

Clean Energy

Today's Reality. Tomorrow's Opportunity.



Capital at the point of impact.



While it is impossible to list all of the people who have contributed to TRF's energy work, we would like to recognize a few of the most instrumental. The Pew Charitable Trusts funded TRF's early work in energy efficiency for nonprofits. The Heinz Endowments funded the regulatory intervention work of Roger Clark and the environmental parties that resulted in the 1998 settlement agreement with PECO to create the Sustainable Development Fund. Nora Brownell and John Hanger, as Pennsylvania Public Utility Commissioners and afterwards, were strong early supporters. The William Penn Foundation and the Heinz Endowments funded the first business plan for SDF. Since then, Janet Haas, the Phoebe W. Haas and Otto Haas Trusts have continued to support TRF's energy work. The first SDF board, especially Liz Robinson, Andrew Altman, John McCawley and Ron Celentano, set the early direction for SDF. Michael Freeman of the Exelon Power Team signed the first long-term power agreements, which made possible the early wind projects in Pennsylvania. Joyce Ferris has been an important partner for SDF's investment in energy companies. Lewis Milford has provided TRF with key policy and market information drawn from his national experience, guiding TRF to international forums where we have shared our clean energy development experience. Finally, we want to recognize the many companies, organizations, individuals and private and public financing partners who have taken the risk to develop clean energy projects and ventures with TRF energy financing, some of which are described in this report.

A special thank you to the Otto Haas Trust which provided funding for TRF to create this report.

Dear Friends and Supporters:

TRF is known for smart allocations of capital in support of housing, commercial, and community facilities projects that meet our wealth building and opportunity mission. Recently we have become recognized for the creative application of information as a way to direct capital allocation, particularly to the most distressed real estate markets. This report introduces you to yet another dimension of TRF — our commitment to environmental stewardship and clean energy.

Energy conservation and clean energy technology are critical parts of the TRF portfolio. They have been so for more than a decade and today they influence almost every aspect of our work. The report details an array of conservation activity and innovation: investments in promising new fuel cells; loans that lead to energy conservation for hospitals, social services centers and businesses; support for educational outreach; and the emergence of a wind energy industry in Pennsylvania.

The convergence of energy investments with a wealth and opportunity mission is rooted in the core reinvestment logic of TRF. It is tied to the fact that we work in older cities and towns struggling to re-assert economic and social relevance in a post-industrial era. As we retrofit older structures and communities, we find new opportunities to achieve energy conservation outcomes. As we imagine ways to retrofit older industries for a new economy, we find that clean energy can make a substantive contribution to future prosperity.

We dedicate this report to the many environmental organizations and industry leaders that have encouraged us to direct so much of our institutional and human capital into environmental issues.

The environmental advocates and industry experts that created first the Nonprofit Energy Savings Investment Program and later the Sustainable Development Fund influenced TRF far beyond the immediate programmatic aims and resources of these initiatives. They led us to a new way to think about our institution itself.

For this, we are especially grateful.



Robert Keith
TRF Board Chair



Jeremy Nowak
President & CEO

June 2006

Clean Energy

TODAY'S REALITY, TOMORROW'S OPPORTUNITY

TRF is nationally known for its community investment and urban development accomplishments. However, few people know of our leadership role in clean energy. For more than a decade, TRF has been one of the nation's most creative and effective champions of sustainable energy. Financing projects from wind power farms to green building design, TRF's efforts have been critical in Pennsylvania's emergence as a leading center for clean and renewable energy.

But the work has only begun. The importance of pursuing and implementing sustainable energy technologies has never been more apparent. It's an opportunity for our region and central to our nation's security, economy and health.

Nationally, our vulnerability to changes in energy supplies was exposed with the 2005 hurricane season. Hurricane Katrina's disruption to oil supplies caused spikes in prices across the nation. From the gas pump to winter heating bills, households across the country are still staggering under the energy cost burden.

We also came face to face with the devastating reality of what extended power outages can do. Basic needs such as lights and communications were suddenly dependent on back-up energy technology like diesel generators, which all too often malfunctioned and quickly ran out of hard-to-reach fuel. Across the Gulf Coast, hospitals, police, government operations and emergency responders struggled, with fatal consequences to those in dire need.

Investing in clean energy and energy conservation technology gives our nation an opportunity to reduce its dependence on fossil fuels and foreign oil. It is also an opportunity for us to emerge as leaders in a global energy economy. Rather than the biggest buyers of energy, we could become the world's biggest purveyors of clean energy.

According to Clean Edge, a clean technology research and publishing firm, investment in clean technologies such as wind, solar photovoltaics, biofuels, fuel cells and hydrogen markets reached \$40 billion in 2005. That market is expected to grow fourfold to \$167 billion in the next 10 years alone.

Regionally, it's an opportunity to create jobs and channel capital into a local market rather than one half-way across the globe. It's part of the reason why sustainable energy is important to TRF. It's also central to our commitment to low-wealth communities, which often bear the unfair burden of rising energy costs and adverse health effects related to living in a polluted environment.

TRF first became involved in the clean energy field in 1993 when it developed the Nonprofit Energy Savings Investment Program (NESIP). NESIP is a \$5 million fund established with help from The Pew Charitable Trusts to support nonprofit facilities' efforts to increase energy efficiency and reduce energy costs. TRF's clean energy responsibilities expanded in 1998 when it was selected to manage the \$32 million Sustainable Development Fund (SDF) established by the Pennsylvania Public Utilities Commission as part of a PECO Energy restructuring. Today, TRF's energy financing is among the most active divisions within TRF's \$300 million portfolio.

Clean energy is a growing force in the mid-Atlantic region. Clean energy and energy conservation technologies are no longer far-off hopes for the future. They are here and working. And this is an industry that is poised to grow exponentially in the next decade.

With the knowledge and experience that we gained from NESIP and SDF, TRF infused a conservation perspective into its broader portfolio, identifying opportunities to finance housing and commercial real estate projects that incorporate green design and conservation technology solutions. As TRF moves into its third decade of development finance, environmental sustainability will play a greater role in shaping its work.

TRF's energy financing programs target businesses, nonprofit organizations, and residents and its success has largely been due to five key principles that shape its operation:

Flexible Financing

TRF's energy financing is based on an entrepreneurial model that is flexible and responsive to market opportunities. Loans and investments are evaluated based on a project's economic viability and ability to generate at least a modest return.

Smart Subsidy

TRF recognizes that to jumpstart market forces for clean energy, subsidy should be used sparingly and strategically. The level of subsidy should be the minimum necessary for leveraging private investment and should reduce over time as market experience develops.

Doubling Impact

TRF is committed to making sustainability an explicit element in all its financing programs. TRF routinely explores co-financing opportunities within its major business lines to further leverage its limited clean energy funds. For example, TRF-financed charter schools can receive additional technical assistance and financial support from TRF to reduce utility expenditures. As a result, these schools can invest more of their budget into classrooms and curriculum.

Leveraging Private Capital

TRF leverages its limited capital base whenever possible by attracting mainstream investors and lenders to its projects. TRF's participation has often improved a project's risk-worthiness, encouraging other, sometimes first-time investors, to finance clean energy projects.

Moving Toward Market

TRF is building the region's clean energy market through small, individual transactions as well as broad, public policy initiatives. From supporting media campaigns to educate consumers to financing critical infrastructure to trade clean energy, TRF is tirelessly advancing the nascent sustainable energy industry's move to scale.

As TRF's experience indicates, the move to clean and efficient energy is an expensive and difficult undertaking. In time, the more conventional markets will finance the clean energy field and clean energy technologies will be the norm rather than the exception. Until then, TRF continues to leverage its capital, use its expertise, and forge new partnerships to build this region's role as a leader in clean energy.

Investing in

CLEAN ENERGY

Pennsylvania is becoming a national leader in clean energy and much of that is due to TRF's work.

TRF's leveraged investments, partnerships, and other programs are supporting clean energy production projects as large as a 64 megawatt wind farm in northeastern Pennsylvania, and as small as a 1 kilowatt solar photovoltaic system installation on affordable homes in North Philadelphia. TRF promotes clean energy production at all scales. Every unit of energy produced locally is one less unit purchased from outside the region.

TRF's financing is supporting the growth of the region's clean energy businesses — and helping establish new ones. Expansion in this sector has enabled the region to establish itself as a center for clean energy industry.

BEAR CREEK WIND FARM

Homegrown Energy

Most electricity is generated by burning coal and it is the dirtiest industry in the US. Pennsylvania's newest electrical generating facility — the wind farm at Bear Creek — uses wind to cleanly produce 71,173 MWH of electricity per year — enough power to supply 8,900 households annually! Located 10 miles southeast of Wilkes-Barre, PA on a mountain ridge 2,000 feet above sea level, the 15 acre wind farm was developed jointly by Community Energy and the investment banking firm Babcock and Brown.

TRF has a longstanding relationship with Community Energy; TRF funded the company's initial business plan and supported its early development. As a leading backer of the Bear Creek wind farm, TRF provided both a \$5.75 million syndicated loan and a \$2 million wind energy production incentive grant to the project.



DELAWARE VALLEY CUSTOM MARBLE, INC.

When Delaware Valley Custom Marble, Inc. undertook a \$772,000 facility expansion, it selected a geothermal air-tempering system to heat and cool 30,000 square feet of manufacturing space. The geothermal system uses the earth's relatively constant natural thermal energy (about 53° Fahrenheit year round in southeastern PA) to heat air in the winter and to cool air in the summer. TRF provided this Chester County, PA business with a \$70,000 loan to purchase and install a geothermal heat pump system that is energy-efficient, environmentally responsible, and cost-effective.

Though the geothermal system has a larger initial price tag than a conventional HVAC system, energy savings have already been dramatic. Propane, which the company used to heat its space previously, has doubled in price since installation of the geothermal system — accelerating the system's original payback period of six and a half years. The savings thereafter go right to the business' bottom line.

TRF financing leveraged more than \$33 million in additional equity for the project, bringing together a range of other investors and lenders — many of whom were first-time investors in wind energy production. TRF also provided underwriting, due diligence and legal work to launch this venture by an independent Pennsylvania wind developer.

The 12 turbines at Bear Creek are the largest in America. The turbines, each generating two megawatts of power, were supplied by Spanish manufacturer Gamesa Energia, which recently selected Pennsylvania as its North American base for operations. Gamesa is also opening two wind turbine manufacturing centers — one in Ebsenburg, PA and the other in the old Fairless Steel Works in lower Bucks County — and plans to bring more than 1,000 well-paying new jobs to Pennsylvania in the next five years. Two new TRF-financed wind farms expected in Pennsylvania by the end of 2006 will also be using Gamesa turbines generating 120 MW of new wind power capacity.

Momentum is growing for more large scale, homegrown energy facilities. As Brent Alderfer, President and CEO of Community Energy notes, "Projects like this are the leading edge of a new energy future. Fuel-free wind energy offers both a clean environment and more jobs here at home. Pennsylvania has an early lead in bringing this new technology on line thanks to the innovative financing and forward thinking leadership of TRF. That leadership opens the door for more local clean power resources in the region — smart investment that benefits everyone."

The wind farm at Bear Creek uses wind to cleanly produce 71,173 MWH of electricity per year – enough power to supply 8,900 households annually!

Incubating Advanced Clean Energy Technologies

Franklin Fuel Cells, Inc. — a start-up company now with 13 employees — holds patents for a fuel cell technology that may soon dominate the fuel cell market. This exciting technology, developed at the University of Pennsylvania and now owned by Franklin Fuel Cells, Inc., allows a fuel cell to operate directly on a wide variety of hydrocarbon fuels (natural gas, propane, diesel, gasoline, methanol, etc.), all without the need for a reformer.



PENNSYLVANIA ADVANCED INDUSTRIAL TECHNOLOGY FUND

As with any early market, the renewable energy and advanced energy efficiency sectors often face capital gaps that impede their growth. One of these gaps has been access to capital for early stage companies. With this in mind, in 2002 TRF and Blue Hill Partners (a venture capital firm focused in the sustainable technology sector) created the Pennsylvania Advanced Industrial Technology Fund (PA-AIT). PA-AIT is a \$2,210,000 venture capital and incubator fund for early-stage renewable and clean energy companies.

This essentially leapfrogs conventional fuel cell technology, which can operate only on pure hydrogen and therefore requires a reformer to strip the hydrogen from the hydrocarbon fuels.

Inexpensive to install and operate, once commercialized this fuel cell will compete to replace conventional power options — including the incumbent technology, the diesel generator — particularly within markets such as auxiliary power units for idling trucks, boats, and planes, and as remote-location generators whose many uses include irrigation pump operation.

TRF led an investment group for Franklin Fuel Cell, Inc. that included EnerTech Capital and two other Pennsylvania regional sustainable energy funds. The total equity investment package of \$3.25 million, including TRF's \$500,000 investment, is enabling Franklin Fuel Cell, Inc. to hire R&D specialists, improve the performance of the cell, streamline the manufacturing process and demonstrate its product's commercial applications.

TRF's initial \$2 million investment in PA-AIT effectively leverages TRF's existing financial and technical resources in meeting its mission of promoting emerging renewable and advanced clean energy technologies, while at the same time diversifying TRF's portfolio risk. PA-AIT invests both capital and management resources into its portfolio companies in exchange for equity positions, and actively helps the companies achieve operational milestones and raise later-stage institutional capital. By attracting other equity co-investors, PA-AIT has built an initial portfolio of three companies to date.

SOLAR PV AT THE GOVERNOR'S RESIDENCE

Solar photovoltaic technology, commonly called PV, is a clean and reliable way to produce electricity. To help bring down the cost of this promising technology, TRF's Solar PV Grant Program has approved 174 grants to date for homes and businesses in Pennsylvania. Grants provide homeowners with up to \$25,000 to purchase a solar PV system. These systems have been installed in a variety of settings and for a range of building types — from rowhomes in North Philadelphia to estate homes in Bucks County.

Included in TRF's solar projects is the Governor's Residence in Harrisburg. The Governor's Residence chose a TRF-funded PV system to provide uninterruptible power and ensure continuity of government in the event that the power grid goes down. The system installed at the Governor's Residence powers telephones and other critical communications equipment, ensuring that the Governor will be able to stay connected thanks to solar-generated electricity.



Investing in

ENERGY EFFICIENCY

Our region is surrounded by cost-effective opportunities to reduce energy waste and to increase energy efficiency for buildings and business operations.

Energy efficiency measures allow businesses and families to lower their utility costs and channel those savings to meet other needs. In these days of skyrocketing fuel costs, energy efficiency is especially important to the low- and moderate-income families that TRF serves.

TRF offers an impressive toolbox of financial products to help large institutions, private businesses, mid-sized organizations and residential customers overcome the first-cost of energy efficiency technologies.

THOMAS JEFFERSON UNIVERSITY HOSPITAL AND ALBERT EINSTEIN HOSPITAL

Achieving Large-Scale Energy Efficiency

By using a contracting mechanism known as an energy service company, or ESCO, Thomas Jefferson University Hospital and Albert Einstein Hospital together are saving nearly \$875,000 a year in energy costs. Like other large facility managers who wish to achieve energy efficiency across their entire operation, these two hospitals contracted with an ESCO that planned and implemented a careful set of energy improvements.

The ESCO hired by the hospitals guaranteed a specific minimum level of energy savings from the installed energy measures that included fluorescent lighting ballast and lamp replacements; lighting fixture reflectors; replacement of incandescent lights with compact fluorescent or halogen lamps; light emitting diode (LED) exit signs; HVAC controls; steam trap replacements; laundry exhaust fan controls; and a number of other measures. The hospitals then entered into an energy performance contract with the ESCO to pay for the energy improvements out of the energy savings of these measures.



Photo: R. Kennedy for GPTMC.

TRF was the funding source for the ESCO energy performance contracts. TRF then resold three-fourths of these loans to local banks, thereby freeing TRF funds for use in other projects. Banks were willing to buy these loans at par due to TRF's reputation for financial rigor and the hospitals' credit-worthiness.

TRF provided \$3.9 million in financing to these two hospitals, with a term of eight years for the Thomas Jefferson University Hospital and 10 years for the Albert Einstein Hospital. Both hospitals are currently saving a total of 2.9 million kWh per year, the dollar value of which far exceeds their annual payments under the TRF-funded ESCO contracts.

Both hospitals are currently saving nearly \$875,000 a year in energy costs.



FAIRMOUNT PARK CONSERVANCY

As part of Philadelphia's Bicentennial Celebration in 1976, incandescent bulbs were installed to outline the roofs of Boathouse Row, one of Philadelphia's most beloved and picturesque landmarks. The decorative lighting brought public acclaim, but cost the Fairmount Park Conservancy \$8,000 per year in electricity bills and more than \$50,000 per year for maintenance and bulb replacement. Like all incandescent bulbs, the Boathouse Row lighting was very inefficient. Only 10 percent of the electricity consumed by incandescent bulbs produces light. The remaining 90 percent is wasted as heat.

To improve energy efficiency and promote a new conservation technology, TRF joined with PECO to replace Boathouse Row's incandescent system with light emitting diode (LED) technology. LED systems use low levels of electricity and are inexpensive to maintain. Plus, the new LED system allows for changes in color and light intensity, increasing the aesthetic impact of the lighting project.

REINHARD STREET HOUSING

Energy Efficiency for the Affordable Housing Market

The challenge of housing affordability does not end with settlement on the houses, but must extend throughout the entire life of the home. No TRF project demonstrates this better than the Reinhard Street houses, a project of 11 townhouses in southwest Philadelphia that incorporate high energy efficiency, passive solar heating and cooling, solar water heating systems and solar PV.

WAWA

Commercial customers can save energy dollars by reducing their electricity consumption, but they can also cut costs by reducing their demand for electricity during high peak periods. Energy monitoring and control devices that cycle equipment on and off and prevent heavy electricity loads from coming on at the same time can drastically cut demand loads with little apparent impact on comfort or operations — all significantly enhancing a business' bottom line.

As an incentive to test off-the-shelf systems, the Wawa Corporation received a TRF grant to support a pilot program that installed monitoring and control devices in six existing Wawa stores and six stores under construction. Wawa selected a load management product from Princeton Energy Systems (PES), a PA-AIT portfolio company.

The PES monitoring and control systems will allow Wawa's headquarters in Delaware County to monitor energy consumption in individual stores and to control equipment to shave peak loads. Headquarters can now make adjustments to air conditioning systems, refrigeration equipment and lighting to keep them operating at optimum levels. The initial results of the pilot were very promising and Wawa is moving to deploy these control technologies in more of its stores. One interesting additional benefit of the system is that the system monitoring allows Wawa to reduce food spoilage, a big source of waste for the company stores.



Through net metering, homeowners can sell any unused energy their home generates back to the public utility grid for its full value. While not quite zero-energy homes, these townhouses will certainly have the lowest energy bills in the city.

TRF's support for the Reinhard Street project includes a \$1 million construction loan and more than \$100,000 in grant support for the cutting-edge energy measures in the homes. Additional support was provided by the City of Philadelphia, the US Department of Energy and PECO Energy.



PREPARATORY CHARTER SCHOOL

Thanks to financing provided by TRF, the Preparatory Charter School of Mathematics, Science, Technology and Careers has seen how year after year, the savings realized from its energy efficiency measures can allow them to shift dollars from its utility budget to its main mission of educating students. Preparatory Charter School serves nearly 500 students in grades 9–12. When the school outgrew its facility, it purchased a one-story, 64,000 square foot former supermarket on Point Breeze Avenue. Extensive renovations followed, including a package of energy measures such as a high-efficiency HVAC system and building features that introduce natural light to spaces that would have otherwise required electrical lighting. TRF provided financing from its charter school program for the general building renovations with additional lower-cost financing for the energy measures.

ENERGY EFFICIENT SUPERMARKETS

Supermarkets annually spend \$5.00 per square foot on energy — and those costs are climbing! Because of the low profit margins in food stores, a one dollar savings in energy benefits the store's bottom line by as much as an \$80 increase in product sales. Most supermarkets can reduce energy costs by 40 percent through cost-effective energy measures. As part of its Fresh Food Financing Initiative (FFFI), TRF is able to help supermarkets select and finance high-efficiency lighting, refrigeration equipment and other energy measures so they can realize those savings.

This innovative initiative is just beginning to help storeowners by evaluating and recommending energy efficiency measures for both new construction and for existing stores. The stores can then take advantage of low-interest commercial loans to finance recommended improvements. Typically, the energy savings exceeds the monthly debt service, so the upgraded supermarket can enjoy an immediate positive cash flow.

Most supermarkets can reduce energy costs by 40 percent through cost-effective energy measures.

Supporting

HIGH-PERFORMANCE GREEN BUILDINGS

High performance green buildings can provide healthy, comfortable and pleasing environments while requiring a small fraction of the energy needed by standard buildings.

The operating cost of these buildings is much lower.

The environmental footprint of these buildings, both in the resources to construct them and to operate them, is much smaller.

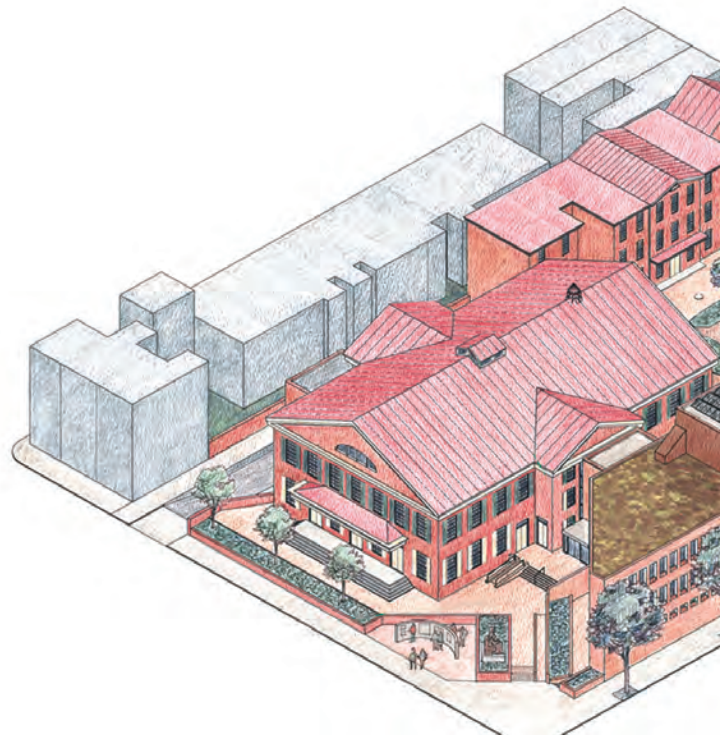
The design process for high performance green buildings differs considerably from traditional practice. Their design reflects an integrated and iterative approach that addresses all aspects of the building – building massing and orientation, building envelope, heating, ventilation and air conditioning (HVAC) systems, and natural materials. One characteristic is shared by all: energy consumption is minimized.

TRF began supporting green building design by providing building design grants, but more recently with the growth of the market TRF has replaced these with zero percent predevelopment loans that cover a broader range of design issues. The predevelopment loan is paid off when the building obtains construction financing, allowing TRF to provide the construction loan or move its capital to other projects. TRF's green building financing is available to architecture and engineering firms, building developers, and building owners.

FRIENDS CENTER

"Greening" an Urban Campus

The Friends Center is a historically — and architecturally — significant urban campus. Located at Philadelphia's 15th and Cherry Streets, the Friends Center houses offices for several major Quaker institutions. Its urban campus is also the site of the historic Central Philadelphia Friends Meeting and its meeting house built in 1856. The existing 100,000 square foot complex is being re-engineered as a green campus. The centerpiece of the \$10.6-million project is a geothermal exchange system. The system will circulate water in a column-well drilled more than 1,000 feet deep beneath the Friends Center.



The ambient temperature of the earth will maintain the circulating water's temperature at 53° Fahrenheit. The building interiors will draw on the water temperature to heat and cool the air.

TRF is providing the Friends Center with a zero percent predevelopment loan to design the geothermal system and drill a test well at the site. Other green features in the renovation plan include a 16 kW solar photovoltaic array, an improved thermal envelope, efficient daylighting and lighting controls and tenant conservation policies designed to maximize opportunities for energy efficiency. The Friends Center will also be purchasing 100 percent of its electricity from wind. By using these demand reduction and renewable energy technologies, Friends Center will reduce its energy use for heating and cooling by 47 percent and fossil fuel emissions by 100 percent.



Friends Center will reduce its energy demand for heating and cooling by 47 percent.

Rag Flats demonstrates an innovative approach to urban renewal that is architecturally pleasing and environmentally sensitive.

RAG FLATS

Rag Flats is a new, market-rate residential garden community in the Fishtown section of Philadelphia that is setting the standard for high-performance design. The 11-unit development incorporates high-efficiency buildings powered by 30 kW of TRF-financed solar photovoltaic panels on the roofs of the buildings. Other green features include lots of natural daylighting throughout the units, EnergyStar lighting and appliances, the collection of rain water runoff for the community's outdoor use, and efficient gas-fired radiant floor heating systems. Rag Flats demonstrates an innovative approach to urban renewal that is architecturally pleasing and environmentally sensitive.



PHILABUNDANCE

When Conservation Supports Mission

The nonprofit organization, Philabundance, fights hunger in the Delaware Valley by collecting surplus meats, produce and dairy products from the food industry to distribute to community agencies serving people in need. Philabundance distributes over 20 million pounds of food annually, serving an estimated 574,000 people.

In 1998, Philabundance acquired an existing 26,600 square foot building in the Philadelphia Food District. Before the operation was moved, the building underwent extensive renovation to accommodate a warehouse with refrigerated storage, loading docks, a vocational training room, and offices.



Philabundance made the commitment that its new building would be a green building that minimizes energy use, has good indoor air quality, conserves resources, and generally imposes a minimal negative impact on the environment. As then President of Philabundance, Scott Schaffer, explained, “Our service is really about the conservation of resources. We wanted our facility to reflect this core value.”

TRF provided technical support to Philabundance and its design team to evaluate and incorporate an extensive list of green building features into the renovation, including an efficient and right-sized HVAC system, additional roof insulation, skylights in the warehouse, minimization of cold storage areas and the purchase of green power for the building’s ongoing operation. A year after the facility opened a check of Philabundance’s actual energy costs found that they were 50 percent lower than that of typical food-handling and warehouse facilities in the region.



PHILADELPHIA UNIVERSITY'S ENGINEERING AND DESIGN INSTITUTE

The Engineering and Design Institute has trained 350 students and practicing professionals in green building design since it began its work in 2000.

The Engineering and Design Institute of Philadelphia University is becoming an incubator for sustainability in the region. TRF provided three grants to the Engineering and Design Institute in support of the Studio’s mission to build the region’s capacity for green building design. These grants supported the design of the Institute and underwrote curriculum development, teacher training, and student scholarships to the Engineering and Design Institute’s green building design seminars. The Institute is located in a Roxborough warehouse that has become a green building with photovoltaic panels and a solar hot water system. The Engineering and Design Institute has trained 350 students and practicing professionals in green building design since it began its work in 2000.

Creating and

In today's emerging clean energy market, not everyone can afford to install the technologies that create clean energy. But increasingly, residents of this region can easily and inexpensively support clean energy by buying it for their homes or businesses.

TRF is actively working to educate the public about the benefits of sustainable energy, to help consumers make informed choices, and to lower barriers that slow clean energy's pace of growth. By supporting media campaigns, customer reward programs and technical studies, TRF is building a region of clean energy consumers and strengthening the mid-Atlantic's position as the center of the nation's expanding clean energy market.

EXPANDING MARKETS FOR CLEAN TECHNOLOGIES



Attracting Clean Energy Businesses to the Region

Encelium is a Canadian company that produces an indoor lighting system that combines energy-efficient fixtures, occupancy sensors to turn lights on and off, ambient daylight sensors to reduce light output when the room is filled with natural light and individual fixture controls so occupants can set their own light levels. The products and systems configured by the company reduce lighting energy usage in a facility by up to 70 percent, reduce a building's overall energy usage by 12-28 percent and improve lighting quality, occupant productivity and workplace ergonomics.

Encelium approached TRF when seeking a site for its first US operation. TRF, working with its equity investment partner Blue Hill Partners and the Pennsylvania Advanced Industrial Technology Fund, introduced the company to eastern Pennsylvania, and provided an equity investment for the US start-up. TRF also provided a \$25,000 demonstration grant to help Encelium underwrite the cost for installing energy-efficient lighting systems at five locations in this area so other potential customers can visit an installation before making their purchase decisions.

Moving Clean Energy to Scale

More than 35,000 homes and businesses in southeastern Pennsylvania currently purchase electricity generated from wind, solar, and other clean and renewable sources. However, many people are still unaware that clean energy is available and generated in the region. The Pennsylvania Clean Energy Campaign aims to let people know that clean energy is here, to popularize clean energy, and to increase customer demand. The campaign provides information about clean energy buying options and shows how easy it is to purchase clean energy.

"When people understand that clean energy is real, it's here and it's working, we will begin to see tremendous movement in the marketplace."

TRF partnered with SmartPower, a nonprofit marketing firm dedicated to promoting clean energy, to launch the Pennsylvania Clean Energy Campaign. The campaign is working closely with The Energy Cooperative Association of Pennsylvania, Green Mountain Energy, Native Energy, and PECO Wind – all clean energy producers. The campaign has produced and aired television and radio spots, and has used the print media and internet to tell its story. A new generation of the campaign is also rolling out that will work with local communities that pledge to purchase 20 percent of their power from clean energy resources in five years.

As part of its efforts to increase clean energy customers, TRF is also encouraging clean energy suppliers to become active consumer educators. TRF's Consumer Education Rewards Program provides cash incentives to clean energy suppliers for consumer education and marketing that results in the signing up of new customers. This \$325,000 multi-year program is for wind, solar, biomass, and low-impact hydro electricity suppliers.

BAT AND WIND ENERGY COOPERATIVE Encouraging a Responsive Industry

All energy resources have environmental consequences and the wind industry is working hard to address the recent discovery that wind turbines in some locations are causing bat fatalities. The Bat and Wind Energy Cooperative — a national alliance of the wind industry and Bat Conservation International and other interests — is conducting major research into this phenomenon, looking for ways to reduce and eliminate wind energy's unintended negative impact to bat populations.





TRF has also provided a handful of seed grants to enable nonprofit organizations to become clean energy marketers and to participate in the customer rewards program. One such group is working to build a customer base among faith-based organizations and their members.

As Brian F. Keane, President of SmartPower, who understands the potential impact of marketing clean energy, explains, “When people understand that clean energy is real, it’s here and it’s working, we will begin to see tremendous movement in the marketplace. And when we actually make it easy for people to purchase clean energy, then we will achieve the elusive ‘tipping point’ that this industry is looking for.”

TRF provided two grants to the Bat and Wind Energy Cooperative. The first supported the 2005 research that for the first time used radar and other sensitive instruments to analyze bat behavior around wind turbines. A follow-up study in 2006 is exploring strategies and tools to deter bats from wind turbines.

TRF is building on this work by partnering with the US Fish and Wildlife Service and the PA Departments of Environmental Protection and Conservation and Natural Resources in a collaborative effort in Pennsylvania and the northeast to develop best practices for siting wind facilities.

CLEAN POWER MARKETS

Developing the Infrastructure for Clean Energy Markets

One of TRF’s first business planning grants was for a start-up called Clean Power Markets. This company saw a business opportunity in creating a tracking and trading system for what are now called Renewable Energy Certificates (REC). An REC is the birth certificate for a megawatt-hour of renewable energy and is used to track the sale of that clean energy unit. Clean Power Markets has gone on to be one of the most influential designers of these tracking systems in New England and across the Mid-Atlantic and Mid-West regions. Clean Power Markets also created and manages the tracking and trading system for solar RECs in New Jersey.

In Pennsylvania, a similar tracking and trading system is known as the Generation Attributed Tracking System (GATS). Operated by PJM, an independent electricity grid system operator, GATS provides a marketplace to buy and sell RECs. In a step to increase participation by even small systems in GATS, TRF has begun aggregating and registering the solar RECs earned by residents and small businesses that own solar PV systems through TRF’s Solar PV Grant program. These aggregated RECs are then sold through GATS, generating a modest financial return for these small system owners. TRF is the first company to list small systems on GATS and lists more solar RECs than anyone else in Pennsylvania.



Clean Energy

Pennsylvania's success with clean energy signals an opportunity for our region as a whole. An opportunity to make energy affordable and reliable for all. To become leaders in a clean energy economy.

When TRF began its energy financing, there was not a wind farm in Pennsylvania or manufacturer of wind turbines in the state. The state was home to only a handful of solar PV installations and had no full-time solar PV installers. State utility policies did not provide for interconnection and net metering. Electric utilities and electricity suppliers were not required to provide an escalating percentage of their power from renewable energy resources and other advanced clean energy technologies. Clean energy was simply not part of Pennsylvania's approach to energy.

Today, the story is dramatically different.

Pennsylvania has six operating utility-scale wind farms with a total generating capacity of 153 MWs, enough to power more than 48,000 homes each year. At the end of 2006, those numbers will grow to eight wind farms, seven of which are TRF-funded, generating 273 MWs of energy and a total investment exceeding \$350 million. One of the world's largest manufacturers of wind turbines recently opened its North American headquarters in Philadelphia and is building two manufacturing facilities in Pennsylvania. There are 14 companies installing solar PV in southeastern Pennsylvania alone — one installer has increased its staff from 2 to 11 full-time people in just the last two years.

An advanced energy portfolio standard was adopted by Pennsylvania in 2004. The Governor and the Secretary of the Pennsylvania Department of Environmental Protection are now strong champions for the economic development benefits of clean energy and the Pennsylvania Public Utility Commission is implementing policies as supportive of clean energy as any in the country.



TODAY'S REALITY, TOMORROW'S OPPORTUNITY

Pennsylvania's success with clean energy signals an opportunity for our region as a whole. An opportunity to make energy affordable and reliable for all. To become leaders in a clean energy economy.

TRF will continue to support the expansion of clean energy in the region. It will work to develop new financial models and approaches that require less public subsidy and facilitate the use of more private capital. As always, TRF will bring to the challenge its entrepreneurial philosophy, its talent for leveraging assets, and its formidable capacity as an equity investor, as evidenced in its work with PA-AIT and Franklin Fuel Cells. It will continue to identify innovative lending opportunities with strong impact as with the energy-efficient affordable homes on Philadelphia's Reinhard Street, giving added meaning to the long-term affordability of these homes. TRF will continue to build its strong track record of professional, independent fund management and its well-developed network of relationships with equity and debt financing partners, public development agencies, foundations and other non-governmental organizations.

The future is not far off when clean energy will be abundant and affordable, when green buildings will become the norm, and when sustainability will be the guiding principle for both public policy and private investment. And with TRF's pioneering work, the mid-Atlantic region is poised to play a vital, prospering role in our nation's transition to that sustainable energy future.



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