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SAINT JOHN'S ABBEY & UNIVERSITY and WESTWOOD RENEWABLES:

SAINT JOHN'S SOLAR FARM PROJECT

Fall, 2009

Participants:

- Saint John's Abbey (physical plant) and University (educational component)
- Westwood Renewables (a Minnesota-based company that specializes in solar electric development, design and education)
- Renewable Development Fund (Project funding provided by customers of Xcel Energy through a grant from the Renewable Development Fund.)

Timeline:

- Construction begins on Sept. 15, 2009
- Construction takes 10-12 weeks
- 20-year contract

Saint John's agrees to:

- Lease four acres of land to Best Power Int'l LLC
- Promote the benefits of solar energy
- Educate students and visitors on solar energy

Westwood Renewable agrees to:

- Install and maintain 400 kW of photovoltaic solar tracking panels
- Provide 575,000 kWh (kilowatt hours) of electricity annually
- Share the solar energy data and research related to the Saint John's site
- Offer occasional classes on solar photovoltaic electricity

Saint John's University was a charter signatory of the American College and University Presidents Climate Commitment in 2007, which directs Saint John's to the ultimate goal of carbon neutrality as part of an ongoing commitment to good stewardship.

Saint John's University sees itself as responsible for good stewardship of the natural environment and seeks to take a leadership role in exercising this responsibility, affirming its commitment to use educational activities to promote environmental awareness, global thinking and collaboration on the local level.

In addition to the modest solar array that was added to the New Science Center at Saint John's in 2008, this solar power project offers a potentially major addition to the university's environmental studies curriculum, as students will now be able to study a system in operation on the Saint John's campus.

400kW Array Fact Sheet

Numbers
400.4 kilowatts of DC power
575,000 kilowatt-kilowatt-hours (575 MWh) of anticipated annual energy production
15,800 MWh produced over the system's 30-year lifespan.

1,820 solar modules. A typical module is approximately 3'x5'
Polycrystalline (c-SI) 13.7% efficient modules
35 Azimuth Trackers driven by two 1hp motors

Location and Site
The solar field will be located on land owned by Saint John's Abbey (also home to Saint John's University), Collegeville, Minnesota. The specific site is located in a field to the west-northwest of the campus's Flynntown apartment complex. The site is 3.9 acres, while the footprint of the array itself is 3.1 acres.

Equipment
Module: Siliken Renewable Energy, Inc: 1820, 220w Modules
Inverter: Advanced Energy Solaron 500 kW, 480 VAC
Tracker: WattSun Micro-Megawatt Horizontal Tracker

Other
System Host: Saint John's Abbey and Saint John's University
Solar Integrator (designer and operator): Westwood Renewables, LLC
Solar Facility Holding Company: Best Power Int'l, LLC

PROFILE

Saint John's Abbey **Saint John's University**

Collegeville, Minnesota 56321

www.saintjohnsabbey.org www.csbsju.edu

Saint John's Abbey is an independent monastic community (non-profit 501c3 religious organization) following the traditions of St. Benedictine as written in the *Rule of St. Benedict*. Having arrived in central Minnesota in 1856, the Benedictine community of Saint John's continues to serve one another and the local, national and worldwide Catholic church and communities through prayer and through pastoral, educational and publishing ministries.

In 1857, Saint John's Abbey established and founded Saint John's University – a private, liberal-arts university; the oldest Catholic men's college in Minnesota. Saint John's as a whole has a strong interest in and commitment to clean, renewable energy.

- Abbot John Klassen wrote in his Foreword to *Saint John's at 150* , "an anniversary such as a sesquicentennial is an opportunity to look forward and think about the future…Saint John's has been blessed with a beautiful natural environment. In a time of rapid development around us, the rural character of our campus, lakes and woodlands cannot be taken for granted. We must constantly renew our commitment to conservation. ..We will contribute to the exploration of alternative energy sources in the context of sensitivity to the planet and our immediate environment."

Abbot John Klassen, appointed Abbot of Saint John's Abbey in 2000: Abbot John is responsible for all aspects of the monastery and its affiliates (including Saint John's University) - to implement the strategic goals and objectives of the monastery, to fulfill its governance function and to give direction and leadership toward the achievement of the organization's philosophy, mission, strategy, and its annual goals and objectives.

Abbot John graduated from Saint John's University in 1967 and from Saint John's School of Theology in 1971. He became a Benedictine monk of Saint John's Abbey in 1972 and was ordained to the priesthood in 1977. He received his doctorate in bio-organic chemistry from The Catholic University of America in Washington, D.C., in 1985. In addition to being a faculty resident and leading various campus programs, Abbot John taught chemistry at Saint John's Prep School (1972-77) and Saint John's University (1983-2000) before being appointed Abbot.

Br. Benedict Leuthner, Saint John's Abbey Treasurer, appointed in 1997: Br. Benedict is responsible for overseeing the finances of Saint John's Abbey and the facilities, physical plant and power house of Saint John's Abbey and its affiliates including Saint John's University. Br. Benedict is a 1982 graduate of Saint John's University, and made his monastic profession to Saint John's Abbey in 1987. He received his MBA in 1994 from Case Western Reserve University in Cleveland, Ohio. Br. Benedict is the project manager and Saint John's lead person on the solar project for Saint John's Abbey and Saint John's University.

Fr. Robert Koopmann, Saint John's University President: Fr. Bob began his appointment as the 12th president of Saint John's University on July 1, 2009. He is a 1968 graduate of Saint John's University, professed as a monk of Saint John's Abbey in 1971 and was ordained a priest in 1981. He has been a professor in Saint John's University music

department since 1975 and has served on the SJU board of regents for a total of 13 years. Fr. Bob has advanced degrees from the University of Wisconsin-Milwaukee (master of music), the University of Iowa (doctor of musical arts) and a master of divinity degree from Saint John's School of Theology•Seminary. He completed post-doctoral study with faculty of the Royal Academy of Music in London and the Juilliard School of Music in New York City.

Westwood Renewables, LLC

Westwood Renewables are renewable energy integrators who provide design builder services for national commercial and utility-scale solar, as well as, small wind projects. Westwood supports institutions, commercial entities and utilities in the siting, permitting, design and construction of renewable energy projects.

Our experience in energy project development began in the late 1970's designing and constructing some of the very first solar and wind energy systems in the Midwest. We have grown to serve clients a variety of solutions across the country.

Mario Monesterio
Principal
Mario is a founder and principal at Westwood Renewables. He has been designing and building solar systems since 1979 and is considered one of the leading solar technology experts in the Midwest. He received his solar practitioner's certification as a solar designer and installer in 1980, the country's first such program and frequently teaches courses in solar design and theory at colleges, trade schools, and seminars across the nation. He continues to be active in local and national efforts to further policy and technology awareness.

Dwight Jelle, PE
Principal
Dwight has been providing solutions for both land and energy development companies since 1986. As President of Westwood Professional Services he has helped develop over 90 wind farm projects representing over 9,000MW of capacity. On the land side he has assisted in the development over 10,000 acres of land for both commercial and residential developers. He understands that the link between land and energy is critical as development becomes more sustainable in the future. As Chief Manager of Westwood Renewables, Dwight will provide the critical link between land customers and renewable energy projects.

Nathan Franzen
Principal & General Manager
Nathan is responsible for the day to day operations of the firm. With his broad base of expertise in business development, contract negotiation, and project management, Nathan focuses on the overall goals of the client and project. He is responsible for marketing, building new client and partner relationships, and enhancing Westwood Renewables suite of services. He holds a Masters in Urban & Regional Planning from the Hubert H. Humphrey Institute of Public Affairs.

Terminology

Photovoltaic (PV) Effect: When light, as photons, strikes a solar cell, it excites the silicon atoms and knocks some of their electrons loose. These loose electrons are channeled into wires where they become current— electricity.

Cell: A PV cell is the basic building block of a solar photovoltaic system. Each cell is made of a semiconductive material, typically silicon. PV cells can produce power for 30 years or longer.

Module: A module is a series of cells wired together and housed in a single frame. This is often called a solar "panel" but the industry uses the term "module" instead.

String: A string is a grouping of modules wired in series. When electrical sources are wired in series, the voltage is increased to the desired level. Groups of strings are wired in parallel.

Array: An array is the total collection of modules and strings in a given solar system.

Inverter: Solar modules produce direct current (DC) power, and the inverter converts it to alternating current (AC) power, which is used in the electrical grid and in our home.

Information on the Solar Project

Q: Why is Saint John's Abbey and Saint John's University interested in building an on-campus solar energy facility?

A: The Benedictine tradition at Saint John's Abbey advocates a strong commitment to stewardship. This solar project is one example of an initiative to broaden and strengthen the monastic community's commitment to green energy and to education – becoming a part of the curriculum and seminars offered at Saint John's University.

Saint John's University was a charter signatory of the American College and University Presidents Climate Commitment in 2007, which directs Saint John's to the ultimate goal of carbon neutrality as part of an ongoing commitment to good stewardship.

Saint John's Abbey and Saint John's University see themselves as responsible for good stewardship of the campus's natural environment and seek to take a leadership role in exercising this responsibility, affirming its commitment to use educational activities to promote environmental awareness, global thinking and collaboration on the local level.

In addition to the modest solar array that was added to the New Science Center at Saint John's in 2008, this solar power project offers a potentially major addition to the university's environmental studies curriculum, as students will now be able to study a system in operation on the Saint John's campus.

Q: Why did Saint John's and Westwood Renewables partner on this project?

A: Education is a major component and goal of the project. As part of the agreement, Saint John's professors and Westwood staff will co-teach solar seminars to students and solar professionals. Locating the facility on a college campus allows students direct access to cutting edge technology.

Q: Does Minnesota have a good solar resource?

A: Quoting the GREEN INSTITUTE ISSUE BRIEF ON SOLAR ENERGY, Building Minnesota's Solar Future: The Option of a "Solar Carve-Out" in the Renewable Energy Standard (Feb 2008): "Minnesota's solar resource is very good – nearly as good as Miami, Florida – and solar resources change more gradually and linearly across distances, unlike wind energy, which is more site specific across the state, and varies with the cube of the wind speed. Solar should also be compared to the retail price of electricity, not any particular technology, since it is offsetting direct retail consumption. New Jersey has a lower solar resource than much of the country, including Minnesota, and yet has the second largest solar market in the U.S. Similarly, Germany has roughly the same solar resource as Alaska (the lowest in the country), and yet in 2006 Germany installed nearly seven times more solar electric capacity than the entire U.S."

Q: How does Minnesota's four seasons affect the production of energy in a solar facility?

A: A solar array will produce more power in the summer because of longer daylight hours and more direct sun. In winter, the solar array will produce less power due to shorter daylight hours and oftentimes cloudier conditions. Interestingly, the cold winter temperatures are actually beneficial to a solar system. A drop in temperature causes an increase in voltage, which corresponds to an increase in power production.

Q: What is the largest MN PV system currently?

A: The largest PV system in Minnesota is currently 100kW. The Saint John's Solar Farm will be approximately four (4) times larger – the largest solar photovoltaic system in the Upper Midwest.

Q: Why does the facility use a motorized tracking system?

A: Having the solar panels "track" the sun increases the efficiency of the array. The modules sit on beams that rotate east to west on a horizontal axis throughout the day, following the path of the sun across the sky. This produces approximately 15% more energy than a typical static array.

Q: How much energy will the facility produce?

A: 575,000 kilowatt-hours (575 MWh) of anticipated annual energy production. The facility will offset about 20% of Saint John's peak energy needs during the summer months and approximately 4% of the campuses overall energy needs on an annual basis.

Solar PV facilities produce power during daylight hours which directly corresponds to time of day when energy consumption peaks. Peak power is the most expensive power to produce which makes solar power more valuable.

Q: How many homes will the system power?

A: The system provides enough annual power for the equivalent of approximately 65 homes.

Q: How long will the system last:

A: The system's life is in excess of 30 years. The solar modules are warranted to produce energy at 80% of its initial capacity after 25 years.

Q: How is the project funded?

A: Approximately $2 million dollars of construction costs will be provided by customers of Xcel Energy through a grant from the Renewable Development Fund (RDF). The remaining funds will come from tax credit and equity investors as well as energy payments that stem from the energy produced by the facility.

Q: Why did the Renewable Development Fund support this project?

A: This project was chosen for funding because of it would deliver 400 kW of solar electrical generating capacity to the Minnesota Xcel Energy service area and provide the opportunity to scientifically test and demonstrate the feasibility of large-scale solar in Minnesota, and to test and demonstrate the technology-to-market transition. The project will:

- Familiarize Minnesotans with Minnesota's climate as a good solar resource, increasing demand for solar systems
- The 3.1 acre solar field will provide a large scale demonstration site of solar power in Minnesota.
- Demonstrate the financial feasibility of large-scale solar PV installations
- Utilize the solar resources in Minnesota to generate energy during peak demand hours, assisting Xcel Energy in cost effectively increasing the percentage of renewables in its generation portfolio and reducing costs related to purchasing peak-period energy
- Track and report on the operating performance of the system – availability, kWh production, seasonal implications, and other metrics – to begin building a foundation of knowledge regarding large-scale solar in the state

Q: Where will the energy go?

A: The solar facility will be connected to Saint John's internal grid.

Q: Who will own the system?

A: The system will be owned by Best Power Int'l LLC. Best Power Int'l is a partnership company that will facilitate tax credit and equity investments for the project. Best Power Int'l will lease the land for the project from Saint John's Abbey and own the solar facilities. All service, operation and maintenance on the solar system and equipment will be provided by Westwood Renewables.

Q: Who will own the Renewable Energy Certificates* (RECs)?

A: A condition of the Renewable Development Fund grant provides Xcel Energy with the rights to the Renewable Energy Credits produced by the facility.

* **Renewable Energy Certificates** (**RECs**), also known as **Green tags**, **Renewable Energy Credits**, or **Tradable Renewable Certificates** (**TRC**s), are tradable environmental commodities in the United States which represent proof that 1 megawatt-hour (MWh) of electricity was renewable (generated from an

eligible renewable energy resource). (Source: http://en.wikipedia.org/wiki/Renewable_Energy_Certificates)