

Xcel Energy
Renewable Development Fund (RDF)

Annual Report to the Minnesota State Legislature

February 15, 2017

Background

The Renewable Development Fund (RDF) is a program administered by Xcel Energy with oversight by the Minnesota Public Utilities Commission. The RDF's purpose was established in an October 5, 2006 Commission Order and was revised to incorporate statutory requirements from the 2012 legislature. The current RDF statute provides that funds in the account may be expended only for the following purposes:

- (1) to increase the market penetration within the state of renewable electric energy resources at reasonable costs;
- (2) to promote the start-up, expansion, and attraction of renewable electric energy projects and companies within the state;
- (3) to stimulate research and development within the state into renewable electric energy technologies; and
- (4) to develop near-commercial and demonstration scale renewable electric projects or near-commercial and demonstration scale electric infrastructure delivery projects if those delivery projects enhance the delivery of renewable electric energy.

The RDF program was authorized by the Minnesota Legislature in 1994 in conjunction with legislation regarding the Prairie Island nuclear generating plant in Red Wing, Minnesota. As a condition of storing spent nuclear fuel in dry casks at Prairie Island, the RDF statute required Xcel Energy to transfer \$500,000 per year for each dry cask containing spent fuel to a renewable energy fund, which amounted to \$9 million annually. In 2003, this statute was amended to extend the life of the nuclear-waste storage at the Prairie Island plant; at that time the amount to be transferred into the RDF was increased to a fixed sum of \$16 million annually. In 2007, the statute was further amended to add an additional assessment for dry casks stored at our Monticello nuclear generating plant in Monticello, Minnesota. From 2008 to 2012 \$19.5 million was set aside annually for the RDF program. In 2013 the annual set-aside increased to \$22.75 million and in 2014 and 2015 the annual set-aside was \$24.6 million. In 2016 the annual set-aside increased to \$25.6 million. A cumulative total of \$301.35 million has been set-aside in the RDF since inception.

According to the RDF statute (Minn. Stat. §116C.779(i)), Xcel Energy must submit an annual report to the chairs and ranking minority members of the legislative committees with jurisdiction over energy policy on projects funded by the account for the prior year and all previous years. The report must, to the extent possible and reasonable, itemize the actual and projected financial benefit to the public utility's ratepayers of each project. Attachment A includes a complete list of projects for all years that have received RDF grant awards.

The costs of RDF program expenses allocated to Minnesota are recovered through a surcharge on our customer bill statements as part of their monthly charges for electricity. In 2017 the RDF charge is \$0.001034 per kWh. For a typical residential customer using 750 kWh per month, the RDF cost per month is \$0.76.

RDF Grant Program Summary

Since its inception, the RDF program has provided over \$276 million for renewable energy initiatives including \$90.6 million for Renewable Energy Production Incentive (REPI) payments, \$100.9 million for legislatively-mandated projects and programs, and \$2.3 million for general program support. Mandated programs have included the appropriation of \$25 million to the University of Minnesota for the Initiative for Renewable Energy and Environment (IREE), \$21 million for the Minnesota Bonus Solar Rebate Program, \$25 million for the Solar Energy Incentive Program, and \$120 million for the Made In Minnesota Solar Energy Production Incentive Account. \$82.2 million has been awarded over four grant cycles to 107 projects (see Attachment B - Financial Statement). As Table 1 below shows, 64 projects have been completed and eighteen are active, including sixteen new Cycle 4 projects. Seven Cycle 4 projects that have been awarded RDF grants have not executed grant contracts and therefore project activity has not begun.

Table 1: Summary of Project Status

Type	Completed	Active as of 12/31/2016	Total
Energy Production	21	9	30
Research	43	9	52
Total	64	18	82

Xcel Energy has responsibility for the day-to-day administration of the RDF. A seven-member advisory group, representing the interests of various stakeholder groups, assists Xcel Energy in evaluating and making recommendations on grant project proposals to Xcel Energy and the Commission. Further details on the members of the advisory group can be found in Attachment C.

Legislatively Directed RDF Projects

Legislation in 2003 created the Renewable Energy Production Incentive (REPI) program to provide production incentives for electricity generated by wind, biogas, and hydro. In 2016 \$2.8 million in RDF funds were disbursed for REPI payments. The Minnesota Department of Commerce administers this program.

The Solar*Rewards program was created in 2010 legislation to provide rebates to an owner of a qualified property for installing solar photovoltaic modules. In 2016 \$3.8 million in RDF funds were disbursed for Solar*Rewards rebates. Xcel Energy administers this program.

In 2013 legislation created two new programs to receive funds from the RDF. The first program is a "Made in Minnesota" solar energy production incentive account to provide production incentives for residential and commercial installations that were manufactured in the state. In 2016, \$12.1 million in RDF funds were disbursed to fund this account. The second program is a solar energy incentive program to replace the existing Solar*Rewards program, which focuses on small facilities of up to 20 kW. In 2016, \$0.49 million in RDF funds were disbursed to fund the new Solar*Rewards program. The Minnesota Department of Commerce administers this program.

Grant-Funded RDF Projects

Energy Production: As shown in Table 2, the 20 completed electric production projects that received RDF grants have resulted in the installation of nearly 28.7 MW of renewable energy nameplate capacity and have overall generated a total of 500,906 MWh of energy over the life of the facilities.

Table 2: Electric Production Projects

Type	Investment	Facilities	Installed Capacity (MW)	Energy Production (MWh)
Biomass	\$27,887,976	1	0.300	2,794
Hydro	\$44,145,119	1	9.176	205,495
Solar	\$35,037,283	18	9.230	40,168
Wind	\$13,075,483	4	9.960	252,450
Total	\$120,145,861	24	28.666	500,906

As shown in Table 3 below, the environmental benefits from these investments are recognized in marketable Renewable Energy Credits (RECs) from qualifying facilities, emission reductions, avoided costs to build conventional facilities, and avoided costs to replace the electricity generated.

Table 3: Environmental Benefits

Value of REC's	Value of Emissions Reductions	Avoided Capacity Value	Avoided Energy Value	Total Value
\$388,714	\$1,295	\$3,500,416	\$13,641,943	\$17,143,655

Research and Development: As shown in Table 4, research and development projects contributed to the development of articles, workshops, and patent applications. Research and development RDF grant dollars leveraged \$0.47 for each grant dollar invested.

Table 4: Research and Development Projects

Technology	Total Investment	Published Articles	Presentations/ Workshops	Patent Applications
Biomass	\$29,850,419	24	61	3
Solar	\$8,052,968	9	25	1
Wind	\$8,778,448	13	50	2
Multiple Tech	\$5,838,144	0	0	0
Total	\$52,519,979	45	131	5

It should be noted that an out-of-state research project used a Minnesota project host located in the NSP-Minnesota service area and is not included in the previous numbers. As shown in Table 5, this project's association to an in-state host keeps the research relevant to Minnesota and directs additional RDF funds to businesses and organizations in the state.

Table 5: Minnesota Hosts Activities

Grantee	Minnesota Host	Host Location	Host Activity
Coaltec Energy USA	P & K Farms	Northfield, Minnesota	Pilot demonstration of biomass gasifier

Conclusion

Xcel Energy appreciates this opportunity to provide this report summarizing the projects funded by the RDF account through 2016.

Project Name	Contract	Project Site		Project End Date	Status	Type	Cycle	Resource	Project Description	Funding RDF Award	Power Development		REC's	Enviro	Externalities		Intellectual Property			
		City	Zone								Capacity (kW)	Generation (MWh)			Avoided Capacity	Avoided Energy	Articles	Presentations	Patent Apps	
CENTRAL REGION																				
1	University of Minnesota (Dairy)	RD4-2	Morris	Central	6/2/18	current	RD	4	Solar/Wind	Model a "net-zero" energy dairy parlor at the West Central Research and Outreach Center by integrating 20 kW wind and 54 kW solar with storage.	\$982,408									
2	City of Hutchinson	EP4-41	Hutchinson	Central	6/1/16	complete	EP	4	Solar	Installed 400 kW photovoltaic fixed-tilt array on a capped municipal landfill and use the power at the adjacent wastewater treatment facility.	\$958,369	400	440	\$401	\$0	\$20,776	\$2,056		2	
3	Best Power Int'l (St. John's Expansion)	EP4-6	Collegetown	Central	3/16/15	complete	EP	4	Solar	Installed a 182 kW photovoltaic fixed-tilt array at St. John's solar farm for a side-by-side comparison with the existing 400 kW single-axis tracking array.	\$172,213	182	534	\$473	\$1	\$17,596	\$15,644			
4	Best Power Int'l (St. John's)	EP3-3	Collegetown	Central	5/8/10	complete	EP	3	Solar	Installed a 400 kW photovoltaic facility at St. John's University to demonstrate commercial viability of solar power in Minnesota.	\$1,994,480	400	4,060	\$3,185	\$11	\$125,424	\$119,432			
5	University of Minnesota (Biomass)	RD3-23	Morris	Central	8/1/11	complete	RD	3	Biomass	Evaluated economic and technical issues related to biomass fuel and integrated gasification combined cycle technology.	\$819,159							6	28	
6	University of North Dakota (Digester)	RD3-68	Princeton	Central	4/30/12	complete	RD	3	Biomass	Field demonstration of a hydrogen sulfide reduction process at the anaerobic digester on the 1,000-acre Haubenschild Dairy Farm.	\$970,558								1	
7	Minnesota Valley Alfalfa Producers	RD3-69	Priam	Central	7/15/15	complete	RD	3	Biomass	Researching application of kinetic disintegration technology to produce biomass pellets from feedstocks with varying levels of moisture.	\$1,000,000									
8	Energy Performance Systems	RD-50	Graceville	Central	2/19/13	complete	RD	2	Biomass	Built and demonstrated equipment for an integrated system to supply farm grown trees as a biomass feedstock to a power plant.	\$957,929								1	
9	Blattner and Sons	BW-06	Avon	Central	12/15/02	complete	RD	1	Wind	Developed a platform that would climb the tower to eliminate that need for crane to construct very tall wind turbines.	\$68,470									
Economic Benefits for West Central Region											\$7,923,586	981	5,033	\$4,058	\$12	\$163,795	\$137,131	6	32	0
NORTH REGION																				
10	University of Minnesota (Torrefaction)	RD4-11	Coleraine	North	9/3/2017	current	RD	4	Biomass	Demonstrate a prototypic torrefaction bioconversion process and distributed electric generation.	\$1,899,449									
11	West Central Telephone Assoc.	RD3-58	Menahga	North	5/12/10	complete	RD	3	Wind/Solar	Designed and tested configurations and specifications of a hybrid wind/solar power system for distributed generation in remote locations.	\$137,000									
12	University of North Dakota (Liguifaction)	RD3-66	Duluth	North	4/10/12	complete	RD	3	Biomass	Designed and demonstrated a mobile biomass liquefaction system that can utilize high moisture wood waste.	\$999,065								1	
13	Mesaba/Excelsior Energy	EP-43	Taconite	North	6/24/10	complete	EP	2	Innovative	To design the basis of a base load Integrated Gasification Combined-Cycle (IGCC) power generation facility.	\$10,000,000									
14	CMEC	EP-44	Little Falls	North	3/12/11	complete	EP	2	Biomass	Designed 959-kW gasification plant to utilize distillers grains and local biomass. Refractory issues prevented completion of the facility.	\$2,000,000									
15	University of Florida	RD-34	Moorhead	North	5/16/09	complete	RD	2	Biomass	Demonstrated two-stage anaerobic digester at American Crystal Sugar in Moorhead, MN to generate methane for conversion to electricity.	\$999,995							3	1	1
16	Gas Technology Institute	RD-38	Coleraine	North	10/12/07	complete	RD	2	Biomass	Developed a method to extract hydrogen from biomass gasification using membrane separation technologies.	\$861,860								1	
Economic Benefits for Northeast Region											\$16,897,369	0	0	\$0	\$0	\$0	\$0	3	3	1
STATEWIDE																				
17	Bergey Windpower Company	EP4-24	St. Cloud/Marshall areas	Statewide	11/24/17	current	EP	4	Solar	Install 500 kW small wind capacity in the jurisdictions of Benton, Lincoln, Meeker, Murray, Nobles, Pipestone, and Stearns counties by constructing 50 distributed 10 kW microturbines.	\$1,106,600	10	0	\$0	\$0	\$8	\$0			
18	Minnesota State Colleges & Universities	HE4-1	St. Paul - hdqtr	Statewide	4/11/19	current	HE	4	All	Created a research program to stimulate the development of renewable electric energy technologies within Minnesota.	\$5,500,000									
19	MN DNR	EP3 - 13	Afton, Ft. Snelling, Lake Shetek, Lac	Statewide	3/12/13	complete	EP	3	Solar	Installed 114 kW of solar photovoltaic generation at various state parks and developed a renewable energy strategy for future DNR facilities.	\$894,000	114	696	\$651	\$2	\$27,337	\$19,631			
Economic Benefits for Statewide Projects											\$7,500,600	124	696	\$651	\$2	\$27,345	\$19,631	0	0	0
SOUTHEAST REGION																				
20	Coaltec Energy USA	RD3 - 77	Northfield	Southeast	4/22/17	current	RD	3	Biomass	Demonstrated the feasibility of biomass gasification on a commercial turkey farm to generate electricity and heat.	\$1,000,000									
21	Dragonfly Solar	EP4-29	Dodge Center	Southeast	12/8/17	current	EP	4	Solar	Install a fixed-tilt 997.5 kW solar array within the footprint of several existing wind farms.	\$1,650,000									
22	Diamond K	EP-51	Altura	Southeast	5/18/14	complete	EP	2	Biomass	Installed a 300 kW of biomass generated and anaerobic digester at the Diamond K Dairy in Winona County, Minnesota.	\$936,530	300	2,794	\$2,583	\$7	\$19,606	\$65,994			
23	AnAerobics, Inc	AB-07	Montgomery	Southeast	6/3/03	complete	EP	1	Biomass	Was to install a 1.7 MW genset and study removal of hydrogen sulfide created during anaerobic digestion but had site control issues.	\$1,300,000									
Economic Benefits for Southeast Region											\$4,886,530	300	2,794	\$2,583	\$7	\$19,606	\$65,994	0	0	0
SOUTHWEST REGION																				
24	Best Power Int'l (School Sisters)	EP4-5	Mankato	Southwest	10/28/15	complete	EP	4	Solar	Installed a 849 kW solar facility at the Mankato campus of the Central Pacific Province of the School Sisters of Notre Dame.	\$900,000	849	1,206	\$995	\$3	\$69,523	\$35,257			
25	Outland Renewable Energy	EP3-10	Slayton	Southwest	4/1/13	complete	EP	3	Solar	Installed 2 MW photovoltaic facility near Slayton, MN to demonstrate the benefits of utility scale use of photovoltaics in Minnesota.	\$2,000,000	2,000	10,288	\$9,732	\$27	\$328,224	\$301,069			
26	Xcel Energy	RD3-12	Beaver Creek	Southwest	12/19/11	complete	RD	3	Wind	Installed a 1.0 MW sodium sulfur battery adjacent a wind farm to validate the value of energy storage for greater wind energy penetration.	\$1,000,000								31	
27	Hilltop	EP-26	Edgerton	Southwest	3/2/09	complete	EP	2	Wind	Installed a 1.5 MW General Electric wind turbine in Lyon County with 100 percent of the electricity sold to Xcel Energy.	\$1,200,000	2,000	28,037	\$17,498	\$74	\$131,882	\$755,841			
28	St. Olaf	EP-39	Northfield	Southeast	4/30/07	complete	EP	2	Wind	Installed a 1.65 MW Micon wind turbine on campus.	\$1,500,000	1,650	26,105	\$18,311	\$68	\$140,901	\$802,842			
29	Rural Advantage	RD-27	Luverne	Southwest	4/12/09	complete	RD	2	Biomass	Demonstrated the commercial production of Miscanthus as a biomass fuel for electric generation.	\$318,800								1	
30	Ag. Utilization Research Institute	RD-69	Beaver Creek	Southwest	9/8/08	complete	RD	2	Biomass	Conducted a feasibility study to couple bio-diesel and wind generation systems to "firm" wind power.	\$760,000									
31	Project Resource Corp	AW-03	Chandler	Southwest	5/31/06	complete	EP	1	Wind	Installed 5.4 MW of wind energy with a new landowner investment model that limits development risk of community shareholders.	\$900,000	5,400	173,365	\$140,281	\$448	\$640,626	\$4,918,044			
32	Pipestone Jasper School	AW-10	Pipestone	Southwest	12/31/04	complete	EP	1	Wind	Installed a 900 kW wind turbine adjacent to the Pipestone-Jasper Public High School.	\$752,835	900	24,943	\$0	\$67	\$166,603	\$842,845			
Economic Benefits for Southwest Region											\$9,331,635	12,799	263,944	\$186,817	\$688	\$1,477,758	\$7,655,898	0	31	1
METRO REGION																				
33	Crown Hydro	AH-01	Minneapolis	Twin Cities	1/20/18	current	EP	1	Hydro	Install 3.2 MW of hydroelectric capacity on the Mississippi River in downtown Minneapolis.	\$5,100,000									
34	Innovative Power Systems	EP4-11	St. Paul	Twin Cities	9/1/17	current	EP	4	Solar	Install 967 kW of solar capacity at four sites within the Innovative Energy Corridor.	\$1,850,000	39	0	\$0	\$0	\$572	\$0			
35	Metropolitan Airports Commission	EP4-13	Bloomington	Twin Cities	6/10/16	complete	EP	4	Solar	Installed a 1.471 MW fixed-tilt solar facility on the Blue parking ramp at Terminal One of MPS airport.	\$2,022,507	1,471	1,468	\$0	\$4	\$70,952	\$42,917			
36	Minnesota Renewable Energy Society	EP4-15	Minneapolis	Twin Cities	5/17/17	current	EP	4	Solar	Install both a rural and urban solar garden totaling 1.0 MW of photovoltaic capacity to observe differences in subscriber interest.	\$2,661,320									
37	Target Corporation	EP4-20	St. Paul	Twin Cities	7/1/17	current	EP	4	Solar	Install a 350 kW roof-mounted, fixed-tilt photovoltaic facility on the Target Superstore.	\$583,513	428	510	\$0	\$1	\$12,703	\$14,910			

Project Name	Contract	Project Site		Project End Date	Status	Type	Cycle	Resource	Project Description	Funding RDF Award	Power Development		REC's	Externalities		Intellectual Property				
		City	Zone								Capacity (kW)	Generation (MWh)		Enviro	Avoided Capacity	Avoided Energy	Articles	Presentations	Patent Apps	
38 Minneapolis Park & Rec. Board	EP4-22	Minneapolis	Twin Cities	12/28/17	current	EP	4	Solar	Install 200 kW of PV capacity at seven locations within the Minneapolis park system to demonstrate the effectiveness of alternative solar designs.	\$969,741	153	158	\$0	\$0	\$5,117	\$4,628				
39 City of St. Paul	EP4-34	St. Paul	Twin Cities	6/9/17	current	EP	4	Solar	Install a 105 kW fixed-tilt photovoltaic facility at CHS Field.	\$555,750	104	55	\$0	\$0	\$5	\$1,596				
40 University of Minnesota (Noise)	RD4-12	Minneapolis	Twin Cities	9/2/18	current	RD	4	Wind	Research the sources and quality of wind turbine sound and the thresholds of potential health impacts on humans.	\$625,102										
41 University of Minnesota (VWS)	RD4-13	Minneapolis	Twin Cities	6/2/20	current	RD	4	Wind	Augment the predictive capabilities of the Virtual Wind Simulator by adding an aeroelastic model and integrating advanced turbine control algorithms.	\$1,391,684								1		
42 Barr Engineering	RD4-14	Minneapolis	Twin Cities	11/6/18	current	RD	4	Wind	Develop portable sensors to assess the health and life expectancy of wind turbine towers and foundations.	\$161,081										
43 University of St. Thomas	HE4-2	Chisago City	Twin Cities	8/12/18	current	RD	4	Solar/Wind	Install a 0.25 MW peak, multi-purpose microgrid in Chisago City to establish an Engineering Senior Design Clinic for microgrid research and testing.	\$2,157,215										
44 University of Minnesota (REMF)	HE4-3	Minneapolis	Twin Cities	8/20/18	current	RD	4	All	Create Renewable Electricity for Minnesota's Future ("REMF") which will fund and support research in renewable electric energy generation.	\$3,000,000								1	5	1
45 Oak Leaf Energy	EP4-48	Shakopee	Twin Cities	10/26/16	complete	EP	4	Solar	Installed a 1,000 kW fixed-tilt photovoltaic facility at the Blue Lake Wastewater Treatment Plant.	\$2,000,000	970	1,720	\$0	\$1	\$32,371	\$12,386				
46 Merrick	EP3-2	Vadnais Heights	Twin Cities	12/22/08	complete	EP	3	Solar	Installed a roof-mounted 100 kW solar photovoltaic facility on a non-profit adult day training and habilitation center.	\$735,000	100	680	\$544	\$2	\$36,330	\$19,545				
47 City of Minneapolis	EP3-11	Minneapolis	Twin Cities	1/15/13	complete	EP	3	Solar	Installed a 600 kW photovoltaic facility on the Minneapolis Convention Center.	\$2,000,000	600	4,517	\$3,792	\$12	\$162,746	\$128,098				
48 freEner-g	EP3-12	Metro Area	Twin Cities	2/17/11	complete	EP	3	Solar	Installed 280 kW photovoltaic capacity through a leasing and service package for residential and small businesses.	\$1,488,922	280	1,444	\$1,178	\$4	\$77,582	\$40,946	1			
49 University of Minnesota (Koda)	RD3-1	Shakopee	Twin Cities	1/22/15	complete	RD	3	Biomass	Development of a production, pre-processing and delivery system for biomass feedstock's from prairie and grasslands.	\$992,989								1	4	
50 SarTec Corporation	RD3-2	Anoka	Twin Cities	7/11/11	complete	RD	3	Biofuel	Researched the growth of algae fed on CO2 from flue gas and extracted the algae oils for conversion into a marketable biodiesel product.	\$350,000										
51 Bepex International	RD3-4	Minneapolis	Twin Cities	7/28/11	complete	RD	3	Biomass	Demonstrated torrefaction and densification as processes to reduce transportation and storage costs associated with biomass feedstock.	\$924,671										
52 University of Minnesota (Nanocrystals)	RD3-25	Minneapolis	Twin Cities	12/26/11	complete	RD	3	Solar	Developed techniques for controlling microstructures of hydrogenated silicon and improving the grain size of microcrystalline silicon PV films.	\$732,032								3	8	
53 University of Minnesota (Cropping)	RD3-28	St. Paul	Twin Cities	9/22/13	complete	RD	3	Biomass	Developed guidelines for accurate management of biomass removal and maintenance of soil quality.	\$979,082								4	7	
54 University of Minnesota (Wind)	RD3-42	Minneapolis	Twin Cities	8/7/13	complete	RD	3	Wind	Developed and tested a Virtual Wind Simulator to provide accurate wind turbulence predictions.	\$999,999								11	13	
55 Lower St. Anthony Falls	EP-34	Minneapolis	Twin Cities	1/31/12	complete	EP	2	Hydro	Restored 9.176 MW hydroelectric generating capacity at the Lower St. Anthony Falls by using run-of-river technology.	\$2,000,000	9,176	205,495	\$189,090	\$525	\$1,006,512	\$5,021,489				
56 University of Minnesota	RD-29	Minneapolis	Twin Cities	9/24/08	complete	RD	2	Biomass	Researched operation of turbo-generators using biomass-derived oils.	\$299,284										
57 University of Minnesota	RD-56	St. Paul	Twin Cities	4/16/08	complete	RD	2	Biomass	Developed model to evaluate options to optimize combustion and electricity generation in ethanol plants.	\$858,363								7	7	
58 Windlogics	RD-57	St. Paul	Twin Cities	11/11/08	complete	RD	2	Wind	Defined, designed, built and demonstrated a complete wind power forecasting system.	\$997,000									1	
59 Center for Energy Environment	RD-94	Minneapolis	Twin Cities	10/12/07	complete	RD	2	Biomass	Developed two web-based programs for planning and development of biomass resources in Minnesota.	\$397,500										
60 MN Dept. of Commerce	AS-05	St. Paul	Twin Cities	9/1/08	complete	EP	1	Solar	Provided rebates of up to \$8,000 for small photovoltaic installations that are wired into the electrical grid.	\$1,150,000	960	12,270	\$0	\$33	\$402,146	\$471,315				
61 Science Museum	AS-06	St. Paul	Twin Cities	12/31/03	complete	EP	1	Solar	Installed a 9 kW solar roof to demonstrate a Zero Energy Building for the Minnesota Science Museum.	\$100,000	9	124	\$0	\$0	\$1,930	\$5,430				
62 Sebesta Blomberg	BB-03	Roseville	Twin Cities	9/30/03	complete	RD	1	Biomass	Examined the feasibility of a gasification system using the byproducts of an ethanol facility to provide heat and power.	\$738,654										
63 Energy Performance Systems	BB-06	Rogers	Twin Cities	12/15/02	complete	RD	1	Biomass	Conversion design of the NSP Granite Falls coal-fired facility to a biomass system capable of utilizing whole trees.	\$266,508										
64 University of Minnesota	CW-06	Minneapolis	Twin Cities	12/31/06	complete	RD	1	Wind	Designed a flywheel battery system to enhance the ability to dispatch wind energy with inertial storage.	\$654,309										1
Economic Benefits for Metro Region										\$39,742,226	14,290	228,439	\$194,604	\$583	\$1,808,966	\$5,763,260	29	45	2	
OUT OF STATE																				
65 Northern Plains Power Tech.	RD3-21	Brookings, SD	Out of State	11/11/12	complete	RD	3	Solar	Developed a loss-of-mains detection based on harmonic signature and synchrophasor data.	\$493,608									4	1
66 Interphases Solar	RD3-53	Moorpark, CA	Out of State	7/20/12	complete	RD	3	Solar	Demonstrated a manufacturing process to produce lightweight, thin-film solar cells.	\$1,000,000								1	5	
67 University of North Dakota	RD3-71	Grand Forks, ND	Out of State	3/23/12	complete	RD	3	Biomass	Demonstrated a thermally integrated biomass gasification systems with a 30 kW low-Btu gas turbine.	\$999,728								1	1	
68 Energy Conversion Devices	RD-22	Rochester Hills, MI	Out of State	10/12/07	complete	RD	2	Biomass	Researched processes to reform bio-ethanol and bio-methanol into hydrogen for use in a fuel cell or gas turbine to generate electricity.	\$900,000										6
69 Coaltec	RD-26	Carterville, IL	Out of State	1/12/07	complete	RD	2	Biomass	Studied handling, performance and emissions to assess feasibility of poultry waste as a sustainable feedstock for a fixed-bed gasifier.	\$450,000										
70 Production Specialties	RD-72	Oklahoma City, OK	Out of State	11/16/09	complete	RD	2	Biomass	Investigated a technology to selectively remove hydrogen sulfide (H2S) from biogas without generating a waste stream.	\$228,735										1
71 Interphases Research	RD-78	Moorpark, CA	Out of State	10/14/08	complete	RD	2	Solar	Developed a concept to manufacture flexible photovoltaic modules in a continuous roll-to-roll electro-deposition process.	\$1,000,000										6
72 Global Energy Concepts	RD-87	Lowell, MA	Out of State	5/7/09	complete	RD	2	Wind	Analyzed and developed advanced methods for reducing uncertainty in wind power estimates.	\$370,000										
73 NREL - Inkjet Solar Cells	RD-93	Golden, CO	Out of State	11/11/08	complete	RD	2	Solar	Designed and developed a thin-film solar cell that will use a direct-write inkjet printing process.	\$1,000,000										
74 NREL-Low Band Gap-Solar	RD-107	Golden, CO	Out of State	12/9/08	complete	RD	2	Solar	Overcome limitations in organic-based solar cells by developing low band gap (red light absorbing) materials.	\$1,000,000								6	2	
75 Iowa State University	RD-110	Ames, IA	Out of State	7/12/07	complete	RD	2	Biomass	Performance testing of a particulate filtration clean-up system for the producer gas from a biomass gasifier.	\$405,000										
76 University of ND - Cofiring	BB-09	Grand Forks, ND	Out of State	3/31/05	complete	RD	1	Biomass	Measured operational and component impacts of co-firing biomass with coal in an indirect fired combined-cycle pulverized-coal furnace.	\$444,478										
77 Community Power Corp.	BB-10	Littleton, CO	Out of State	3/24/05	complete	RD	1	Biomass	Designed, developed, and tested a centrifugal filter capable of removing sub micron particles and aerosols from a hot producer bio-gas stream.	\$638,635										
78 University of ND - SCR Performance	BB-12	Grand Forks, ND	Out of State	6/30/06	complete	RD	1	Biomass	Examined the rates and mechanisms of catalyst deactivation within the emissions from a biomass co-fired utility boiler.	\$60,000										
79 Colorado School of Mines	CB-07	Golden, CO	Out of State	12/31/07	complete	RD	1	Biomass	Developed a fuel cell prototype for use in ambient or high temperatures.	\$1,116,742										
80 University of ND - SOFC	CB-08	Grand Forks, ND	Out of State	10/31/07	complete	RD	1	Biomass	Incorporated solid oxide fuel cells (SOFCs) and gasification into one integrated system to produce electricity.	\$1,250,142										1
81 NREL	CS-05	Golden, CO	Out of State	7/9/07	complete	RD	1	Solar	Design and develop of solutions and techniques to use an inkjet printing process for the manufacturing of thin-film solar cells.	\$934,628										
82 Global Energy Concepts	CW-02	Lowell, MA	Out of State	10/1/03	complete	RD	1	Wind	Translated the effects of a turbine's rotating flexible blades into a linear model for use in wind turbine design software.	\$75,000										
Economic Benefits for Out of State Area										\$12,366,696	0	0	\$0	\$0	\$0	\$0	\$0	8	25	2
TOTAL ALL PROJECTS										\$98,648,642	28,494	500,906	\$388,714	\$1,291	\$3,497,470	\$13,641,914	46	136	6	

RDF advisory group

- Joe Sullivan¹, manager strategic relations
Center for Energy and Environment
Representing the environmental community
- Michelle Rosier², senior campaign and organizing manager
Sierra Club North Star Chapter
Representing the environmental community
- Lise Trudeau, engineer
Minnesota Division of Energy Resources
Representing residential customers
- Cam Winton³, director energy and labor management
Minnesota Chamber of Commerce
Representing commercial and industrial customers
- Heather Westra
Representing Prairie Island Indian community
- Kevin Schwain, manager emerging customer program
NSP-Minnesota
Representing NSP-Minnesota
- Tami Gunderzik, senior manager product portfolio
NSP-Minnesota
Representing NSP-Minnesota

RDF Administration

- Bria Shea, program manager
- Mark Ritter, grant administrator

¹ Prior to Mr. Sullivan joining the RDF advisory group, Eric Jensen was an environmental representative on the RDF advisory group from 2012-2015.

² In December 2016 Ms. Rosier resigned and this position is currently vacant.

³ Prior to Mr. Winton joining the RDF advisory group, Ben Gerber was the commercial and industrial customer representative on the RDF advisory group from 2012-2015. In December 2016 Mr. Winton resigned and this position is currently vacant.

RENEWABLE DEVELOPMENT FUND FINANCIAL STATEMENT
As of December 31, 2016

	2001 - 2015	2016	Since RDF Inception (2001-2016)
Total RDF Credits *	\$275,750,000	\$25,600,000	\$301,350,000
Excelsior	\$10,000,000	\$0	\$10,000,000
Energy Production Grants	\$21,747,537	\$5,425,476	\$27,173,013
Research Grants	\$31,430,006	\$5,491,849	\$36,921,855
Total RDF Grant Payments	\$63,177,543	\$10,917,325	\$74,094,868
Administrative Costs	\$2,257,362	\$25,343	\$2,282,705
University of Minnesota	\$25,000,000	\$0	\$25,000,000
REPI	\$87,799,237	\$2,831,220	\$90,630,457
Solar Rebates	\$24,027,936	\$16,110,517	\$40,138,453
Other Legislative Mandates	\$25,451,809	\$0	\$25,451,809
Total RDF Costs	\$227,713,887	\$29,884,405	\$257,598,292

SUMMARY OF RDF PROGRAM FUNDS

Total Amount Credited to RDF	(+)	\$301,350,000
Total RDF Payments	(-)	\$257,598,292
Total Amount of Grant Awards	(-)	\$105,520,897
Total Amount of RDF Grants Paid	(+)	\$74,094,868
Unencumbered Cumulative Balance	(=)	\$12,325,679

* The 2015 Cask Storage Schedule included a cask that was not final but was included in this report. The inclusion caused an error to be reflected in 2015 numbers.

RDF Congressional Districts (1/1/2016 - 12/31/2016)									
RDF Contract	Grant	Type	Cycle	Renewable Category	Host Site		Project Sponsor		
					District	Location	District	Organization	
District 1									
EP4-24	\$1,106,600	EP	4	Solar	MN06	Lincoln, Lyon, Pipestone Co.	OK	Bergey Windpower, Norman	
EP4-29	\$1,650,000	EP	4	Solar	MN01	Dodge City	MN03	Dragonfly Solar, Lakeville	
HE4-1	\$5,500,000	HE	4	All	MN01	Minnesota State, Mankato	MN04	City of St. Paul	
RD4-14	\$161,081	RD	4	Wind	MN01	Grand Meadows, Nobles Co.	MN05	Barr Engineering, Minneapolis	
District 2									
RD3-77	\$1,000,000	RD	3	Biomass	MN02	P & J Farms, Northfield	IL	Coaltec Energy USA, Carterville	
EP4-15	\$2,661,320	EP	4	Solar	MN02	Northfield	MN05	MRES, Minneapolis	
EP4-48	\$1,650,000	EP	4	Solar	MN01	Dodge City	MN03	Dragonfly Solar, Lakeville	
EP4-34	\$2,000,000	EP	4	Solar	MN02	BLWWTP, Shakopee	CO	Oak Leaf Energy, Denver	
RD4-2	\$982,408	RD	4	Solar/Wind	MN02	WCROTC, Morris	MN05	U of M, Minneapolis	
District 3									
EP4-13	\$2,022,507	EP	4	Solar	MN03	MAC, Bloomington	MN03	MAC, Bloomington	
District 4									
EP4-11	\$1,850,000	EP	4	Solar	MN04	EIC, St. Paul	MN05	IPS, Minneapolis	
EP4-20	\$583,513	EP	4	Solar	MN04	Midway Superstore, St. Paul	MN05	Target, Minneapolis	
EP4-34	\$555,750	EP	4	Solar	MN04	CHS Field, St. Paul	MN04	City of St. Paul	
HE4-1	\$5,500,000	HE	4	All	MN05	Century College	MN04	MnSCU, St. Paul	
HE4-2	\$2,157,215	HE	4	All	MN05	UST, St. Paul	MN05	UST, St. Paul	
HE4-3	\$3,000,000	HE	4	All	MN05	U of M, Minneapolis	MN04	U of M, St. Paul	
District 5									
AH-01	\$5,100,000	EP	1	Hydro	MN05	Crown Hydro, Minneapolis	MN05	Crown Hydro, Minneapolis	
EP4-11	\$1,850,000	EP	4	Solar	MN04	EIC, St. Paul	MN05	IPS, Minneapolis	
EP4-15	\$2,661,320	EP	4	Solar	MN05	North Minneapolis	MN05	MRES, Minneapolis	
EP4-20	\$583,513	EP	4	Solar	MN04	Midway Superstore, St. Paul	MN05	Target, Minneapolis	
EP4-22	\$969,741	EP	4	Solar	MN05	MPRB, Minneapolis	MN05	MPRB, Minneapolis	
RD4-2	\$982,408	RD	4	Solar/Wind	MN02	WCROTC, Morris	MN05	U of M, Minneapolis	
RD4-11	\$1,899,449	RD	4	Biomass	MN08	NRRI, Coleraine	MN05	U of M, Minneapolis	
RD4-12	\$625,102	RD	4	Wind	MN05	U of M, Minneapolis	MN05	U of M, Minneapolis	
RD4-13	\$1,391,684	RD	4	Wind	MN05	U of M, Minneapolis	MN05	U of M, Minneapolis	
RD4-14	\$161,081	RD	4	Wind	MN01	Grand Meadows, Nobles Co.	MN05	Barr Engineering, Minneapolis	
HE4-3	\$3,000,000	HE	4	All	MN05	U of M, Minneapolis	MN04	U of M, St. Paul	
District 6									
EP4-24	\$1,106,600	EP	4	Solar	MN06	Stearns, Sherburne, Meeker	OK	Bergey Windpower, Norman	
HE4-1	\$5,500,000	HE	4	All	MN05	St. Cloud State, St. Cloud	MN04	City of St. Paul	
District 7									
EP4-41	\$958,369	EP	4	Solar	MN07	City of Hutchinson	MN08	City of Hutchinson	
District 8									
RD4-11	\$1,899,449	RD	4	Biomass	MN08	Granite Falls,	MN05	U of M, Minneapolis	