor, which instantly reforms gasified carbonaceous waste into Synthesis gas; an ideal gasified fuel for Micro turbine DG Gen-Sets, or used to produce Methanol or other valuable chemicals including synthetic fuels, urea, ammonia acetic acid, etc.”

The system uses carbonaceous waste, meaning garbage and sewage, heats it up to create a gas which is passed through the system to create the synthesis gas. That sums up the three issues, garbage, sewage, and electricity. This technology is so new that many rely on the old information and lean on technology that has no ROI.

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Solar Power

Photo-voltaic cells have been around since the late 1800's. Bell Labs increased their efficiency from 1% to 6% in the 1950's with the discovery of silica-based solar panels. Efficiency has since increased to over 40%, but this is limited to extremely expensive scientific products not commercially available.

Note that I said *maximum* not average. The average effectiveness of solar panels in production today is less than 20% and that comes with a hefty price tag and little to no ROI. However, there is still hope for this technology.

New developments in nano technology have produced solar power units that synthesize photosynthesis. This new breed of solar technology has breached the 50% effectiveness barrier. With continued R&D, solar power will eventually become a viable source of energy.

Wind Turbines

There are two types of wind turbines used to produce energy today - the HAWT (Horizontal Axis Wind Turbine) and the VAWT (Vertical Axis Wind Turbine). The HAWT, with its rows of giant white towers and propellers forming wind farms, is the best recognized design. HAWT's are stationary and face the predominant wind. If the wind is not strong enough or if the directions of the prevailing winds change, the turbines do not turn. The overall efficiency of the HAWT is not great but it still beats creating nuclear waste or spilling tons of hydrocarbons into the atmosphere.

The VAWT is becoming more common. Scale to scale, it is more efficient than HAWT. It can be placed without regard to wind direction. VAWT's turn in lower wind speeds but the drawback to these units is size. Currently, the size of VAWT's are much smaller than HAWT's and therefore cannot produce as much energy. VAWT's shine however, when considering rooftop placement or to support individual facilities buildings.

Wind Belt

Wind belt technology is entirely different than the wind turbines, and boasts 50% greater efficiency than any wind turbine. Wind belt technology is not new, but until recently has not been developed. Using specially designed straps, this new method of capturing wind energy can use existing radio towers or power poles.

The belts are attached at different heights around the structure while the opposite end of the belt attaches to a tuner on the ground that adjust the tension of the belt and transforms the movement into electricity. When the wind blows, the belts with the leading edge facing the wind begin to

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vibrate. This oscillation creates energy without having big machines that must overcome gravity, weight, and friction.

This technology is being perfected and in the near future will enable us to more completely harness the power of the wind. Combine that with the advanced technologies in solar and we will soon have a system that is over 100% efficient.

CE – The Bottom Line

The old “green” movement didn’t refer to the environment, but to the color of the all-mighty dollar. The bottom line. Making money was the sole reason for doing business, which sometimes came at great cost to the health and future of our world.

The new, more enlightened, green movement need not be at odds with old maxims. In fact, it cannot survive without them. Cost Efficiency remains a requirement for any well-meaning company to remain viable in increasingly competitive world markets.

Some solutions have immediate benefits while other returns take longer. Such considerations should be weighed when designing the best plans for a given situation.

As with all other elements of the Sustainability Equation, I have good news. Many of the products mentioned in this paper are not only good for the environment; they’re easy on the pocket book. In fact, if a solution doesn’t result in financial savings, I don’t consider it a serious solution. As I stated before, no element of the equation can be ignored.

Multipliers

In the beginning of this paper, I mentioned that the Sustainability Equation may be adjusted to any situation by adding multipliers to any element. These multiplier(s) may depend on an organization’s ability to implement specific strategies, available capital investment, zoning or other regulation, long- vs. short-range goals, and so forth.

These multipliers need not be exact in order to indicate where time and energy may best be invested for optimal sustainability increase with a particular project. Here are a few examples:



Lack of Capital

If you don't have up-front investment capital to implement sustainability solutions, a few multipliers are recommended. B (behaviors) may be emphasized as an element that does not require investment yet provides immediate savings. Any savings could possibly be reinvested into other solutions.

CE (cost effectiveness) also becomes more important. Put a 2 or 3 in front of these factors, and then search for solutions with low up-front costs or immediate returns.

$$S = 2B + ESP + EM + EEP + RE + 3CE$$

Long Range Responsibility

If your group can afford to focus on long-term sustainability returns, or if public image is a concern, RE (renewable energy) becomes a valuable element to focus on as benefits continue to accrue and since the general public is well-informed on this area and such investments reflect well your commitment to sustainability.

$$S = B + ESP + EM + EEP + 3RE + CE$$

Focused Opportunity

If your organization stands to benefit the most in specific areas – such as fuel economy for a shipping fleet (EEP), lighting and heating and cooling efficiency for an office building (EM or EEP), or reducing environmental toxins for a manufacturing plant (ESP), add an appropriate multiplier to the related element in order to emphasize its importance.

$$S = B + 2ESP + 3EM + 2EEP + RE + CE$$

Conclusion

Sustainability is an equation. Each factor in the equation must be considered and researched to discover hidden opportunities to lessen our impact and leave our world a better place than we found it.

Any company who pays attention to the opportunities to go green will not only be greener, but save more “green,” which can now be accomplished far more quickly than even a few years ago.



Most people have little idea of just how much we can improve our planet with relatively little effort and investment. Please help spread the word.

Need help with recycling? There are some excellent websites that can help. Visit www.eye4image.com/green-resources.html to see a current list.

For more information regarding sustainability and outstanding green products, visit: www.UISMinc.com and www.UISMinc.com/news.

Sustainability =
Behaviors + Environmentally Safe Products + Energy Management
+ Energy Efficiency Products + Renewable Energy + Cost Efficiency

About the Author

Hardy L. DeLay IV, Founder & CEO, has a BS degree in Management of Technical Operations from Embry-Riddle Aeronautical University, Daytona Beach, FL. and is a service connected disabled veteran. Hardy started UISM in 2007 after working in sales and marketing for many years. A nationally-known speaker on energy topics, Hardy has experience with starting two other successful businesses, and has invaluable experience in the industry. He is currently completing an Executive MBA from the University of Saint Thomas in Minneapolis, MN.

Hardy has enjoyed participating in different extreme sports from an early age, from racing dirt bikes to rock climbing to SCUBA diving. These sports have inspired a deep and abiding love of nature. Hardy's spiritual beliefs and his personal experience with his other business startups have given him a strong desire to make a difference both for helping the environment and for helping people.

1. <http://www.cleanenergyresourceteams.org>
2. <http://www.floridasynqas.com>

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