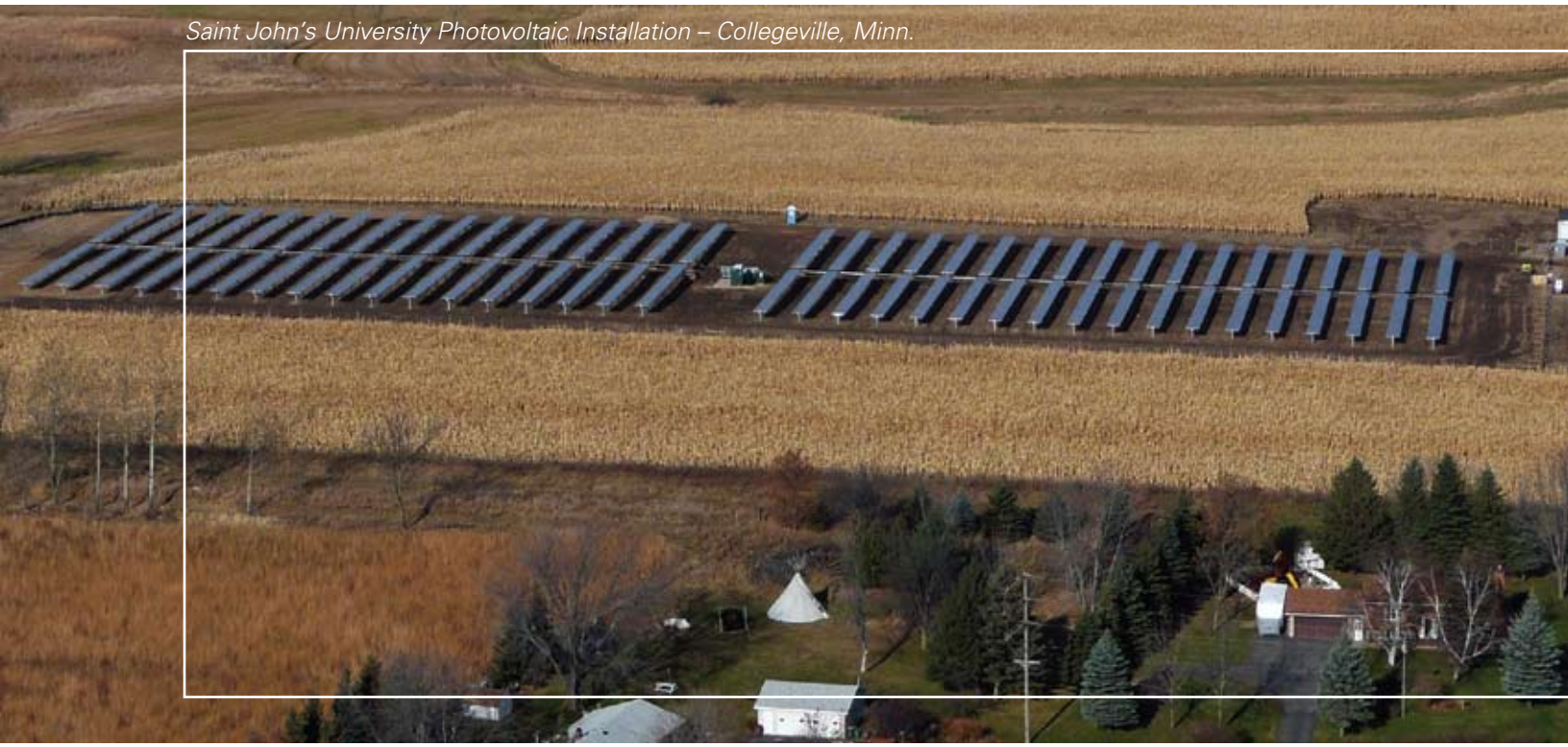

Saint John's University Photovoltaic Installation – Collegeville, Minn.

XCEL ENERGY
RENEWABLE DEVELOPMENT FUND (RDF)

Biennium Report
to the
Minnesota State Legislature
and the
Minnesota Public Utilities Commission

JANUARY 1, 2007 – DECEMBER 31, 2008

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I. EXECUTIVE SUMMARY

Xcel Energy's Renewable Development Fund ("RDF") reports robust progress from January 1, 2007 through December 31, 2008. During this period, RDF projects resulted in the installation of more than 1,750 kW of renewable electrical generating capacity and the production of more than 44,880 MWh of renewable electrical energy. The RDF investment in research continues to show dividends as demonstrated by the publishing of 25 journal articles or scientific papers. In addition, a third funding cycle ("Cycle 3") was issued and resulted in an award of more that $22 million in grants across a diverse mix of 22 projects designed to either research and develop renewable energy processes ("R&D") or demonstrate emerging renewable energy production technologies ("EP").

The RDF program objective is to remove entry barriers that renewable energy technology developers face as they struggle to compete with conventional energy sources in the marketplace. All awarded projects support the state's energy policy goals and meet particular selection criteria designed to benefit Minnesota ratepayers.

In May 2007, with the concurrence of the Minnesota Public Utilities Commission ("Commission"), we announced the $22.6 million award availability for Cycle 3 and issued a Request For Proposals ("RFP"). The RDF Advisory Board, with assistance from an independent consultant, reviewed more than 80 proposals from academic institutions, established private companies, and new venture organizations. Twenty-two projects were selected, along with two additional reserve projects. Reserve projects were awarded a grant subject to funds becoming available if a higher scoring project voluntarily returns their grant award prior to entering into an RDF grant contract. The Commission, in its Order issued April 1, 2008, approved the final selections and authorized us to enter into contracts with the various awardees to proceed with their respective projects.

Project highlights from the past two years include:

- **Solar GeoThermal:** Merrick Inc., a nonprofit organization located in Vadnais Heights, Minnesota, utilized a $735,000 RDF grant to install a 100 kW solar photovoltaic ("PV") project at their 52,000 square feet office building/training facility. This solar geothermal project, completed during the summer of 2008, is a model example of using renewable energy for a geothermal heating and cooling system to provide 100 percent of the heating and cooling needs of their facility. The solar array will reduce Merrick's use of non-renewable energy by at least 33 percent.

Merrick Inc. – 100 kW Photovoltaic Installation

- **Biomass Fuel:** Bepex International, a Minneapolis-based business with customers throughout the world, is using a $925,000 RDF research and development grant to develop a cost-effective method to densify biomass feedstocks that will help reduce transportation costs and allow co-firing with coal. The pilot model has produced biomass briquettes that have very similar physical properties to coal for storage, handling, and grindability. The briquettes will be tested under simulated conditions of an existing boiler unit at an Xcel Energy power plant.

Bepex International – Collecting corn stover

Bepex International – Shredded stover and briquettes

- **Solar PV Research:** The National Renewable Energy Laboratory ("NREL"), in conjunction with the University of Minnesota, utilized a $1 million RDF grant to design and develop a thin film solar cell that uses ultrasonic spraying and a binary, multi-layer approach that separates the application of inks and precursors. The research project received national recognition and was a recipient of the 2008 R&D Magazine 100 Award for their development of hybrid Copper Indium Gallium (di)Selenide (CIGS) technology, an award recognizing the 100 most technologically significant new products of the year. NREL has indicated this new technology will go to commercialization on a small-scale basis in the fall of 2009.

A complete list of RDF projects that were active at some point during the past biennium is attached to this report. (See Appendix A.) We are pleased with the success and achievements of these projects. As exemplified by the project highlights and benefits summarized in this report, the RDF program continues to develop renewable resources within Minnesota and expand the renewable energy knowledge base needed to more fully realize the state's renewable energy capabilities.

II. RDF PROGRAM BACKGROUND

The Renewable Development Fund (RDF) was established in 1994 in conjunction with Minnesota legislation concerning the Prairie Island Nuclear Plant in Red Wing, Minnesota. As a condition of storing spent nuclear fuel in dry casks at Prairie Island, Minn. Stat. § 116C.779 initially required Xcel Energy, as the public utility owner of the plant, to transfer to a renewable energy fund $500,000 for each dry cask containing spent fuel after January 1, 1999. In 2003, this statute was amended to require the transfer of $16 million annually to the RDF program, of which $10.9 million annually shall be used to fund renewable small-wind, hydro and biogas incentives via the renewable energy production incentive ("REPI") program administrated by the Department of Commerce. (See Section IV for further discussion of REPI.)

We recover the net cost of Commission-approved program expenses through an adjustable surcharge on the rates Xcel Energy charges for electricity. This surcharge mechanism is known as a "rate rider." Each year, Xcel Energy submits to the Commission on October 1 an RDF annual report, tracker account and true-up filing which summarizes past expenses, provides a future expense forecast, and sets the RDF rate rider for the forthcoming year.

The RDF Advisory Board serves as a voluntary and independent entity to assist in evaluating and selecting grant project proposals for recommendation to the Company and the Commission. The RDF Advisory Board uses technical and professional consulting resources as needed to carry out its duties. The Board has seven members (See Appendix B) consisting of representative from the following interest groups:

- Environmental Interests (2)
- Prairie Island Indian Community (1)
- Residential Ratepayers (1)
- Commercial and Industrial Ratepayers (1)
- Xcel Energy (2)

Xcel Energy program staff has responsibility for the practical day-to-day administration of the RDF grant contracts and resources.

III. RDF PROGRAM MISSION AND PERFORMANCE METRIC EVALUATION

The RDF's mission is to:

- Increase the market penetration of renewable energy resources at reasonable costs in the Xcel Energy service territory
- Promote the start-up, expansion and attraction of renewable energy projects and companies in the Xcel Energy service territory
- Support emerging renewable energy technology through research and development

RDF administration has established the following performance metrics for evaluating mission effectiveness:

- Expansion of Knowledge Base
- Environmental Benefits
- Economic Benefits

These performance metrics, detailed below, are revisited after the completion of each project to determine whether the project 1) remained on course with its stated goals, 2) furthered RDF program objectives, and 3) was a prudent and beneficial grant award on behalf of Xcel Energy ratepayers.

Expansion of Knowledge Base: Project milestone reports submitted by grant recipients provide a public venue and discussion base for cutting-edge activities. These reports are available at Xcel Energy's project Web site at www.xcelenergy.com/rdf. In addition, the publication and presentation of project findings within the scientific and commercial community provide the opportunity to expand the academic and practical knowledge base of renewable energy technologies. During the biennial period, 10 articles were published in scientific journals. Fifteen scientific papers were presented at a variety of regional, national, and international venues. (See Appendix C.) Local media have also covered RDF projects at the following events to help promote renewable energy initiatives within the NSP service area of Minnesota:

- Innovative Rural Development Initiatives Tour hosted by USDA, which viewed the AURI (RD-69) wind-firming project near Beaver Creek, Minn. (March 2007)
- 1st Annual Crop tour hosted by Rural Advantage (RD-27) to demonstrate Miscanthus as an alternative energy crop near Luverne, Minn. (September 2007)
- Dedication of wind turbine hosted by St. Olaf College (EP-39) in Northfield, Minn. (September 2007)

- Public tour of solar display hosted by Merrick Inc. (RD3-2) in Vadnais Heights, Minn. (August 2008)
- 2nd Annual Crop tour hosted by Rural Advantage (RD-27) to demonstrate Miscanthus as an alternative energy crop near Luverne, Minn. (September 2008)
- Ground breaking hosted by Xcel Energy (RD3-12) to provide public awareness of wind to battery initiative in Luverne, Minn. (November 2008)
- Workshop hosted by University of Florida (RD-34) to explore biogasification technologies and a tour of the RDF project at the American Crystal Sugar Company in Moorhead, Minn. (December 2008)

Environmental Benefits: One of the RDF's environmental contributions is the avoidance of both air pollutant and greenhouse gas emissions when compared with alternative methods of generating electricity. Installed RDF energy production projects generated 44,881 MWh of electricity during the 2007 to 2008 biennium. Overall, RDF projects have generated a total of 59,873 MWh of electricity produced from a renewable energy resource. (See Table IIIa). Since solar electricity is only generated during daytime periods, it can help meet demand energy requirements.

Table IIIa - RDF Power Electrical Power Production

Project Name	Cycle	Nameplate Capacity	Date Installed	Electricity Produced	
				Biennium (2007 – 2008)	Total (To Date)
SOLAR PROJECTS					
Merrick	3	100 kW	2008	21 MWh*	21 MWh
MN Dept. of Commerce	1	960 kW	2003 - 2008	1,805 MWh	4,224 MWh
Science Museum	1	9 kW	2003	27 MWh	69 MWh
Total Solar Projects (3 Projects)		**1,069 kW**		**1,852 MWh**	**4,313 MWh**
WIND PROJECTS					
Pipestone Jasper School	1	900 kW	2004	3,390 MWh	6,921 MWh
Project Resource Corp	1	5,400 kW	2006	32,399 MWh	41,399 MWh
St. Olaf	2	1,650 kW	2007	7,240 MWh	7,240 MWh
Total Wind Projects (3 Projects)		**7,950 kW**		**43,029 MWh**	**55,560 MWh**
Total Projects	**6**	**9,019 kW**		**44,881 MWh**	**59,873 MWh**

**Includes two months of operation since the photovoltaic system became operational in November 2008*

Solar and wind resources have provided all RDF project power generation to date; these sources create no air emissions. When compared to electrical energy produced by coal, the RDF generation has provided environmental benefits through the reduction in several primary air emission categories (See Table IIIb). Solar and wind-sourced electrical generation offsets the release of particulate matter resulting from conventional electrical power generation.

Table IIIb - Air Emission Reductions (Compared to Coal)

Emission	Prior to 2007 (pounds)	Biennium (2007 - 2008) (pounds)	Total (pounds)
CO_2	31,933	95,597	127,529
SO_2	201	601	802
NO_x	114	341	455
VOCs	0.76	2.29	3.05
Hg	0.16	0.49	0.65
Pb	0.20	0.59	0.79

Emissions data are based on statistics provided in the U.S. Department of Energy's Energy Information Administration *Annual Energy Review 1998.*

Economic Benefits: RDF grants for renewable energy research and energy production initiatives generate significant economic benefits. During the biennium RDF expenditures have included $13.7 million in RDF project grant reimbursements, $19.9 million in REPI payments, and $11.4 million in funding for special legislative projects. RDF expenditures promote and expand economic activity on both a local and regional scale through the purchase of goods and services, expansion of employment opportunities, and in some cases, the fostering of new or expanded business opportunities. In the case where permanent energy production facilities are constructed, the RDF investment can also expand the property tax base for a community through land improvements. RDF grant funds support supply-side economic growth by providing an incentive for people to produce goods and services which allow consumers to benefit from a greater supply of those goods and services at lower prices.

1. **Leveraged Funds:** RDF funds effectively leverage other funds to expand and/or enhance project activity. Since RDF program inception in 2002, RDF grant awards have stimulated the investment of over $131 million in construction activity, goods and services as a result of the start-up, expansion and attraction of renewable energy projects and companies in the Xcel Energy service territory. Energy production projects leverage $3.37 for every RDF dollar spent. (See Table IIIc) An additional $12 million has been leveraged for research and development in Minnesota. Predominate sources for energy production cost-sharing are corporate investments and the U.S. Department of Agriculture.

Table IIIc - Leveraged Funds (Energy Production*)

Technology	Grant	Cost Share	Total Costs	Leverage
Biomass	$4,236,530	$18,630,840	$22,867,370	440%
Hydro	$7,100,000	$29,300,000	$36,400,000	413%
Innovative	$10,000,000	$45,500,000	$55,500,000	455%
Solar	$4,367,922	$1,111,807	$5,479,729	25%
Wind	$4,352,835	$6,646,503	$10,999,338	153%
Total	$30,057,287	$101,189,150	$131,246,437	337%

** Includes all EP projects that had approved RDF grant contracts from 3/1/2002 - 1/1/2009.*

Research and development projects typically do not have the extensive leverage capacity as compared to energy production because the funding is predominately applied to personnel rather than construction and material costs (See Table IIId). Nevertheless, RDF grant awards are more widely distributed amongst various recipients for research projects; 38 such projects received funding since the program's inception compared to 16 energy production projects. Predominant sources for research cost-sharing are the U.S. Department of Energy, National Science Foundation, and corporate investments.

Table IIId - Leveraged Funds (Research and Development*)

	Minnesota			Outstate			
Technology	RDF Grant	Cost Share	Leverage	RDF Grant	Cost Share	Leverage	Total Leverage
Biomass	$8,312,939	$860,433	10%	$11,324,938	$5,307,007	47%	31%
Solar	$732,032	$0	0%	$4,934,628	$1,421,700	29%	25%
Wind	$1,719,779	$141,437	8%	$445,000	$25,973	6%	8%
Total	$10,764,750	$1,001,870	9%	$16,704,566	$6,754,680	40%	28%

** Includes all RD projects that had approved RDF grant contracts from 3/1/2002 - 1/1/2009.*

2. **Job Creation:** Money being invested into an area's economy for the material delivery of goods and services results in the need to hire additional or retain existing employees to meet the business needs. Thus, money spent on energy production projects as well as research and development projects provide real economic benefits, although such benefits are difficult to quantify. Organizations such as the National Renewable Energy Laboratory, the U.S. Department of Energy, and the American Council for an Energy Efficient Economy have developed "job calculator" models to evaluate the impact of dollars spent on renewable energy and energy efficiency projects. On average, these tools indicate that between 10 to 11 jobs are created and/or retained (permanent and temporary) for each $1 million invested. If valid, these job calculators would suggest that RDF program expenditures of $40.6 million during the 2007-2008 biennium have resulted in creating or retaining between 406 to 446 jobs in the biennium.

It should be noted that several out-of-state projects utilized Minnesota contractors or project hosts located in the NSP service area and are not included within the previous numbers. This project association keeps the research relevant to Minnesota and directs additional RDF funds to businesses and organizations in the state. These projects include:

- American Crystal Sugar Corp., Moorhead, Minn. hosted the project demonstration site for the University of Florida (RD-34)
- Cargill Inc., Minneapolis, provided consulting services for Iowa State University (RD-1104)
- The Natural Resources Research Institute, Coleraine, Minn. hosted the gasification testing for Gas Technology Institute (RD-38)
- The University of Minnesota provided consulting services for NREL (RD-93)
- Haubenschild Farms, Princeton, Minn. provides feedstock and a testing site for University of North Dakota (RD3-68)
- P & J Farms, Northfield, Minn. is host to the gasification demonstration for Coaltec USA (RD3-77)

Although it is difficult to determine a value for the economic benefits generated from the R&D project activity, RDF research is aimed at new technologies that will lower the manufacturing costs or investment to install renewable energy power facilities. RDF activity is striving to lower the production costs and increase efficiency for thin film photovoltaic technologies, identify efficient and economical methods to purify biomass generated syngas, and improve the efficiency and production from wind power. These activities will assist Minnesota in securing viable renewable energy businesses and providing long-term economic benefits.

IV. RDF FUNDING ACTIVITY

Since 2001, the RDF program has provided approximately $122 million for renewable energy initiatives including $19.3 million for REPI payments, $33.4 million for legislative mandated programs, and $1.7 million for general program support. The balance of $67.5 million has been awarded over three grant cycles resulting 62 projects as follows:

- RDF Grant Awards:

2001 (Cycle 1 – 17 Projects)

— $15.5 million in grant awards across 17 projects

— 11 research projects: 8 for early stage; 3 for near-commercial stage

— 6 energy production projects: 4 currently generate about 19,708 MWh annually, 1 is not yet complete (Crown Hydro at 18,908 MWh annually).

2005 (Cycle 2 – 23 Projects)

— $29.5 million in grant awards across 23 projects

— 17 research projects: 10 for early stage; 7 for near-commercial stage

— 6 energy production projects: 2 currently generate about 8,187 MWh annually, 3 are not yet complete (67,814 MWh annually), 1 is not a renewable energy project (Excelsior Energy).

2007 (Cycle 3 – 22 Projects)

— $22.5 million in grant awards across 22 projects

— 16 research projects: 5 for early stage; 11 for near-commercial stage

— 6 energy production projects 1 currently generates about 123 MWh annually, 5 are not yet complete (4,970 MWh annually).

- RDF funding provides the financial support for Minnesota's REPI program. REPI payments are paid to qualifying small wind, biogas and hydroelectric projects operating and generating electricity in Minnesota. Owners of energy conversion systems with a capacity of 2 MW or less receive 1.5 cents for each kilowatt-hour (kWh) produced for the first 10 years. Project owners apply to the Department of Commerce to qualify for the incentive. If they are deemed eligible, the project must be operational within 18 months, or approval to receive the incentive payment is withdrawn. REPI has assisted in the purchase of 2,696,206 MWh of electricity at the cost of $24.9 million since the program inception.

- The State Legislature appropriated $15.25 million from the RDF to fund the Next Generation Energy Initiative (Next Gen). Enacted in 2007, Next Gen provides a framework to generate more locally-produced renewable fuels and reduce carbon emissions. Next Gen strengthens Minnesota's commitment to the development of locally-owned renewable energy projects, and supports research, development and deployment of biofuels, renewable hydrogen, E-85 and high-efficiency technologies.

V. OVERALL RDF PROJECT STATUS

In order to maintain program transparency, the RDF administration files quarterly progress reports with the Commission (available on its Web site) summarizing individual project activity. In addition, RDF grant recipients submit project milestone reports to Xcel Energy providing a detailed description of activities and findings. We post milestone reports on the RDF Web site at www.xcelenergy.com/rdf.

A. Current Contracts

RDF projects have contract periods of varying lengths and start dates based upon the specific variables and time requirements inherent to the project. Project duration ranges from two months to 60 months. Some projects are dependent upon seasonal factors (i.e. wind patterns, weather, crop growth, winter construction restrictions, etc.), so project tasks need to be synchronized with calendar dates.

Of the 52 projects that have entered into RDF grant contracts since the program's inception, 13 projects were initiated during the biennial period (See Table Va).

Table Va - Summary of Projects Initiated (1/1/2007 – 12/31/2008)

	Prior to 12/31/2006	1/1/2007 - 12/31/2008
Cycle 1	17	–
Cycle 2	22	1
Cycle 3	–	12

Twelve projects were completed prior to the biennial period, 18 projects were completed during the biennial period and 22 remain active (See Table Vb).

Table Vb - Summary of Completed Projects (1/1/2007 – 12/31/2008)

	Prior to 12/31/2006	1/1/2007 - 12/31/2008	Active as of 1/1/2009
Cycle 1	12	5	1
Cycle 2	–	14	9
Cycle 3	–	1	11

Nearly $57 million has been obligated through RDF grants to date. Also, $10.8 million is obligated to 10 RDF grant awardees that still must complete the due diligence process before an RDF grant contract can be executed.

B. Energy Production Project Status

Ten energy production projects were active during the biennial period of which four completed their proposal activity with an installed capacity of 3.65 MW (See Table Vc). Annual electrical production from this installed capacity is 8,844 MWh. More than $26 million of RDF funding has been awarded and obligated to these 10 RDF energy production projects. This investment has leveraged an additional $92 million for project design, planning, and materials for construction projects in Minnesota.

Table Vc - Summary Energy Production Projects (1/1/2007 – 12/31/2008)

Technology	Total Projects	Completed Projects	Installed Capacity (MW)	Funds Leveraged
Biomass	2	0	0	$12,530,840
Hydro	2	0	0	$29,300,000
Innovative	1	0	0	$45,500,000
Solar	3	2	1.059	$1,023,507
Wind	2	2	3.650	$3,742,503
Totals	10	4	4.709	$92,096,850

C. Research and Development Project Status

Thirty-one research and development production projects were active during the biennial period with 15 completing their proposal activity during that period. (See Table Vd). More than $26 million of RDF funding has also been awarded and obligated to R&D projects. This investment has leveraged an additional $26.6 million from other sources for renewable energy research.

Table Vd - Summary Research Development Projects (1/1/2007 – 12/31/2008)

Technology	Total Projects	Completed Projects	Published Articles	Scientific Papers	Funds Leveraged
Biomass	22	10	5	11	$17,489,602
Solar	6	4	6	3	$5,666,660
Wind	3	1	–	1	$3,503,999
Totals	31	15	11	15	$26,660,261

D. Reimbursement of Project Costs

Grant funds are disbursed on a reimbursement basis according to project progress as stipulated in project milestones. Disbursements of RDF monies are not made until the RDF milestone requirements are satisfied. Payments are based on a reimbursement schedule that is defined in the RDF grant contract and unique for each project. Nearly $14 million was dispersed in the biennium to reimburse project costs (See Table Ve). Some projects were completed under budget, and a $660,541 savings was thus returned to the fund for future RDF grant awards.

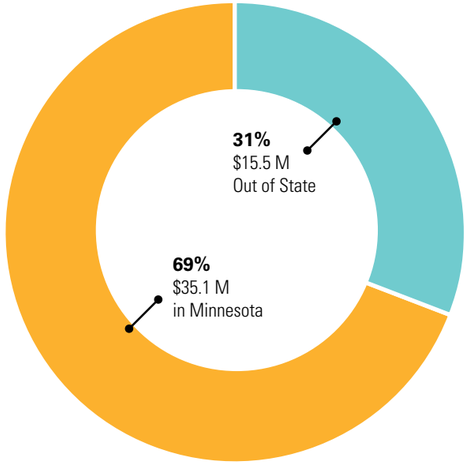
Table Ve - Use of Funds Under RDF Contract (1/1/2007 – 12/31/2008)

Cycle	Contracted RDF Funds	RDF Funds Dispersed			Funds not utilized
		Prior to 12/31/2006	1/1/2007 - 12/31/2008	Balance after 1/1/2008	
Cycle 1	$15,550,401	$10,878,496	$755,238	$3,617,899	$298,767
Cycle 2	$29,440,996	$7,261,038	$12,005,485	$9,812,699	$361,774
Cycle 3	$11,641,206	$0	$957,534	$10,683,672	$0
Total	$56,632,603	$18,139,535	$13,718,257	$24,114,270	$660,541

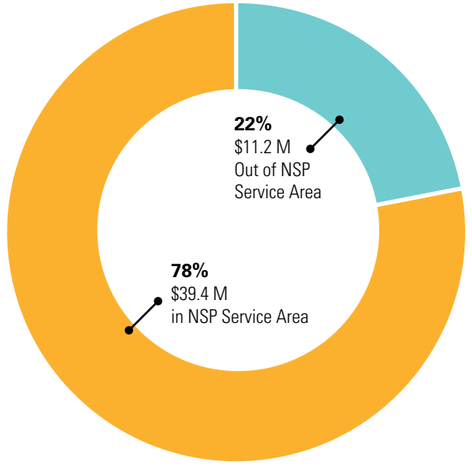
E. Project Benefits to NSP Ratepayers in Minnesota

A majority of RDF projects are based in Minnesota and the Northern States Power Company ("NSP") service territory of Minnesota, North Dakota, and South Dakota. As a result, a majority of RDF dollars are also spent in those areas. One selection criteria includes the benefits a project will bring to NSP ratepayers in Minnesota. Therefore, research activity conducted by an entity that is not located in Minnesota needs to be applicable and transferable to the environment and resources in the state. This is often accomplished through the use of a Minnesota site serving as a host to demonstrate a project's finding. Appendix D details the Minnesota congressional districts that have either hosted project activity or have had a project sponsor(s) located within their boundaries. The following figures illustrate the breakout of project location and funding inside and outside of Minnesota and inside and outside of NSP's service territory.

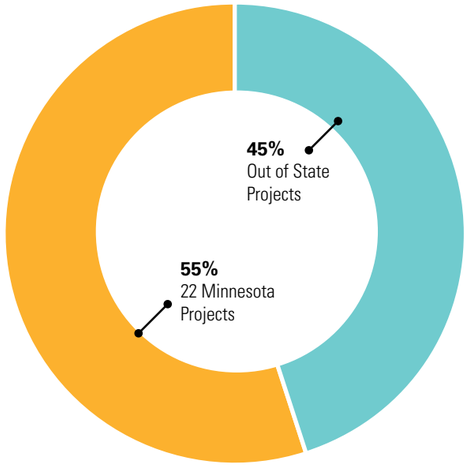
RDF Funding in Minnesota



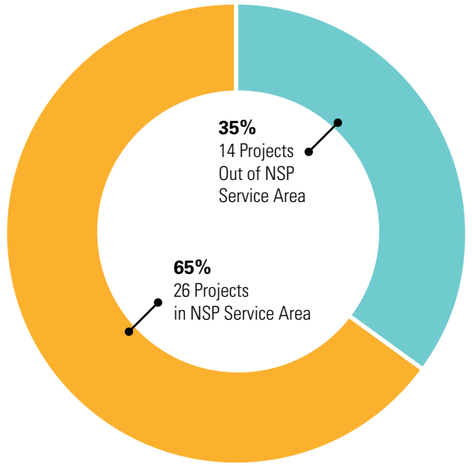
RDF Funding in NSP Service Area



RDF Projects in Minnesota



RDF Projects in NSP Service Area



VI. CYCLE 3

A. RFP Solicitation

Xcel Energy issued an RFP for projects for Cycle 3 grants on May 16, 2007; applications were received by July of that year. An independent entity, Princeton Energy Resources International, LLC (PERI), evaluated and scored the proposals on the basis of technical soundness and economic benefits. A total of 13 eligible energy production proposals were received including 11 solar PV, one biomass, and one hydrogen production from biomass. A total of 78 eligible research and development proposals were submitted representing a variety of technology categories: 33 biomass, 5 biofuel, 18 wind, 15 solar PV, 5 hydro, and 2 solar thermal electric.

B. Board Consideration and Commission Approval

The Board's goal for Cycle 3 was funding later stage research projects so a preference was given to proposals in a pilot or pre-commercial stage of development. In addition, the EP projects selected reflect the Board's philosophy of funding projects that will facilitate the movement of renewables into the energy marketplace and eventually result in installations of renewable resources and technologies that are not currently commercially viable, rather than subsidizing commercial renewable installations. Also, consistent with policy implemented in the second funding cycle, wind or biomass projects receiving REPI payments from the Department of Commerce, or solar projects receiving funding or having applied for funding from the Department of Commerce Solar Rebate Program, were not eligible to participate for additional RDF funding in Cycle 3.

After PERI scored the proposals, the RDF Advisory Board selected 24 projects that were subsequently submitted to the Commission for final approval. The Commission approved Cycle 3 grant awards in April of 2008, consisting of 17 R&D projects totaling more than $14 million and five EP projects totaling more than $8 million. In addition, two reserve projects were selected as alternate EP replacements.

C. Contracting Process

Subsequent to Commission approval of the Cycle 3 grant awards, we prepared RDF grant contracts. The contract development process involves a due diligence review of the applicant's organizational structure, financing, and project methodologies to identify and mitigate risks that may potentially limit the success of the project. Project activities, completion schedules, deliverables, grant distributions, and special conditions are developed and incorporated into the grant contract to assure project activity is consistent with the project proposals as approved and to protect the interests of Xcel Energy ratepayers.

At the conclusion of the biennial period, 12 RDF grant contracts were developed and approved; project activity had begun for all of contracted Cycle 3 grant awardees. Contract development was in progress for 10 additional Cycle 3 RDF grant awardees. Contracts become effective for RDF projects on the date the Commission issues its Order providing final approval of the grant contract. Historically, this has been the date when the Minnesota Office of Energy Security ("OES") completes a compliance review to assure that the grant contract is consistent with Commission Orders and indicates if any further action is required by the Commission.

VII. RDF PROGRAM ENHANCEMENTS

Given the unique public/private nature and relatively short history of the RDF program, we have worked closely with the Commission, the OES, and interested stakeholders to seek continuous improvements in RDF operations and public communications. We have incorporated experience gained through the RDF bidding process and grant administration into current program operational guidelines and oversight procedures. Program refinements made during the past two years include:

A. Reporting Revisions

- Developed standardized formats for monthly progress reports and milestone reports
- Focused report elements on benefits, accomplishments, and progress made towards the project objectives
- Established administrative processes to review reports and invoices that assure compliance with RDF contracts

B. Communication Enhancements

- Created cross linkages on the Xcel Energy RDF Web site
- Posted RDF milestone reports, final reports, and publications on the RDF Web site at www.xcelenergy.com/rdf/.
- Created RDF project fact sheets for completed projects (See Appendix E for examples)

C. Governance Enrichment

- Added two RDF Advisory Board members per Commission Order to represent residential and commercial ratepayers
- Established standing monthly RDF Advisory Board teleconferences scheduled for the second Tuesday of each month

D. Contract Modifications

- Standardized RDF contract including provisions pertaining to renewable energy credits, intellectual property rights, contractor payments, and events of default
- Developed formula for energy production projects to allow bidders to calculate the realistic target price for electrical sales
- Identified critical components that may impact the timely completion of projects (i.e. site control, permits, additional financing, feed stock supplies, special equipment, etc.) and prepared special grant contract conditions to limit risks to ratepayers
- Developed reserve pool of two additional proposals to use as replacements for proposals that voluntarily decline a grant award

VIII. CONCLUSION

The RDF is clearly a unique program within the state and amongst the states. It is the only such program offered by any electric utility within Minnesota, and it is the only public/private renewable development initiative statutorily established by any state. More importantly, the RDF program has become one of the most reliable funding source in Minnesota providing valuable financial support for renewable energy research, development, demonstration and deployment efforts in Minnesota.

The renewable energy research, development, demonstration and deployment program in Minnesota can be described as a three-legged stool and is comprised of three primary areas of focus.

1. RDF Program: RDF grants have historically focused on:
    - Medium to large dollar grants ($400,000 - $2,000,000)
    - Long-term projects (2 – 4 years)
    - Conducted by the private sector and universities
2. OES Program: OES grants have historically focused on:
    - Medium dollar grants ($100,000 - $300,000)
    - Short-term demonstration projects (Next Gen)
    - Energy production incentives (REPI)
3. IREE Program: IREE grants have historically focused on:
    - Small to medium dollar grants ($20,000 - $250,000)
    - Short-term projects
    - Conducted by University of Minnesota faculty and students

All three legs of the stool are necessary to provide a stable support system, and the RDF has been a consistent, reliable source of funding for all three components of Minnesota's renewable energy research, development, deployment and demonstration efforts.

RDF looks forward to building on its success and helping shape Minnesota's renewable energy future.

Appendix

Appendix A – RDF Projects During Biennium (1/1/2007 – 12/31/2008)

	Contract	Project Name	Grant	Type	Cycle	Category	Status	Project End Date
1	AH-01	Crown Hydro	$5,100,000	EP	1	Hydro	Active	9/4/2007*
2	AS-05	MN Dept. of Commerce	$1,150,000	EP	1	Solar	Completed	9/1/2008
3	CB-07	Colorado School of Mines	$1,116,742	RD	1	Biomass	Completed	12/31/2007
4	CB-08	Univ. of ND - SOFC	$1,250,142	RD	1	Biomass	Completed	10/31/2007
5	CS-05	NREL	$934,628	RD	1	Solar	Completed	7/9/2007
6	EP-26	Hilltop	$1,200,000	EP	2	Wind	Active	3/2/2009
7	EP-34	Lower St. Anthony Falls	$2,000,000	EP	2	Hydro	Active	8/1/2009
8	EP-39	St. Olaf	$1,500,000	EP	2	Wind	Completed	4/30/2007
9	EP-43	Mesaba/Excelsior Energy	$10,000,000	EP	2	Innovative	Active	6/24/2010
10	EP-44	CMEC	$2,000,000	EP	2	Biomass	Active	7/12/2010
11	EP-51	RCM Digesters/Diamond K Dairy	$936,530	EP	2	Biomass	Active	7/31/2008**
12	RD-22	Energy Conversion Devices	$900,000	RD	2	Biomass	Completed	10/12/2007
13	RD-26	Coaltec	$450,000	RD	2	Biomass	Completed	1//12/2007
14	RD-27	Rural Advantage	$318,800	RD	2	Biomass	Active	4/12/2009
15	RD-29	University of Minnesota	$299,284	RD	2	Biomass	Completed	9/24/2008
16	RD-34	University of Florida	$999,995	RD	2	Biomass	Active	5/16/2009
17	RD-38	Gas Technology Institute	$861,860	RD	2	Biomass	Completed	10/12/2007
18	RD-50	Energy Performance Systems	$957,929	RD	2	Biomass	Active	3/16/2011
19	RD-56	University of Minnesota	$858,363	RD	2	Biomass	Completed	4/16/2008
20	RD-57	Windlogics	$997,000	RD	2	Wind	Completed	11/11/2008
21	RD-69	AURI	$760,000	RD	2	Biomass	Completed	9/8/2008
22	RD-72	Production Specialties	$228,735	RD	2	Biomass	Active	11/16/2009
23	RD-78	Interphases Research	$1,000,000	RD	2	Solar	Completed	10/14/2008
24	RD-87	Global Energy Concepts	$370,000	RD	2	Wind	Active	5/7/2009
25	RD-93	NREL - Inkjet Solar Cells	$1,000,000	RD	2	Solar	Completed	12/9/2008
26	RD-94	Center for Energy Environment	$397,500	RD	2	Biomass	Completed	10/12/2007
27	RD-107	NREL-Low Band Gap-Solar	$1,000,000	RD	2	Solar	Completed	12/9/2008
28	RD-110	CSET and Iowa State University	$405,000	RD	2	Biomass	Completed	7/12/2007
29	EP3 - 2	Merrick	$735,000	EP	3	Solar	Completed	12/22/2008
30	EP3 - 12	Freenerg	$1,488,922	EP	3	Solar	Active	3/10/2010
31	RD3 - 1	University of Minnesota	$992,989	RD	3	Biomass	Active	10/22/2013
32	RD3 - 4	Bepex International	$924,671	RD	3	Biomass	Active	7/28/2010
33	RD3 - 23	University of Minnesota	$819,159	RD	3	Biomass	Active	6/11/2010
34	RD3 - 25	University of Minnesota	$732,032	RD	3	Solar	Active	10/22/2011
35	RD3 - 28	University of Minnesota	$979,082	RD	3	Biomass	Active	1/22/2013
36	RD3 - 53	Interphases Solar	$1,000,000	RD	3	Solar	Active	10/22/2011
37	RD3 - 66	University of North Dakota	$999,065	RD	3	Biomass	Active	12/31/2011
38	RD3 - 68	University of North Dakota	$970,558	RD	3	Biomass	Active	12/31/2011
39	RD3 - 71	University of North Dakota	$999,728	RD	3	Biomass	Active	12/31/2010
40	RD3 - 77	Coaltec Energy USA	$1,000,000	RD	3	Biomass	Active	10/22/2010
		Total RDF Projects	**$50,633,714**					

** An amendment approved by the Commission extends the end date of the project to 400 days from the property acquisition date.*
*** Dependant upon the date a PPA is approved.*

Appendix B

RDF Advisory Board

- Bill Grant, Associate Executive Director
  Izaak Walton League
  Representing Environmental Community
- Linda Taylor, Clean Energy Director
  Fresh Energy
  Representing Environmental Community
- Lise Trudeau, Engineer
  Minnesota Office of Energy Security
  Representing Residential Ratepayers
- Mike Franklin, Energy Policy Director
  Minnesota Chamber of Commerce
  Representing Commercial & Industrial Ratepayers
- Heather Westra
  Representing Prairie Island Indian Community
- Betsy Engelking, Director of Resource Planning
  Xcel Energy
  Representing Xcel Energy
- Brian Zelenak, Manager Regulatory Administration
  Xcel Energy
  Representing Xcel Energy

RDF Staff

- Debra Paulson, Program Manager
- Mark Ritter, Grant Administrator
- Robert Newman, Grant Administrator

Appendix C - Scientific Articles and Presentations

Scientific Articles

Date	Grant #	Grantee	Article Title	Journal
October, 2007	RD-107	NREL	Theoretical Studies on Conjugated Phenyl-Cored Thiophene Dendrimers for Photovoltaic Applications	American Chemical Society
February, 2008	RD-56	U of M	Use of Distillers By-Products and Corn Stover as Fuels for Ethanol Plants	Integration of Agricultural and Energy Systems
April, 2008	RD-56	U of M	Characterization of Feed Streams and Emissions from Biomass Gasification/ Combustion at Fuel Ethanol Plants	Applied Engineering in Agriculture
April, 2008	RD-34	U of F	Thermophilic Anaerobic Digestion of Sugar Beet Tailings	American Society of Agricultural and Biological Engineers
May, 2008	RD-34	U of F	Single-State, Batch, Leach-Bed, Themophilic Anaerobic Digestion of Spent Sugar Beet Pulp	ScienceDirect
May, 2008	RD-107	NREL	Distannylated Isothianaphthene: A Versatile Building Block for Low Bandgap Conjugated Polymers	Macromolecules
May, 2008	RD-34	U of F	Biogasification of Sugarbeet Processing By-products	Sugar Industry/ Zuckerindustrie
August, 2008	RD-107	NREL	Exciton Migration in Conjugated Dendrimers: A Joint Experimental and Theoretical Study	Chemistry of Materials
August, 2008	RD-107	NREL	Structure-Dependent Photophysics of First Generation Phenyl-Cored Thiophene Dendrimers	Journal of Physical Chemistry
January, 2009	RD-56	U of M	Fuel Properties of Biomass Feed Streams at Ethanol Plants	Applied Engineering in Agriculture

Papers/Presentations

Date	Grant #	Grantee	Paper Title	Conference	Location
March, 2007	RD-22	ECD	Alkaline Enhanced Reformation (AER)	18th Annual NHA Hydrogen Conference	San Antonio, TX
April, 2007	RD-72	Production Specialties	Gas Treating Problems and Opportunities for Renewable Resources	Oklahoma Research Day	Edmond, OK
April, 2007	RD-78	Interphases	Growth and Characterization of Electrodeposited CIS Absorbers	Materials Research Society	San Francisco, CA
May, 2007	RD-34	U of F	Biogasification of Sugarbeet Processing By-products	23rd General Assembly of the CITS	Rostock-Warnemünde/ Germany.
June, 2007	RD-56	U of M	Integrating Biomass to Produce Heat and Power at Ethanol Plants	American Society of Agricultural and Biological Engineers	Minneapolis, MN
June, 2007	RD-56	U of M	Economics of Biomass Gasification/Combustion at Fuel Ethanol Plants	American Society of Agricultural and Biological Engineers	Minneapolis, MN
June, 2007	RD-56	U of M	Economics of Biomass Gasification/Combustion at Fuel Ethanol Plants	5th International Starch Tech. Conference	Champaign-Urbana, IL
July, 2007	RD-22	ECD	Fuel Reformation Using Alkaline Enhancement	International Hydrogen Energy Congress and Exhibition	Istanbul, Turkey
August, 2007	RD-56	U of M	Utilization of Biomass for Electrical Generation: Technical and Policy Considerations	U of M Electrical Engineering Seminar series	Various within MN
November, 2007	RD-22	ECD	Alkaline Enhanced Biofuel Reformation for Low Cost Hydrogen Production	2nd Annual World Hydrogen Technology Convention	Montecatini Terme, Italy
February, 2008	RD-56	U of M	Use of Distillers By-Products & Corn Stover as Fuels for Ethanol Plants	Farm Foundation	Atlanta, GA
April, 2008	RD-38	GTI	Direct Hydrogen Production From Biomass Gasifier Using H2 Selective Membrane	NHA Annual Hydrogen Conference	Sacramento, CA
July, 2008	RD-107	NREL	Tailored Thiophene Based Dendrimers for Photovoltaic Applications	Organic Microelectronics and Optoelectronics	San Francisco, CA
August, 2008	RD-57	Windlogics	The Role of Wind Forecasting in Utility System Operation	International Council on Large Electric Systems	Paris, France
August, 2008	RD-107	NREL	Optimizing Donors for Organic Photovoltaic Devices	SPIE Optics and Photonics	San Diego, CA

RDF Congressional Districts (1/1/2007 - 12/31/2008)

RDF Contract	Grant	Type	Cycle	Renewable Category	Host Site		Project Sponsor	
					District	Location	District	Organization
District 1								
RD-27	$318,800	RD	2	Biomass	MN01	Forrest Farms, Luverne	MN01	Rural Advantage, Fairmont
RD-69	$760,000	RD	2	Biomass	MN01	Minwind Energy, Luverne	MN07	AURI, Marshall
District 2								
EP-39	$1,500,000	EP	2	Wind	MN02	St. Olaf College, Northfield	MN02	St. Olaf College, Northfield
RD3 - 1	$992,989	RD	3	Biomass	MN02	Rahr Malting, Shakopee	MN05	U of M, Minneapolis
EP-51	$936,530	EP	2	Biomass	MN02	Diamond K Dairy, Altura	CA	RCM Digesters, Berkley
RD3 - 77	$1,000,000	RD	3	Biomass	MN02	P & J Farms, Northfield	IL	Coaltec Energy USA, Carterville
District 3								
EP-26	$1,200,000	EP	2	Wind	MN07	Edgerton area	MN03	Hilltop Farms, St. Louis Park
District 4								
EP3 - 2	$735,000	EP	3	Solar	MN04	Merrick, Vadnais Heights	MN04	Merrick, Vadnais Heights
RD-29	$299,284	RD	2	Biomass	MN04	U of M, St. Paul	MN05	U of M, Minneapolis
RD-56	$858,363	RD	2	Biomass	MN04	U of M, St. Paul	MN05	U of M, Minneapolis
RD3 - 23	$819,159	RD	3	Biomass	MN04	U of M, St. Paul	MN05	U of M, Minneapolis
EP3 - 12	$1,488,922	EP	3	Solar	MN05	Minneapolis	MN04	freEner-g, Minneapolis
RD-57	$997,000	RD	2	Wind	MN07	Lake Benton area	MN04	Windlogics, St. Paul
AS-05	$1,150,000	EP	1	Solar	multiple	Statewide locations	MN04	Dept. of Commerce, St. Paul
District 5								
AH-01	$5,100,000	EP	1	Hydro	MN05	Crown Hydro, Minneapolis	MN05	Crown Hydro, Minneapolis
EP-34	$2,000,000	EP	2	Hydro	MN05	St. Anthony Falls, Minneapolis	MN05	U of M, Minneapolis
RD-94	$397,500	RD	2	Biomass	MN05	CEE, Minneapolis	MN05	CEE, Minneapolis
RD3 - 4	$924,671	RD	3	Biomass	MN05	Bepex, Minneapolis	MN05	Bepex, Minneapolis
RD3 - 25	$732,032	RD	3	Solar	MN05	U of M, Minneapolis	MN05	U of M, Minneapolis
EP3 - 12	$1,488,922	EP	3	Solar	MN05	Minneapolis	MN04	Freenerg, Minneapolis
RD-93	$1,000,000	RD	2	Solar	MN05	U of M, Minneapolis	CO	NREL, Golden
RD-107	$1,000,000	RD	2	Solar	MN05	U of M, St. Paul	CO	NREL, Golden
RD3 - 1	$992,989	RD	3	Biomass	MN02	Rahr Malting	MN05	U of M, Minneapolis
RD-29	$299,284	RD	2	Biomass	MN04	U of M, St. Paul	MN05	U of M, Minneapolis
RD-56	$858,363	RD	2	Biomass	MN04	U of M, St. Paul	MN05	U of M, Minneapolis
RD3 - 23	$819,159	RD	3	Biomass	MN04	U of M, St. Paul	MN05	U of M, Minneapolis
RD3 - 28	$979,082	RD	3	Biomass	MN07	U of M, Morris	MN05	U of M, Minneapolis
District 6								
RD-50	$957,929	RD	2	Biomass	MN07	Traverse County area	MN06	EPS, Rogers
District 7								
EP-26	$1,200,000	EP	2	Wind	MN07	Edgerton Area	MN03	Hilltop Farms, St. Louis Park
RD-50	$957,929	RD	2	Biomass	MN07	Traverse County area	MN03	EPS, Rogers
RD-57	$997,000	RD	2	Wind	MN07	Lake Benton area	MN04	Windlogics, St. Paul
RD3 - 28	$979,082	RD	3	Biomass	MN07	U of M, Morris	MN05	U of M, Minneapolis
RD-34	$999,995	RD	2	Biomass	MN07	ACSC, Moorhead	FL	University of Florida, Gainsville
RD-69	$760,000	RD	2	Biomass	MN01	Minwind, Luverne	MN07	AURI, Marshall
District 8								
EP-44	$2,000,000	EP	2	Biomass	MN08	CMEC, Little Falls	MN08	CMEC, Little Falls
EP-43	$10,000,000	EP	2	Innovative	MN08	Excelsior Energy, Coleraine	MN08	Excelsior Energy, Coleraine
RD-38	$861,860	RD	2	Biomass	MN08	NRRI, Coleraine	IL	GTI, Des Plaines
RD3 - 68	$970,558	RD	3	Biomass	MN08	Haubenschild Farms, Princeton	ND	UND, Grand Forks

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INFORMATION SHEET
RENEWABLE DEVELOPMENT FUND FROM XCEL ENERGY

Investing in Renewable Energy
Identifying Effective Biomass Strategies in Minnesota: Quantifying Minnesota's Resources and Evaluating Future Opportunities

Project Description:

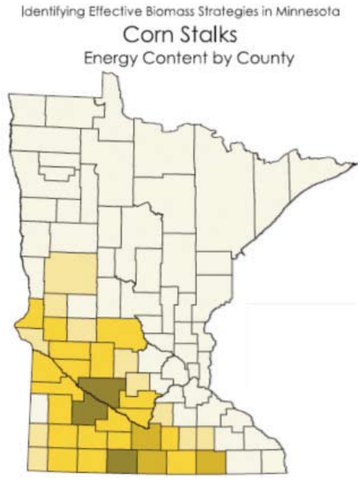
The Center for Energy and Environment conducted an objective evaluation of Minnesota's biomass resources that can help developers evaluate, select, build and operate effective bio-power projects and help policy makers frame measures to support them.

The project created:

1. A computer-based interactive calculator named the Bio-Power Evaluation Tool (BioPET) that identifies locations, types and volumes of biomass fuels and calculates the costs of generated power.
2. A web-based, user-driven, electronic geographic information system (GIS) tool, called gopher, that graphically represents the locations of, and relationships between, relevant infrastructure and biomass resources.

Methodology:

All existing major biomass and bio-waste feedstocks in Minnesota were inventoried and cataloged, including facilities that produce biomass or bio-waste. Existing energy infrastructure, including electric generation and transmission facilities, were mapped with a GIS system and overlaid with biomass sources and facilities. The viability of each major feedstock and technology was assessed by the reliability of the technology and its cost. Biomass project opportunities were then identified and prioritized based on feedstock availability, scale and reliability of available technologies.



Grantee: Center for Energy and Environment
Project Dates: 10/12/2005 – 10/12/2007
RDF Funding Cycle: 2nd
Project Funding: $397,500 RDF Grant
Project ID: RD-94
RDF Mission: To increase renewable energy market penetration, assist renewable energy projects and companies, and support emerging renewable energy technology through research and development.

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Investing in Renewable Energy | Identifying Effective Biomass Strategies in Minnesota: Quantifying Minnesota's Resources and Evaluating Future Opportunities

Executive summary:

This project developed several resources to aid in the identification of areas in Minnesota where relationships between fuel sources, local conditions and appropriate technologies produce a promising opportunity for a biomass project. With this information, funding organizations, policy makers, and state regulators will be better able to select the most cost-effective projects for implementation. The project did not advocate for or against specific bio-power projects; rather it helped to ensure that the state's limited resources are allocated to the best bio-power opportunities. To achieve this goal, the project identified biomass opportunities throughout the state with a specific emphasis on local conditions that could impact the cost-effectiveness of a proposed project. The results of this survey are graphically represented with an Internet-based mapping tool so that the best opportunities for electrical generation can be distinguished. In addition, an evaluation tool was developed to assess proposed biomass projects. This tool generates a cost approximation per kW and kWh so that various projects can be compared using a common denominator.

Benefits:

By using components created by this project, developers can determine optimal combinations of location, infrastructure, biomass fuels and processing and conversion technology for their projects. Funders can also verify them, and policy makers can gauge the practical consequences of rules, regulations, and laws. Conversely, communities and economic developers can use these tools to scope out local resources to attract bio-power developments to their areas.

Lessons learned:

- Economic opportunities for biomass power are the most profitable when co-firing biomass with coal in existing or expanded power plants is used.
- Combined heat and power (CHP) facilities will be the most efficient to biomass fuel, especially if natural gas is used.
- Plants already generating steam and electricity with biomass may find it feasible to expand and sell biomass power to utilities that need to meet renewable energy standards.
- Direct combustion or gasification of biomass in stand-alone-plants is less economical.

Outcome:

- BioPET, a spreadsheet tool designed to assist in comparing diverse bio-power projects by calculating a common economic metric (a levelized annual cost in ¢/kWh).
- gopher, a web-based program to create a map focusing only on the resources necessary for a particular biomass project.

RDF Mission:
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Investing in Renewable Energy
Utility Scale Wind Energy Forecasting System

Project Description:

WindLogics received funding to define, design, build and demonstrate a complete wind power forecasting system. The project goal was to deliver an operational tool for Xcel Energy system operators to forecast wind power. The successful tool would: demonstrate prototype products that improve forecast accuracy, use new methodology, complete the development of system simulation assessments and include an adverse weather component

Methodology:

WindLogics engaged a cross-functional project team to develop a complete wind power forecasting system for utility-wide use by Xcel Energy system operators. In addition, the team conducted system simulation and sensitivity analysis to determine the impact of wind variability on the grid. Finally, the team developed technologies that aided the scheduling and operating of wind heavy power systems.

Executive summary:

The project has led to significant improvements in wind energy forecasting technology, weather system visualization, wind integration analysis and unit commitment efficiency. A failed forecast or an extreme weather event can easily result in a major over or under prediction of wind energy output. By combining advanced weather models, GIS visualization, state of the art emergency management system (EMS) advances and statistical modeling, a system was devised that makes substantial headway in reducing the cost and impact of these events.

Grantee: Windlogics, Inc.
Additional Team Members: EnerNex, Utility Wind Interest Group, Areva
Project Dates: 2/11/2006 – 11/11/2008
RDF Funding Cycle: 2nd
Project Funding: $997,000 RDF grant (Total project costs $1,585,600)
Project ID: RD-57
RDF Mission: To increase renewable energy market penetration, assist renewable energy projects and companies, and support emerging renewable energy technology through research and development.

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Benefits:

- Improvement in wind power forecast accuracy
- Advances in unit commitment theory through the use of advanced statistical tools that enable operators to safely run systems with higher levels of wind penetration and lower reserve requirements, which produces a significant savings in cost.
- High Wind Warning System (HWWS) and the use of tall tower data allow for the prediction of large ramp events with more accuracy which allows control room operators to call up reserves (or shut down unnecessary units) before a crisis occurs.
- Development of a model that allows an analysis of the cost to integrate wind power within the grid.

Lessons learned:

- The additional cost for wind variability and uncertainty per MWh of wind energy delivered to Minnesota companies ranges from $2.11 to $4.41.
- A single-function balancing authority can significantly affect results by: sharing balance authority functions, reducing requirements for ancillary services such as regulation and load following and reducing by 50% the required amount of regulation capacity.
- The transmission expansion assumptions, as defined by the West Region Studies Group (RSG) report of May 2006, were adequate for transportation of wind energy.
- The Midwest Independent Transmission System Operator (MISO) energy market plays a large role in reducing wind generation costs.
- The contribution of wind generation to power system reliability is subject to substantial variability.

Outcome:

- Implemented a wind speed and energy forecast system which is accessible via a web interface for the 652 MW Xcel Energy Minnesota footprint.
- A HWWS was developed which allows the user to visualize National Weather Service watches and warnings, real-time met tower and ground station observations, radar and existing wind turbine locations within a user friendly geographic information system (GIS) interface.
- In August 2008, a paper on the project findings entitled "The Role of Wind Forecasting in Utility System Operation" was presented by the WindLogics project team at the International Council on Large Electric Systems (CIGRÉ) in Paris, France.

RDF Mission:
To increase renewable energy market penetration, assist renewable energy projects and companies, and support emerging renewable energy technology through research and development.

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Investing in Renewable Energy

Solar Geothermal Project provides electricity, heating, and cooling for non-profit organization

Project Description:

Merrick, Inc., a non-profit agency that provides vocational training to adults with developmental disabilities, installed a 100 kW solar photovoltaic (PV) system on its roof. The solar array was connected to an existing geothermal heating and cooling system to help create one of the most unique and environmentally friendly commercial buildings in the State of Minnesota.

The project is an excellent example of combining alternative technologies in a commercial setting. The solar array provides approximately 33% of Merrick's electricity needs while the geothermal system meets 100% of the agency's heating and cooling needs. This solar geothermal combination was one of the first of its kind in Minnesota and provides a learning opportunity for other companies exploring alternative energy solutions.

The project received an RDF grant in combination with a $52,000 investment from Merrick. In addition, Merrick invested $250,000 on weatherization and energy efficiency improvements to further reduce energy needs.

Methodology:

- Lars Architectural Services designed the solar array
- Building permits were obtained from the City of Vadnais Heights and a project engineer reviewed the plans to ensure the building could support the solar array
- The mounts, inverters and solar panels were procured from AEE Solar
- Energy Concepts of Hudson, Wisconsin installed the 525 panel solar array for Merrick
- The solar array installation was complete after passing electrical testing by the State of Minnesota and Xcel Energy

Grantee: Merrick, Inc.
Additional Team Members: Energy Concepts, Inc. (project designer and installer
Project Dates: 10/22/2008 – 12/22/2008
RDF Funding Cycle: 3rd
Project Funding: $735,000 RDF Grant (Total project costs $787,000)
Project ID: EP3-2
RDF Mission: To increase renewable energy market penetration, assist renewable energy projects and companies, and support emerging renewable energy technology through research and development.

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Investing in Renewable Energy | Solar Geothermal Project provides electricity, heating, and cooling for non-profit organization

Executive summary:

The Solar Geothermal Project is a unique combination of renewable technologies utilizing solar and geothermal to provide electricity, heating, and cooling for a non-profit organization. In addition to the significant environmental benefits, the project provides long-term social benefits, as the organization is able to invest more money into its community programs due to its reduced energy costs. The Xcel Energy Renewable Development Fund continues to promote the growth of alternative energies in Minnesota by funding projects like Merrick's solar geothermal system.

Benefits:

- **Increased Renewable Energy:** The grid-connected project adds another 100 kW of solar power to electricity generation in Minnesota
- **Educational Opportunity:** The solar geothermal project provides an example on how organizations can successfully combine alternative energy sources to create an environmentally-friendly building
- **Social Benefit:** The solar array will generate approximately 33% of the total electricity needed to power the 52,000 square foot facility, reducing Merrick's electricity costs and allowing the non-profit to increase funding for its community programs
- **Environmental Benefit:** Over the next 25 years, the reduction in use of coal-generated electricity eliminates the emission of 6.2 million pounds of carbon dioxide, 10,800 pounds of sulfur dioxide and 18,000 pounds of nitrous oxide to the air

Lessons learned:

- Net metering and standby service requirements associated with self-generation projects should be resolved prior to project completion. Early attention to such matters will help prevent metering and billing problems after initiation of solar system operations.
- To limit snow load and wind shear, south facing panels were slanted 13 degrees, which is less than optimal.

Outcome:

The Solar Geothermal Project has demonstrated that a small non-profit organization can successfully create an environmentally friendly, economically viable building and has helped Merrick move closer to becoming 100% self-sustaining from an energy standpoint.

RDF Mission:

To increase renewable energy market penetration, assist renewable energy projects and companies, and support emerging renewable energy technology through research and development.

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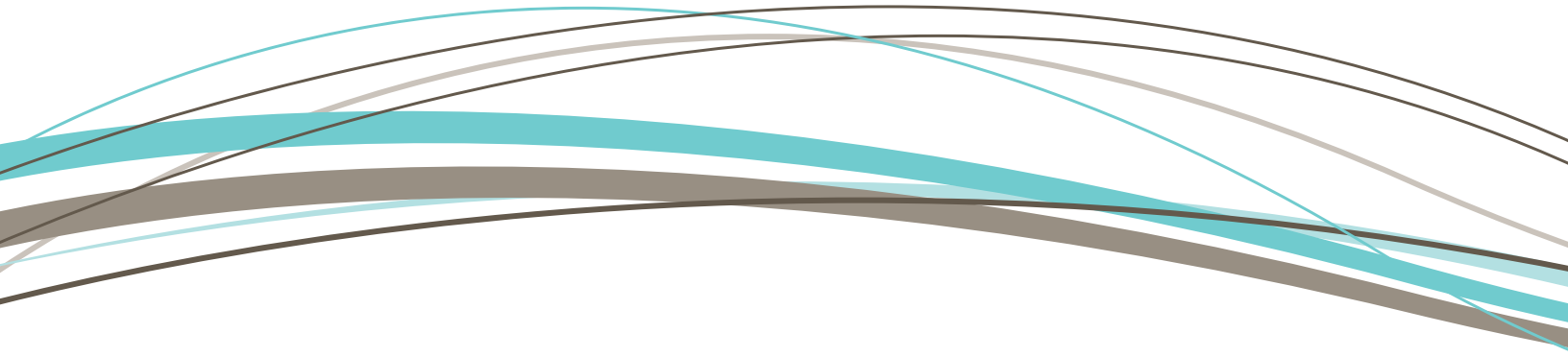

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