# Accelerating Sustainability: Combining On-site Renewables and Energy Efficiency to Fuel Economic, Environmental and Social Progress

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## Introduction

The drive toward sustainability continues unabated. Worried about energy security, unstable fuel prices and greenhouse gas emissions, a growing number of schools, universities, governments, businesses and other organizations are committed to improving their environmental and social performance along with their financial results – their triple bottom lines.

By doing so, these organizations are cutting costs, protecting the environment and improving their competitiveness while creating more productive and comfortable workplaces, strengthening the communities in which they operate and reaping other benefits.

Some organizations have chosen energy efficiency as a path to sustainability. Others are using on-site renewable sources such as biomass, solar and wind to generate their own sustainable power supplies. However, those organizations that have adopted *both* approaches are accelerating their progress towards sustainability. In many cases, on-site renewable energy facilities can be financed through cost savings from energy efficiency measures.

Coupling the development of on-site renewable energy facilities with energy efficiency measures certainly increases the complexity of a sustainability initiative – in many cases beyond an organization's in-house capabilities. However, by working with a partner such as Johnson Controls that is adept and experienced in every aspect of both renewable energy and energy efficiency initiatives, an organization can reach its sustainability objectives more quickly by teaming energy efficiency measures with installation of an on-site renewable energy facility.

This paper presents:

1. The advantages of combining energy efficiency measures with on-site renewable energy initiatives
2. Best practices for managing the complexities of on-site renewable energy technologies, financing options, incentives and legal considerations
3. The preferred development process organizations should follow to accelerate their journey on the road to sustainability
4. The advantages of working with an energy efficiency and renewable energy leader such as Johnson Controls

## Flushed with Sustainable Success

It might just surprise people in Baltimore to learn that thanks to an innovative public works project that combines energy efficiency and renewable energy generation, every time they flush a toilet they're helping their city save tax dollars, protect the environment and build a stronger community.

The Back River Wastewater Treatment Plant is one of two wastewater plants serving the 1.6 million people who call metropolitan Baltimore home. Working with energy efficiency and renewable energy expert Johnson Controls, the City of Baltimore has substantially improved energy efficiency at Back River through upgrades to the facilities, and installed an energy generation facility that is fueled by methane gas produced in the wastewater treatment process.

The result: energy cost savings of $1.8 million annually.

"Each year, the City of Baltimore spends about $40 million on energy," says George L. Winfield, director of the Department of Public Works. "The City wants to reduce energy costs – whether by consuming less energy or by producing it more efficiently. This project does both."

In addition, the project reduces annual emissions of carbon dioxide by 31 million pounds – the equivalent of taking the emissions of 5,600 cars off of Baltimore streets and highways.

"The emissions reductions are especially important to the City," says Winfield. [i]

Plus, 25% of the work on the project was performed by minority- and women-owned contractors in the Baltimore area, helping to strengthen and diversify the local economy.

## A Symphony of Sustainability

The City of Baltimore is just one of many organizations demonstrating that energy efficiency and on-site renewable energy working in concert accelerate progress toward sustainability.

The Dow Jones Sustainability Index defines corporate sustainability as "a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments." [ii]

Achieving sustainability has fast become a major priority for governments, schools and businesses concerned about rising demand for energy, unstable fuel prices, uncertain energy security and the threat of global climate change.

These organizations also are discovering that by making progress towards sustainability, they benefit their triple bottom line – a phrase coined in 1994 by John Elkington, described by *BusinessWeek* as "a dean of the corporate-responsibility movement for three decades." [iii]

The triple bottom line expands the traditional measures of an organization's success to include environmental and social results alongside its financial performance.

In the case of Baltimore's Back River project, the triple bottom line could be defined as:

- Lower energy costs = financial performance
- Reduced emissions = environmental performance
- Local economic development = social performance

The Back River project would have generated these benefits if it involved only energy efficiency upgrades to plant facilities and equipment, or if it included only the installation of an on-site renewable energy facility. But working together, energy efficiency and renewable energy multiply these benefits and accelerate Baltimore on its road to sustainability.

According to the U.S. Department of Energy and other experts, together, energy efficiency and renewable energy offer organizations a wide range of triple bottom line benefits:

*Economic Benefits*

- Lower utility bills due to energy-efficient facilities and equipment. [iv]
- More stability in energy costs, because renewable energy provides a hedge against rising fossil fuel prices. [v]
- New sources of revenue when excess electricity generated from renewables can be sold to a utility.
- Increased local economic development, since projects tend to be labor-intensive and local. [vi] A recent study by the Union of Concerned Scientists estimates that a national standard requiring that 20% of electricity in the U.S. be generated from renewable energy sources by 2020 would create 185,000 new jobs and result in $66.7 billion in new capital investment. [vii]

*Environmental Benefits*

- Smaller carbon footprint and lower or no emissions of air pollutants from renewable energy generation.[viii] The UCS study estimates that reductions in emissions of greenhouse gases such as carbon dioxide resulting from a 20% by 2020 national renewable energy standard would be equivalent to removing more then 36 million cars from the nation's roadways.
- Minimal impact on water resources, since pollutants are not discharged into surface water and solar and wind energy do not require cooling water. [ix]

*Social Benefits*

- Increased energy security due to reduced reliance on foreign energy supplies. [x]
- Healthier indoor and outdoor environments where people live and work, the result of lower emissions of pollutants.
- Educational opportunities in schools, colleges and universities that install and operate renewable energy facilities.
- Improved image with citizens, employees (existing and potential) and other stakeholders with demonstrated leadership on economic and environmental matters. [xi]
- Higher standards of living in communities where higher paying "green collar" jobs in renewable energy are created.

In the past, energy efficiency and on-site renewable energy programs have often advanced along separate pathways. However, a 2007 study conducted by the American Council for an Energy-Efficient Economy (ACEEE) and the American Council on Renewable Energy (ACORE) concludes that investments in both are essential to creating a secure energy future for the U.S.

"Efficiency and renewable resources need each other to win the race for clean and secure energy," says ACEEE Acting Executive Director Bill Prindle. "Efficiency keeps demand growth in check so that renewables can begin to cut emissions and oil imports."

The study finds that "synergies between energy efficiency and renewable energy use the strengths of one to complement the weaknesses of the other, thereby advancing both." [xii]

Examples of these synergies include:

- *Timing:* Energy efficiency can deliver near-term energy savings, but its long-term potential is limited. On the other hand, renewables can produce some energy in the near term, while providing significant long-term growth potential.
- *Cost:* Improving energy efficiency generally costs less than existing or new power generation, but renewables are becoming more competitive as technology improves and traditional energy costs escalate. Strategies that include both efficiency and renewables can result in more price stability and lower average energy prices.

- *Economic Development:* Energy efficiency and renewables generate investment and create jobs in different business sectors, compounding the economic impact. Often, these impacts are to the local economy, unlike utility expenditures that may be exported to distant power companies.
- *Geography:* Renewable energy sources are more available in some geographic regions of the country than others. Wind power, for example. However, energy efficiency is available without consideration to location. In regions where renewable resources are limited, more emphasis can be placed on developing energy efficiencies.
- *Power System:* On a hot, sunny day energy efficiency reduces power demand while renewable energies such as solar and wind operate at peak capacity to increase supply. The result is a reduction in the use of peak generated power – the most costly to produce.

Energy efficiency and renewable energy are already working collaboratively to advance sustainability:

- *Public Benefit Funds:* More than half of the states now operate these funds to educate consumers and provide incentives for investments in both energy efficiency and renewable energy projects. Funding comes from a charge on customers' utility bills. [xiii]
- *Resource Standards:* 24 states plus the District of Columbia now have Renewable Portfolio Standards in place, and several coordinate them with Energy Efficiency Resource Standards to drive lower energy demand and higher utilization of renewable power sources. [xiv]
- *Zero Energy Homes:* Residential construction that utilizes high-efficiency appliances, building materials and HVAC systems along with renewable energy sources such as solar photovoltaic and solar thermal to create homes that generate as much energy as they consume.
- *Corporate Initiatives:* Companies such as office supplier Staples have financed significant renewable energy projects with cost savings realized from energy efficiency improvements.
- *Public Buildings:* Large public facilities such as the University of South Carolina, which recently completed installation of a biomass cogeneration energy plant that burns wood waste to generate steam and electricity for on-campus use. The project is funded in part by cost savings from energy efficiency measures.
- *Power Industry:* Utilities such as Austin Energy help customers increase both their energy efficiency and investment in renewable energy – lowering their energy costs and increasing the reliability of their power supply.
- *Landfill Gas:* A landfill in Model City, New York burns landfill gas to produce electricity, which is sold to the grid. Waste heat from the co-generation facility is captured and used to heat a ten-acre tomato-growing greenhouse, eliminating the need for additional heat during the cold months of the year.

Energy efficiency improvements also make renewable energy projects more affordable – by reducing the amount of energy renewables need to generate. When performed first, energy efficiency improvements also prevent the installation of excess renewable energy generation capacity.

## Managing a Complex Process

As we've seen, coupling installation of a renewable energy facility with energy efficiency improvements results in accelerated progress toward sustainability goals, but it also adds complexities to the undertaking that can include:

- Renewable technology selection
- Securing funding
- Legal considerations
- Project management

These complicated issues – each of which is discussed in more detail below – require the assistance of a knowledgeable and experienced partner.

### Renewable Technology Selection

The U.S. Department of Energy's Energy Information Administration (EIA) estimates that approximately 9% of electricity generated and consumed in the U.S. currently comes from renewable sources. [xv] EIA projects that power generation from renewables will grow at about 1.5% per year through 2030 – roughly the same rate at which EIA estimates overall demand for electricity in the U.S. will grow over the same period. [xvi]

Among the primary renewable energy technologies currently in use are:

#### *Biomass*

Biomass refers to all trees, grasses, crops and other living plant materials. These plant materials can be burned in their solid form to produce heat that can be used to generate electricity, or they can be converted to liquid and gaseous fuels. [xvii]

Biomass sources that are most commonly used to produce energy are plentiful across the country and include:

- Waste materials from the wood products industry – such as sawdust
- Wood residues from municipalities and industry – such as bark stripped from trees or construction debris
- Forest debris and thinnings
- Agricultural residues – such as corn stalks
- Fast-growing trees and crops – such as switch grass
- Animal manures [xviii]

In many cases, organizations that have a significant and ongoing need for heat can be ideal candidates for biomass projects. While some local utility rates make generation of electricity from biomass financially unattractive, biomass can economically provide heat for industrial processes, hospital laundries, university central plants or other similar facilities – while producing (as a byproduct) electricity that can sold to a utility to generate additional revenue.

Financial feasibility is a significant hurdle to overcome in biomass-to-energy projects and requires the expertise of qualified specialists to:

- Secure one or more fuel sources that are low-cost, reliable and nearby
- Accurately determine costs to transport the fuel to the biomass generator
- Identify the technology best suited to the fuel(s) and other factors
- Determine the availability of incentives to help offset startup costs

### *Wind*

Wind energy is one of the fastest growing renewable energy sources in the world. [xix]

Wind is produced by differences in the rates at which the earth's land and water surfaces heat up and cool off, so this energy resource will continue to blow as long as the sun remains in the sky.

Accurately measuring average wind speed is critical to determining whether a wind turbine is feasible at any given location. Currently, ideal average wind speeds of between 7 and 9 meters per second (roughly 15 to 20 miles per hour) are required for utility-scale wind turbines suitable for commercial applications such as schools or government facilities. Average wind speeds are determined through a wind resource assessment conducted by qualified specialists.

Wind turbine projects may require a variety of studies, permits, contracts and agreements, above and beyond other renewable energy projects, including:

- Zoning permits
- A study of flicker effect (the visual flicker a wind turbine can produce when the sun is shining)
- A noise study
- An avian study to gauge any potential impacts on birds and bats
- A Federal Aviation Administration (FAA) study to determine if the wind turbine might interfere with aviation radar

### *Solar*

Solar photovoltaic (PV) panels are made up of silicon and other materials that release tiny amounts of electricity when exposed to light. Solar PV systems collect and convert these bursts of electricity into usable power. Like wind power, this renewable resource will be available as long as the sun shines and it is virtually emission-free. [xx]

Important factors to evaluate when considering a solar PV installation include:

- The cost of electricity in the area – higher utility prices make solar energy more affordable
- Available incentives – Grants, rebates and other incentives from federal and state governments, and utilities can be critical to determining the financial feasibility of a project
- Value of Renewable Energy Credits (RECs) – which can be sold to improve the financial feasibility of a project
- Resource potential –availability of sunlight for solar PV is rated good to excellent across virtually the entire U.S. with sunny areas of the southwest having the greatest resource potential. Qualified experts can estimate the amount of electricity that can be generated from available sunlight at any location.
- Availability of net metering – the ability of electric meters to run backwards when customers sell excess energy generated from renewable sources back to their utility. Generally, all of the electricity generated by solar PV systems is used on-site except in areas where high electricity rates make it feasible to sell solar power to a utility at a profit.

Solar thermal systems can be financially attractive to organizations that have significant and ongoing demands for hot water – for example, commercial kitchens, as well as hotels with swimming pools that require heating. Solar thermal systems collect warmth from the sun to heat water in a tank and distribute it through the building's plumbing system. Simple paybacks on solar thermal systems can be as low as ten years.

### *Digester Gas*

The Department of Energy estimates that some 3,500 municipal wastewater treatment plants use a process called anaerobic digestion, which produces methane as a by-product. However, less than 100 of these plants use this so-called "digester gas" to generate electricity. [xxi]

Methane produced by wastewater treatment plants cannot be released into the atmosphere. Many plants simply burn the gas in flares, but given the fact that wastewater treatment can account for as much as 40% of the electricity a municipality consumes, turning digester gas into low-cost electricity can be a financially attractive and environmentally-friendly alternative.

Typically, systems developed for this purpose trap the digester gas and burn it as fuel in engines that turn generators to produce electricity. Heat generated as a byproduct can be captured and used in the digestion process, which must be performed at a consistent 98°F, further increasing the overall efficiency of the system. The digester gas can also be burned as an alternative to natural gas in boilers, hot water heaters and other equipment.

It's important that a municipality considering a digester gas project have qualified experts evaluate the project's feasibility based on:

- Whether a digester is on site – if digestion is not used, the project is typically not financially feasible
- Volume of wastewater – 10 to 20 million gallons per day is ideal (the volume typically generated by communities with between 100,000 and 500,000 in population)
- Makeup of the digester gas – which may require cleaning to remove impurities before it is burned
- The aeration process and equipment employed by the plant – diffused aeration is more energy efficient than mechanical; fine-bubble aeration is more energy efficient than coarse bubble
- The potential to improve the energy efficiency of pumping equipment and controls

Municipalities in which a wastewater treatment plant and landfill are located close to one another are ideal candidates for digester gas projects. Here's why:

- Wastewater treatment plants can use all the electricity they can generate from digester gas and still require additional power from a utility
- Landfills with similar gas-to-energy facilities typically generate more electricity than they can use and sell their surplus power to a utility at rates lower than the utility charges its customers
- Where the two facilities are close enough together, the landfill can transmit its surplus electricity to the wastewater treatment plant, significantly reducing the amount of power the plant must purchase from a utility

### *Landfill Gas*

Similar to wastewater treatment plants, the decomposing solid waste in landfills produces gas that is primarily made up of methane – which is 25 times more harmful to the environment than carbon dioxide. [xxii]

Qualified experts are required to help city and county governments considering a landfill gas-to-energy project determine the feasibility by considering:

- The volume of gas produced by the landfill – typically landfills that have at least one million tons of solid waste in place and are continuing to receive waste are viable candidates
- Whether a gas collection system is already in place (most currently operating landfills have a collection system) – if not, the project must be capable of paying back the cost of installing a collection system along with the gas-to-energy system
- Whether impurities will need to be removed from the gas before it is burned

Electricity generated can be used to power landfill operations, with the surplus being sold to a local utility or other third party.

One important legal consideration: it is important for the city or county that owns the landfill to understand that it retains responsibility for maintaining and operating the landfill – these responsibilities cannot be transferred to the organization managing the gas-to-energy project.

### *Geothermal Heat Pumps*

Just a few feet below the surface of the Earth, the temperature of the ground changes little from season to season – remaining at between 45° and 75°F, depending on latitude. In winter, this source of relative warmth is used to heat buildings. In summer, the relatively cooler ground is used as a sink to remove heat from buildings, which can be used to provide hot water at virtually no cost. [xxiii]

Geothermal heat pump systems are made up of three basic components:

- A loop of plastic pipes buried beneath the surface of the soil or a pond and filled with a liquid – typically water or anti-freeze, depending on the climate
- The heat pump that removes heat from the liquid in winter, or transfers heat to it in summer
- Air distribution system – the conventional ductwork that delivers air through a building [xxiv]

To evaluate the feasibility of a geothermal heat pump system, qualified experts must determine the type of system suitable to the application based on a number of different factors:

- Space availability - Horizontal piping systems are less costly, but only feasible in new construction or where sufficient space is available. In most existing commercial applications, vertical piping is required.
- Geology of the site – Different soil types conduct heat more efficiently and may require less piping. In locations where solid rock is close to the surface, vertical piping is required.
- Hydrology – Availability of water for installing a closed-loop pond system, or groundwater for an open loop configuration. [xxv]

One significant advantage of geothermal heat pump systems: because heat pumps are highly modular, they can be installed in many locations in a building, making them ideal for applications such as office buildings, schools and other facilities where extensive local control of room temperature is desired.

Some buildings have recently achieved significant levels of energy efficiency using geothermal heat pump systems in conjunction with radiant heating and cooling, using pipes run throughout a concrete slab to both heat and cool the building. When combined with a source of renewable energy, it is even possible to achieve a net zero energy building – one that produces all the energy it needs on site. This was the solution Johnson Controls designed and installed at Integrated Design Associates in San Jose, CA – which is the first net zero energy, net zero carbon commercial office building in the US.

Geothermal heat pumps are also well-suited for buildings in which heating and cooling systems run simultaneously for all or part of the year.

### *Funding Options*

Securing financing can be one of the biggest challenges facing organizations pursuing renewable energy projects – especially for organizations in the public sector. Schools, universities and governments at every level are often unable to include such projects in capital improvement budgets. Coupled with budgets that may already be stretched and a general reluctance to raise taxes and/or issue bonds, these organizations can be left with few alternatives. Fortunately, an increasing number are able to use performance contracting to finance projects.

Under a performance contract, energy efficiency measures and renewable energy projects can be funded with cost savings on utility bills and operating expenses that result from the improvements. This permits organizations to use expense budgets, rather than capital outlays, to finance these projects.

For example: A performance contract at the Back River Wastewater Treatment Plant enabled the City of Baltimore to upgrade lighting, install new HVAC systems, improve facilities management practices and begin burning waste gas to generate electricity and heat for plant operations. The $1.8 million in annual cost savings that resulted were enough to pay for the entire project and guarantee the City cost savings, as well as reductions in energy usage and greenhouse gas emissions, for decades beyond the contract period.

Back River is evidence that a performance contract enables organizations to take a more comprehensive view of their energy usage and have a significant impact on both their demand for energy and their energy supply. For example: a school hoping to fund construction of a wind turbine with a 15-year performance contract can look beyond energy efficiency measures with a rapid return on investment (lighting retrofits, for instance), and consider improvements to facilities, equipment and operations that have longer, but larger, paybacks.

Performance contracts used to fund renewable energy projects typically run for between 10 to 20 years, and include guaranteed savings in energy and costs. If the savings aren't realized, the energy services company behind the contract pays the difference. As a result, accurately projecting energy and cost savings are a critical step in the performance contracting process, which includes:

1. Having a contractor conduct a detailed, investment-grade, sustainability audit
2. Conducting a technical review of the sustainability audit to confirm energy and other cost-savings estimates, sustainability achievement objectives, opportunities and commitments, cost estimates, individual projects, monitoring and verification plans, and cash flow analysis projections
3. Developing the performance contract for the client organization's review and approval

4. Implementing the project
5. Ongoing operation and maintenance
6. Tracking performance against guarantees [xxvi]

The guarantee of cost savings provided by performance contracts can make it easier for organizations to secure traditional forms of financing to fund a project, which may include:

- A traditional loan from a financial institution
- A lease-purchase agreement in which the equipment vendor leases the equipment (a wind turbine, for example) to the organization for a contracted period of time, after which the organization owns the equipment
- Third-party ownership in which a separate entity (an equipment vendor, private equity investors, a community or others) own the equipment, sell energy back to the site host under a long-term agreement, and benefits from the tax credits and other incentives that may be not be available to public sector organizations.

Other potential funding sources include:

- State Public Benefit Funds – typically financed through a fee added to consumers' utilities bill, these funds offer grants, rebates and low-interest loans for energy efficiency and renewable energy projects.
- State Clean Energy Funds – similar to Public Benefit Funds, but funded through other means. The funds provide grants, rebates and low- or zero-interest loans for energy efficiency and renewable energy projects [xxvii]

In addition, a variety of federal, state and utility incentives are available to improve the financial feasibility of renewable energy projects, including:

- Federal and state tax credits and accelerated depreciation schedules for businesses and corporations installing renewable energy facilities
- Federal Clean Renewable Energy Bonds (CREBs) – the bonds give federal tax credits to private lending institutions that provide zero-interest loans to state and local governments for renewable energy projects
- Federal Renewable Energy Production Incentive (REPI) – payments to state and local governments that sell power generated from renewable sources
- Rebates, grants, low- or zero-interest loans, and bonds from state and local governments and utility companies for the purchase and installation of renewable energy equipment and facilities [xxviii]

Revolving funds managed by student organizations and faculty advisers are one potential financing option for colleges and universities. At Macalester College in St. Paul, Minnesota, the Clean Energy Revolving Fund established by students raised nearly $70,000 from the college president's discretionary fund, a student government association and the Environmental Studies department to finance renewable energy and energy efficiency projects on campus. [xxix]

Finally, the market value of Renewable Energy Certificates (RECs) can help make on-site renewable energy projects financially feasible. A REC – also known as a Green Tag or Tradable Renewable Certificate (TRC) – represents the environmental attributes of electricity generated from renewables such as biomass, wind, solar, or other sources and then delivered to the power grid. For example: the emissions avoided when a school generates electricity from a wind turbine and sells its surplus power to its local utility, rather than burning fossil fuels to produce the same amount of electricity. Any organization with an on-site renewable energy facility that's connected to the grid can sell the RECs it earns on the open market to businesses, governments, individual consumers and others wishing to offset their use of electricity generated from fossil fuels. RECs are also purchased by utilities to comply with state mandates called Renewable Portfolio Standards requiring them to generate a certain percentage of their power from renewable sources. The price of RECs at the time of sale is based on market demand and other factors. One key consideration with RECs: an organization selling RECs from an on-site renewable energy facility can no longer claim that it is using energy generated from renewable energy sources – even if some of the energy generated is being used by the organization. That claim goes to the purchaser of the RECs. The seller of the RECs can, however, continue to claim that it is generating electricity from renewable sources. [xxx]

## Legal Considerations

Renewable energy projects involve a host of legal considerations – from land acquisition to power supply agreements to maintenance contracts and beyond – making the assistance of an attorney experienced in the complexities of renewable energy projects essential to avoiding unpleasant and costly surprises down the road.

How each enterprise is structured is a key issue that impacts many other aspects of a project, including the availability of many federal and state financial incentives. It also impacts the ability to secure financing.

A joint venture agreement is required to resolve issues such as:

- Who will manage the venture and how decisions will be reached (to avoid deadlocks)
- Restrictions on transfers of shares and exit strategies (including right of first offer)
- Capital contributions of the venture partners
- What happens in the case of defaults that may include non-permitted transfers, bankruptcy or failure to make capital contributions
- Available remedies that may include purchase rights and dissolution

Prior to and during the development phase of a renewable energy project, a variety of legal agreements may be required, depending on the nature of the project. These may include:

- Contracts acquiring real estate rights
- Zoning permits
- Tax abatement agreements
- Siting and permitting agreements based on studies involving aviation radar, environmental impacts or other issues
- Equipment supply agreements with manufacturers
- Contracts with construction contractors
- Fuel supply agreements
- Operation and maintenance agreements
- Permits to generate electricity
- Power supply agreement if surplus electricity will be supplied to third parties
- Interconnection agreement if surplus electricity will be supplied to a utility

Among the leading legal hurdles that organizations initiating a renewable energy project must overcome are:

1. Avoiding clashes where legal agreements intersect. For example: a wind project in which a joint venture has an agreement to sell surplus power to a utility beginning on a specified date. However, the turbine manufacturer fails to deliver the turbine by the date agreed upon in the equipment purchase contract, delaying construction. Both legal agreements must define a consistent remedy for this situation to avoid a potential legal battle.
2. Structuring the enterprise to maximize the availability of financial incentives and financing. For example: an enterprise structured as a governmental entity will have little use for federal and state tax credits that may be available for a renewable energy project, but might qualify for Clean Renewable Energy Bonds (CREBs).
3. Securing real estate rights. Failure to identify all property owners at a renewable energy site, and obtain air-tight agreements with them can result in significant delays and headaches down the road.
4. Obtaining regulatory permission to generate and sell power. Generally, Federal agencies regulate these activities if they cross state lines and where environmental concerns are involved. State and local agencies regulate power generation that occurs within their borders.
5. Negotiating an agreement to connect a renewable energy facility to a power grid to sell electricity to a utility.

These and the many other complex legal issues involved in renewable energy projects are frequently outside the expertise of an organization's in-house counsel, requiring the assistance of an attorney with knowledge and experience in renewable energy ventures. [xxxi]

## Project Management

Enhancing energy efficiency efforts with renewable energy generation is an achievable objective for virtually any organization wanting to accelerate its drive towards sustainability. But it is also a complex process that can prove to be beyond the technical and management expertise of many organizations, requiring the help of an organization such as Johnson Controls.

From start to finish, the disciplined process that should be followed in the development of renewable projects breaks down into five distinct elements, each as critical as the others to the overall success of the initiative:

### *Due Diligence – Developing the Plan*

This initial phase is aimed at determining the overall feasibility of a project, particularly from a financial perspective.

In order to make this preliminary determination, project planners need to identify and thoroughly understand:

- Estimated project costs – among them the costs of conducting any necessary studies, solution design and development, equipment acquisition and installation, operations and maintenance
- All available incentives – potentially including grants, rebates, bonds, tax credits and other incentives from federal and state governments and utilities
- The value of renewable energy credits that can be sold in the global marketplace

- The most favorable financing mechanism to fund the project – whether it's third party funding, simple debt, lease-to-own or another financing alternative
- The projected payback period
- Important legal considerations, among them how the deal will be structured, how risks will be allocated, and the scope of the legal and contractual infrastructure

The result of this phase is a detailed financial proposal for the client organization to consider and act upon.

Not many renewable energy providers recognize the critical importance of this phase in helping a client organization make an informed decision about a renewable energy project.

***Technology Selection – Selecting the Means***

The objective of this phase is to prove or disprove – with real-world data – the assumptions made and conclusions reached in the first phase.

Accomplishing this involves:

- Conducting required site surveys, soil borings, environmental and other studies to confirm project feasibility
- Determining the right technologies – emphasizing fit with project objectives, capabilities, scalability and life cycle costs
- Identifying the right technology vendors, and getting quotes for equipment and installation

Project engineers with significant experience in specific renewable energy sources make these determinations and utilize them to develop a detailed and comprehensive project development agreement (PDA). Often, as a result of developing this PDA, improvements in the financial performance of the project are realized.

***Project Management – Executing the Plan***

This phase begins as soon as a contract is executed and requires the knowledge and expertise that only comes with experience gained managing renewable energy projects.

This phase involves:

- Developing a construction and commissioning schedule
- Managing project partners and subcontractors to complete construction on time and on budget
- Commissioning the installed equipment and controls to ensure they perform up to expectations

***Operate and Maintain – Sustain the Plan***

Once construction and commissioning are completed, operation and maintenance of the renewable energy facility begins and continues for the term of the contract.

Under an operation and maintenance agreement, the facility is managed to maximize up time, ensure the projected life cycle of equipment and manage all risks, such as, for example, unanticipated changes in the availability of one fuel source for a biomass renewable energy facility.

***Guarantee the Plan***

Throughout the term of contract, the performance, payback and other results listed in the project development agreement should be guaranteed, providing significant peace of mind to the client organization.

## Conclusion

As responsible organizations and citizens of a global community, it is our responsibility to secure our energy future, reduce our carbon footprint, protect our air and water, and build a stronger society – in short, to continue on a path toward sustainability.

Many schools, universities, governments, businesses and other organizations have already embraced a commitment to becoming more sustainable, and many are finding that they can dramatically accelerate the pace of their progress by combining on-site renewable energy generation with energy efficiency measures. In many instances, organizations are using cost savings from energy efficiency initiatives to finance construction of on-site renewable energy facilities that they could not otherwise fund.

Undertaking energy efficiency measures and on-site renewable energy generation simultaneously adds technical, financial, legal and other complexities to any organization's sustainability initiative.

However, smart organizations are finding the most effective way to manage these complexities and accelerate their progress toward sustainability is to work with a service provider such as Johnson Controls that brings significant knowledge and experience in both disciplines – energy efficiency and renewable energy – to the partnership.

## Resources

[i] EnergyVortex.com. http://www.energyvortex.com/pages/headlinedetails.cfm?id=2550&archive=1

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