OFFICE OF THE LEGISLATIVE AUDITOR
STATE OF MINNESOTA

EVALUATION REPORT

Renewable Energy Development Fund

OCTOBER 2010

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OFFICE OF THE LEGISLATIVE AUDITOR
STATE OF MINNESOTA • James Nobles, Legislative Auditor

October 2010

Members of the Legislative Audit Commission:

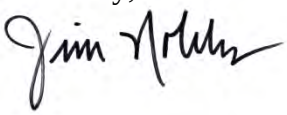
The 1994 Legislature mandated the establishment of the Renewable Development Fund (RDF) to help foster the creation of electricity from renewable sources. The RDF is funded entirely by Xcel Energy ratepayers and maintained in a company account rather than the state treasury.

Originally, expenditures from the RDF were controlled through the regulatory authority of the Public Utilities Commission. More recent legislative actions have fragmented the way RDF-supported projects are approved and administered and made the purpose of the RDF less clear.

We recommend that the Legislature clarify which types of projects are eligible for RDF support and consolidate the project approval process. The Legislature also should strengthen oversight of RDF supported projects and ensure that Xcel ratepayer representatives are more directly involved.

Our evaluation was conducted by Joel Alter (manager), Valerie Bombach, and Sarah Roberts, with assistance from Britta Johnson. We received the full cooperation of the Public Utilities Commission, Department of Commerce, Xcel Energy, and University of Minnesota.

Sincerely,



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Summary

The Renewable Development Fund was created to help develop renewable sources of electricity, but its impact so far has been limited.

Major Findings:

- Since 1999, Xcel Energy has transferred about $165 million into a Renewable Development Fund (RDF), as directed by state law. The fund was established "for development of renewable energy sources," and grants from the fund were initially awarded entirely by the Public Utilities Commission (PUC). (pp. 7, 13)
- During the past decade, the Legislature has broadened the RDF's allowable uses, and administrative responsibility for RDF-funded projects has grown more diffuse. Increasingly, the Legislature has played a role in the allocation of RDF funds. (pp. 10, 14, 17)
- RDF project costs are borne mainly by Xcel Energy's Minnesota ratepayers. However, representatives of these ratepayers have not been adequately involved in RDF project selection processes. (pp. 7, 24)
- Many RDF projects have helped advance knowledge about renewable energy technologies, but a much more limited number have directly contributed to the deployment of these technologies in Minnesota. (p. 33)
- There has been inadequate public communication of RDF-funded project findings and information on the status of the fund. (p. 43)
- Most RDF grants have been awarded using reasonable administrative processes, but there are some inconsistencies among RDF administrators in grant selection criteria and oversight. (pp. 22, 25, 28)
- The RDF is maintained by a private corporation outside the state treasury—an unusual arrangement for a state-mandated account. (p. 8)
- State law does not address the use of RDF funds for administrative purposes. (p. 29)

Key Recommendations:

- The Legislature should consider adopting a single process—with clearer criteria—for approving projects to receive RDF grants, assigning authority for final decisions to either the PUC or the Legislature. (pp. 47-51)
- If the Legislature opts to have the PUC approve all projects, it should clarify the purpose and structure of the board that now advises the PUC on project selection. (p. 53)
- If the Legislature prefers to assume final authority for all RDF grant awards, it should (1) create an advisory board to help select projects and (2) designate the RDF as a state fund. (pp. 48, 51-52)
- The Legislature should require that reports on individual projects and the RDF's overall financial status be posted online, preferably at one public Web site. (p. 54)
- The Legislature should amend state law to address the use of the RDF for administrative costs. (p. 56)

Report Summary

The 1994 Legislature mandated the creation of the Renewable Development Fund (RDF) for the purpose of developing renewable sources of electricity, such as wind, solar, and biomass. Xcel Energy—as operator of the state's nuclear power plants—was required to annually transfer funds to the RDF as part of legislation that allowed Xcel to store spent nuclear fuel at its Prairie Island nuclear plant (and later its Monticello plant). Since 1999, Xcel has transferred about $165 million into the RDF, and Xcel recovers RDF expenditures from its ratepayers.

The RDF is maintained by a private company and subject to minimal state oversight, but it has been accessed by the Legislature as if it were a state fund.

Through mid-2010, about 200 grants had been made with RDF funds. Nearly half focused on biomass as an energy source. About 86 percent of RDF grants were awarded to Minnesota-based grantees.

The RDF is not part of the state treasury, but the Legislature has increasingly designated how its revenues are used.

The RDF is maintained by Xcel Energy, not a state agency. The Legislature apparently established the RDF as an account outside the state's budget process to discourage its use by future legislatures for purposes other than those originally envisioned.

As a non-state fund, the RDF is subject to limited review by executive branch finance staff, and it has not been subject to financial audits by the Office of the Legislative Auditor. Rarely have funds been established in a similar way in Minnesota state government.

State law says expenditures from the RDF may only be made with the approval of the Public Utilities Commission (PUC). Increasingly, however, the Legislature has played a role in the allocation of RDF funds, transferring them to various agencies to administer legislatively specified initiatives. Also, the Legislature has broadened the RDF's allowable uses, authorizing projects that go beyond the original purpose of developing renewable sources of electricity.

Because the Legislature has accessed the RDF as if it were a state fund, the Legislature should consider making the RDF part of the state treasury and subject to the state's budgeting and oversight processes. This would subject the fund to greater accountability. The Legislature should also consider whether a fund intended to foster renewable energy development throughout Minnesota should continue to be funded by a single utility. However, we do not recommend extending RDF financial obligations to other utilities unless the Legislature establishes a clear rationale in law for collecting such revenues.

Fragmentation of RDF administration has contributed to inconsistencies in project selection and grants management.

Originally, the PUC approved all RDF projects and grantees. The PUC still plays a role in approval and oversight of certain projects, but the Legislature, Department of Commerce, and University of Minnesota now also select projects (without direct PUC participation).

Most RDF grants have been awarded on the basis of reasonable administrative processes for project selection—for example with proper solicitations of proposals and involvement of outside experts.

However, fragmentation of administrative responsibilities has contributed to some important inconsistencies.

Xcel Energy's Minnesota ratepayers pay for most RDF costs, but they are not always represented in RDF project selection processes.

For example, Xcel Energy ratepayer representatives are involved in the selection of projects approved by the PUC, but they are not formally represented in the selection of other projects. Also, while RDF reports overseen by Xcel Energy acknowledge the role of the RDF and Xcel ratepayers, the reports overseen by the University of Minnesota and Department of Commerce usually do not. In addition, some types of projects that the PUC has deemed ineligible for RDF funding—such as projects not related to electricity production—have been authorized by the Legislature. Furthermore, Xcel Energy and the Department of Commerce enter into formal contracts with grantees, but the University of Minnesota does not.

State law references a PUC-created advisory body (the RDF Board) in the project selection process, but the law does not adequately specify the composition and purpose of the board. The Legislature should clarify the role of this board.

The RDF's impact on electricity generation has been limited, partly reflecting the types of projects funded.

The Legislature should also consider consolidating the RDF project approval process, rather than continuing with multiple avenues for allocating RDF revenues and authorizing projects. Options for consolidation include (1) relying on a regulatory body (the PUC) to select all projects (as originally prescribed by the RDF law) or (2) establishing a process in which the Legislature would authorize all RDF projects based on input from an advisory body (perhaps a modified version of the RDF Board). The latter option should only be considered if the Legislature brings the RDF into the state treasury and therefore under its budgetary authority. Under either approach, the Legislature should consider adopting clearer statutory criteria to guide the selection of RDF projects.

Many RDF projects have improved knowledge about renewable energy, but the RDF's direct impact on the deployment of these technologies has been limited.

Some RDF-funded grants have aimed to create or refurbish facilities that produce renewable energy. Overall, these grants have had a small impact on Minnesota's electricity generation. In 2007, the electricity produced as a result of these grants equaled less than 0.1 percent of the electricity generated statewide.

Also, some large RDF grants have not led to the creation of energy production facilities that were intended. For instance, a firm spent $10 million in RDF funds to design and plan a "clean coal" plant for which the PUC has not authorized a purchase of power agreement. Another RDF grantee's plans for a hydroelectric facility have been stopped by its inability to obtain a lease of city park land.

RDF-funded "incentive payments" to existing renewable energy facilities have had a somewhat larger impact.[1] In 2007, the electricity produced by these facilities equaled about 1.5 percent of the electricity generated by Minnesota utilities.

[1] Under Minnesota's Renewable Energy Production Incentives program, payments are made to facilities based on the actual amount of electricity produced.

The findings of RDF projects have not been adequately conveyed to policy makers and persons who might put this research to use.

Most RDF grants have been for "research and development" projects that address underlying questions about new technologies. While some RDF research projects have contributed to tangible outcomes—such as licenses for commercial uses of technology, or patent applications—most have not had impacts this direct. This partly reflects the fact that many projects approved by the University of Minnesota or PUC have involved preliminary stages of research for unproven technologies (such as new types of photovoltaic cells to capture solar energy). Often this research has involved exploration of basic scientific concepts and assumptions, not applications in the later stages of technology development or ones related to specific Minnesota users.

Early-stage research can be an important part of technology development, but it is unusual for this type of research to be funded by individual states' renewable energy initiatives or the ratepayers of an individual utility. There is probably a role for RDF-funded research of this sort, but our report suggests that the Legislature sharpen the focus of the RDF by stating in law a preference for projects with direct Minnesota benefits "where reasonable."

Communication of RDF information has been inconsistent and sometimes inadequate.

Clear communication of RDF project results provides accountability to policy makers, the general public, and ratepayers, and it can also help ensure greater use of the reports.

No single report has presented the Legislature or others with a clear, consolidated overview of all RDF activities, such as a list of all RDF-funded projects. Also, there is no single Web site that provides links to all RDF-funded reports. This partly reflects the fact that RDF projects have been administered by multiple entities. For example, Xcel Energy has provided online links to all final reports issued by the grantees it oversees on behalf of the PUC. However, there are no Web sites with links to all of the RDF reports overseen by the University of Minnesota and Department of Commerce.

Furthermore, the adequacy of individual RDF reports has varied. Many of the reports are challenging to understand—especially for nonexperts, but also for some readers with more technical knowledge. Some of the reports lack the details that might be useful to other researchers, to persons interested in putting the technology to use, or to people who want to better understand what was accomplished with large grants through a publicly authorized program.

State law should address possible uses of RDF funds for administrative costs.

State law does not explicitly address whether—and which—administrative costs can be paid for from the RDF. Xcel Energy and the University of Minnesota have paid for certain RDF administrative costs with RDF funds; the Department of Commerce generally has not.

The PUC has adopted a policy capping the RDF-funded administrative costs borne by Xcel Energy, but this cap does not apply to other entities administering RDF funds. In addition, there have been differing interpretations of the PUC's administrative cost cap.

Introduction

In recent years, the Minnesota Legislature has set ambitious goals for the state to move toward greater use of renewable forms of energy. For example, state law now has a goal of having renewable energy account for 25 percent of the state's energy usage by 2025.[1]

In addition, legislators have been asking questions about the effectiveness of existing state strategies to increase the use of renewable energy. Thus, in 2009, the Legislative Audit Commission directed the Office of the Legislative Auditor to evaluate a renewable energy development account, known as the Renewable Development Fund (RDF), that was established 15 years earlier.[2] Our evaluation addressed the following questions:

- **How reasonable is the process for determining which projects will be authorized for funding from the Renewable Development Fund? What types of projects have been funded so far?**

- **To what extent have these projects met the goal of fostering development of renewable forms of energy? To what extent have these projects provided Minnesota-specific benefits?**

- **Has information on project outcomes been effectively communicated to the public and policy makers?**

In the RDF's early years, all RDF projects were authorized by the Public Utilities Commission (PUC) and administered by Xcel Energy. Our evaluation focused considerable attention on PUC-authorized, Xcel-administered RDF projects. However, to provide the Legislature with a complete overview of the RDF, we also examined RDF projects that have been administered by other entities—notably the Minnesota Department of Commerce and University of Minnesota—and we looked at the oversight practices of those entities.

During our evaluation, we examined a wide variety of documents related to Renewable Development Fund projects. We reviewed many final reports and executive summaries for projects initiated since 2001 and completed by mid-2010, as well as some interim reports that have been issued for completed or ongoing RDF projects. We reviewed all of the RDF-related requests for proposals, and we reviewed samples of project-specific grant agreements, work statements, and research proposals. We also reviewed Minnesota laws related to the RDF, as well as RDF-related orders issued by the PUC.

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[1] *Minnesota Statutes* 2009, 216C.05, subd. 2.

[2] *Minnesota Statutes* 2009, 116C.779, subd. 1(a) references the creation of a "renewable development account," but this is commonly referred to as the "Renewable Development Fund." This report primarily uses the term Renewable Development Fund—or RDF—when discussing this program and the account in which its revenues are deposited.

Many RDF projects involve technical issues, so we contracted with three specialized firms with appropriate expertise to review ten RDF projects.[3] We asked the contractors to help us assess the alignment of the final reports with the original project goals, the adequacy of the reports for experts and non-experts, and the extent to which the reports made unique, useful contributions to renewable energy development and existing knowledge. We limited these reviews to RDF-funded research projects that examined solar, wind, or biomass technologies.

We interviewed officials with the main organizations that oversee or administer RDF grants. This included Xcel Energy, the PUC, the Department of Commerce's Office of Energy Security, and the University of Minnesota's Initiative for Renewable Energy and the Environment. We interviewed members of the RDF Board, which provides advice on projects under consideration for RDF funding by the PUC. We also interviewed some legislators and legislative staff, and we talked with several people regarding other states' renewable energy programs.

We assembled descriptive information on all RDF projects and the appropriations that supported them. Where available, we obtained information on project-related impacts. For some projects, we spoke with research managers or others familiar with the projects. We also reviewed information on the RDF's history of revenues and expenditures.

As described in Chapter 1, the RDF's revenues are linked to the amount of spent fuel storage at Minnesota's nuclear power plants, and the costs for RDF projects are covered by the ratepayers of one electrical utility (Xcel Energy). Thus, while the term "renewable energy" has sometimes been used in reference to certain vehicle fuels (such as ethanol) produced from renewable sources, the Renewable Development Fund was established to foster the generation of *electricity* from renewable sources. Throughout this report, we use the term "renewable energy" to refer to renewable sources of electricity, not to vehicle fuels.

Appendix A of this report outlines a framework that may help readers understand the common stages of technology development. Appendix B provides a list of RDF grant projects that have been approved since the Renewable Development Fund was created. Appendix C provides a brief summary of the processes that have been used to select RDF projects.

[3] We contracted with Conversion Technology and Marketing, LLC (Cecil Massie), the Wisconsin Energy Conservation Corporation (Donald Wichert and Niels Wolter), and Delta Research (Thomas Pelsoci).

1 RDF Revenues and Administration

Over the past decade, the Renewable Development Fund (RDF) has been one of Minnesota's primary sources of grants focused on renewable sources of electrical energy. As we discuss in this chapter, this fund has some unusual characteristics—notably, its management by a private corporation and its focus on research and development. The chapter provides a brief overview of Minnesota's renewable energy policies, discusses administrative responsibilities for RDF revenues and project oversight, and examines the purpose of the RDF.

BACKGROUND

In 2008, 12 percent of electricity generated in Minnesota came from renewable sources.

Energy is generally considered "renewable" if it comes from natural resources and is naturally replenished. Minnesota statutes identify several sources of renewable electrical energy: wind, sun, water, geothermal (heat from the earth), and biomass. Biomass includes trees, other vegetation, landfill gas, and the predominantly organic components of wastewater effluent, sludge, or other wastewater treatment byproducts.[1] In addition, animal manure is often considered a type of biomass.

According to the U.S. Department of Energy, 9.3 percent of electricity generated in the U.S. in 2008 came from renewable sources.[2] By comparison, 12.0 percent of electricity generated in Minnesota in 2008 came from renewable sources. Minnesota's electricity was primarily produced from coal plants (58 percent) and nuclear power (24 percent).[3] Minnesota has no significant fossil fuel resources, such as coal, petroleum, or natural gas. However, compared with other states, Minnesota has relatively high potential for energy from wind and biomass.[4]

The Legislature has established broad policies that support development of renewable energy. For example, statutory language passed in 1980 that remains in effect today says:

> The legislature finds and declares that continued growth in demand for energy will cause severe social and economic

[1] *Minnesota Statutes* 2009, 216B.2422, subd. 1, and 216B.1691, subd. 1. *Minnesota Statutes* 2009, 216B.1691, subd. 1, treats hydrogen as a form of renewable energy if it is generated from one of the other sources of renewable energy.

[2] U.S. Department of Energy, *State Electricity Profiles 2008* (Washington, D.C., March 2010), 141 and 309.

[3] Minnesota imports coal mostly from Montana and Wyoming for its coal-fired power plants.

[4] For maps showing the potential energy generated from various renewable sources, see National Renewable Energy Laboratory, http://www.nrel.gov/gis/maps.html.

> dislocations, and that the state has a vital interest in providing for: increased efficiency in energy consumption, the development and use of renewable energy resources wherever possible, and the creation of an effective energy forecasting, planning, and education program.[5]

This law also says the Legislature intends to monitor the transition to a period when "the supply of renewable energy resources is readily available and adequately utilized."[6] In 2007, the Legislature enacted statewide goals to reduce fossil fuel energy use and increase the use of energy from renewable sources. State law says:

Minnesota has one of the nation's most ambitious renewable energy goals.

> It is the energy policy of the state of Minnesota that: (1) the per capita use of fossil fuel as an energy input be reduced by 15 percent by the year 2015, through increased reliance on energy efficiency and renewable energy alternatives; and (2) 25 percent of the total energy used in the state be derived from renewable energy resources by the year 2025.[7]

In addition, Minnesota is among the 28 states that have adopted "renewable portfolio standards."[8] Such standards generally require electrical utilities to generate a certain share of their power from renewable sources. In 2007, Minnesota enacted legislation creating renewable energy standards for each of the state's utilities, as shown in Table 1.1. Minnesota has among the nation's most ambitious renewable portfolio standards. Utilities are required by Minnesota law to file plans showing how they will meet these standards. The Minnesota Public Utilities Commission (PUC) is required by law to monitor compliance with the standards. If the PUC finds noncompliance by a utility, it may order the utility to take corrective actions. If the utility does not comply with such orders, the PUC may impose financial penalties.[9]

Various federal and state programs provide incentives for development of renewable energy in Minnesota. For example, since 1992 the federal government has had a Renewable Energy Production Incentive (REPI) that pays for electricity generated and sold by qualifying renewable energy facilities.[10] As we discuss later in this chapter, a Minnesota version of the REPI program is funded

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[5] *Minnesota Statutes* 2009, 216C.05, subd. 1.

[6] *Ibid.*

[7] *Minnesota Statutes* 2009, 216C.05, subd. 2.

[8] U.S. Environmental Protection Agency, "Renewable Portfolio Standards Fact Sheet," April 2009, http://www.epa.gov/chp/state-policy/renewable_fs.html, accessed August 17, 2010. The District of Columbia has also adopted a renewable portfolio standard. In addition to the 28 states with such standards, 5 states have renewable portfolio standard goals, not requirements.

[9] *Minnesota Statutes* 2009, 216B.1691, subd. 7.

[10] This program was designed to complement the federal renewable energy production tax credit, which is available to businesses that pay federal corporate taxes. Federal REPI payments are 1.5 cents per kilowatt-hour in 1993 dollars (indexed for inflation) for the first ten years of operation, subject to the availability of annual appropriations.

Table 1.1: State Objectives for Renewable Energy Generation by Minnesota Utilities

Year	Percentage of Electricity That Must be Generated From Renewable Sources: Xcel Energy	Other Utilities
2010	15%	NA[a]
2012	18	12%
2016	25	17
2020	30	20
2025	NA[a]	25

NOTES: Compliance with the standards is based on utilities' total retail electric sales to customers in Minnesota at the end of the indicated years. Eligible renewable energy technologies include (1) solar; (2) wind; (3) hydroelectric with a capacity of less than 100 megawatts; (4) hydrogen, provided that after January 1, 2010, the hydrogen must be generated from the resources listed here; or (5) biomass, which includes, without limitation, landfill gas, an anaerobic digester system, the predominantly organic components of wastewater effluent, sludge, or related byproducts from publicly owned treatment works (but not including incineration of wastewater sludge to produce electricity), and an energy recovery facility used to capture the heat value of mixed municipal solid waste or refuse-derived fuel from mixed municipal solid waste as a primary fuel.

[a] "NA" indicates not applicable, reflecting instances in which standards are not specified in law.

SOURCE: *Minnesota Statutes* 2009, 216B.1691, subd. 1 and 2a.

by the Renewable Development Fund.[11] Another example of a renewable energy incentive is the Community-Based Energy Development (C-BED) program, enacted by the 2005 Legislature to promote locally owned wind energy facilities in Minnesota.[12] The program was expanded in 2007 to include other renewable technologies.[13] Under this program, utilities are required to negotiate with qualified C-BED projects for possible purchase of renewable power.

The 1994 Legislature required the utility generating electricity from nuclear power to establish the Renewable Development Fund.

There are also federal and state grant and loan programs that are intended to foster the development of renewable energy. The remainder of this report focuses on Minnesota's largest such program, the RDF.

RENEWABLE DEVELOPMENT FUND ADMINISTRATION

The 1994 Legislature mandated the creation of a "renewable development account" for the purpose of developing renewable energy sources.[14] (This account is commonly known as the Renewable Development Fund, and will be

[11] Minnesota's REPI program offers subsidies of 1.0 to 1.5 cents per kilowatt-hour of electricity sold to a utility. The program is open to qualified wind energy conversion facilities, hydroelectric facilities, on-farm biogas recovery facilities, and anaerobic digester systems, as specified in *Minnesota Statutes* 2009 216C.41.

[12] *Laws of Minnesota* 2005, chapter 97, art. 2, sec. 1, subd. 1.

[13] *Laws of Minnesota* 2007, chapter 136, art. 4, sec. 1, subd. 1.

[14] *Laws of Minnesota* 1994, chapter 641, art. 1, sec. 10.

referred to as such throughout this report.) Xcel Energy—as the operator of the state's nuclear plants—was required to transfer money to the RDF as part of legislation that allowed it to store spent nuclear fuel at the Prairie Island nuclear power plant.[15] The law was later amended to require additional deposits into the RDF for nuclear waste stored at the utility's nuclear generating plant located in Monticello.[16] Xcel Energy maintains this account and is responsible for RDF financial reporting.[17] The context for the RDF law—which made payments to the RDF contingent on a utility's continued use of nuclear energy to generate electricity—suggests that the law's references to "renewable energy" refer to sources of *electrical* energy rather than other types of energy (such as vehicle fuels).

Source of Funds

State law specifies the amount of money Xcel must deposit into the RDF, based on (1) the volume of spent nuclear fuel Xcel maintains in dry cask storage for its plants and (2) whether the plants are operational.[18] As shown in Table 1.2,

- **From 1999 through December 2010, Xcel Energy will have transferred about $165 million into the Renewable Development Fund.**

Xcel Energy transfers funds into the RDF, and expenditures are recovered from Xcel's ratepayers.

These deposits represent Xcel's account obligations resulting from an initial 9 storage casks in 1999 at Prairie Island to a total of 39 casks at its two nuclear plant locations in 2010 (29 at Prairie Island and 10 at Monticello).[19] Xcel's current annual contribution to this account is $19.5 million.[20] Based on the utility's forecast of additional spent nuclear fuel, this fund contribution will increase to $24.5 million for a total of 55 storage casks in 2013.

State law requires Xcel Energy to make payments to the RDF as remuneration for storage of nuclear waste, but it also authorizes the utility to recover from

[15] The legislation also required Xcel to: (1) make a good faith effort to obtain an alternative storage site for nuclear waste, (2) construct or purchase enough wind resources to generate 425 megawatts of power, (3) construct or purchase 125 megawatts of biomass power, and (4) provide limited rate discounts to low-income customers. The 1994 law allowed placement of the storage casks immediately, but Xcel was not required to start paying into the RDF until 1999.

[16] *Laws of Minnesota* 2007, chapter 57, art. 2, sec. 9, subd. 1(b).

[17] Public Utilities Commission, *Order Adopting Proposal for Oversight and Operation of Renewable Development Fund* (Docket No. E-002/M-00-1583), April 20, 2001, 9-10.

[18] The original law required Xcel Energy to deposit $500,000 annually for each cask stored for any part of a year. In 2003, the Legislature amended the per-cask per-year formula to require an annual payment of $16 million each year the Prairie Island plant is operating, and $7.5 million if the plant is not in operation. In 2010, the Legislature again modified the payment requirement; the utility's obligation will revert to $500,000 annually per cask per year when there are 32 storage casks at Prairie Island. The utility forecasts that the total number of casks at this facility will not reach 32 until August 2012. For the Monticello plant, the law requires a $350,000 annual payment for each cask stored for any part of a year.

[19] Based on Xcel Energy projections for storage casks through December 2010.

[20] Xcel Energy reports storage casks and payment obligations on a calendar year basis.

Table 1.2: Number of Xcel Energy Nuclear Waste Storage Casks and Payments to RDF, 1999-2010

Year	Total Number of Storage Casks	Annual Payments to RDF (in thousands)
1999	9	$ 4,500
2000	12	6,000
2001	14	7,000
2002	17	8,500
2003	17	16,000
2004	17	16,000
2005	20	16,000
2006	22	16,000
2007	24	16,000
2008	34	19,500
2009	35	19,500
2010[a]	39	19,500
Total Payments		$164,500

NOTE: Represents total storage casks at both the Prairie Island and Monticello sites as of December 31 each year.

[a] Represents projected year-end totals.

SOURCE: Xcel Energy.

Payments into the RDF are based on the storage of spent fuel at Xcel's nuclear power plants.

ratepayers expenditures from the fund for renewable energy projects.[21] Xcel Energy charges its electric customers a monthly amount—included in the "Resource Adjustment Fee" in the utility's billing statements—for the RDF projects and related administrative expenses. Although the utility's service area covers various regions in Minnesota and other states,

- **Costs for Renewable Development Fund projects are borne primarily by the Minnesota ratepayers of Xcel Energy.**

Xcel Energy serves about half of Minnesota's residential (non-farm) and commercial electricity customers. According to a cost allocation methodology approved by the PUC, Xcel's Minnesota ratepayers bear the full cost of most RDF expenditures.[22] This methodology has been in place since 2004 and is intended to reflect Minnesota-specific funding priorities and directives regarding the RDF. In 2010, the amount billed to an average Minnesota residential customer of Xcel Energy to cover RDF costs totaled nearly $7 for the year.

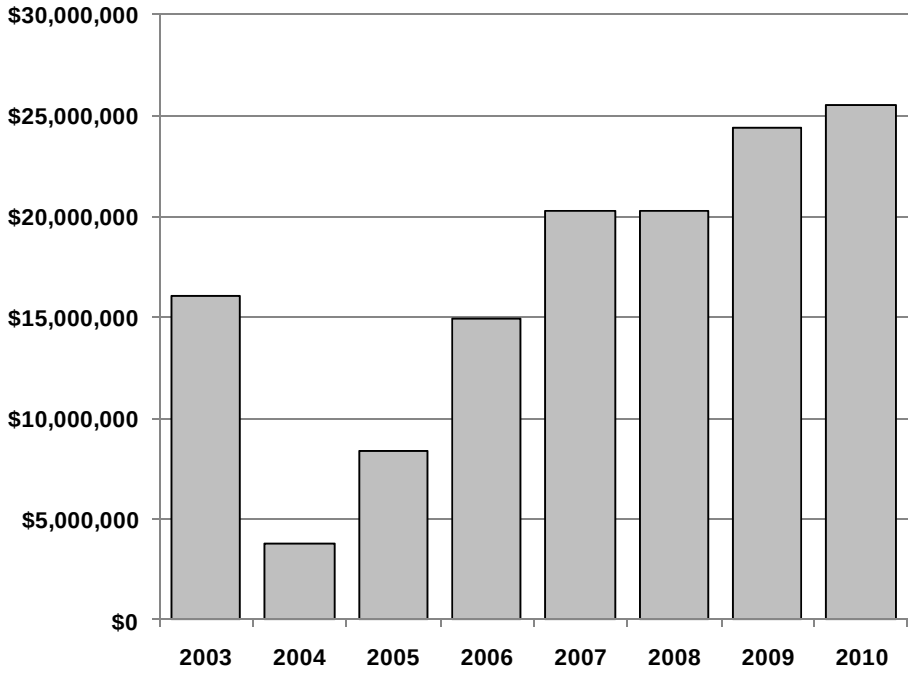
[21] *Minnesota Statutes* 2009, 216B.1645, subd. 2.

[22] Specifically, Xcel's Minnesota ratepayers pay for all of the following: (1) research and development projects administered by Xcel Energy; (2) legislatively mandated projects administered by the Department of Commerce, including Renewable Energy Production Incentive projects; and (3) transfers of RDF funds to the University of Minnesota's Initiative for Renewable Energy and the Environment. According to Xcel, about 70 percent of the costs of "energy production" RDF projects administered by Xcel are recovered from Xcel's Minnesota customers.

Status of the Renewable Development Fund

Between 2003 and 2010, the RDF balance has fluctuated due to expenditures for renewable energy source projects and various legislative initiatives.[23] Figure 1.1 shows the annual RDF expenditures during this period. In a report to the 2010 Legislature, Xcel Energy estimated that the account's unencumbered fund balance was about $6.6 million at the end of fiscal year 2010.

Figure 1.1: RDF Annual Expenditures, 2003-2010



NOTE: Expenditures for 2010 are estimated.

SOURCE: Office of the Legislative Auditor, analysis of Xcel Energy data.

It is worth noting that:

- **The Legislature created the Renewable Development Fund outside of the state's treasury, which is an unusual arrangement.**

The RDF is maintained by a private corporation (Xcel Energy) rather than a state agency. The utility must track and report on fund payments and expenditures, and it compiles information for biennial reports to the Legislature. According to a former legislative staffer who helped draft the RDF law, the RDF was intentionally established separate from state accounts in an effort to discourage

[23] Although the first RDF projects were approved by the PUC in April 2002, expenditures for these projects did not occur until February 2003.

its use by legislators for purposes other than those originally envisioned. Staff from the Minnesota Department of Management and Budget, the Legislature, and the Office of the Legislative Auditor told us that rarely have funds been set up in a similar way in state government.[24]

Individuals we spoke with noted several implications of the RDF's status as a non-state fund outside the state's treasury. First, the RDF is subject to limited review and oversight by the state. State law requires that the PUC approve expenditures from the fund.[25] (The commission regulates public utilities in Minnesota to ensure safe, reliable, and efficient utility services at fair and reasonable rates.) However, the state's budget agency (the Minnesota Department of Management and Budget) does not request or receive reports on the fund's status, receipts, or balance. This department only reviews RDF funds for which the law directs deposits into a state fund—for example, at the Department of Commerce. The PUC has jurisdiction over the accounting practices of public utilities, but the RDF has not been subject to financial audits by the Office of the Legislative Auditor.

Although the Legislature mandated the creation of the RDF, it is unclear whether money deposited by a private corporation in an account outside the state treasury is "public" money.

Second, because the RDF is a non-state fund, the Department of Management and Budget does not prepare information on the fund's ongoing financial status. Xcel Energy prepares detailed financial statements and forecasts of the account's status on a calendar year basis, and then legislative staff must translate this information to a state fiscal year basis (or ask Xcel to do so) for use during legislative sessions. Legislative staff expressed mixed views about the adequacy and usefulness of the information previously provided by Xcel on the fund's status, although they generally expressed satisfaction with the information presented by Xcel in 2010. We observed some inconsistencies in financial reporting by Xcel, including a 2010 status report that overstated Xcel's annual fund payments for cask storage by $3.5 million.

Third, the Legislature's allocations of money from the RDF have been a subject of debate, partly reflecting the RDF's status as a fund outside the state treasury. Although the Legislature mandated the creation of the RDF, there are unresolved questions about whether money deposited by a private corporation into an account outside the state treasury is "public" money and available for appropriation. For fiscal years 2010-11, legislative actions have directed the expenditure of more than $38 million in RDF money. Some people questioned whether it is appropriate for the Legislature to designate RDF money for specific

[24] Staff we spoke with did not recall any other funds structured in a similar way, with the exception of the ClearWay account established in 1998 as a result of the state's litigation and settlement with several companies that produce tobacco products. Among the settlement provisions, the agreement required the tobacco companies to provide $202 million to fund two accounts. A court-approved plan provided for a private, nonprofit corporation to administer the funds, which are to be used for grants, research, intervention, and related purposes. ClearWay—the organization previously known as the Minnesota Partnership for Action Against Tobacco—is governed by a board of directors appointed by government officials and through board member election. Although ClearWay was created by state government to serve a public purpose, it is not a state agency and receives no benefits or services from the state. As such, its accounting records and payroll information are not part of the state's reporting systems.

[25] *Minnesota Statutes* 2009, 116C.779, subd. 1(c).

projects and grant recipients. Also, legislative staff told us there is a lack of clarity about which legislative committees have jurisdiction over the RDF.[26]

There has been some previous consideration about transferring administration of the RDF to an entity other than Xcel Energy. In 2003, the Legislature authorized the PUC to explore whether to transfer administration of the RDF to an independent third party. Subsequent testimony to the PUC noted concerns about possible conflicts of interest and project oversight by Xcel. In 2006, the PUC concluded that such a change should not be pursued. It said that a transfer of administrative responsibilities could be expensive and time-consuming, and that a third party might not outperform Xcel. The PUC noted that that the RDF's administrative structure and procedures would always be a work in progress, and it ordered Xcel to incorporate various improvements in its RDF oversight activities.

Expenditure Authorizations by the PUC and Legislature

State law authorizes the Public Utilities Commission to approve RDF expenditures, but increasingly the Legislature has directly allocated RDF funds.

State law generally recognizes the PUC as the agency with primary responsibility for the Renewable Development Fund. The law authorizes the PUC to approve "reasonable" expenditures from the RDF,[27] and it says: "Expenditures from the [RDF] may only be made after approval by order of the Public Utilities Commission upon a petition by the public utility."[28] Since 2000, the PUC has held numerous hearings and issued orders establishing a project selection process and governance model for the RDF. These activities have involved the input of various interested stakeholders to help define the roles and responsibilities of Xcel Energy, the Minnesota Department of Commerce, and a PUC-established advisory board on RDF issues.[29] However,

- **The Legislature has increasingly played a role in the allocation of RDF funds, transferring them to various agencies to administer legislatively specified initiatives.**

Figure 1.2 is a flow chart that shows the path of revenues into the RDF and out to various administering entities. Initially, all RDF expenditures occurred through the PUC's process for approving projects. The first projects ("Cycle 1") were approved by the PUC in April 2002, totaled $15.2 million, and were administered

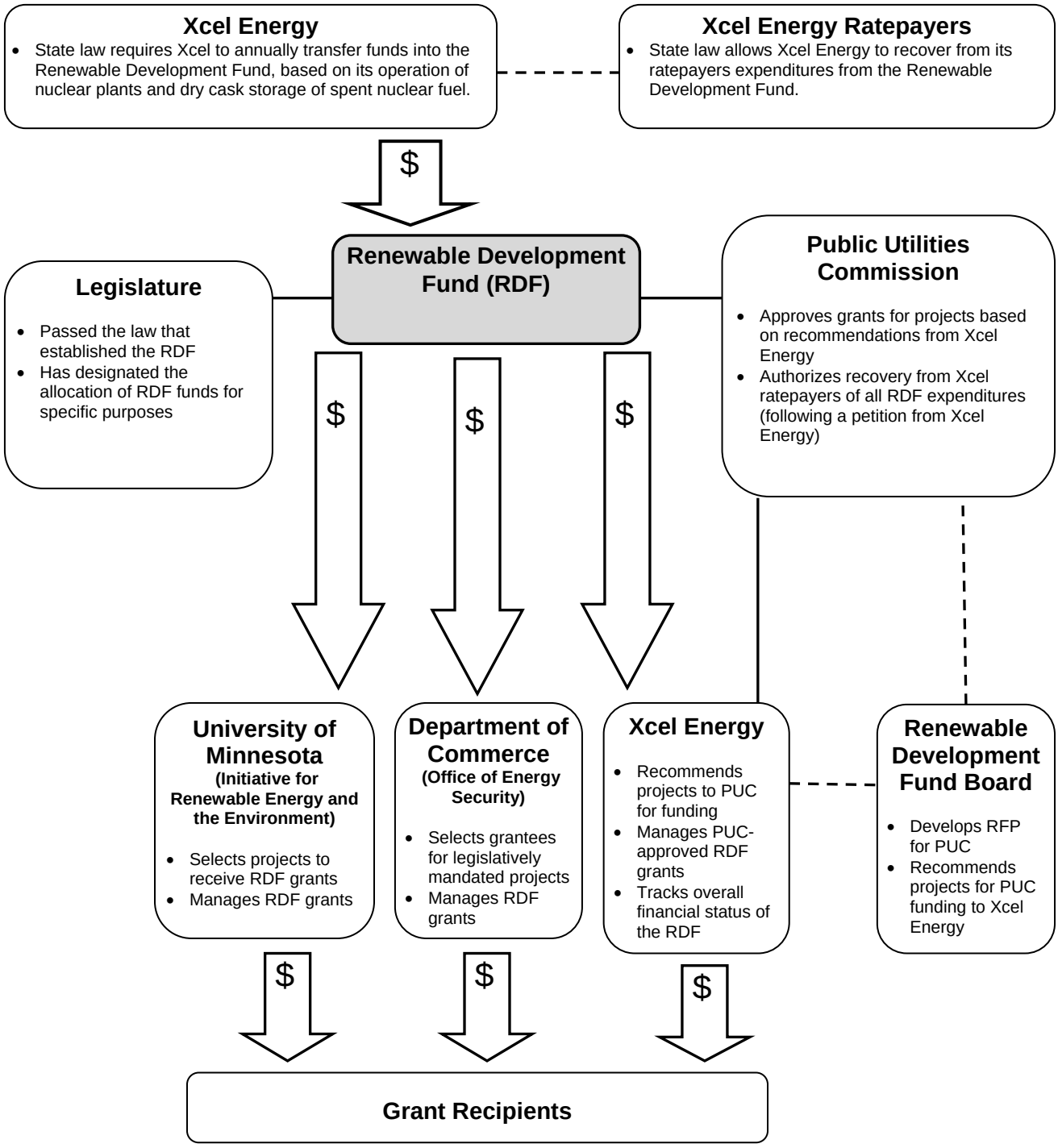
[26] Legislative staff advised us that, unlike bills affecting state funds and accounts, RDF spending bills are *not* required to be referred to a legislative finance committee. For bills affecting state funds and accounts, for example, House of Representatives Rule 4.10 requires that "a House or Senate bill that directly, substantially, and specifically affects any present or future financial obligation, budget policy, or revenue of the State must be referred… to the appropriate Finance or Tax Committee before the bill receives its second reading."

[27] *Minnesota Statutes* 2009, 216B.1645, subd. 1.

[28] *Minnesota Statutes* 2009, 116C.779, subd. 1(c).

[29] We discuss this advisory board (the RDF Board) further in Chapter 2.

Figure 1.2: Flow of Funds To and From the Renewable Development Fund

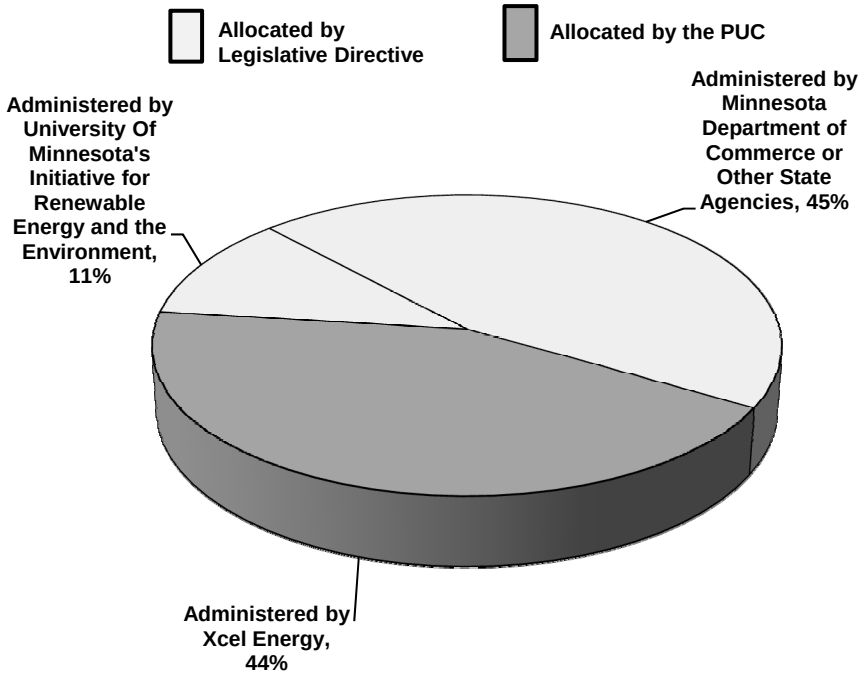


SOURCE: Office of the Legislative Auditor, analysis of Minnesota statutes and RDF administrative data.

by Xcel Energy. In 2004, the PUC authorized another $26.5 million for "Cycle 2" projects, administered by Xcel Energy.[30]

Starting in 2003, the Legislature mandated the use of the RDF for a variety of specific programs and projects, often to be managed by entities other than Xcel. Figure 1.3 shows that between fiscal years 2002 and 2010, about 56 percent of RDF project allocations were made through legislative directives. Most of the legislatively directed expenditures were for initiatives administered by two entities—the University of Minnesota's Initiative for Renewable Energy and the

Figure 1.3: Percentage of Total RDF Dollars Allocated to Grant Oversight Organizations, by Allocation Process, Fiscal Years 2002-2010



NOTES: Allocations for the statutorily mandated Renewable Energy Production Incentives program are included in the Department of Commerce total. Allocations for the $10 million Excelsior Energy/Mesaba project (which was specifically authorized by the Legislature but subsequently approved by the PUC) and for a $5 million "pilot investment program" are included in the Xcel Energy total as projects for which the PUC made allocations of RDF funds.

SOURCE: Office of the Legislative Auditor, analysis of Minnesota laws and Xcel Energy financial data.

[30] The total expenditures for Cycle 2 projects were reduced to about $19.8 million following the discontinuation of several projects.

Environment and the Minnesota Department of Commerce (through its Office of Energy Security).[31]

In 2003, the Legislature started setting aside a portion of the RDF to help fund an existing program (the Renewable Energy Production Incentive, or REPI) previously supported by the state's general fund.[32] This state program pays participating facilities for the generation and sale of electrical energy produced from renewable energy wind, hydro, and biomass resources.[33] Currently, up to $10.9 million annually is available for qualifying participants.[34] REPI allocations have accounted for a large share of Xcel Energy's annual payments into the RDF. For example, in 2008 through 2010, REPI allocations were 56 percent of Xcel's total RDF payment obligations. Also, on several occasions, the Legislature mandated direct transfers of RDF funds to the University of Minnesota to administer grants for qualifying projects. These allocations to the University totaled $10 million (2003), $3 million (2007), and $5 million annually from 2009 through 2012.

Most legislatively directed allocations from the RDF have been administered by the Department of Commerce or the University of Minnesota.

Between 2007 and 2009, the Legislature mandated more than two dozen other initiatives funded from the RDF, totaling about $14.2 million. Most of these initiatives are grant projects administered through the Department of Commerce, although some projects require involvement of other state agencies or the University of Minnesota. In 2010, the Legislature also required the allocation of a total of $21 million in RDF funds between fiscal years 2011 and 2015 for a solar rebate program to be administered by Xcel Energy.[35]

Overall, the Legislature's actions have had a significant impact on the RDF fund balance and, therefore, the PUC's ability to authorize new projects. For the near term, a majority of Xcel's payments into the RDF (currently $19.5 million) have been designated to fund the University of Minnesota allocation, the REPI program, and the solar rebate program.

PURPOSE OF THE RENEWABLE DEVELOPMENT FUND

When the 1994 Legislature required the establishment of the Renewable Development Fund, it provided limited guidance regarding expenditures from the RDF. The original law contained a single statement that addressed the RDF's purpose: "Funds in the account may be expended only for development of renewable energy sources."[36] This statement remains in the law today. Not until

[31] Between 2002 and 2010, about 32 percent of RDF grant expenditures and 65 percent of grant projects occurred through Minnesota state or local agencies or public higher education institutions.

[32] *Laws of Minnesota* First Special Session 2003, chapter 11, art. 2, sec. 1.

[33] *Minnesota Statutes* 2009, 216C.41.

[34] *Minnesota Statutes* 2009, 116C.779, subd. 2.

[35] *Laws of Minnesota* 2010, chapter 361, art. 5, sec. 3.

[36] *Laws of Minnesota* 1994, chapter 641, art. 1, sec. 10.

1999 did the law specify which agency (the PUC) was authorized to approve spending from the RDF.[37]

According to some legislative and agency staff who were present during initial discussions about the RDF legislation, the expectation of legislators was that RDF grants would be used to support activities that could contribute to electricity generation. As we discuss in Chapter 2, it is reasonable to assume that the RDF's focus was on electricity-related projects, given that its source of funding was the ratepayers of an electrical utility. However, the RDF law did not (and does not today) explicitly address whether the funded projects must be related to electricity generation.

Since the RDF's creation,

- **The Legislature has broadened the Renewable Development Fund's allowable uses.**

Some legislatively authorized projects have not had a clear connection to creation of renewable electrical energy.

On occasions when the Legislature has allocated RDF funds to the University of Minnesota, it has specified in law lists of topics that the University "shall" or "may" research. Some of these topics have gone beyond the RDF's original purpose regarding "development of renewable energy sources." For example, the 2003 Legislature directed the University to research possible substitutes for chemicals and materials made from fossil fuel.[38] Similarly, the Legislature later authorized the University to conduct research related to energy conservation.[39] Activities to promote alternative product materials and energy conservation are different than activities to develop *sources* of renewable energy.

In addition, the Legislature has authorized the use of RDF funds for some individual projects that do not have a clear connection to the RDF purpose stated in *Minnesota Statutes*, 116C.779. The largest single RDF expenditure ($10 million) occurred in response to a legislatively authorized project that was intended to rely significantly on a form of nonrenewable energy (coal).[40] In addition, we reviewed RDF-funded initiatives passed by the Legislature between 2007 and 2009 and concluded that about one-third of these were not consistent with a strict interpretation of the Renewable Development Fund's statutory purpose.[41] For example, the Legislature used the RDF to fund "green"

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[37] *Laws of Minnesota* 1999, chapter 200, sec. 1. The law said (and still says today): "Expenditures from the account may only be made after approval by order of the public utilities commission upon a petition by the public utility."

[38] *Laws of Minnesota* First Special Session 2003, chapter 11, art. 2, sec. 18.

[39] *Laws of Minnesota* 2007, chapter 57, art. 2, sec. 3, subd. 6(8), appropriated $3 million to the University of Minnesota "for purposes set forth in *Minnesota Statutes* section 216B.241, subd. 6." *Laws of Minnesota* 2007, chapter 57, art. 2, sec. 21, amended *Minnesota Statutes* 2006, 216B.241, subd. 6 to include energy conservation and energy efficiency activities.

[40] *Laws of Minnesota* First Special Session 2003, chapter 11, art. 4, sec. 1. The law made eligible for RDF funding a project "that makes use of an innovative generation technology utilizing coal as a primary fuel" (subd. 1).

[41] For this analysis, we interpreted the purpose of the RDF to be generation of electricity from renewable sources. Research, planning, or administrative activities unrelated or weakly related to this purpose were considered outside of the RDF's intended scope.

manufacturing and jobs initiatives,[42] and to conduct a site evaluation of the St. Paul Ford vehicle manufacturing plant for possible uses.[43] Also, the Legislature used RDF funds to conduct several studies pertaining to a carbon emissions trading (sometimes known as a "cap-and-trade") program.[44] Such initiatives may be worthwhile activities. Nevertheless, it is unclear how these projects would contribute to the *development* of renewable energy sources, so they represent a broadening of the RDF's uses. In addition, as we discuss further in Chapter 2, some projects funded with RDF dollars have related to renewable energy but not to electricity generation. For example, the Legislature funded various projects to explore innovative automobile technologies, including plug-in hybrid electric vehicles that could actually *increase* the use of electricity.[45]

It is worth noting that the Public Utilities Commission, with input from various stakeholders, adopted its own mission statement for the RDF in 2006. According to the PUC's order,

> The overall purpose (mission) of the fund 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 and stimulate research and development into renewable technologies that support this mission.[46]

This mission statement is somewhat more detailed than the statutory language, and it does not apply to RDF projects overseen by agencies other than the PUC. Also, this statement does not explicitly address whether RDF projects should be related to the development of electrical energy, although (as we discuss in Chapter 2) the PUC's requests for RDF proposals have made projects unrelated to electricity ineligible to receive RDF grants.

The RDF's focus on "research and development" activities is unusual among states' renewable energy funds.

The PUC mission statement says that one purpose of the RDF is to stimulate research into renewable energy technologies. Appendix A discusses the stages of technology development, ranging from concept development to the actual application of viable technologies. The activities leading up to the actual deployment of a technology are often referred to as the "research and development" stages. We found that:

- **Minnesota is one of a limited number of states that have created funds for the purpose of renewable energy "research and development."**

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[42] *Laws of Minnesota* 2008, chapter 363, art. 6, secs. 3 and 11-12.

[43] *Laws of Minnesota* 2008, chapter 363, art. 6, sec. 3, subd. 4.

[44] *Laws of Minnesota* 2008, chapter 340, secs. 3-5.

[45] *Laws of Minnesota* 2007, chapter 57, art. 2, sec. 3, subd. 6(4).

[46] Public Utilities Commission, *Order Adopting Process and Operational Improvements, Ending Time Restriction on Administrative Expenditures, and Requiring Further Filings* (Docket No. E-002/M-00-1583), October 5, 2006, 9.

A 2004 review by staff at the Lawrence Berkeley National Laboratory said nine states had funds that "offered support to research and development of new clean energy technologies."[47] The report said that three of these funds—including Minnesota's Renewable Development Fund—"have arguably been the most aggressive in pursuing [research and development] activities."[48] National experts told us that Minnesota's RDF—along with programs in California and New York—remain the most noteworthy state-level, renewable energy research and development programs today. They said that most states' efforts in renewable energy have been focused on deployment of proven technology, not on "early-stage" research of renewable energy technologies.

Individual RDF projects typically explore a limited part (rather than the full range) of a particular technology's development. However, as we discuss in chapters 2 and 3, the RDF has funded a wide variety of projects—some addressing the early stages of technology development, some addressing later stages, and some that use proven technologies to actually produce electricity.

[47] Garret Fitzgerald, Ryan Wiser, and Mark Bolinger, *A Survey of State Clean Energy Fund Support for Research and Development Projects* (Berkeley, CA: Berkeley Lab and Clean Energy States Alliance, October 2004), 1.

[48] *Ibid.*, 2.

2 Project Selection and Oversight

Since 2001, the Renewable Development Fund (RDF) has been the revenue source for about 200 grants and legislative initiatives. The process for choosing grant recipients can have an important impact on the overall success of the RDF program.

This chapter begins with background on the project selection process for RDF grants, including changes over time and aggregate data on the grants awarded.[1] We then provide our assessment of the administrative processes used to select projects to receive grants. Finally, we discuss a number of issues related to project selection and oversight that, in our view, deserve the attention of the Legislature and administering agencies.

BACKGROUND

As provided for in state law, the first RDF projects were all approved by the Public Utilities Commission.

In 1999, the Legislature authorized a relatively simple process for the expenditure of RDF funds. At that time, the Legislature adopted statutory language that said: "Expenditures from the [RDF] may only be made after approval by order of the public utilities commission upon a petition by the public utility."[2] Initially, RDF expenditures occurred only after the Public Utilities Commission (PUC) approved projects that had been proposed in response to PUC-authorized solicitations.[3]

But, as noted in Chapter 1, the Legislature has increasingly designated the uses of RDF revenues. In some cases, the Legislature has directly specified projects for which the RDF must be used. In other cases, the Legislature has allocated funds to entities other than the PUC, and these entities have determined which applicants for RDF funding should receive grants. Due to these legislative directives,

- **Administrative responsibility for selection and oversight of RDF projects has grown more diffuse.**

[1] This chapter focuses on the selection and oversight of RDF grants; it does not examine the RDF payments made under the Renewable Energy Production Incentive program (described in Chapter 1). According to *Minnesota Statutes* 2009, 16B.97, subd. 1, grants involve payments to grantees "to support a public purpose authorized by law." Grants are not primarily intended for the benefit or use of the granting agency.

[2] *Laws of Minnesota* 1999, chapter 200, sec. 1.

[3] As required by law, Xcel Energy made project recommendations to the PUC, and the PUC acted on these recommendations.

Today, there is fragmented responsibility for RDF project selection and oversight.

Table 2.1 shows key changes in responsibilities for project selection and oversight since 2001, when proposals for RDF grants were first solicited. During this time, the PUC has approved RDF grants totaling $62.5 million, all administered by Xcel Energy.[4] But statutes now give the University of Minnesota's Initiative for Renewable Energy and the Environment responsibility to administer the RDF funds it has been legislatively allocated, and the Department of Commerce's Office of Energy Security administers legislatively mandated grants and the Renewable Energy Production Incentive (REPI) program. Since 2003, legislative actions have resulted in RDF allocations of $28 million for grants administered by the Department of Commerce and University of Minnesota, plus $66.5 million for REPI payments.[5]

Table 2.1: Administrative Responsibilities for Project Selection and Oversight, 2001 and 2010

	2001	2010
Project Selection	• Public Utilities Commission[a]	• Public Utilities Commission[a] • University of Minnesota • Department of Commerce[b]
Project Oversight	• Xcel Energy	• Xcel Energy • University of Minnesota • Department of Commerce

[a] The Public Utilities Commission is responsible for final approval of projects recommended by the RDF Board and Xcel Energy.

[b] The Department of Commerce's project selection is sometimes done with assistance from other agencies, such as the Department of Agriculture or the Department of Employment and Economic Development.

SOURCE: Office of the Legislative Auditor.

State law still says that RDF expenditures may only be made after approval by the PUC. However, PUC officials told us the commission has neither the authority nor staffing to oversee legislatively mandated projects. Thus, the commission does not second-guess projects authorized by the Legislature (including projects funded through the legislative allocations of RDF funds to the University of Minnesota). Rather, Xcel Energy annually provides the commission with information on forecasted expenditures, reflecting the PUC's own project selections and those that are legislatively authorized, and the entire forecast is approved by PUC order.

Overall, the Legislature's increasing role in directing the use of RDF funds has reduced the extent to which RDF expenditures are determined through the PUC's project approval process. In 2003, the RDF Board recommended that the PUC issue new requests for proposals (RFPs) after the "substantial completion of the

[4] This total does not include (1) grant awards that have been returned to the PUC and (2) grants for three projects for which contract negotiations were not concluded as of August 2010.

[5] Of the $66.5 million allocated by the Legislature for REPI, expenditures through mid-2010 had totaled about $55 million.

prior cycle," possibly every two years.[6] However, after issuing RFPs in 2001 and 2003, the third RFP was not issued until 2007. The PUC has yet to issue a fourth RFP. Xcel staff told us the RDF Board waits until it has a critical mass of uncommitted dollars (between $18 and $25 million) in the RDF before recommending the issuance of a new RFP, and they said a new RFP has been deferred due to the limited funds available for new projects.

Number and Size of RDF Grants

Since the RDF was established in 2001, it has funded all or part of 201 projects and initiatives (excluding the REPI program).[7] Appendix B contains descriptive information on each of these projects, and Table 2.2 provides summary information.

As Table 2.2 shows, the grants approved by the PUC and administered by Xcel Energy have tended to be much larger than those administered by the University of Minnesota or the Department of Commerce. This partly reflects the different

Since 2001, more than $90 million in RDF grants have been awarded.

Table 2.2: Number and Amounts of Renewable Development Fund Grants, 2001-2010

	Number of Grants Awarded	Total Grant Amount	Average Grant Amount	Median Grant Amount
Public Utilities Commission and Xcel Energy	59[a]	$62,501,690	$1,059,351	$924,671
University of Minnesota	95	17,279,867	181,893	70,000
Department of Commerce	47	10,622,310	226,007	150,000
All Grants	201	$90,403,867	$ 449,770	$244,700

NOTES: Projects that are in progress may not yet have received all of their allotted grant funds. For the PUC/Xcel and Department of Commerce projects, the dollars shown reflect the grant awards approved for projects rather than dollars actually spent to date. The University of Minnesota's data on grant amounts are based on actual expenditures for some of the completed projects; in other cases, the University's data reflect the original grant amounts. Payments made under the REPI and solar rebate programs are not included in this table. Project numbers are current as of June 2010.

[a] The number of projects reflects all projects that have been approved by the PUC and for which Xcel Energy and the grantee have successfully negotiated contracts.

SOURCE: Office of the Legislative Auditor, analysis of project data from Xcel Energy, the University of Minnesota's Initiative for Renewable Energy and the Environment, and the Department of Commerce.

[6] Public Utilities Commission, *Staff Briefing Papers: In the Matter of a Request of Northern States Power d/b/a Xcel Energy for Approval of a Renewable Development Fund Oversight Process* (Docket No. E-002/M-00-1583), June 26, 2003, 22.

[7] Some of these projects have had revenue sources in addition to RDF grants, such as private investments or grants from other sources.

limits established by the administering agencies. Since 2003, PUC-approved grants have been limited to $2 million for energy production projects and $1 million for research and development projects. The University, on the other hand, limits its large grant awards to $750,000. In addition, the University places limits on certain types of smaller grants. "Seed grants" (up to $70,000) are intended to support initial research that might later attract larger grants. Starting in 2009, the University also accepted proposals for "early career" grants of up to $150,000; these grants are designed to support faculty in the early stages of their careers. The Department of Commerce administers most of the legislative RDF grant initiatives, and these initiatives sometimes specify in law the grant recipient and award amount. For other cases, the department has not set a standard limit applicable to all awards.

Project Types

"Research and development" has been the focus of most RDF grants.

According to Minnesota law, RDF funds "may be expended only for development of renewable energy sources."[8] To this end, the PUC established two project categories: (1) energy production and (2) research and development.[9] All of the projects approved by the PUC and administered by Xcel have fallen into one of these two categories, as have most of the projects administered by the University of Minnesota and the Department of Commerce. On the whole, we estimated that 77 percent of all projects supported with RDF funds have been research and development projects, while 14 percent have been energy production projects and 9 percent have been other types (mainly projects that are more administrative, educational, or policy-related in nature). Research and development projects have accounted for 55 percent of all RDF grant awards (in dollars), while energy production projects have accounted for 40 percent.

The RDF has funded more projects related to biomass than to any other renewable energy source. We estimated that, since the inception of the fund, 46 percent of all projects (and 41 percent of all RDF grants, in dollars) have been biomass-related.[10] Table 2.3 shows the number of projects relating to each of the primary renewable energy sources.

Locations of Grantees

State law says that preference for RDF projects must be given to development of renewable energy source projects "located within the state." Appropriately, 86 percent of all approved RDF grants have been awarded to grantees based in Minnesota. This largely reflects the high percentages of Minnesota-based

[8] *Minnesota Statutes* 2009, 116C.779, subd. 1(a).

[9] The energy production category is intended to fund projects that create newly constructed renewable energy facilities or refurbish existing facilities, resulting in the production of renewable energy. The research and development category funds projects focused on improving knowledge and application of new or experimental renewable energy technologies.

[10] The PUC's requests for proposals have encouraged the submission of biomass projects by stating an explicit preference for them or by placing limits on other technologies that are already viable. For instance, the RFPs have increasingly limited the eligibility of wind projects, due to the commercial viability of wind technologies.

Table 2.3: Renewable Development Fund Grant Projects by Energy Source, 2001-2010

	Total Number of Projects	Percent	Number of Projects Administered by: Public Utilities Commission/ Xcel Energy	University of Minnesota	Department of Commerce
Biomass	92	46%	31	45	16
Solar	34	17	12	19	3
Wind	20	10	11	7	2
Conservation	12	6	0[a]	6	6
Other	43	21	5	18	20
All Grants	201	100%	59	95	47

NOTES: "Conservation" refers to projects that focused not on development of renewable energy but instead on conserving energy or using it more efficiently. "Other" includes projects relating to hydroelectric energy, geothermal energy, hydrogen production, or a combination of energy sources. It also includes projects in which the energy source was not clear in the project descriptions we reviewed, as well as projects entirely unrelated to renewable energy or energy conservation. Project numbers are current as of June 2010.

[a] RFPs issued for the PUC's project approval process have explicitly disqualified projects related to energy conservation from consideration.

SOURCE: Office of the Legislative Auditor, analysis of project data from Xcel Energy, the University of Minnesota's Initiative for Renewable Energy and the Environment, and the Department of Commerce.

Eighty-six percent of RDF grants have been awarded to grantees based in Minnesota.

contractors for grants administered by the University of Minnesota (100 percent) and Department of Commerce (96 percent). At the University of Minnesota, RDF grants are only available to projects submitted by the University's researchers. In the case of the Department of Commerce-administered projects, many of these projects have been explicitly directed in statute to focus on Minnesota issues or to have Minnesota contractors—thus, it is not surprising that most of the contractors for these projects have been Minnesota-based.

In contrast, the PUC has awarded a smaller percentage of its RDF grants—56 percent—to projects with Minnesota-based entities as the primary contractor. PUC criteria have given highest priority to Minnesota-based projects, but PUC solicitations have attracted many grant proposals from around the country.[11]

ADEQUACY OF PROJECT SELECTION PROCESSES

Appendix C provides brief summaries of the processes that have been used to award grants by the PUC, University of Minnesota, and Department of Commerce. To help us evaluate RDF project selection and oversight practices, we considered requirements for grants management in state law and policy.

[11] For "energy production" projects, each of the PUC's RFPs has stated a preference for projects located in Minnesota or within Xcel Energy's Minnesota service area. For "research and development" projects, the PUC's first two RFPs stated a preference for Minnesota projects, but the third did not.

Since 2008, the Minnesota Department of Administration has adopted policies on topics such as RFPs, criteria for awarding grants, and the use of grant agreements.[12] These policies apply only to state agencies, including the Department of Commerce. The University of Minnesota and Xcel Energy are not required to comply with these policies. Also, many RDF grants were awarded before the adoption of these policies. Nevertheless, the state's grants management policies provide a worthwhile benchmark for evaluating RDF practices.

In our view,

- **RDF grants have generally been awarded on the basis of reasonable project selection processes.**

For the most part, RDF administrative agencies follow good practices when soliciting proposals and selecting grantees.

We observed that the various entities administering RDF grants have generally used reasonable procedures to solicit project proposals. For example, we found that the RFPs for competitive grants typically (1) were consistent with statutory language, (2) described the specific purposes and priorities for a given round of grants, (3) described what constituted a complete application, (4) described the criteria used to rank or score the proposals, and (5) described the overall process for evaluating and selecting projects. Also, we observed that, during competitive processes for awarding grants, the administering agencies have usually used outside experts to help evaluate or rank proposals. For example, the PUC's project approval decisions have taken into account detailed reviews of proposals conducted by a technical consulting firm, and the University of Minnesota has used external reviewers (for instance, from other universities) to help select projects for its larger RDF grants.

Later in this chapter, we note some aspects of grants management practices used by RDF administrative entities that have been inconsistent or inadequate. Also, some questionable projects have been selected for RDF funding, despite the use of appropriate procedures to solicit proposals. For example, later discussions in this report note some RDF-supported projects that have not provided Minnesota-specific benefits or did not accomplish what was originally proposed. For the most part, however, we concluded that RDF administrative agencies have made good faith efforts to solicit and select projects that align with legislative directives.[13]

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[12] See Minnesota Office of Grants Management, http://www.admin.state.mn.us/ogm. Laws passed in 2007 codified grants management processes and practices for state agencies and required the Department of Administration to "create general grants management policies and procedures that are applicable to all executive agencies" (*Laws of Minnesota* 2007, chapter 148, art. 2, sec. 22).

[13] We did not systematically analyze the cost-effectiveness of RDF projects. Thus, while we concluded that there have generally been reasonable processes for awarding RDF grants, it is possible that some of the technologies researched in these projects have limited economic viability (based on the cost of the energy they can generate). The technical consultants we hired also questioned the cost-effectiveness of some RDF research projects they reviewed, in light of the size of the projects' grants and our consultants' assessment of the value of the projects' final products.

ISSUES NEEDING ATTENTION

Role of RDF Board

In 2001, the PUC ordered the creation of the RDF Board, largely to help administer its project selection process. According to this order, the board's responsibilities included "developing a Request for Proposals (RFP) based on the selection criteria, applying the selection criteria, and assisting in the selection of winning bidders."[14] The RDF Board was not recognized in state law until 2007, when *Minnesota Statutes* 2006, 116C.779, subd. 1, was amended to reference a "renewable development fund board." The language, which is still in effect today, suggests that the board has a role in evaluating RDF project proposals. However,

- **State law does not adequately specify the nature and purpose of the RDF Board.**

State law mentions the RDF Board but does not clearly define its role.

The law does not explicitly define the board or its role. The RDF Board is only mentioned once, and yet this reference reads as though the board's role has been established elsewhere in law. Specifically, the law says that Xcel Energy may apply for RDF grants, but its proposals "must be evaluated by the renewable development fund board in a manner consistent with that used to evaluate other renewable development fund project proposals."[15] Besides this implication that the RDF Board evaluates project proposals, the law is silent on the board's role, as well as its relationship to the PUC, Xcel Energy, and the selected grantees.

Without clarity in the statute, there is room for misinterpretation of the board's role. Xcel Energy's RDF Web site says that "the RDF is governed by" the RDF Board and that the board "selects proposals for grant funding."[16] Xcel's most recent biennial report to the Legislature characterizes the board somewhat differently: "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 [Public Utilities] Commission."[17] In practice, the latter is more accurate; the RDF Board makes project recommendations to Xcel Energy, which then submits proposals to the PUC for approval.

The scope of the RDF Board's role in project selection and oversight is also not directly addressed by state law. In practice, the RDF Board assists with selection and oversight of projects under the purview of the PUC, but it plays no role in

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[14] Public Utilities Commission, *Order Adopting Proposal for Oversight and Operation of Renewable Development Fund* (Docket No. E-002/M-00-1583), April 20, 2001, 9.

[15] *Minnesota Statutes* 2009, 116C.779, subd. 1.

[16] Xcel Energy, "Renewable Development Fund," http://xcelenergy.com/rdf, accessed August 11, 2010.

[17] Xcel Energy, *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*, (Minneapolis, 2010), 6.

projects administered by the Department of Commerce or the University of Minnesota.

Finally, state law does not address the RDF Board's composition or terms of its members. The board now has seven members: two representing environmental organizations, two representing Xcel Energy, one representing the Prairie Island Indian Community, and two representing Xcel ratepayers. The initial PUC order establishing the RDF Board required that the board have "equal numbers" of members representing environmental organizations and Xcel Energy, but it did not specify what those numbers should be. A subsequent order (2003) implied that Xcel and environmental organizations should each have two appointees when it ordered the addition of a single representative of the Prairie Island Indian Community, expanding the board to "five members." In 2006, the PUC ordered the addition of the two most recent board members, one representing residential ratepayers and one representing commercial ratepayers. Despite the PUC's continuing direction on board composition, there are no written procedures for selecting new members, and members' terms are open-ended rather than of defined length. In addition, although PUC orders refer to RDF Board members appointed by "the environmental community," the orders do not specify who has authority to make these appointments. In Chapter 4, we recommend that the Legislature clarify the RDF Board's composition and role.

State law does not address the RDF Board's composition or terms of its members.

In our view, one of the strengths of the PUC project approval process—and specifically, the PUC's solicitation of advice from an RDF Board—are its opportunities for input from representatives of Xcel Energy ratepayers. As noted in Chapter 1, Xcel Energy ratepayers bear the cost of RDF projects. But, in contrast to the PUC project approval process,

- **Representatives of Xcel Energy ratepayers have not been formally involved in the RDF project selection processes for legislatively mandated projects or the University of Minnesota.**

In Chapter 4, we suggest that the Legislature consider ways to ensure that RDF projects are consistently selected through a process that provides opportunities for input from ratepayers.

Intended Purpose of RDF Projects

Minnesota law provides limited guidance regarding the types of projects that may be funded from the RDF. During our review of RDF projects, we became aware of two areas in which the statutes might benefit from greater clarity. In Chapter 4, we suggest that the Legislature consider clarifying these issues through the adoption of statutory criteria for RDF projects.

Relationship of Projects to Electricity Production

In Chapter 1, we noted that Xcel Energy electricity ratepayers are the source of funding for the RDF. However,

- **State law does not specify whether RDF projects must relate to production of electricity, and funded projects have varied in the extent to which they do so.**

Since the creation of the RDF, the law has specified that RDF funds "may be expended only for development of renewable energy sources."[18] The two most recent requests for RDF proposals authorized by the PUC stated that "projects that apply to or emphasize energy use or conversion applications other than electricity production" were ineligible for RDF funds.[19] This policy reflects the commission's belief that a fund supported directly by electricity ratepayers should be used only for projects with potential to provide direct benefits to those ratepayers. The PUC-authorized RFPs have not applied to projects administered by the University of Minnesota or Department of Commerce. In fact, many of the RDF projects overseen by the University and Department of Commerce have not been intended (or required) to contribute to electricity production.

Many RDF projects overseen by the University of Minnesota or Department of Commerce have been unrelated to electricity generation.

In the case of the University of Minnesota, the Legislature has supplemented the original RDF statute with language that outlines authorized uses of the RDF by the University. Table 2.4 shows the current language. This language does not directly specify whether the funded projects must contribute to electricity production, but several of the categories appear to authorize projects *not* related to electricity production. For example, the University of Minnesota is authorized to fund projects that focus on energy conservation, energy storage, or analysis of policy options. In addition, the University has authorized a number of RDF-funded projects related to renewable vehicle fuels. In earlier years, the statutory language authorized the University to fund projects related to "development of environmentally sound production, distribution, and use of energy, *chemicals, and materials* from renewable sources" (emphasis added).[20] Thus, the University used RDF funds for several projects related to development of products (such as

Table 2.4: Activities That the University of Minnesota May Fund From Its RDF Allocation

Activities funded by the Legislature's grants from the RDF to the University of Minnesota's Initiative for Renewable Energy and the Environment may include, but are not limited to:

- Environmentally sound production of energy from a renewable energy source, including biomass and agricultural crops;
- Environmentally sound production of hydrogen from biomass and any other renewable energy source for energy storage and energy utilization;
- Development of energy conservation and efficient energy utilization technologies;
- Energy storage technologies; and
- Analysis of policy options to facilitate adoption of technologies that use or produce low-carbon renewable energy.

SOURCE: *Minnesota Statutes* 2009, 116C.779, subd. 3.

[18] *Minnesota Statutes* 2009, 116C.779, subd. 1(a).

[19] Xcel Energy, RDF requests for proposals, December 30, 2003 and May 16, 2007.

[20] *Laws of Minnesota* First Special Session 2003, chapter 11, art. 2, sec. 18.

polymers) made from renewable materials rather than petroleum. In 2006, Xcel Energy estimated for the PUC that only 28 percent of the projects that had been funded through the University of Minnesota's RDF allocation were related to electricity production.[21]

In addition, the Legislature has mandated the use of RDF funds for a variety of specific projects in recent years, and some of these were not directly related to electricity production. In Chapter 1, we noted that a number of these projects were not consistent with the original RDF statute. For example, the Legislature has authorized projects intended to improve vehicles' ability to use electricity; these projects were not intended to produce energy. Likewise, it is unclear how legislatively mandated projects to develop a "green economy" report, for example, would relate to electricity production.

Again, the issue for the Legislature to consider is whether funds generated by the ratepayers of an electrical utility should be used exclusively for purposes related to electricity generation. In this regard, the PUC has held project proposals to a standard that legislatively mandated projects and University of Minnesota projects have not had to meet. Also, electricity ratepayers are represented on the RDF Board, which provides advice on project selection to Xcel Energy and the PUC, but there are no formal provisions for ratepayer input in the case of projects administered by the University of Minnesota, Department of Commerce, or other recipients of legislative RDF allocations.

Xcel ratepayers are not formally represented in many decisions about RDF projects.

Project Benefits That Directly Relate to Minnesota

A second issue regarding the purpose of RDF projects is the extent to which these projects provide benefits that are unique to Minnesota or the ratepayers who pay for the program. We observed that:

- **Many RDF projects have conducted broad, early-stage research that, while potentially important in the advancement of general knowledge about renewable energy, have not focused on Minnesota-specific applications.**

Earlier, we noted that state law says "preference must be given to development of renewable energy source projects located within the state," and we said that 86 percent of RDF projects have been awarded to Minnesota-based grantees.[22] However, we also considered whether the research itself had some sort of Minnesota-specific application. For this analysis, we examined RDF projects to see whether they: (a) were conducted in direct cooperation with a specific

[21] Xcel Energy, *In the Matter of the Request of Northern States Power Company d/b/a Xcel Energy for Approval of a Renewable Development Fund Oversight Process: Compliance Report* (Docket No. E002/M-00-1583), November 14, 2006, 3. Xcel said that all of the PUC-approved projects funded by the RDF had an intended outcome of eventual generation of electrical energy from renewable sources.

[22] *Minnesota Statutes* 2009, 116C.779, subd. 1(a). This provision could be interpreted to mean that preference should be given to projects conducted by Minnesota-based researchers or companies; alternatively, it could mean that preference should be give to projects that will directly foster development of renewable energy in Minnesota.

Minnesota company, test site, or facility; (b) addressed Minnesota-specific questions (for example, addressing the overall potential for biomass-based energy in Minnesota), or (c) used products that were grown or generated in Minnesota. By our estimates, about 58 percent of RDF projects had a specific Minnesota connection of this sort. All Department of Commerce-administered projects, about three-fourths of Xcel Energy-administered projects, and about one-fourth of University of Minnesota-administered projects had specific Minnesota connections (other than the location of the grantee).

Some RDF money has supported "basic science" research with no Minnesota-specific applications.

Examples of projects without Minnesota-specific applications included a number of studies authorized by the University of Minnesota and PUC that addressed basic scientific issues related to solar energy cells. These studies—with the ultimate aim of fostering more cost-effective solar technologies—undoubtedly have potential value in the renewable energy field. However, it is reasonable to ask whether it is prudent for a single state's ratepayers to bear their cost. We discussed the RDF-funded solar projects with the manager of the U.S. Department of Energy's solar energy technologies program. He expressed some surprise regarding these RDF projects, noting that many seemed as if they would be more appropriately pursued at the federal level. Likewise, we hired technical consultants to review two RDF-funded solar energy research projects, and they suggested that the projects seemed better suited to funding by the federal government rather than an individual state.[23]

There is room for debate regarding which types of research projects are most suitable for RDF funding. On one hand, state-authorized funding that supports early-stage, "basic science" research could help institutions like the University of Minnesota build and sustain its core capacities in the renewable energy field. Having this expertise might be an important state asset, even if the University's research projects do not lead to renewable energy technologies that uniquely benefit Minnesota companies or ratepayers. On the other hand, early-stage research often does not lead to commercial applications or scientific breakthroughs. It is worth asking whether there is sufficient accountability to Minnesota ratepayers for these types of projects, and Chapter 4 discusses options for ensuring that ratepayers are represented in RDF project selection decisions.

Finally, we note that some RDF-funded activities have directly served persons or businesses in Minnesota but outside the service area of Xcel Energy. According to a PUC order, the purpose of the RDF is to increase the market penetration of renewable energy projects, companies, and resources "in the Xcel Energy service territory."[24] However, Minnesota's REPI program (authorized by *Minnesota Statutes* 2009, 116C.779, subd. 2) is open to applicants throughout the state. Also, the PUC in 2003 gave the Minnesota Department of Commerce a grant to operate a solar energy rebate program that was open to applicants throughout the state. In contrast, the 2010 Legislature authorized a new solar rebate program

[23] The solar projects reviewed by our consultants were (1) "Solid State Titanium Solar Cells," which received a $935,000 grant from the PUC and (2) "Ink Jet Direct Write Solar Cells," which received a $253,000 grant from the University of Minnesota.

[24] Public Utilities Commission, *Order Adopting Process and Operational Improvements, Ending Time Restriction on Administrative Expenditures, and Requiring Further Filings* (Docket No. E-002/M-00-1583), October 5, 2006, 9.

funded by the RDF, but it limited rebate eligibility to Xcel Energy customers.[25] Again, it is worth asking whether there has been sufficient accountability to Xcel ratepayers in cases where project benefits have focused on companies or individuals outside the Xcel service area.

Inconsistencies in Project Administration and Oversight

Early in this chapter, we said that RDF grants have generally been awarded on the basis of reasonable project selection processes. However, our review of RDF grants management also indicated that:

- **RDF administrative entities' grant oversight practices are sometimes inconsistent, and some practices do not meet state agency standards for grants management.**

The University of Minnesota's grantees—unlike other RDF grantees—do not enter into written contracts.

One area of inconsistency is the use of "grant agreements." State policy requires state agencies to use written grant agreements that specify the legal relationship between the granting agency and the grantee.[26] We observed that Xcel Energy and the Department of Commerce enter into formal contracts with each RDF grant recipient, but the University of Minnesota does not.[27] In the case of University-administered grants, the terms of an RDF project proposal are accepted by the University in a brief "award letter" to grant recipients, and recipients are also subject to the University's accounting guidelines. However, the University does not enter into signed contracts with its grantees, and the University has generally provided grant recipients with fewer specifications than the other RDF administrative agencies regarding expected "deliverables," timeframes for project activities, and oversight activities by the administering agency. While the University of Minnesota is not required to comply with the state's grant policies, we think this is a noteworthy area of inconsistency in grant practices.

A second inconsistency in contract management practices has been the extent to which project performance has been linked to grant payments. We observed that the grant agreements developed by Xcel Energy and the Department of Commerce usually establish performance milestones and link payments to the contractors with achievement of these milestones. In contrast, the University of Minnesota provides grantees with funding up-front, although its award letters specify that, for multi-year projects, funding beyond the first year will depend on receipt of annual reports outlining progress and accomplishments. State grant

[25] *Laws of Minnesota* 2010, chapter 361, art. 5, sec. 3.

[26] Minnesota Department of Administration, Office of Grants Management, Policy 08-04, *Policy on the Use of Grant Agreements*, July 15, 2008.

[27] Every Xcel contract includes sections on reporting requirements, confidentiality, recordkeeping, and disputes, among other things. Xcel's contracts include a series of project-specific exhibits that detail project timelines, budgets, and research activities. The Department of Commerce has consistently used grant agreement templates developed by the Minnesota Department of Administration for state agencies, with particular emphasis on budgets, timelines, and reporting requirements.

policy says that "reimbursement is the preferred method for making grant payments," noting that advance payments are allowable "in certain situations."[28]

Many RDF-funded reports do not disclose the source of their funding.

Another administrative inconsistency has been the extent to which RDF project reports have disclosed the source of their funding. The most recent grant agreements administered by Xcel Energy have required RDF-related reports to include statements that the work occurred as a result of "funding from the customer-supported Xcel Energy Renewable Development Fund." In our view, such disclosures are an important way to inform readers about the role of RDF grants in these projects. Also, it is useful to clarify that the source of these grants is the ratepayers (or "customers") of Xcel Energy. The Department of Commerce and University of Minnesota do not require the reports they administer to contain such disclosures, and most of the RDF-funded reports administered by these entities do *not* mention the RDF and Xcel's electricity ratepayers.

A final inconsistency among RDF projects has been the extent to which their proposals or workplans addressed the expected impact of the research. Especially for the research and development projects administered by Xcel Energy and the University of Minnesota, it was sometimes challenging for us to determine whether the projects achieved their expected results. In some cases, this reflected the fact that research proposals and grant agreements did not adequately describe (1) the current level of knowledge or technological advancement in an area and (2) how this would be affected by the proposed research.[29] In contrast, most of the Department of Commerce projects were relatively narrow in scope or involved a single research stage, and tasks were well articulated in the grant agreement or workplan. For example, some projects involved a demonstration and test of specific technology to help measure its commercial viability.

Administrative Costs

Agencies that administer RDF grants (or administer the RDF account itself) incur costs for activities such as project selection, contract development, financial management, and grant oversight. However,

- **State law does not explicitly address whether—and which—administrative costs can be paid for from the RDF.**

The agencies with RDF oversight or administrative responsibilities have addressed administrative costs in different ways. The PUC has adopted a broad policy that authorizes expenditure of RDF funds for Xcel and the RDF Board to

[28] Minnesota Department of Administration, Office of Grants Management, Policy 08-08, *Policy on Grant Payments*, March 24, 2009.

[29] Appendix A provides one example of a framework that describes the sequence of steps typically followed in development of a technology or product.

evaluate project proposals and "to monitor and evaluate the RDF."[30] Xcel's administrative expenditures have included the costs of administrative staff, the consultants used to review grant proposals, certain membership dues, and printing costs. Xcel officials told us that their company has not sought RDF reimbursement for overhead costs related to office space, computers, telephones, accounting services, and legal services.

Xcel Energy and the University of Minnesota have used RDF funds for administrative costs, while the Department of Commerce generally has not.

University of Minnesota officials told us that they do not have a specific definition of which administrative expenses can and cannot be reimbursed from the RDF. In general, however, University officials said they have used RDF funds to pay for overhead costs that are not related to specific RDF projects. This has included certain costs for administrative staff salaries and benefits, travel, training, consultant services, outreach-related activities and sponsorships, and assessments by the University for overhead costs.[31]

While certain Xcel and University of Minnesota administrative costs have been paid for from the RDF, the Department of Commerce has rarely used RDF funds to cover costs related to its administration of RDF grants. Rather, the department has relied on its appropriations from the state general fund or special revenue funds to pay for most of these costs.

In addition, we found that:

- **Xcel Energy (and not the other administering agencies) is subject to a cap on its RDF-related administrative costs, although this cap has received differing interpretations.**

By PUC order, Xcel's administrative costs must not exceed 5 percent of its "total annual allocation." However, the method of calculating the percentage dedicated to administrative expenditures (and, thus, determining Xcel's compliance with the limit) has been subject to varying interpretations. The ambiguity lies in the term "total annual allocation," which was not defined by the PUC order. Xcel has defined the RDF's total annual allocation as all costs "which are incurred to support the overall RDF program."[32] This includes not only the grant payments made to PUC-approved RDF projects, but also payments to legislatively mandated programs that are administered by other agencies. Xcel has annually used this definition to calculate administrative costs in filings approved by the PUC. By this measure, Xcel's administrative expenses have typically been below 2 percent.

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[30] Public Utilities Commission, *Order Adopting Proposal for Oversight and Operation of Renewable Development Fund* (Docket No. E-002/M-00-1583), April 20, 2001, 9-10, and Attachment ("Renewable Development Fund Draft Selection Criteria"), 3-4.

[31] Outreach activities have included the University of Minnesota's financial support for renewable energy conferences or meetings, as well as costs related to student entries in competitions (such as construction of solar cars or solar houses).

[32] Xcel Energy, *In the Matter of the Petition of Northern States Power Company, a Minnesota Corporation and Wholly Owned Subsidiary of Xcel Energy Regarding Renewable Development Fund Annual Report, Tracker Account True-up and Request for New 2008 Rate Rider Factor* (Docket No. E-002/M-07-1274), October 1, 2007, 7.

The Department of Commerce—which reviews Xcel's administrative costs for the purpose of assessing the impact of the RDF on Xcel's rates—uses a different interpretation of "total annual allocation." The department has preferred to compare Xcel's administrative expenses to the cost of only the grants administered by Xcel, using the rationale that the grants administered by other agencies might not demand much time from Xcel staff. By this measure, Xcel's administrative costs have twice exceeded the 5 percent annual limit (see below).

Table 2.5 shows Xcel's annual administrative cost percentages since 2003, calculated by both methods.[33] These percentages vary considerably from year to year, partly reflecting the cyclical nature of the grant-making process. For example, in Table 2.5, Xcel's largest administrative costs as a percentage of its grant payments (15.1 percent in 2004, and 6.3 percent in 2008) were reported for the two years in which Xcel's grant payments were the lowest. Perhaps this reflects the fact that Xcel's activities related to project selection and

There have been differing interpretations of the PUC's policy that caps RDF administrative costs.

Table 2.5: Xcel Energy's Administrative Costs, Calendar Years 2003-2009

			Xcel Energy Administrative Costs		
	Grant Payments to PUC-Approved Projects[a]	All RDF Payments[b]	$	As a Percentage of Xcel's Grant Payments[c]	As a Percentage of All RDF Payments[d]
2003	$ 5,990,393	$ 16,028,178	$ 207,924	3.5%	1.3%
2004	2,259,576	3,772,587	342,320	15.1	9.1
2005	3,897,273	8,357,698	135,366	3.5	1.6
2006	6,942,092	14,957,873	188,681	2.7	1.3
2007	10,816,130	20,297,977	431,952	4.0	2.1
2008	3,586,863	20,260,556	225,703	6.3	1.1
2009	7,669,238	24,414,225	118,053	1.5	0.5
Total	$41,161,565	$108,089,094	$1,649,999	4.0%	1.5%

NOTES: Xcel staff told us that a "small amount" of Xcel's pre-2003 administrative costs were reported in 2003 for reimbursement by the RDF, but they did not know the exact amount. According to a PUC order, Xcel's administrative costs are not to exceed 5 percent of the RDF's "total annual allocation."

[a] This category includes grant payments made to PUC-approved projects plus administrative expenditures.

[b] This category includes grant payments made to PUC-approved projects plus administrative expenditures, as well as payments made for legislative mandates such as REPI, projects administered by the Department of Commerce, and grants administered by the University of Minnesota.

[c] Administrative costs were calculated as a percentage of RDF expenditures related to PUC-approved projects, including grant payments and administrative expenditures.

[d] Administrative costs were calculated as a percentage of RDF payments and disbursements made by any of the three RDF administering agencies, including grant payments, REPI payments, and administrative expenditures.

SOURCE: Office of the Legislative Auditor, analysis of data from Xcel Energy's filings to the Public Utilities Commission.

[33] A PUC staff member interpreted "total annual allocation" in yet another way: the amount of Xcel Energy's statutory obligation to the RDF in a given year ($19.5 million in 2009, for example). By this measure, Xcel's administrative expenditures have never exceeded 3 percent.

establishment of new contracts occur at a time when previously approved projects have mostly been completed (resulting in lower grant payments).

In contrast, the University of Minnesota provided us with administrative cost data summarized by project cycle, rather than by year. Specifically, the University reported that it spent 8 percent of its 2003 RDF appropriation on administrative activities, and it spent 2 percent of its 2007 appropriation on administrative activities. (As noted earlier, the University is not subject to a specific cap on RDF administrative spending.) For purposes of measuring compliance with limits on administrative spending, it may be preferable to consider administrative expenditures in the context of the grants awarded during the multi-year project cycle in which they were incurred—as the University has done. In Chapter 4, we recommend that the Legislature authorize the use of RDF funds for certain administrative costs and establish limits on these expenditures in law.

3 Project Impacts

Nationally, the goal of fostering increased use of renewable energy has been difficult to achieve. Despite considerable focus on alternative energy sources since the United States' "energy crisis" in the 1970s, renewable energy today accounts for a smaller share of electricity consumed in the U.S. than it did in 1973.[1]

The Minnesota Legislature has set goals for increased use of renewable energy, and the Renewable Development Fund (RDF) is one mechanism for helping the state achieve these goals. This chapter examines available information regarding the impact of RDF projects. It also evaluates the adequacy with which the results of these projects are communicated to potential users of the information.

DEVELOPMENT OF RENEWABLE ENERGY

RDF projects are supposed to help develop renewable energy sources.

According to Minnesota law, the purpose of the RDF is the "development of renewable energy sources."[2] To help us assess the impact of RDF projects, we reviewed documents that described projects' intentions and outcomes. Where available, we reviewed data on the amount of energy these projects produced. For some projects, we interviewed grant administrators or research managers; for some others, we contracted with technical experts to provide us with assessments of the projects and their impacts. Overall, we found that:

- **Many RDF projects have helped advance knowledge about renewable energy technologies, but a much more limited number of these projects have directly contributed to the deployment of renewable sources of electricity in Minnesota.**

The impact of grant projects on renewable energy development can be difficult to assess. First, while some RDF projects are intended to directly subsidize energy production, others are intended to have effects in a more indirect or long-term way—for example, by providing information that might some day help foster commercially viable energy sources. Appendix A discusses the stages of technology development—from initial ideas to commercial applications—and RDF projects vary in the parts of this process on which they focus. Second, grants for RDF projects are one of many factors that can affect the development of renewable energy sources. For example, research may demonstrate the feasibility of a particular technology, but capital costs, feedstock prices, or the costs of competing energy sources could affect whether (and when) it is

[1] According to our analysis of data from the U.S. Energy Information Administration, renewable energy accounted for 9.7 percent of electricity consumed in the U.S. in 2008, compared with 14.7 percent in 1973.

[2] *Minnesota Statutes* 2009, 116C.779, subd. 1(a).

developed commercially. Third, an RDF grant typically funds only a portion of the product development process, rather than taking a new technology all the way from its initial concept to commercialization. While it would have been useful to compare each project's achievements to its intended outcomes, we found (as discussed in Chapter 2) that some project workplans and contracts did not adequately characterize the level of progress that an individual project was intended to achieve.[3]

We think there is mixed evidence regarding the impact of RDF projects on renewable energy development, both for (1) energy production projects and (2) research and development projects. Furthermore, it is unclear whether Xcel Energy ratepayers' significant investment in the RDF has provided them with comparable benefits. In the sections below, we discuss project outcomes for RDF projects, and we offer aggregate data where available. Appendix B contains a list of all RDF-funded projects.

Energy Production Projects

The intent of some RDF expenditures has been to directly support energy production.

The RDF has contributed to direct production of electricity from renewable energy in two main ways: grants and incentive payments. First, RDF grants have been given to projects intended to create "a newly constructed renewable energy facility or a refurbishment of an existing renewable energy facility that results in an increase in the production of renewable energy."[4] Typically, these grants have been awarded in response to solicitations for proposals. Grant-funded energy production projects have accounted for 14 percent of all RDF grant projects and 40 percent of all dollars awarded through RDF grants. Over the past decade, RDF grants for energy production projects have totaled more than $36 million.

Second, the RDF also pays for Minnesota's Renewable Energy Production Incentive (REPI) program. This program was established in 1994, and it has been funded by the RDF since 2003. While RDF energy production grants aim to develop new energy-producing facilities or refurbish old ones, the REPI program provides payments to existing renewable energy facilities based on the amount of electricity they actually produce. Specifically, certain types of facilities can qualify for 1.0 to 1.5 cents per kilowatt-hour of electricity

[3] Requests for proposals often did not specify a framework that applicants could use to identify the current and proposed "stage of development" for a given technology, and proposals varied in how adequately they described this. In addition, based on samples we reviewed, the University of Minnesota's award letters for RDF grants usually had less specific information on expected "deliverables" than the grant agreements administered by Xcel Energy and the Department of Commerce.

[4] Public Utilities Commission, *Order Adopting Proposal for Oversight and Operation of Renewable Development Fund* (Docket No. E-002/M-00-1583), April 20,2001, Attachment ("Renewable Development Fund Draft Selection Criteria"), 1.

produced.[5] Since 2003, the RDF has funded about $55 million in REPI payments.

However, RDF grants and incentive payments have had limited impact on electricity produced in Minnesota.

Energy production projects funded by RDF grants and incentive payments have had a limited impact on electricity production in Minnesota. In part, this reflects the fact that RDF projects have been selected for a variety of reasons, not just on the basis of the amount of energy to be generated. Overall, we estimated that:

- **Electricity produced as a result of RDF energy production grants equaled less than 0.1 percent of the total electricity generated by Minnesota utilities in 2007.**

- **Electricity produced and sold by facilities participating in Minnesota's REPI program equaled about 1.5 percent of the total electricity generated by Minnesota utilities in 2007.**

While the electricity generation impact of the RDF grants has been very small, some of these projects—and the REPI program, too—have provided useful demonstrations of renewable energy applications. For example, a solar rebate program funded by RDF grants helped pay for the installation of 297 solar electric systems for qualifying residential and business customers in Minnesota between 2002 and mid-2010.[6] Also, legislatively mandated grants for on-farm anaerobic digesters have helped two small dairy farms create sufficient power to run their operations, plus some electricity sold for public use.

Energy production grants and REPI payments have also contributed to some environmental benefits. For example, Xcel Energy estimated that the six RDF energy production grants it administered during calendar years 2007 and 2008 accounted for 128,000 fewer pounds of carbon dioxide emissions than coal-generated energy would have produced. This was about 0.03 percent of Minnesota's total annual carbon dioxide emissions, a modest impact.[7]

On the other hand, some large investments of RDF funds in energy production grant projects have not achieved the intended results. For example, in 2005, a private company (Excelsior Energy) received a $10 million RDF grant—the largest single grant made from the RDF—to assist with development of a "clean

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[5] Participation in the REPI program has increased since the RDF began funding the program—from 96 facilities in 2003 to 210 currently enrolled facilities in 2010. Over the past eight years, REPI has paid incentives to a total of 216 Minnesota facilities—208 wind, 4 biogas, and 4 hydro—for generating renewable energy. Biogas is a byproduct of the anaerobic digestion of biomass.

[6] This program—administered by the Department of Commerce—was initially funded by a Public Utilities Commission RDF grant in 2003. The program subsequently received additional funding through legislative appropriations from the RDF. Department surveys of participants reported that most were satisfied with their solar electric systems.

[7] Xcel Energy, *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* (Minneapolis, 2010), 9. Minnesota's total carbon dioxide-equivalent emissions in 2006 totaled 152 million metric tons (Minnesota Department of Commerce and Minnesota Pollution Control Agency, *Progress in Addressing Climate Change, Biennial Greenhouse Gas Emissions Reduction Report and Annual GHG Legislative Proposal Report* (St. Paul, January 2009), 4).

Some large RDF expenditures for energy production projects have not achieved the intended results.

coal" plant.[8] The Public Utilities Commission (PUC) denied the plant's proposed purchase of power agreement in 2007, declaring that the proposed agreement was not in the public interest.[9] Unless Excelsior can secure an agreement ensuring that this plant can sell the power it generates, the project will probably not proceed to completion. Excelsior has already spent its entire $10 million RDF grant on plant engineering and permitting costs.

The second largest RDF grant ever authorized was for another energy production project that has stalled. In 2003, the PUC approved a $5.1 million grant for the Crown Hydro project, based on a proposal for development of a hydroelectric power plant near downtown Minneapolis. Developers of this project have spent $1.5 million in RDF funds on preliminary work. However, the Minneapolis Park Board—over a multi-year period—has not authorized a lease of its land for this project, and the park board currently has no plans to authorize this project at its proposed location. The Excelsior and Crown Hydro grants demonstrate that actions external to the RDF funding process can adversely affect projects that have spent significant amounts of RDF funds to produce energy. Although it is possible that these projects were approved with full understanding of external factors that could affect project success, we suggest in Chapter 4 that the process for determining the most worthy RDF project proposals should explicitly consider such factors.[10]

Finally, it is worth noting one other large energy production grant project that had an unsatisfactory conclusion. In that project, a disagreement between the grantee and host company led to the company refusing to provide the grantee with access to the work site.[11] The project incurred more than $1 million in RDF-funded expenses and never resulted in a final report.

Research and Development Projects

Research and development projects often focus on new or experimental technologies, and it can be challenging for public organizations to promote scientific progress. A 2007 report by the National Research Council concluded that: "No theory exists that can reliably predict which research activities are

[8] In 2003, the Legislature authorized in statute an "innovative energy project" that would use coal as a "primary fuel in a highly efficient combined-cycle configuration with significantly reduced… emissions from those of traditional technologies" (*Laws of Minnesota* First Special Session 2003, chapter 11, art. 4, sec. 1). The law specified that this project would be eligible for a $10 million RDF grant, subject to the approval of the entity administering the RDF. The RDF Board recommended against an RDF grant for the Excelsior project, but the Public Utilities Commission said in 2005 that the Legislature intended for this project to receive an RDF grant (barring unforeseen events), and it ordered that Excelsior be awarded this grant.

[9] According to the commission, "The terms and conditions of the proposed contract result in unreasonably high prices, which translate into unreasonably high rates." The State of Minnesota Court of Appeals concurred with the PUC's determination in a May 2010 decision.

[10] PUC staff told us that the park board initially indicated support for the Crown Hydro project, so the board's later objections to the project were unexpected.

[11] The grant—authorized by the PUC in 2002—was awarded to AnAerobics, Incorporated, and it was sometimes described as the "Waste to Renewable Energy" project.

most likely to lead to scientific advances or to societal benefit."[12] Analysts from the National Renewable Energy Laboratory have observed that: "[W]hile there is reasonable evidence in the literature that public [research and development] provides significant social return on investment, there is still no consensus on the impact of public [research and development] on the advancement of a technology into the market, [or] the time required for a technology to penetrate the market to a certain point."[13]

Not all RDF-supported projects were designed to create renewable energy.

Research and development projects have accounted for three-fourths of all RDF projects. However, when considering the impact of such projects on renewable energy generation, it is worth reiterating from Chapter 2 that certain RDF-funded research projects were never *intended* to create renewable energy. For example, the University of Minnesota has allocated RDF funds to various research projects that focused on energy conservation. It has also funded research aimed at the development of polymers made from renewable materials. The University has been authorized by state law to conduct such projects and perhaps these projects have made important contributions in their fields. However, projects focusing on energy conservation and polymers do not seem consistent with a program established to develop "renewable energy sources."[14] Likewise, the Legislature has mandated the use of the RDF for a number of projects that have not fostered development of renewable energy sources. For example, the Legislature has used the RDF to pay for a study of "cap-and-trade" emissions programs, processes to help citizens participate in community-based energy planning, and a project to test the efficiency of plug-in hybrid vehicles. These projects did not contribute to the generation of renewable energy.

Below, we discuss the extent to which RDF-funded research and development projects have contributed to the program's overall goal of fostering renewable energy sources.

Development of Useful Applications of Renewable Energy Technology

Many RDF research projects have aimed to find renewable energy technologies that can be put to use in "real world" situations. Some of the projects' proposals have set very ambitious goals, as indicated in the following examples:

> The proposed project seeks to design/develop a solar cell that would be significantly cheaper to produce than current wafer-

[12] Irwin Feller and Paul C. Stern, eds., *A Strategy for Assessing Science: Behavioral and Social Research on Aging* (Washington, D.C.: National Academies Press, 2007), 89. Parts of this report focused on the use of research related to aging issues, but some parts provided a more general commentary on the development and use of scientific information.

[13] Michal C. Moore, Douglas J. Arent, and Douglas Norland, "R&D Advancement, Technology Diffusion, and Impact on Evaluation of Public R&D," *Energy Policy* 35, n. 3 (2007): 1472.

[14] *Minnesota Statutes* 2009, 116C.779, subd. 1.

> based silicon solar cells, the mainstay of the photovoltaic industry.[15]
>
> It is anticipated that a group of technologies to produce energy and chemicals from widely available but under-utilized biomass will be developed. This will have a major impact on the production, use, and security of U.S. energy.[16]

The accomplishments of RDF-funded research and development projects have generally been more indirect and less dramatic than the ones suggested by these examples. We found that:

Some RDF grants have contributed to commercial development of new technology or patent applications.

- **The overall impact of RDF-funded research and development projects is unclear, as most have supported intermediate—rather than final—steps in the development of particular renewable energy technologies.**

In a limited number of cases, it appears that RDF projects have helped new technologies become commercially viable. For instance, a federal laboratory received a $1 million RDF grant and made progress in developing a type of solar cell.[17] The lab recently negotiated a license with a Texas-based firm that plans to produce this technology commercially. A principal investigator from this federal lab told us that development of the product "wouldn't have happened" without funding from Minnesota's RDF.

In addition, some grantees (but not most) have applied for patents as a result of their RDF research.[18] Grant recipients do not always intend to seek patents as a result of their RDF projects, but patent applications are one indication that a grantee is seriously pursuing a commercial application of a product or technology. Of the 28 closed, completed research and development RDF projects authorized by the PUC, 7 have resulted in patent applications.[19] Of the 46 closed projects the University of Minnesota funded from its 2003 RDF allocation from the Legislature, we are aware of 5 that have resulted in patent applications.[20]

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[15] Wayne L. Gladfelter and William H. Smyrl, "Ink Jet Direct Write Solar Cells: A Proposal to [the University of Minnesota's Initiative for Renewable Energy and the Environment]," 2005.

[16] Roger Ruan, "Development of Commercially Transferable Thermochemical Conversion Strategies," [Initiative for Renewable Energy and the Environment] Multi-Year Grants Cover Page, 2005.

[17] The PUC authorized this project, and the National Renewable Energy Laboratory received the grant.

[18] It often takes several years for the federal government to act on patent applications.

[19] In addition, one project still in progress has submitted a patent application. Also, several PUC-authorized projects are field testing existing patents.

[20] The University of Minnesota maintains a database on its RDF projects that includes information on patent applications. The University's database had information on patent applications for four RDF projects, and a former University of Minnesota project manager provided us with information on a patent issuance for which information was not recorded in the University's database.

Some RDF-funded demonstrations of technology applications at particular businesses or farms have provided potentially useful insights to similar operations elsewhere. For example, a $300,000 RDF grant helped a Minnesota food processing plant incorporate an anaerobic digester into its operations, leading to the production of energy from food byproducts. Our technical consultant said this research demonstrated a "good application" of a commercially available technology. He said that information on how the plant used the digester would probably be of interest to other food processing plants in the Midwest. Likewise, we heard positive comments about a $137,000 RDF grant that helped a Minnesota regional telephone company develop wind and solar back-up capabilities that could address power outages at remote locations. Several RDF Board members and Xcel staff said they were impressed by this project, noting that this technology has potential applications elsewhere (for example, by state parks or other phone companies).

But some RDF research projects have been, at most, a first step toward new energy technologies.

Many RDF research projects have made less tangible contributions than the examples discussed above. Even when RDF projects have contributed to existing knowledge about the feasibility and practicality of a given technology, such research often represents just one step toward the actual deployment of new technologies—and with no guarantees of eventual success. For example, a research manager for an RDF-funded project described the contribution of his work as follows: "This is good, old-fashioned, fundamental research that may one day produce a big benefit. It still is a bit early to tell."

In some cases, RDF research reports have helped to document problems with the economic viability of certain technologies. An RDF project developed a design and engineering plan that would allow an existing Xcel power plant to use whole trees as a fuel source, but Xcel rejected this option partly because the RDF research estimated that such a conversion would require significant capital expenditures. Another RDF project examined a process for "reforming" bio-ethanol and bio-methanol into hydrogen, but its results indicated that this process for creating electricity was more expensive than simply burning the fuels (without converting them to hydrogen).[21] There have also been cases in which RDF projects helped to advance knowledge about potential technologies, but subsequent research has indicated that these technologies would not be economical. For instance, one RDF project reported fairly positive findings regarding a technology to transform sugar beet tailings to energy, but further analyses obtained by the company producing the tailings led it to conclude that the costs of the process were too high.

Finally, it is worth noting that some RDF projects seeking useful applications of renewable energy technology have encountered unanticipated problems. For instance, one RDF project aimed to integrate a particular type of engine with a gasifier, but the engine manufacturer went out of business and the project's scope had to be modified. Another project explored the potential for generating power from biomass by integrating solid oxide fuel cells with gasification systems. However, the project was unable to procure fuel cells of the size originally

[21] A technical consultant who reviewed this project for our office questioned the underlying premise for this study, observing that there has been no serious consideration of using the examined feedstocks (ethanol and methanol) for electricity generation.

intended, and the power generated did not come close to achieving the project's intended cost per kilowatt-hour.

Overall, research into emerging renewable energy technologies is a legitimate focus of the RDF program, and there has been a wide range of outcomes from RDF projects. In part, this reflects the range of RDF projects and the differing stages of technology they have explored. Most RDF research projects have not directly led to commercial applications, but many have helped enhance knowledge about renewable energy technologies.

Academic Publications

Another way that RDF projects can help advance the development of renewable energy is through the publication of research findings. Not all RDF research projects have a goal of generating published articles on their research; some are more focused on demonstrating specific applications of technologies or products. Still, published research can be one way that the results of RDF projects are shared among potential users.

A limited number of RDF-sponsored projects have conveyed knowledge about renewable energy technologies through published articles.

We examined the number of academic publications (and resulting citations in other journals) relating to RDF research and development projects administered by Xcel Energy and the University of Minnesota.[22] It can take time for articles to be published in academic journals, so we limited our review to "closed" projects that were initiated in 2005 or earlier. We found that:

- **Some RDF research projects have resulted in multiple published articles (sometimes frequently cited by other researchers), but most projects have not resulted in publications.**

Of the 27 completed RDF research and development projects we examined that were administered by Xcel, 4 (14 percent) have resulted in publications.[23] The grantee for each of these projects was either a university or a national laboratory—no publications have so far resulted from projects conducted by private businesses or nonprofit organizations. Many of the published articles have had few citations in other journals, but the combined publications associated with one study (a project that examined low-band gap solar materials) have been referenced 63 times in other articles.[24]

Only one-fifth of the 46 completed University of Minnesota-administered RDF projects have generated published articles, but these articles have been more frequently cited in academic journals than those articles related to Xcel-

[22] The number of citations for articles were determined using the Science Citation Index Expanded and the Social Sciences Citation Index. Most of the projects administered by the Department of Commerce are in progress or have been completed recently—thus, we did not look for evidence of published research resulting from these projects.

[23] Three additional Xcel-administered projects, all being conducted by the University of Minnesota, are still in progress but have already resulted in published journal articles.

[24] Each of the four projects with publications had at least eight total citations in other journal articles.

administered projects.[25] Of the University's nine completed RDF research projects resulting in publications, all but one resulted in multiple journal articles. The median number (per RDF project) of citations of these articles in other journals was 24. Two studies (one that addressed the use of nanoparticles and nanowires in solar cells, and another on the optimization of microbial fuel cells) have been used very widely in their fields. In each case, the publications resulting from the projects have been cited in more than 170 other articles.

Additional Grants or Other "Leveraged" Funding

Some RDF projects have helped make possible subsequent research grants. For example, University of Minnesota researchers used two RDF grants to examine ways to convert (1) organic compounds to hydrogen and (2) waste carbohydrates to electricity. Subsequently, the University's proposal to continue this research received funding in a very competitive federal grant process, suggesting that outside experts perceived that this technology has high potential value.[26] Another University of Minnesota project funded by a $600,000 RDF grant assessed the potential of microwaving biomass. Our technical consultant told us that this technology shows promise as a potential source of energy and soil enhancements. Following completion of the RDF project, the University has continued to explore this technology with federal, state, and private grants.[27]

RDF grants sometimes leverage other grants or private investments.

Also, the costs of RDF-supported projects are sometimes shared by other grants or private investments. We reviewed data from the University of Minnesota on funds "leveraged" by its RDF projects while those projects were ongoing. The data indicated that the University's RDF projects have leveraged an additional $22 million in shared costs to date. This is equal to 128 percent of the University's RDF grants.

We examined similar data for projects administered by Xcel Energy. According to Xcel, the RDF projects it has administered have leveraged an additional $69 million in shared costs—through other grants or private investments that support the cost of these projects.[28] This is equal to 131 percent of the RDF grants administered by Xcel.

In addition, the Department of Commerce requires some RDF grant recipients to provide matching funds as a condition of the award. As of mid-2010, the RDF projects administered by the department had leveraged more than $14 million. This is equal to 133 percent of the RDF grants administered by the department.

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[25] Three additional projects administered by the University are still in progress but already have been the subject of published journal articles.

[26] The University of Minnesota's proposal received a $2.2 million federal grant from the Advanced Research Projects Agency-Energy (ARPA-E) in 2009. Initially, there were 3,700 proposals for this round of ARPA-E grants, and 37 were selected for funding.

[27] According to the University, this project has leveraged more than $3 million in grants from non-RDF sources.

[28] Based on data provided to the Office of the Legislative Auditor by Xcel Energy in July 2010, for projects under contract with Xcel Energy (but not including the Excelsior Energy project).

Information on leveraged funds should be interpreted with caution, however. It can be difficult to (1) conclusively determine that an RDF grant "caused" other investments; and (2) determine what non-RDF public and private investments would have occurred in the absence of the RDF grants.

COMMUNICATION OF PROJECT RESULTS

Clear communication of RDF project results is important for two reasons. First, this provides accountability to the Xcel ratepayers (who fund the projects) and the general public. Second, good communication of results can be an important part of "technology transfer"—that is, getting others to use and apply the research results.

We first examined whether there has been adequate public communication regarding the RDF program as a whole. We found that:

- **Public reporting on the RDF has not provided the Legislature or public with a comprehensive picture of fund-related activities or impacts.**

No single report has presented a clear, consolidated picture of all RDF activities.

This partly reflects the fact that RDF projects have been administered by multiple entities. While some of these entities have prepared reports focusing on their own RDF-related activities, no single report has presented a clear, consolidated picture of all RDF activities.

Among the entities that administer RDF projects, Xcel Energy has presented the most complete summary of its own activities. For example, Xcel's most recent report on the RDF has a listing of all projects it administered that were active during a recent two-year period.[29] The report also makes some estimates of the economic, environmental, and educational impacts of the RDF projects it administered.[30] Unfortunately, the report does not clearly convey to its readers that it is presenting information on only a portion of the projects funded by the RDF.[31]

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[29] Xcel Energy, *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*, (Minneapolis, 2010), Appendix A. This report presented information on projects that were active during calendar years 2007 and 2008.

[30] The conclusions reached about some of these impacts are debatable. For example, Xcel estimated that total RDF expenditures (about $41 million) during a two-year period resulted in the retention or creation of more than 400 jobs. Xcel made this estimate using models developed by several national energy organizations. Such estimates can be subject to debate, given that it is hard to know the job impacts that would have occurred from alternative expenditures of public or private dollars in the absence of the RDF.

[31] One page of the Xcel Energy report (p. 22) acknowledges that two other administrative entities also make renewable energy grants funded from the RDF. However, this discussion is confusing because (1) it refers to the Xcel-administered grants as the "RDF Program," even though other entities also administer RDF grants, (2) it uses unexplained acronyms ("OES," "IREE") to describe the grants administered by other entities, and (3) the report never clarifies that its scope is limited to Xcel-administered projects.

The University of Minnesota has provided the Legislature and general public with some aggregated information related to RDF-funded projects, but the information has not been presented in a way that would help readers assess RDF impacts. The most recent annual report of the University's Initiative for Renewable Energy and the Environment noted that this organization was established in 2003 to disburse revenues from the RDF.[32] However, many of the organization's projects have been supported by sources of funding other than the RDF, and the report did not clearly indicate which of the projects it described were RDF-funded.

Another of the entities that administers RDF funds—the Minnesota Department of Commerce—has not prepared a report summarizing the RDF projects it has overseen or their impacts.

We also looked at the way in which the findings of individual RDF research projects have been communicated. State law has no requirements regarding communication of project results, but we think it is reasonable to expect that these results could be readily accessible to the public. For example, Minnesota's Legislative-Citizens Commission on Minnesota Resources (LCCMR) performs a role similar to that of the organizations that administer RDF projects. Specifically, the LCCMR oversees grants of state funds for research projects related to the environment and natural resources.[33] The LCCMR Web site includes links to "work programs" (describing the planned activities for approved projects), final reports, and executive summaries.

No single Web site has a list of all RDF projects or links to all final reports.

We found that:

- **Public communication of the findings from individual RDF research projects has been inconsistent and sometimes inadequate.**

There is no single Web site that contains a list of all RDF-funded projects or provides links to all project-related reports. However, some information is available at the Web sites of the various entities that administer RDF projects. Table 3.1 provides a summary of the information related to RDF projects that is available on public Web sites.

One of the RDF administrative entities (Xcel Energy) puts all of the reports resulting from PUC-authorized RDF grants on a public Web site, as it was required to do by a 2006 commission order.[34] Xcel's Web site also contains links to stand-alone executive summaries of many (but not all) projects' final

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[32] University of Minnesota, Institute on the Environment, *2009 Annual Report, Initiative for Renewable Energy and the Environment* (St. Paul).

[33] The LCCMR makes recommendations to the Legislature regarding which projects should be funded, and it oversees projects that have received funding.

[34] Public Utilities Commission, *Order Adopting Process and Operational Improvements, Ending Time Restriction, Administrative Expenditures, and Requiring Further Filings* (Docket No. E-002/M-00-1583), October 5, 2006, 8. The PUC order specifically required that Xcel's Web site include "all studies and reports produced as part of any project funded by the Renewable Development Fund," including executive summaries for each report.

Table 3.1: RDF Grant Administrators' Web-Based Mechanisms for Communicating Information Related to RDF Reports

Does the grant administrator have a public Web site with:	Grant Administrator		
	Xcel Energy	University of Minnesota	Department of Commerce
Complete final and intermediate reports?	Yes	No	No
Brief project summaries?	Yes	Yes	No
Lists of publications resulting from RDF-funded research?	No	Yes	No

SOURCE: Office of the Legislative Auditor.

Xcel Energy provides considerable online information on the RDF projects it administers, more so than the University of Minnesota and Department of Commerce.

reports.[35] While Xcel's Web-based information is the most complete of the RDF administrative agencies, it is worth noting that the reports at the Xcel Web site have typically received fairly limited viewing. Among a sample of 20 final reports for which we obtained Web usage information, the average number of online "hits" per day over a three-month period in 2010 was fewer than one per report. In addition, Xcel Energy's Web site does not include data on the overall financial status of the RDF, nor does it include the quarterly reports on project status that Xcel presents to the PUC. The quarterly reports describe "active" projects, some of which have been underway for years but have no substantive information on the Xcel Web site.[36]

The University of Minnesota provides limited information on a Web site regarding the individual RDF projects it administers. At the Web site for the University's Initiative for Renewable Energy and the Environment, an online database provides information on individual projects this initiative has overseen. However, the database does not identify which projects received RDF funding; many of the projects on this Web site were funded from non-RDF money (or combinations of RDF and non-RDF sources). The database provides links to brief (typically one-page) summaries for each completed or ongoing project, but it does not provide links to the final reports for these projects. Users can query the database to obtain a list of all projects in a particular category (such as solar energy), but they cannot get a single list of all the projects in the database.

Finally, the Department of Commerce does not have a Web site specifically focused on the RDF-funded projects it administers. A few RDF-funded projects have final reports that are accessible through the department's Web site, but there is no central online location that houses reports related to RDF grants administered by the department. On the other hand, the Department of Commerce has, through its contracts with grantees, required some methods of

[35] See Xcel Energy's RDF Web site at: http://www.xcelenergy.com/rdf.

[36] For example, in 2002 the PUC authorized the Crown Hydro project to receive RDF funding up to $5.1 million. So far, $1.5 million in RDF funds have been spent, but there are no reports at the Xcel Web site that describe these expenditures or the status of this uncompleted project.

communicating project results that have not been routinely required by Xcel Energy and the University of Minnesota. Specifically, some Department of Commerce contracts require its RDF grantees to provide summaries of project results or activities to local newsletters and pertinent organizations. The department has also required some grantees to develop project-specific Web sites.

In addition to looking at the ways that RDF reports are made available to the public, we reviewed the content of many RDF reports and executive summaries that have been issued over the past decade. For a sample of ten RDF projects, we hired technical consultants to review the adequacy of the information presented in project-related reports—both from the perspective of technical experts and the general public. Overall, we found that the adequacy of the reports varied. Some reports are excellent, with clear description of the research (including sufficient descriptions of the technology and how it was implemented) and understandable presentations of the research findings. For example, the University of Minnesota issued a useful 2008 report on the potential for electricity generation using biomass fuels at ethanol plants.[37] Although this report is very long (more than 300 pages), our technical consultant said the report is thorough, well-organized, of practical value to ethanol plant managers, and well-written for both experts and non-experts. In addition, Xcel Energy's Web site has links to short summaries or "fact sheets" for many of the projects it has administered, and these often provide useful overviews for the general public.

Many RDF reports are challenging for the public and sometimes even experts to understand.

However, many of the RDF reports are challenging to read and comprehend—especially for non-experts, but sometimes for readers with more technical knowledge, too. Table 3.2 discusses some of the problems that we (or our technical consultants) noted with individual reports. For example, one of our consultants said that the final report of a $1 million RDF grant project is so poorly documented that it would be unlikely that any researchers (other than those who wrote the report) could pursue this early-stage research further. For several reports, our consultants said that the reports provide inadequate background information, insufficient technical details or financial analyses, or discussions that are confusing or poorly edited. In our view, inadequate communication of RDF project findings—whether through Web sites, summary reports, or reports on individual projects—may be one reason why the RDF has not had a larger impact on energy development.

[37] R. Vance Morey, Douglas G. Tiffany, and Dennis L. Hatfield, *Generating Electricity with Biomass Fuels at Ethanol Plants* (St. Paul: University of Minnesota, June 13, 2008).

Table 3.2: Examples of Problems with Selected RDF Reports

Inadequate documentation:

- A study evaluated the feasibility of using a digester to convert vegetable tailings into methane gas and electricity.[a] According to our technical consultant, the final report does not include information that a company's executives would need to make decisions on capital investments—such as a profit and loss statement, information on materials handling and effluent processing, and "flow sheets" showing how this technology could be incorporated into the existing plant.
- A study examined the potential of digester technology at a different Minnesota plant.[b] Our technical consultant said the final report should have provided more information on a key component of this project (a gas pipeline) and should have explained the basis for the return-on-investment rate presented in the report.
- A study aimed to develop "solid state titanium solar cells."[c] Our technical consultant said the laboratory processes are not described in sufficient detail in the final report to be replicated or verified, and the report presents no quantification of the results.
- A study investigated the viability of creating energy from turkey manure.[d] Our technical consultant reviewed the final report and said: "The technical data is poorly presented, and an expert would not be able to extract much more than a broad brush conclusion that this unit can burn poultry litter and some sense of the energy potential… [T]he key question of why this technology is equal or superior to other technologies is unanswered."

Weak editing:

- A study examined certain aspects of a larger research project intended to develop inexpensive solar cells.[e] Our technical consultant said the final report is "choppy" and seems "glued together," rather than cohesively presenting its findings. The report also has references to six graphics that do not appear in the report.
- A study examined various ways to convert biomass to energy.[f] Our technical consultant thought the research was promising but said the final report is disjointed and incomplete. The report has missing footnotes, a key acronym that is not defined, and small graphics that are barely readable.

Too technical for general readers:

- A study examined ways to make proton exchange membrane fuel cells more efficient.[g] The entire 161-page final report is written in extremely technical language. The one-paragraph executive summary is also technical, and the report does not convey the significance of its findings in non-scientific terms.

Too brief:

- The University of Minnesota-Morris received two $500,000 RDF grants to explore options for using biomass rather than fossil fuels for its heating and cooling systems.[h] The final report summarizes "key results and findings" in just five sentences. For example, the report does not explain why it concludes that corn stover appears to be a good candidate for gasification, nor does it present the results of emission testing.

Weak alignment of the final report with requirements in the project's contract:

- A report[i] does not provide the "process and instrumentation designs" required by the RDF contract.
- A report intended to design a storage system for wind energy[j] focuses mainly on the motor-generator part of this system and provides little information on other important system components.

[a] Kristin Riley, *Conversion of Biomass into Energy and Compost: Milestone 6 Progress Report, Xcel Energy Contract RD-34* (Gainesville, FL: University of Florida, May 16, 2009).

[b] Seneca Foods Corporation, *Renewable Methane from Vegetable Processing Industry Project* (Montgomery, MN: Seneca Foods, December 2009).

[c] Donald C. Selmarten, *Final Report: Renewable Energy Development Fund Project "Solid State Titania Solar Cell"* (Golden, CO: National Renewable Energy Laboratory, August 2007).

[d] Coaltec Energy, *Gasification of Poultry Litter to Convert Waste Material to Energy* (Carterville, IL, November 1, 2006).

[e] Wayne L. Gladfelter, William Smyrl, Bing Luo, Andrew Bierbaum, and Francis Guillaume, *Ink Jet Direct Write Solar Cells* (St. Paul: University of Minnesota, September 1, 2008).

[f] Roger Ruan, Lanny Schmidt, David Kittleson, Douglas Tiffany, Paul Chen, and others, *Development of Commercially Transferable Thermochemical Conversion Technologies* (St. Paul: University of Minnesota, August 1, 2008).

[g] Andrew M. Herring, *New Electrocatalysts for Proton Exchange Membrane Fuel Cells Based on Heteropoly Acids (HPA)* (Golden, CO: Colorado School of Mines, May 22, 2008).

[h] Lowell Rasmussen, *Morris Biomass Project* (Morris, MN: University of Minnesota, February 2005).

[i] Coaltec Energy, *Gasification of Poultry Litter*.

[j] Department of Electrical Engineering, *Enhancing the Dispatchability of Wind Energy Using Inertial Storage and Hybrid Systems* (Minneapolis: University of Minnesota, December 2006).

SOURCE: Office of the Legislative Auditor, analysis of selected RDF reports.

4 Recommendations and Policy Options

The Legislature needs to refine and reform the state's use of the RDF.

The Renewable Development Fund (RDF) is a potentially important mechanism for fostering development of renewable energy in Minnesota. Since its creation, this fund has provided a sizable amount of money (more than $150 million) for grants and programs. But, as discussed in the previous chapters, the fund's administration has grown more fragmented over time, and its impact on the generation of electricity from renewable sources has often been indirect and limited. In addition, the Legislature has increasingly allocated money from this fund for specific projects, some of which have not been consistent with the fund's original purpose. From a legal perspective, it remains unclear whether the RDF is public money, raising questions about the Legislature's increasing designation of its use.

In our view, the Legislature should take steps to ensure that (1) state law specifies a clear purpose for the RDF, (2) RDF projects are approved in a coordinated, thoughtful process with improved accountability to the ratepayers who provide its revenues, and (3) potential users of the RDF project results have easy access to clear, informative reports. In addition, the Legislature should strongly consider bringing the RDF into the state treasury and the state's budgeting process to enhance accountability. This chapter offers a variety of recommendations and policy options for improving the RDF.

STRUCTURE AND PURPOSE OF THE RENEWABLE DEVELOPMENT FUND

RECOMMENDATION

The Legislature should consider various options for revising (or clarifying) the structure and purpose of the Renewable Development Fund.

It has been 16 years since state law required the creation of the RDF and nearly 10 years since the first proposals for RDF funding were solicited. The original legislation that created the RDF was very brief, and there have been ongoing questions about the intended uses of the fund, its structure, and how it is administered. We think the Legislature should consider several changes or clarifications related to the RDF's structure and purpose. We present these options—without specific recommendations—in the sections below, offering observations that the Legislature should consider in making these policy choices.

Policy Option: Consolidating the Project Approval Process

In Chapter 2, we observed that the RDF project approval and oversight process has grown disjointed. In the RDF's early years, the Public Utilities Commission (PUC) authorized and oversaw all RDF-funded projects. The PUC still plays a role, but the Legislature, University of Minnesota, and Department of Commerce now have separate roles in RDF project authorization and oversight.[1] This fragmentation of responsibilities has contributed to inconsistencies in the types of projects approved, and it has weakened the connection between electricity ratepayers (who provide the RDF's revenues) and RDF expenditures.

The Legislature should consider consolidating the RDF project approval process, and we offer two options.

The Legislature should consider consolidating RDF project approval, through one of two approaches. Under the first option, the Legislature would refrain from making allocations of RDF funds or decisions regarding individual RDF projects. Rather, the PUC would be allowed to once again make all RDF project selections. Under the second option, the Legislature would establish an overarching legislative approval process for RDF projects, similar to the process used by the Legislative-Citizen Commission on Minnesota Resources (LCCMR). (The LCCMR recommends environment and natural resource projects for legislative funding.) Table 4.1 discusses the merits of each approach.

Both approaches would have the advantage of consolidating into a single process the multiple processes that now exist for approving RDF projects.[2] In addition, both approaches could directly incorporate input from electricity ratepayers (and other interests) into the decision-making process. The PUC already has an advisory body (the RDF Board) that includes ratepayer representatives.[3] If the Legislature were to establish an LCCMR-type process for selecting RDF projects, it could consider using the RDF Board (or a modified version of this board) to obtain input from ratepayer representatives and other interests.[4]

In choosing between Options 1 and 2, shown in Table 4.1, a key issue is whether the Legislature has legal authority to make allocation and project decisions regarding a privately held fund. The Legislature created the RDF and, in recent years, the Legislature has taken an active role in allocating RDF funds and

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[1] As noted in Chapter 2, the PUC is required by *Minnesota Statutes* 2009, 116C.779, subd. 1 (c) to approve all expenditures made from the RDF. The PUC approves expenditure forecasts that include information on legislatively mandated projects funded by the RDF, but the PUC has not overruled projects the Legislature has authorized.

[2] If the Legislature consolidates the process for making RDF grants, it should consider using this same process to determine how much should be allocated annually for the Renewable Energy Production Incentive program. This would require amending *Minnesota Statutes* 2009, 116C.779, subd. 2(a), which now specifies the amount of RDF funds allocated for REPI.

[3] As noted in Chapter 2, the RDF Board now plays a role only in the PUC's project selection process; it has played no role in projects selected or administered by the Legislature, University of Minnesota, or Department of Commerce.

[4] If the Legislature decides to expand the RDF Board's role by having it advise the Legislature on selection of RDF projects, the Legislature should also consider changes in the board's composition. For example, it would be useful for such a board to have representation from the Legislature and the University of Minnesota.

specifying individual RDF projects. However, there are lingering questions about whether money in the RDF is *public* money and part of the state's budget. Perhaps money set aside by a company in a privately held account should not

Table 4.1: Options for Consolidating the RDF Project Approval Process

OPTION 1: PUBLIC UTILITIES COMMISSION APPROVAL OF ALL RDF PROJECTS

PRO	CON
• **Consolidates project approval.** This option would establish a consolidated process for approval of RDF projects, rather than having separate processes involving actions by the Legislature, PUC, Department of Commerce, and University of Minnesota. • **Provides opportunities for ratepayer input.** In the past, many RDF projects have been selected without direct input from ratepayer representatives. An advisory board—with representatives of ratepayers and other interests—could provide the PUC with recommendations on which projects to fund. The PUC has already established such a board for this purpose. • **Links revenues collected for a regulatory purpose to decisions by a regulatory body.** It is unclear whether the Legislature has legal authority to allocate funds that are not deposited in the state treasury. Arguably, however, it is reasonable for a regulatory body (the PUC) to make allocation decisions regarding funds set aside as part of the state's regulation of nuclear power plants. • **Has established a reasonable process.** The PUC has previously solicited proposals for RDF projects, and it has established a reasonable process for making decisions on which projects to fund.	• **Questions about the appropriateness of some previous PUC-approved projects.** Some legislators have questioned whether agencies (such as the PUC) are better able than elected officials to select appropriate projects for RDF funding. Some PUC-authorized projects have been worthwhile, while others do not appear to have resulted in significant benefits to ratepayers. • **Unusual role for PUC.** The PUC is primarily a regulatory agency. PUC officials said it is somewhat unusual for the PUC to perform administrative functions, such as grant solicitation and oversight.

OPTION 2: LEGISLATIVE APPROVAL OF ALL RDF PROJECTS, BASED ON RECOMMENDATIONS FROM AN LCCMR-TYPE ADVISORY BODY

PRO	CON
• **Consolidates project approval.** This option would establish a consolidated process for approval of RDF projects, rather than having separate processes involving actions by the Legislature, PUC, Department of Commerce, and University of Minnesota. • **Provides opportunities for ratepayer input.** Prior to legislative approval of RDF projects, the Legislature could obtain recommendations from an advisory body (as it now does from the LCCMR). Ratepayers could be represented on such a body; previously, ratepayer representatives have not had a formal venue for input on the Legislature's RDF allocation decisions. • **Involves the Legislature in allocations from a state-created fund.** The Legislature created the RDF, so some legislators believe it is appropriate for the Legislature to direct the allocation of revenues in this fund—as indicated by the Legislature's actions in recent years.	• **Faces possible challenges regarding the legality of legislative approval.** It is unclear whether the revenues deposited in the RDF should be considered public or private money. The Legislature has previously allocated funds from the RDF, but the legality of direct legislative involvement in RDF allocations is debatable. • **Questions about the appropriateness of previous legislative decisions.** Since 2003, the Legislature has designated specific uses for RDF funds in many instances. Some of these initiatives have strayed from the fund's original purpose or have not resulted in impacts that benefit ratepayers. Other projects have been worthwhile and consistent with the RDF law. • **Might be a slower process.** Some people expressed concern to us that it takes a long time under the LCCMR process between initial project solicitation and the allocation of funding.

SOURCE: Office of the Legislative Auditor.

be treated as if it were a part of the state's budget, even though it is subject to state regulatory control through the PUC. Especially if the Legislature favors Option 2, it should strongly consider statutory changes that would bring the RDF into the state treasury (a policy option we discuss later in this chapter).

RDF projects need stronger coordination and state-level oversight.

In addition, the Legislature should consider how the University of Minnesota should receive any RDF funding under Option 1 or Option 2. On one hand, University researchers could submit proposals for RDF funding that would compete with all other proposals received by the PUC or an LCCMR-type body. Some past University research projects have been funded in this manner by the PUC and LCCMR. On the other hand, the University could be authorized to have a separate process (but subject to state-level approval and oversight) for making recommendations about which University-led projects should be funded. University officials told us they would prefer having a separate process, especially for the purpose of getting input from national experts and academics from other universities regarding University of Minnesota researchers' project proposals. They expressed concern to us that a "one-size-fits-all" approach for selecting RDF projects might not provide enough technical expertise to evaluate the University's proposals. Whatever approach the Legislature adopts, there is a need for stronger coordination and state-level oversight of RDF projects, including the University's.

Finally, a consolidated project selection process should be complemented by periodic, consolidated reporting to the Legislature on project outcomes. The Legislature should consider designating one entity—perhaps the Department of Commerce, PUC, or Xcel Energy—to prepare a biennial report that covers all RDF-funded projects. Such a report could describe the projects and—to the extent possible—discuss the RDF's impact in helping foster the development of renewable energy sources in Minnesota.

Policy Option: Adopting Uniform Project Eligibility Criteria in Statute

In Chapter 2, we noted that the criteria that have been applied to the different RDF project selection processes have sometimes been inconsistent. The RDF law has provided limited guidance to the PUC about the types of projects that should be funded from the RDF. Thus, the PUC has established its own criteria for reviewing project proposals. At the same time, the RDF law has included more detailed language indicating the types of projects that the University of Minnesota is directed or authorized to fund.

An area of inconsistency has been the treatment of projects that are unrelated to electricity generation. The PUC has declared these projects ineligible for funding. One reason for limiting RDF funding to projects that could help generate electricity is that electricity ratepayers are the source of all RDF funding. Projects that examine the feasibility of renewable sources of electricity have the potential to provide direct benefits to these ratepayers. However, the Legislature and University of Minnesota have used RDF funding for a number of projects that were not intended to lead to electricity generation. For example, projects that explore alternative vehicle fuels, non-petroleum-based consumer

The Legislature should clarify which types of projects are eligible for RDF grants.

materials, or ways to create "green jobs" might be socially valuable, but it is unclear why the ratepayers of a single electrical utility should bear their costs. State law says the RDF should be used only to support "development of renewable energy sources," but the law does not directly state whether these sources should contribute to electricity generation.[5] It would be useful for the Legislature to clarify the RDF law on this matter.

Likewise, PUC policies have disqualified from consideration for PUC-authorized grants some other types of projects that have been supported with RDF grants by the Legislature or University of Minnesota. This includes projects in the following categories: (1) projects related to energy conservation or management of energy demand, (2) projects to promote education or awareness about renewable energy technologies, and (3) solar thermal projects that are primarily intended to produce heat rather than electricity. To ensure greater consistency among the projects selected for RDF funding by the PUC, University of Minnesota, and Legislature, it might be useful to have a single set of project criteria in law.

In our view, it is possible for the RDF to support a wide range of projects under the umbrella of uniform project selection criteria. For example, even if the Legislature amended state law to require that RDF projects be related to renewable sources of *electricity*, this criterion could accommodate projects focusing on basic scientific research as well as projects involving the application of proven technologies.

Policy Option: Designating the RDF as a State-Managed Fund

In Chapter 1, we discussed the RDF's unusual status. It was created by state law, but it is maintained outside of the state's treasury by a private corporation. As a non-state fund, it is subject to only limited review by the state's budget agency, and it has not been subject to financial audits by the Office of the Legislative Auditor. In fact, it is unclear whether funds deposited in the RDF are public dollars, available for legislative allocation or appropriation.

We heard some support for allowing this fund to remain under Xcel Energy's management. For example, an RDF Board member told us that Xcel staff have the expertise to manage this fund, and that Xcel has taken into account the interests of its ratepayers in its oversight of this fund. Also, the PUC considered in 2006 whether to transfer administration of the account to an independent third party, and it concluded that such a change should not be pursued. A former legislative staffer told us that the RDF was intentionally established as a non-state fund in an effort to discourage legislators from using this fund for unintended purposes during the appropriation process.

[5] *Minnesota Statutes* 2009, 116C.779, subd. 1. A former legislative staffer who helped draft the RDF law told us the law's original intent was to fund projects—whether research projects or projects that directly subsidized energy production—that could provide direct benefits to electrical ratepayers.

Making the RDF a state fund would subject it to additional scrutiny.

However, the Legislature has regularly designated uses of the RDF, despite its status as a non-state fund. Because this fund has been accessed by the Legislature as if it were a state fund, perhaps it should be managed by a state agency (such as the Department of Commerce). Making the RDF a state fund could subject it to additional scrutiny—from the state budget agency, from state financial audits, and from legislative finance committees. Such scrutiny is important because (1) the fund's revenue source is designated by state law, (2) state law establishes the fund's purpose, and (3) many of the fund's expenditures are made through state agencies or public higher education institutions.[6] Because the status of this account is so unusual compared with that of other state-authorized funds, we think the Legislature should be inclined to bring this account under the management of a state agency unless significant concerns about such a transfer come to light.

We do not envision that any such changes would affect the PUC's traditional role in regulating utilities' services and rates. For example, the PUC would continue to approve Xcel Energy's rates, including the portion of rates that covers the cost of the RDF program.

Policy Option: Establishing RDF Funding Sources Other than Xcel Energy

In the early 1990s, Northern States Power (which is now a subsidiary of Xcel Energy) sought approval to expand its storage of nuclear waste in above-ground casks. The PUC approved storage in 17 casks, but the Minnesota Court of Appeals said that such storage required legislative approval, too. The 1994 Legislature authorized expanded storage, but it placed many conditions on Northern States Power.[7] One of these conditions was the requirement for the utility to annually transfer funds to the RDF.

Thus, the RDF is a direct outgrowth of a history that is unique to Xcel Energy, which operates Minnesota's nuclear power plants. By law, Xcel's annual payments to the fund have always been directly related to its use of dry-cask storage for spent nuclear fuel. Xcel is the only one of Minnesota's public utilities that pays into the RDF. In 1999, the Legislature authorized Xcel Energy to recover from its ratepayers expenditures from the RDF for renewable energy projects.[8] Consequently, Xcel ratepayers ultimately cover the cost of RDF projects.

Some people we spoke with suggested that the Legislature should consider assessing RDF project costs to the ratepayers of various Minnesota utilities, not just Xcel Energy. First, as noted in Chapter 1, all utilities in the state will be expected to produce increasing shares of their power in coming years from

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[6] Between 2002 and 2010, about 32 percent of RDF grant expenditures and 65 percent of grant projects occurred through Minnesota state or local agencies or public higher education institutions.

[7] For further discussion of this legislation, see: Mike Bull and John Helland, *Nuclear Waste Management and the Prairie Island Legislation* (St. Paul: House of Representatives Research Department, August 1997).

[8] *Laws of Minnesota* 1999, chapter 200, sec. 2.

Unless the Legislature establishes a clear rationale for RDF revenues, we do not recommend that utilities other than Xcel be required to pay into the fund.

renewable sources. While Xcel Energy derives benefits from knowledge gained through RDF projects, so can other utilities. Second, some people question whether Xcel ratepayers should bear the sole burden for the RDF, especially in light of evolving public views toward nuclear power. The issue of how to safely store spent nuclear fuel over the long term has not yet been resolved. But utilities that burn coal and natural gas generate greenhouse gases, and concerns about global warming have led some people to look more favorably toward nuclear power (which does not have carbon emissions).

At this time, we do not recommend that the Legislature amend state law to collect RDF revenues from utilities other than Xcel Energy. It is unclear to us whether the RDF law imposes on Xcel a fee, a tax, or something else. Until there is greater clarity in law about the nature and purpose of Xcel's obligation to pay into the RDF, we cannot recommend that similar obligations be extended to other utilities. Legislators seeking equitable treatment of utilities could also consider eliminating the RDF altogether, unless there is stronger evidence that RDF projects are having significant, positive impacts within Minnesota.

STRUCTURE AND PURPOSE OF THE RDF BOARD

RECOMMENDATION

The Legislature should clarify the structure and purpose of the Renewable Development Fund Board.

The PUC created the RDF Board in 2001, largely to help Xcel Energy recommend projects for RDF funding (subject to the commission's approval). We observed in Chapter 2 that Minnesota law references the RDF Board but does not specify its membership, the terms of the members, or its responsibilities. In addition, PUC orders have not specified the terms of RDF Board members, and some PUC provisions regarding board composition, size, and the appointment process are vague. For example, PUC documents reference appointment of some members by "the environmental community," but it is unclear who specifically has authority to make these appointments.

At a minimum, we think state law should be amended to clarify the following regarding the current board and its members: composition, member appointment process, terms of members, and the roles and reporting relationships of the board. If the Legislature decides to assume responsibility for selection of all RDF projects (an option discussed earlier in this chapter), the Legislature should consider getting recommendations from a revised version of this board regarding which projects to fund.

REPORTING REQUIREMENTS

RECOMMENDATION

The Legislature should require that:

- ***All projects funded from the Renewable Development Fund (RDF) produce a written final report that includes sufficient detail for technical readers and a clearly written summary for non-technical readers;***
- ***RDF financial reports include more useful information, including the basis for Xcel Energy's deposits into the fund and the actual expenditures that have been made from the fund; and***
- ***Final reports, mid-project status reports (where applicable), and RDF financial reports be posted online, preferably accessible through a single public Web site.***

State law should include basic reporting requirements for RDF projects and financial statements.

In Chapter 3, we said it is important for RDF project results to be clearly communicated. Good communication can help other people learn from the results of these projects, perhaps leading to implementation of new technologies. It can also foster understanding of RDF projects by policy makers and the public, perhaps contributing to public accountability for RDF expenditures. Statutory provisions cannot guarantee that RDF reports will be well written and effectively communicated, but we think it makes sense to have some basic reporting requirements in state law.

First, we think the law should explicitly require a written final report from each RDF project. These reports will receive attention from some readers interested in very technical, detailed aspects of renewable energy technology. On the other hand, we think the need for public accountability demands that RDF reports also provide a summary that is suited to readers with more general interest. Even if the law requires reports to serve both the technical and general reader, the agencies administering RDF funds will need to oversee grantees carefully to help ensure that reports communicate effectively.

Also, Xcel Energy—as the appointed administrator of the RDF—should report more useful information on the fund's financial status. The utility's financial reports have included information on fund liability and unencumbered balance. These reports are used to determine (1) the amount of funds available for renewable energy projects and (2) ratepayer recovery fees (subject to PUC approval). For accountability purposes, we think it would be helpful for these reports to have additional information in a format easily used by ratepayers and the public. In particular, the reports should show the basis for Xcel's transfers into the fund—specifically, the number of storage casks and their dates of use. Also, Xcel should provide summary information on actual grant expenditures, in

addition to providing information on the amount of the approved grants and the overall fund balance.

It would be preferable to have a single online location where the public could access RDF reports.

In addition, RDF reports should be more readily accessible than they are now. It would be useful to have a single Web site where readers could access all RDF-related reports and other relevant information. If the Legislature mandates development of a single RDF Web site, it would probably make sense for this responsibility to be assumed by either the Department of Commerce—which is already required by state law to "compile and maintain information concerning existing and potential renewable energy developments and resources in the state"[9]—or Xcel Energy—which currently maintains a fairly useful RDF Web site and has overall responsibility for RDF financial reporting. The RDF Web site should include information on the status of projects that have been ongoing for an extended period of time. For example, it is not acceptable that Xcel Energy's RDF Web site has provided no substantive information on the Crown Hydro project, a $5 million grant authorized in 2002 but now stalled.[10]

RECOMMENDATION

The Legislature should require that all final reports produced pursuant to RDF grants acknowledge that the work was made possible in whole or part by the Minnesota Renewable Development Fund, noting that this fund is financed by Xcel Energy ratepayers.

If the Legislature continues to rely solely on Xcel Energy to provide the revenues for the RDF, reports should explicitly reference both the RDF and the fact that this fund is supported by Xcel's ratepayers. If the Legislature decides that other utilities should be required to help finance the RDF, the language in this disclosure should be modified appropriately. In our view, this type of disclosure is important because the RDF, now supported by one company's ratepayers, is an unusual funding source. Making readers aware of a report's connection to electricity ratepayers may help foster public accountability for these expenditures.

OTHER RECOMMENDATIONS

RECOMMENDATION

The Legislature should amend Minnesota Statutes 2010, 116C.779, subd. 1, to clarify that preference in the project selection process should be given, where reasonable, to proposals submitted by Minnesota applicants, that use Minnesota products or facilities, and that will provide direct benefits to Minnesota residents or businesses.

[9] *Minnesota Statutes* 2009, 216C.053.

[10] Xcel Energy provides quarterly reports to the PUC regarding ongoing projects. It would be useful for the most recent quarterly report to be posted online.

In Chapter 2, we noted that 86 percent of RDF grants have been awarded to grantees based in Minnesota. But we also observed that many of the RDF-funded research projects—especially those authorized by the University of Minnesota—have not focused on projects with applications that are unique to Minnesota. Thus, we recommend that the Legislature clarify vague statutory language that now establishes a preference for RDF projects "located within the state."[11]

We think that a fund supported primarily by Minnesota ratepayers should make special efforts to foster Minnesota-specific benefits—such as working with Minnesota companies or using Minnesota products. Our recommendation would still allow the approval of projects—"where reasonable"—that could yield broad-based benefits (beyond the boundaries of Minnesota) or that represent early-stage research (before commercial applications of the technology are viable). However, we also think that the process for selecting RDF projects should give extra weight to projects with potential to offer tangible benefits to Minnesotans (or to the Minnesota ratepayers whose fees pay for RDF projects).

State law should authorize and limit the use of the RDF to pay for certain administrative costs.

RECOMMENDATION

The Legislature should authorize in law the use of the Renewable Development Fund to pay for certain administrative costs, as specified or limited by statute.

In Chapter 2, we observed that the RDF statute does not explicitly authorize the use of RDF funding to pay for administrative costs. We think it is reasonable for the Legislature to provide such an authorization, but the Legislature should also consider setting limits on administrative spending. We noted that limits on RDF administrative spending set by the PUC have been open to interpretation. If the Legislature wishes to set a limit on RDF administrative costs, it should clearly define in statute the basis for calculating such a cap. In addition, the Legislature should assign responsibility for monitoring compliance with such a cap to a state agency. The most logical candidates for this responsibility would be the Department of Commerce or PUC. We think the Department of Commerce might be the better choice, given its larger size and broad-based administrative responsibilities in the energy field. In contrast, the PUC is primarily a regulatory agency rather than an administrative agency, even though it has played a role in approving and overseeing certain RDF projects.

RECOMMENDATION

The Legislature should amend Minnesota Statutes 2010, 116C.779 to require that Renewable Development Fund project selection decisions consider the likelihood that the proposed projects will be completed in a timely manner, including any need for proposed projects to obtain authorizations, leases, or permits from external bodies.

[11] *Minnesota Statutes* 2009, 116C.779, subd. 1(a).

In Chapter 3, we noted two large RDF projects that were approved years ago but have not proceeded to completion, reflecting opposition to these projects from external bodies. We recognize that unpredictable circumstances may sometimes cause delays in project completion. But we think it is a good idea for the project selection process to explicitly consider issues that are likely to affect project implementation, particularly approvals or authorizations from external entities.

List of Recommendations

- The Legislature should consider various options for revising (or clarifying) the structure and purpose of the Renewable Development Fund (RDF). (p. 47) These include options for:
  - Consolidating the project approval process. (p. 48)
  - Adopting uniform project eligibility criteria in statute. (p. 50)
  - Designating the RDF as a state-managed fund. (p. 51)
  - Establishing RDF funding sources other than Xcel Energy. (p. 52)
- The Legislature should clarify the structure and purpose of the RDF Board. (p. 53)
- The Legislature should require that:
  - All projects funded from the RDF produce a written final report that includes sufficient detail for technical readers and a clearly written summary for non-technical readers. (p. 54)
  - RDF financial reports include more useful information, including the basis for Xcel Energy's deposits into the fund and the actual expenditures that have been made from the fund. (p. 54)
  - Final reports, mid-project status reports (where applicable), and RDF financial reports be posted online, preferably accessible through a single public Web site. (p. 54)
- The Legislature should require that all final reports produced pursuant to RDF grants acknowledge that the work was made possible in whole or part by the Minnesota RDF, noting that this fund is financed by Xcel Energy ratepayers. (p. 55)
- The Legislature should amend *Minnesota Statutes* 2010, 116C.779, subd. 1, to clarify that preference in the project selection process should be given, where reasonable, to proposals submitted by Minnesota applicants, that use Minnesota products or facilities, and that will provide direct benefits to Minnesota residents or businesses. (p. 55)
- The Legislature should authorize in law the use of the RDF to pay for certain administrative costs, as specified or limited by statute. (p. 56)
- The Legislature should amend *Minnesota Statutes* 2010, 116C.779 to require that RDF project selection decisions consider the likelihood that the proposed projects will be completed in a timely manner, including any need for proposed projects to obtain authorizations, leases, or permits from external bodies. (p. 56)

Stages of Technology Development

Appendix A

The Renewable Development Fund (RDF) has paid for a wide variety of types of projects. Some have involved "early-stage" research, focused on theoretical frameworks, informal assessments, or initial laboratory investigations. Some "later-stage" projects have focused on technology that is already well developed, leading to commercialization of the technology or actual production of energy. Other projects have fallen in between, perhaps involving detailed laboratory research or development of prototypes. Individual projects typically focus on a limited part of an emerging technology's development or application, rather than taking the technology all the way from an initial concept to commercial use.

A 2009 Minnesota Department of Commerce report on renewable energy noted that technology development "is inherently risky and only a small percentage of new ideas will find commercial use."[1] The report said that some technologies may be only a few years away from being economically competitive; for others, "industry doesn't have much confidence that scale-up potential of currently proposed solution(s) will be viable within the next 10 to 15 years."[2] Thus, in the early stages of a given technology's development, there is significant risk that the technology will not prove to be viable (or will require many years to demonstrate its viability). In the later stages, key questions about a technology's viability might have been addressed, but there may be significant capital costs to deploy the technology in a "real world" setting.

To help readers understand the distinct phases of technology development that an RDF project might address, we present the framework below. This sequence is based on the "common stages of product development" presented in the Department of Commerce's 2009 report.

[1] Minnesota Department of Commerce, *Clean Energy Technology Roadmap* (St. Paul, November 2009), 39.

[2] *Ibid.,* 5.

Table A.1: Stages of Technology Development

Stage	Activities
Idea Stage	Develop basic concepts and theoretical frameworks ("I wonder if…")
Preliminary Investigation	Make informal technical and market assessments. Conduct initial literature and patent reviews. No laboratory work.
Initial Laboratory Investigation	Make basic observations about a technology's properties, assumptions, and principles. Practical applications are formulated but not yet proved.
Detailed Laboratory Investigation	"Proof of concept." Document the known and unknown capabilities of the technology, and conduct thorough literature reviews and patent searches. Simulate how system components would work together.
Laboratory Scale-Up	"Proof of application." Narrow the research to the most feasible lines of investigation. Verify the technology's technical capabilities, and identify issues that must be solved to achieve technical and economic viability. Determine energy flows and transformations, and examine environmental considerations.
Prototype Project	Demonstrate performance of a prototype in a simulated or actual operating environment. Develop data on technical and economic viability issues, and develop engineering data that could be used for full-scale applications.
Commercial-Scale Demonstration	Validate whether the technology works in its final form and under actual operating conditions. Develop sufficient information to help potential investors determine whether to support commercial production of this technology.
Commercial Production	Based on the previous steps, assemble information needed to acquire financing and justify commercial development (final design, detailed engineering specifications, production data, manufacturing processes, and performance metrics).
Market Entry and Penetration	Potential users determine that the technology's technical and economic performance is convincing, leading to sales and market penetration.

SOURCE: Office of the Legislative Auditor, analysis of Minnesota Department of Commerce, *Clean Energy Technology Roadmap* (St. Paul, November 2009), 39-40.

Projects Funded by Renewable Development Fund, 2002-2010
Appendix B

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
PROJECTS AWARDED BY THE PUBLIC UTILITIES COMMISSION AND ADMINISTERED BY XCEL ENERGY						
High Performance Biogas Treating	RD-72	$228,735	Closed	R&D	Biomass	Production Specialties (OK)
Feasibility of Producing Electricity and Heat Utilizing Steam Turbines and Spark Ignited Engine Generators at Generation II's Corn Ethanol Plant	BB-03	$738,654	Closed	R&D	Biomass	Sebesta Blomberg & Associates, Inc.
Using Whole Trees as a Fuel Source for Xcel Energy's Minnesota Valley Plant	BB-06	$266,508	Closed	R&D	Biomass	Energy Performance Systems
Biomass Cofiring's Impact on the Operations of a Next-Generation Power System	BB-09	$444,478	Closed	R&D	Biomass	University of North Dakota (ND)
Centrifugal Filter for Removal of Tars and Particulates From a Biomass Gasifier Stream	BB-10	$638,635	Closed	R&D	Biomass	Community Power Corporation (CO)
Effects of Biomass Combustion on Selective Catalytic Reduction Performance	BB-12	$60,000	Closed	R&D	Biomass	University of North Dakota (ND)
New Electrocatalysts for Proton Exchange Membrane Fuel Cell	CB-07	$1,116,742	Closed	R&D	Biomass	Colorado School of Mines (CO)
Solid Oxide Fuel Cell Gasification System	CB-08	$1,250,142	Closed	R&D	Biomass	University of North Dakota (ND)
Development of a Biomass Fueled Stirling Engine	RD-110	$405,000	Closed	R&D	Biomass	Iowa State University (IA)
Renewable Fuels to Hydrogen Gas	RD-22	$900,000	Closed	R&D	Biomass	Energy Conversion Devices (MI)
Gasification of Poultry Litter	RD-26	$450,000	Closed	R&D	Biomass	Coaltec Energy USA, Inc. (IL)
Miscanthus Biomass Feasibility Project	RD-27	$318,800	Closed	R&D	Biomass	Rural Advantage
Biomass-Derived Fuels	RD-29	$299,284	Closed	R&D	Biomass	University of Minnesota
Sugar Beets to Methane Project	RD-34	$999,995	Closed	R&D	Biomass	University of Florida (FL)
Direct Hydrogen Production from Biomass Gasifier Using Hydrogen-Selective Membrane	RD-38	$861,860	Closed	R&D	Biomass	Gas Technology Institute, (IL)
Generating Electricity with Biomass Fuels at Ethanol Plants	RD-56	$858,363	Closed	R&D	Biomass	University of Minnesota
Coupling Wind and Bio-Diesel Generation Systems	RD-69	$760,000	Closed	R&D	Biomass	Agricultural Utilization Research Institute
Identifying Effective Biomass Strategies	RD-94	$397,500	Closed	R&D	Biomass	Center for Energy and the Environment
Renewable Energy Kit for Remote Telecom Equipment	RD3-58	$137,000	Closed	R&D	Other	West Central Telephone Association
Solid State Titania Solar Cells	CS-05	$934,628	Closed	R&D	Solar	National Renewable Energy Laboratory (CO)
Low Band Gap Materials for Organic Photovoltaics	RD-107	$1,000,000	Closed	R&D	Solar	National Renewable Energy Laboratory (CO)

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Projects Funded by Renewable Development Fund, 2002-2010 (continued)

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
Flexible Photovoltaic Cell for Cost-Effective Electricity Generation	RD-78	$1,000,000	Closed	R&D	Solar	InterPhases Solar (CA)
Ink Jet Solar Cells	RD-93	$1,000,000	Closed	R&D	Solar	National Renewable Energy Laboratory (CO)
Self-Erecting Wind Turbine	BW-06	$68,470	Closed	R&D	Wind	D.H. Blattner and Sons, Inc.
Development of Wind Turbine Models for Control Design	CW-02	$75,000	Closed	R&D	Wind	Global Energy Concepts, LLC (WA)
Enhancing the Dispatchability of Wind Energy Using Inertial Storage	CW-06	$654,309	Closed	R&D	Wind	University of Minnesota
Wind Energy Forecasting System	RD-57	$997,000	Closed	R&D	Wind	Windlogics, Inc.
Reducing the Uncertainty in Wind Power Energy Estimates	RD-87	$370,000	Closed	R&D	Wind	Global Energy Concepts, LLC (WA)
Waste to Renewable Energy	AB-07	$1,300,000	Closed	EP	Biomass	AnAerobics, Inc. (NY)
Mesaba/Excelsior Energy Coal Gasification	EP-43	$10,000,000	Closed	EP	Other	Excelsior Energy, Inc.
Minnesota Department of Commerce Solar Rebate Program (started in 2003)	AS-05	$1,150,000	Closed	EP	Solar	Minnesota Department of Commerce
Science House	AS-06	$100,000	Closed	EP	Solar	Science Museum of Minnesota
Installation of Solar Photovoltaic System to Operate a Geothermal Heating and Cooling System	EP3-2	$735,000	Closed	EP	Solar	Merrick, Inc.
Installation and Operation of a Large-Scale Photovoltaic System	EP3-3	$1,994,480	Closed	EP	Solar	Best Power International
Prototype Wind Turbine Installations	AW-03	$900,000	Closed	EP	Wind	Project Resources Corporation
Public School Wind Turbine Generation	AW-10	$752,835	Closed	EP	Wind	Pipestone Area School District
Hilltop Farm	EP-26	$1,200,000	Closed	EP	Wind	Hilltop Farm Corporation
St. Olaf College Wind Generation	EP-39	$1,500,000	Closed	EP	Wind	St. Olaf College
Lowering Biomass Feedstock Costs	RD3-1	$992,989	In Progress	R&D	Biomass	University of Minnesota
Flue Gas CO_2 Capture and Rapid Growth Algae to Produce Biodiesel and Other Renewable Fuels	RD3-2	$350,000	In Progress	R&D	Biomass	SarTec Corporation
Biomass Electricity Generation at Ethanol Plants	RD3-23	$819,159	In Progress	R&D	Biomass	University of Minnesota
Biomass Crop Management for Sustainable Harvests	RD3-28	$979,082	In Progress	R&D	Biomass	University of Minnesota
Torrefaction and Densification of Biomass Fuels for Generating Electricity	RD3-4	$924,671	In Progress	R&D	Biomass	Bepex International
Indirect Liquefaction of Wood Waste for Remote Power Generation Fuel	RD3-66	$999,065	In Progress	R&D	Biomass	University of North Dakota (ND)
Converting Biomass into Biogas	RD3-68	$970,558	In Progress	R&D	Biomass	University of North Dakota (ND)

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Projects Funded by Renewable Development Fund, 2002-2010 (continued)

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
Integrated Gas Turbine-Gasifier Pilot-Scale Power Plant	RD3-71	$999,728	In Progress	R&D	Biomass	University of North Dakota (ND)
Gasification to Convert Biomass to Combined Heat and Power	RD3-77	$1,000,000	In Progress	R&D	Biomass	Coaltec Energy USA, Inc. (IL)
Farm Grown Trees for Energy	RD-50	$957,929	In Progress	R&D	Biomass	Energy Performance Systems
Using Power System Harmonics as Loss of Mains Detection for Distributed Energy Resources	RD3-21	$493,608	In Progress	R&D	Other	Northern Plains Power Technologies (SD)
Nanocrystal Silicon Films	RD3-25	$732,032	In Progress	R&D	Solar	University of Minnesota
Pilot Line for Flexible Photovoltaic Modules	RD3-53	$1,000,000	In Progress	R&D	Solar	InterPhases Solar (CA)
Sodium Sulfur Battery Energy Storage and its Potential to Enable Further Integration of Wind	RD3-12	$1,000,000	In Progress	R&D	Wind	Xcel Energy Services, Inc.
High Resolution Virtual Wind Simulator Project	RD3-42	$999,999	In Progress	R&D	Wind	University of Minnesota
Biomass Demonstration Plant at Central Minnesota Ethanol Cooperative	EP-44	$2,000,000	In Progress	EP	Biomass	CMEC and Sebesta Bloomberg
Diamond K Dairy Digester	EP-51	$936,530	In Progress	EP	Biomass	RCM Digesters, Inc. (CA)
Crown Hydro, Mississippi River Hydroelectric Energy Facility	AH-01	$5,100,000	In Progress	EP	Hydro	Crown Hydro
Lower St. Anthony Falls Hydroelectric Project	EP-34	$2,000,000	In Progress	EP	Hydro	Brookfield Power (MA)
A Solar Electric Solution for Residential Projects	EP3-12	$1,488,922	In Progress	EP	Solar	freEner-g, LLC
Renewable Energy Strategies for the Department of Natural Resources	EP3-13	$894,000	In Progress	EP	Solar	Minnesota Department of Natural Resources
PROJECTS AWARDED BY THE UNIVERSITY OF MINNESOTA'S INITIATIVE FOR RENEWABLE ENERGY AND THE ENVIRONMENT						
Petroleum Fuels in Real-Time from Renewable Resources	LG-B13-2005	$308,165	Closed	R&D	Biomass	University of Minnesota
Development of Commercially Transferable Thermochemical Conversion Technologies	LG-B2-2005	$599,784	Closed	R&D	Biomass	University of Minnesota
Liquid Fuels from Biomass: An Integrated Biorefinery Approach	LG-B23-2005	$512,990	Closed	R&D	Biomass	University of Minnesota
Improved Utilization of Minnesota Biofuels	LG-B24-2005	$270,000	Closed	R&D	Biomass	University of Minnesota
Bacterial Synthesis of Bioplastic from Renewable Materials	LG-B28-2005	$270,000	Closed	R&D	Biomass	University of Minnesota
Genetic Diversification and Yield Improvement of Woody Crops for Energy and Environmental Applications in Minnesota	LG-B7-2005	$269,971	Closed	R&D	Biomass	University of Minnesota
An Integrated Approach for Optimization of Microbial Fuel Cells	LG-B8-2005	$477,000	Closed	R&D	Biomass	University of Minnesota
Design and Synthesis of Electrically Conducting Polymers from Renewable Materials	LG-B9-2005	$405,000	Closed	R&D	Biomass	University of Minnesota
Value-Added Technologies for Utilization of Crop Bioproducts and Residues	M1-2004	$100,000	Closed	R&D	Biomass	University of Minnesota
Renewable Hydrogen and Chemicals from Ethanol	M8-2004	$25,000	Closed	R&D	Biomass	University of Minnesota
Development of Research Infrastructure for Hybrid Poplar Biomass Production in Minnesota	SG-B10-2004	$24,085	Closed	R&D	Biomass	University of Minnesota
Synthesis and Properties of Polyesters Using 3-Hydroxy Proprionic Acid (3HP) as the Primary Building Block	SG-B12-2004	$25,000	Closed	R&D	Biomass	University of Minnesota

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Projects Funded by Renewable Development Fund, 2002-2010 (continued)

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
Development of a Biorefining Model for Corn Processing	SG-B2-2004	$24,920	Closed	R&D	Biomass	University of Minnesota
Functional Genomics of Bacterial Energetics	SG-B3-2004	$33,994	Closed	R&D	Biomass	University of Minnesota
Using Genomics Tools to Manipulate Carbon Partitioning to Increase Crop Yields of Biofuels and Biobased Products	SG-B4-2004	$31,660	Closed	R&D	Biomass	University of Minnesota
Genetic Basis of Biomass Accumulation in the Model Plant Arabidopsis Thaliana Grown in Ambient and Elevated CO_2 Environments	SG-B5-2004	$25,000	Closed	R&D	Biomass	University of Minnesota
Making Biodiesel from Crop Residues	SG-B7-2004	$29,232	Closed	R&D	Biomass	University of Minnesota
Combustion Studies of Biomass-Derived Oil Sprays	SG-B8-2004	$25,000	Closed	R&D	Biomass	University of Minnesota
Moisture Degradation Kinetics of Poly Lactic Acid Products	SG-B9-2004	$36,688	Closed	R&D	Biomass	University of Minnesota
Reforming Ethanol and Biodiesel to Produce Hydrogen	SG-H2-2004	$25,000	Closed	R&D	Biomass	University of Minnesota
Energy from Grass: Summarizing and Disseminating Directed Class Research	SG-P2-2004	$25,000	Closed	R&D	Biomass	University of Minnesota
Large Scale Production of Polyhydroxalanoic Acid	SO1-2004	$25,000	Closed	R&D	Biomass	University of Minnesota
Energy-Efficient Roof and Attic System	M4A-2004	$20,000	Closed	R&D	Conservation/ Efficiency	University of Minnesota
Advanced Energy-Efficient Roof System	M4B-2004	$250,000	Closed	R&D	Conservation/ Efficiency	University of Minnesota
Renewable Roof for Residential Buildings	SG-C1-2004	$39,352	Closed	R&D	Conservation/ Efficiency	University of Minnesota
Intelligent Building Control with Renewable Energy Sources and Distributive Passive Wireless Microelectromechanical System Sensors	SG-C2-2004	$33,705	Closed	R&D	Conservation/ Efficiency	University of Minnesota
Integrated Building Systems for Energy Efficiency and Renewables	SG-C3-2004	$44,871	Closed	R&D	Conservation/ Efficiency	University of Minnesota
A Multi-Port DC-DC Converter for Universal Use with Renewable Energy Sources in Residential Buildings and Fuel Cell Vehicles	LG-C9-2005	$32,569	Closed	R&D	Other	University of Minnesota
Hydrogen Fueling Stations	M6-2004	$20,000	Closed	R&D	Other	University of Minnesota
Application of Hybrid Wind-Solar Electricity Generation in Western Minnesota	SG-C5-2004	$18,513	Closed	R&D	Other	University of Minnesota
Catalysts and Electrode Structures for Electrochemical Oxidation	SG-H1-2004	$25,000	Closed	R&D	Other	University of Minnesota
Investigation of Composite Coatings for Photo BioChemical Generation of Hydrogen from Carbohydrates	SG-H3-2004	$25,000	Closed	R&D	Other	University of Minnesota
Bringing Energy-Efficient Hybrid Vehicles to Market	SG-P5-2004	$15,528	Closed	R&D	Other	University of Minnesota
Thin Multi-Layer Latex Coating Photobioreactor for Optimal Light Adsorption and Hydrogen Evolution	SO3-2004	$53,000	Closed	R&D	Other	University of Minnesota
Thin Multi-Layer Latex Coating Photobioreactor for Optimal Light Adsorption and Hydrogen Evolution II	SO3b-2004	$129,672	Closed	R&D	Other	University of Minnesota
Ink Jet Direct Write Solar Cells	LG-C1-2005	$253,410	Closed	R&D	Solar	University of Minnesota

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Projects Funded by Renewable Development Fund, 2002-2010 (continued)

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
Solar Thermal Heating Systems: Innovation in Materials and Design	LG-C3-2005	$455,943	Closed	R&D	Solar	University of Minnesota
Solar Cells Based on Semiconductor Nanoparticles and Nanowires	LG-C5-2005	$300,000	Closed	R&D	Solar	University of Minnesota
Renewable Energy from Sunlight Using Organic Photovoltaics	LG-C6-2005	$537,669	Closed	R&D	Solar	University of Minnesota
Next Generation Solar Heating Systems	M2-2004	$50,000	Closed	R&D	Solar	University of Minnesota
The Study of Photoelectrochemical Processes for Hydrogen Production	SG-H5-2004	$25,000	Closed	R&D	Solar	University of Minnesota
University of Minnesota-Morris Biomass District Heating Alternative	D2-2004	$500,000	Closed	EP	Biomass	University of Minnesota
University of Minnesota-Morris Biomass District Heating Alternative II	D2b-2004	$500,000	Closed	EP	Biomass	University of Minnesota
Power Purchase Agreement/RFP for a Wind Turbine	D4-2004	$7,800	Closed	EP	Wind	University of Minnesota
Turbine Purchase Submitted (related to D5-2004)	D5-2004	$1,952,200	Closed	EP	Wind	University of Minnesota
Sustainable Fast-Sourcing Systems for Biomass Energy Production: Two Minnesota Case Studies	SG-P1-2004	$23,439	Closed	R&D	Biomass	University of Minnesota
Pre-Design and Economic Modeling for an Integrated Renewable Energy Facility at University of Minnesota-Morris	D1-2004	$36,551	Closed	APE	Other	University of Minnesota
Renewable Energy Research and Development Center, University of Minnesota-Morris Coordinator Position	D3-2004	$110,000	Closed	APE	Other	University of Minnesota
Full Cost Accounting of Renewable Energy Systems	SG-P3-2004	$37,747	Closed	APE	Other	University of Minnesota
Solar/Hydrogen Fuel Cell Use	D6-2004	$20,000	Closed	APE	Solar	University of Minnesota
Designer Proteins for Efficient Enzymatic Degradation of Recalcitrant Cellulose	LG-B4S2-2005	$122,500	In Progress	R&D	Biomass	University of Minnesota
Mimicking Fungal Biomass Decomposition Using Biphasic Biocatalysis	RC-0008-11	$135,000	In Progress	R&D	Biomass	University of Minnesota
Engineering of a Multi-Species Fermentation Platform for Biofuel Production	RL-0001-11	$472,500	In Progress	R&D	Biomass	University of Minnesota
Biofuels for the Farm	RL-0004-09	$200,000	In Progress	R&D	Biomass	University of Minnesota
Processing Dried Distillers Grains into Biofuels and Other Value-Added Products	RL-0010-11	$250,000	In Progress	R&D	Biomass	University of Minnesota
Next-Generation Biofuels and the Ecosystem Services They Provide: Sustainability and the Biomass Production Landscape	RL-0023-11	$500,000	In Progress	R&D	Biomass	University of Minnesota
Performance and Emissions of a Second Generation Biofuel Dimethyl Ether	RL-0024-11	$500,000	In Progress	R&D	Biomass	University of Minnesota
Air Pollution Impacts of Conventional and Alternative Fuels	RL-0026-09	$171,239	In Progress	R&D	Biomass	University of Minnesota
Converting Solid Biomass to Hydrocarbon Liquid Fuels	RL-0032-09	$143,192	In Progress	R&D	Biomass	University of Minnesota
Lactic Acid Fermentation Using Dairy Manure as the Sole Carbon and Nitrogen Source	RS-0004-11	$47,677	In Progress	R&D	Biomass	University of Minnesota
Enhanced Biogas Formation from Animal Wastes	RS-0006-09	$67,716	In Progress	R&D	Biomass	University of Minnesota

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Projects Funded by Renewable Development Fund, 2002-2010 (continued)

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
Biohydrogen-Based Biofuel Cells: Highly Efficient and Clean Electricity Generation Using Mixed Wastewater Feedstocks	RS-0010-09	$70,000	In Progress	R&D	Biomass	University of Minnesota
Development of Torrefied Wood Microchips as an Energy-Efficient Biofuel for Pellet Stoves and Boilers	RS-0010-11	$66,042	In Progress	R&D	Biomass	University of Minnesota
Minnesota Microorganisms for Electrical Biocatalysis	RS-0013-09	$70,000	In Progress	R&D	Biomass	University of Minnesota
Regulation of Cell Wall Growth and Composition in Nitrogen Fixing Biomass Crops in Minnesota: Medicago and Related Forage Crop and Woody Species	RS-0018-11	$69,827	In Progress	R&D	Biomass	University of Minnesota
Conversion of Waste Lignin to Liquid Fuels and Other High Value Products: A Fundamental Study Exploring Two Options	RS-0019-11	$69,790	In Progress	R&D	Biomass	University of Minnesota
Transcriptomics to Identify Lignin-Degrading Enzymes in Fungi	RS-0028-09	$75,000	In Progress	R&D	Biomass	University of Minnesota
Energy-Efficient Inorganic-Bonded Structural Insulated Panels	RS-0029-09	$52,650	In Progress	R&D	Biomass	University of Minnesota
Hydrothermal Carbonization of Algae and Agricultural Wastes: Synthetic Biocoal	RS-0037-09	$70,000	In Progress	R&D	Biomass	University of Minnesota
Combining Geothermal Energy Extraction and CO_2 Sequestration to Produce Clean, Renewable, Carbon Negative Electricity	RL-0014-09	$244,700	In Progress	R&D	Geothermal	University of Minnesota
The Unintended Climate Consequences of North American Carbon Sequestration from Afforestation and Reforestation	RC-0010-11	$121,361	In Progress	R&D	Other	University of Minnesota
Strategies for the Reduction of Carbon Dioxide to Methanol	RC-0011-11	$135,000	In Progress	R&D	Other	University of Minnesota
Thermochemical Fuels: Solar at Night	RL-0001-09	$382,344	In Progress	R&D	Other	University of Minnesota
New Forms of Cross-Sector Cooperation for Achieving Breakthroughs in Sustainable Renewable Energy and Energy Conservation Technologies	RS-0006-11	$70,000	In Progress	R&D	Other	University of Minnesota
Universal Utility Interface for Plug-in Hybrid Vehicles with Vehicle-to-Grid Functionality	RS-0025-09	$70,527	In Progress	R&D	Other	University of Minnesota
High-Throughput Nanofabrication Technologies for Low-Cost Plasmonic Photovoltaics	RC-0009-11	$135,000	In Progress	R&D	Solar	University of Minnesota
Improving Organic Solar Cells with Graded Interfacial Modifications	RC-0016-11	$135,000	In Progress	R&D	Solar	University of Minnesota
Solar Recycling of CO_2 to Fuels	RL-0003-11	$499,997	In Progress	R&D	Solar	University of Minnesota
New Environmentally Benign Sulfides for Sustainable Large-Scale Photovoltaics	RL-0004-11	$500,000	In Progress	R&D	Solar	University of Minnesota
Converting Sunlight into Electricity with High-Efficiency Organic Solar Cells	RL-0006-11	$500,000	In Progress	R&D	Solar	University of Minnesota
Materials Innovation to Enable Solar Home Heating in Cold Climates	RL-0015-11	$300,000	In Progress	R&D	Solar	University of Minnesota
Laterally Integrated Photovoltaic Devices	RL-0019-09	$403,320	In Progress	R&D	Solar	University of Minnesota
Next Generation Dye-Sensitized Solar Cells	RS-0009-09	$70,000	In Progress	R&D	Solar	University of Minnesota
Experimental and Theoretical Investigations of Conducting Polymers for Solar Cells	RS-0011-11	$59,546	In Progress	R&D	Solar	University of Minnesota

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Projects Funded by Renewable Development Fund, 2002-2010 (continued)

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
Development of a Solar Smoleniec/Stirling Hybrid Thermo-Mechanical Generator	RS-0014-11	$63,875	In Progress	R&D	Solar	University of Minnesota
Converting Mining Waste Rock to Passive Solar Tiles	RS-0017-11	$50,000	In Progress	R&D	Solar	University of Minnesota
Reduction of CO_2 to CH_4 Using Nanostructured Heterojunction Photocatalysis	RS-0021-09	$69,178	In Progress	R&D	Solar	University of Minnesota
Improving Efficiency of Wind Turbines by Means of Model-Based Flow Control	RC-0014-11	$134,992	In Progress	R&D	Wind	University of Minnesota
Pumped Hydro Energy Storage Using Abandoned Mine Pits on the Mesabi Iron Range of Minnesota	RL-0013-11	$250,000	In Progress	R&D	Wind	University of Minnesota
Hydrostatic Transmission for Wind Power Generation	RS-0008-09	$57,406	In Progress	R&D	Wind	University of Minnesota
Open Accumulator Compressed Air Storage Concept for Wind Power	RS-0027-11	$68,817	In Progress	R&D	Wind	University of Minnesota
Improved Energy Production for Large Wind Turbines	RS-0039-09	$50,000	In Progress	R&D	Wind	University of Minnesota
Sustainable Polymers: Tomorrow's Advanced Materials	RL-0009-09	$296,000	In Progress	APE	Biomass	University of Minnesota
Evaluation, Validation, and Demonstration of Small-Scale Renewable Energy Systems for Homes and Businesses	RL-0007-09	$304,790	In Progress	APE	Conservation/ Efficiency	University of Minnesota
State Climate Action Planning	RS-0034-09	$69,100	In Progress	APE	Other	University of Minnesota
LEGISLATIVELY MANDATED PROJECTS ADMINISTERED BY THE MINNESOTA DEPARTMENT OF COMMERCE						
Economic and Emissions Analysis of Plasma Arc Gasification of Corn Cob and Wood Chips	B15490	$150,000	Closed	R&D	Biomass	FluiDyne Engineering Corporation dba Phoenix Solutions Co.
Modularized Ethanol Production System	B15700	$300,000	Closed	R&D	Biomass	Easy Energy Systems, Inc.
Field-to-Facility Supply Process for Biomass Gasification Systems	B15944	$150,000	Closed	R&D	Biomass	Chippewa Valley Ethanol Company, LLLP
Feasibility of Swine Manure Anaerobic Digestion System	B16614	$95,808	Closed	R&D	Biomass	ECOCORP (VA)
Workforce Analysis of Renewable Energy Industry Skills and St. Paul Ford Workers	B12643	$30,000	Closed	R&D	Other	Minnesota Department of Employment & Economic Development
Plug-in Hybrid Electric Vehicles Grant Program Administration	B21146	$31,192	Closed	R&D	Other	Bemidji State University
Hybrid Vehicle Conversion to Plug-in Hybrid Electric Vehicle	B21146	$28,250	Closed	R&D	Other	Dakota Technical College
Hybrid Vehicle Conversion to Plug-in Hybrid Electric Vehicle	B21146	$29,000	Closed	R&D	Other	Hennepin Technical College
Hybrid Vehicle Conversion to Plug-in Hybrid Electric Vehicle	B21146	$24,664	Closed	R&D	Other	Lake Superior College
Hybrid Vehicle Conversion to Plug-in Hybrid Electric Vehicle	B21146	$29,000	Closed	R&D	Other	Minnesota State Community and Technical College
Hybrid Vehicle Conversion to Plug-in Hybrid Electric Vehicle	B21146	$28,893	Closed	R&D	Other	Northwest Technical College

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Projects Funded by Renewable Development Fund, 2002-2010 (continued)

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
Hybrid Vehicle Conversion to Plug-in Hybrid Electric Vehicle	B21146	$29,000	Closed	R&D	Other	St. Cloud Technical College
St. Paul Ford Plant Site Evaluation	B22432	$100,000	Closed	APE	Other	City of Saint Paul
Vegetable Residuals Anaerobic Digester System	B15299	$300,000	Closed	EP	Biomass	Seneca Foods Corporation
Jer-Lindy Farms Anaerobic Digester System	B17482	$48,500	Closed	EP	Biomass	Jer-Lindy Farms
West River Dairy Anaerobic Digester System	B18010	$225,000	Closed	EP	Biomass	West River Dairy, LLP
Riverview Anaerobic Digester System	B24480	$225,000	Closed	EP	Biomass	Riverview, LLP
HourCar Solar Electric Charging Stations for Plug-in Hybrid Electric Vehicles	B15945	$50,000	Closed	EP	Solar	Neighborhood Energy Connection
Clean Energy Resource Teams	B04915	$239,750	Closed	APE	Conservation/ Efficiency	The Minnesota Project
Clean Energy Resource Teams	B04920	$250,000	Closed	APE	Conservation/ Efficiency	The Green Institute
Clean Energy Resource Teams	B04928	$760,250	Closed	APE	Conservation/ Efficiency	University of Minnesota
Governance Options for Carbon Cap & Trade Program Revenues	B22334	$74,000	Closed	APE	Other	University of Minnesota
Minnesota Wind Energy Loan Program	B12256	$15,500	Closed	APE	Wind	Southwest Initiative Foundation
Renewable Methanol System for Biodiesel Production	B15871	$297,675	In Progress	R&D	Biomass	Rational Energies, LLC
Economic Viability of Liquid Fuel Production from Biomass Gasification	B17075	$300,000	In Progress	R&D	Biomass	Gradient Technology
Membrane-Solvent Extraction Process for Cellulosic Ethanol Production	B18601	$295,872	In Progress	R&D	Biomass	3M Company
Educational Outreach Services and Test Center for Biomass Combustion Technology; Support Technology Commercialization from Minnesota Companies	B37592	$1,500,000	In Progress	R&D	Biomass	Minnesota State University, Mankato
Advanced Gas Separation and Purification System for Hydrogen Production	B42760	$149,125	In Progress	R&D	Biomass	Atmosphere Recovery, Inc.
West Central Minnesota Renewable Ammonia Production Feasibility Study	B43745	$45,450	In Progress	R&D	Biomass	Swift County Rural Development Authority
Develop Statewide Geothermal Heat Flow Maps for Geothermal Power Generation in MN	B35495	$300,000	In Progress	R&D	Geothermal	University of Minnesota-Duluth
Testing Protocol for Plug-in Hybrid Electric Vehicles	B07036	$200,000	In Progress	R&D	Other	Minnesota State University, Mankato
Hybrid Vehicle Conversion to Plug-in Hybrid Electric Vehicle	B08399	$264,604	In Progress	R&D	Other	Minnesota State University, Mankato
International Renewable Energy Technology Institute Plug-in Hybrid Electric Vehicles Conversion Kits	B10938	$275,000	In Progress	R&D	Other	Minnesota Department of Transportation

(continued on next page)

Projects Funded by Renewable Development Fund, 2002-2010 (continued)

Project Title	Project ID	Grant Amount	Status	Project Type[a]	Energy Source[b]	Grantee (and Grantee's State, if Not Minnesota)
Modeling Framework for Analyzing Low-Carbon Fuels Standards for Vehicles	B24112	$200,000	In Progress	R&D	Other	University of Minnesota
Retrofit Hybrid Drive System on a City of Minneapolis Recycling Truck	B33639	$42,000	In Progress	R&D	Other	University of Minnesota
Automotive Technology Projects to Improve Vehicle and Engine Fuel Efficiency.	B36227	$400,000	In Progress	R&D	Other	Minnesota State University, Mankato
Performance of Solar Thermal Walls in Minnesota Buildings	B16337	$59,164	In Progress	R&D	Solar	Minnesota State University, Mankato
National Solar Rating and Certification Laboratory	B39474	$588,000	In Progress	R&D	Solar	University of Minnesota
Diamond K Feeds Anaerobic Digester System	B18104	$250,000	In Progress	EP	Biomass	Diamond K Feeds, LLP
Roseau School District Biomass/Hydrogen Gasifier for Electricity	B42930	$150,000	In Progress	EP	Biomass	Pembina Trail Resource Conservation & Development
Installation, Evaluation, and Training Program for Residential-Scale Wind Energy Systems	B15671	$145,800	In Progress	EP	Wind	Minnesota State University, Mankato
Clean Energy Resource Teams	B32781	$250,000	In Progress	APE	Conservation/ Efficiency	The Green Institute
Clean Energy Resource Teams	B32847	$933,524	In Progress	APE	Conservation/ Efficiency	University of Minnesota
Clean Energy Resource Teams	B33095	$66,476	In Progress	APE	Conservation/ Efficiency	The Minnesota Project
Statewide Plan for a Green Economy; Green Manufacturing Initiative	B24821	$250,000	In Progress	APE	Other	Blue Green Alliance Trust Fund
Statewide Plan for a Green Economy; Green Manufacturing Initiative	B32904	$25,000	In Progress	APE	Other	Minnesota Environmental Initiative
Study of the Economic, Environmental, and Public Health Impacts on Minnesota of a Cap & Trade Program	B36357	$420,812	In Progress	APE	Other	Midwestern Governors Association of the Council of State Governments (D.C.)

NOTES: In some cases, we modified project titles from those used by the RDF administrative entities. For this reason, we have included the identification number used for each project by its respective administrative entity. This appendix includes all RDF projects administered by Xcel Energy, the University of Minnesota, and the Department of Commerce; legislative allocations of RDF funds to other administrative entities are not reflected in this appendix.

[a] The types of projects include research and development projects (R&D); energy production projects (EP); and projects that are more administrative, policy-related, or educational in nature (APE). These categories of projects are discussed further in chapters 2 and 3.

[b] "Energy Source" refers to the type of renewable energy the project is designed to produce or study, with the exception of "Conservation/Efficiency" projects, which are intended to reduce the need for energy. The "Other" category includes projects involving a combination of renewable energy sources, projects focused on areas other than renewable electrical energy (such as vehicle fuels or clean coal), and projects in which it was unclear from the project description what energy source was to be used in the study.

SOURCE: Office of the Legislative Auditor, analysis of data provided by Xcel Energy, the University of Minnesota, and the Minnesota Department of Commerce.

RDF Project Selection Processes

Appendix C

Three entities—the Public Utilities Commission (PUC), University of Minnesota's Initiative for Renewable Energy and the Environment, and the Minnesota Department of Commerce—play key roles in the selection of Renewable Development Fund (RDF) projects and grantees. These entities have differing processes for making these selections, and this appendix briefly summarizes these processes.

Public Utilities Commission

The PUC regulates Minnesota's electricity, natural gas, and telephone industries. According to the commission, its mission "is to create and maintain a regulatory environment that ensures safe, reliable and efficient utility services at fair and reasonable rates."[1] State law also says that expenditures from the RDF may be made only by order of the PUC.[2]

The PUC has authorized 59 projects (all administered by Xcel Energy) over the course of three funding "cycles."[3] The commission has established an advisory board (the RDF Board, described in Chapter 2) that helps with the project selection process. At the beginning of a new funding cycle, the RDF Board creates a request for proposals (RFP) that, among other things presents the goals of the fund, selection timelines, selection criteria, and how proposals will be evaluated. Once the RFP is approved by the PUC and issued, applications are accepted for a period of several weeks. The RDF Board contracts with an outside consulting firm that helps evaluate the feasibility and technical merits of the proposed projects.[4] The board makes project recommendations (based on the consultant's recommendations in conjunction with the board's own project rankings), and Xcel submits the list of recommendations to the PUC for approval. Before the PUC approves the projects, it hears public comments (such as objections from bidders whose proposals were not recommended for approval)

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[1] Public Utilities Commission, "Mission Statement," http://www.puc.state.mn.us/PUC/aboutus/index.html, accessed September 16, 2010.

[2] *Minnesota Statutes* 2009, 116C.779, subd. 1(c).

[3] This count does not include several projects that were authorized but have not proceeded. In several cases, the grantee decided not to move forward with the project and voluntarily declined the award; another three projects have been authorized but as of August 2010 had not yet finalized a contract with Xcel Energy.

[4] Since the second funding cycle, the RDF Board has contracted with Princeton Energy Resources International, based in Rockford, Maryland, for assistance with proposal evaluations.

and Xcel's responses to them. In the three funding cycles to date, the PUC has approved all of the projects recommended for approval by the RDF Board, (though in one instance it requested additional information about certain projects before granting approval). During the second funding cycle, the PUC ordered the funding of one legislatively authorized project that the RDF Board did not recommend for funding.

The PUC has improved its project selection processes and RFPs over time. After approving the first round of projects, the PUC ordered the RDF Board to submit information on possible improvements to the project selection process. The board made suggestions to alter the board composition, clarify the goals of the fund, and set funding limits, among other things, many of which were adopted by the commission. While the RFP for the first funding cycle was largely a satisfactory document, the RFPs for the second and third cycles were greatly improved, with clarified requirements and better scoring systems.

The PUC has used a project approval process in which documents filed with the commission have been available for public viewing and comment. Also, the Department of Commerce is required by law to represent the public interest in all matters related to public utilities and rates; thus, the department comments on most RDF-related issues before the PUC. When issuing orders to approve project selections or require additional information, the PUC takes into consideration the opinions expressed by the Department of Commerce.

The University of Minnesota's Initiative for Renewable Energy and the Environment

In 2003, the University of Minnesota received a $10 million state appropriation from the RDF, which helped establish the University's Initiative for Renewable Energy and the Environment. This organization makes grants to University faculty and staff for RDF-funded research projects. In addition to the 2003 appropriation, the Legislature granted the University RDF appropriations in 2007 ($3 million) and 2009 ($5 million per year for four years).

The PUC and the RDF Board are not involved with the selection of University-administered RDF projects. In contrast with the PUC's project selection process, there is no opportunity for public comment on the University of Minnesota's project selections. Grants made from the University's 2007 and 2009 RDF appropriations were selected using a three-step process: (1) review of proposals by a small group of Minnesota technical experts, (2) review by a panel of national experts, and (3) review by the director of the Institute on the Environment and the director and associate director of the Initiative for Renewable Energy and the Environment.[5]

The University's project selection process improved substantially between 2003 and the present. For example, most projects selected in 2003 were identified

[5] The Initiative for Renewable Energy and the Environment became part of the University's Institute on the Environment in 2007.

without a formal RFP.[6] In subsequent years, RFPs were used to solicit proposals for all of the University's RDF-funded projects, and these RFPs have improved over time. In 2005, the University issued an RFP in the form of a five-page letter to interested faculty.[7] The RFPs issued in 2008 (to distribute funds from the 2007 appropriation) and 2009 were considerably more formal and detailed and included evaluation criteria, funding constraints, descriptions of evaluation processes, and detailed instructions for the pre-proposal (for large grants) and final proposals (all grants).

Department of Commerce

On issues related to energy utility rates and facility siting, the Minnesota Department of Commerce advocates on behalf of the public before the PUC. In addition, the Department's Office of Energy Security provides energy-related assistance to Minnesota residents, builders, utilities, policymakers, and others.

During the 2007, 2008, and 2009 legislative sessions, the Legislature passed into law more than two dozen RDF-funded initiatives that required Department of Commerce involvement or oversight. The grant-making processes for each of these initiatives involved one of several approaches, depending on the appropriation language. Some legislative initiatives specified a competitive process for awarding grants, similar to the process followed by the PUC. In other cases, legislation designated a specific entity to undertake a project, and thus no competitive process was necessary (or appropriate). For example, in 2009 the University of Minnesota at Duluth was directed to develop statewide geothermal heat flow maps to help determine the potential of geothermal power generation in Minnesota. For such projects, the Department of Commerce staff developed a workplan that incorporated the intended scope and purpose of the appropriation—information that would typically be articulated in an RFP solicitation and grantee proposal. The department awarded other grants through informal solicitations or as "single source" grants.[8] State policy authorizes single source grants for cases in which the grant recipient has unique skills or qualifications.[9] Overall, a majority of the RDF grant initiatives administered by the Department of Commerce were implemented through single source awards. In general, we found that the department followed the state's recommended processes for soliciting and awarding grants.

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[6] In 2003, four research "clusters" of faculty identified the potential recipients of early "seed grants" of less than $25,000. Each cluster used its own process to select roughly $100,000 worth of projects. While one cluster issued a simple RFP, the other three clusters identified potential projects using more informal methods.

[7] For these grants, interested parties submitted a pre-proposal, which was reviewed by a panel of external reviewers (academics from outside of the University, government agency staff, and business representatives). Selected bidders were then invited to submit full proposals.

[8] Due to safety concerns, the department did not use a completely open process for soliciting proposals for automotive technology grants. Rather, the department designated some of these grants as demonstration projects, limiting eligibility to higher education institutions.

[9] Minnesota Department of Administration, Policy 08-07, *Policy on Single and Sole Source Grants*, 08-07, July 15, 2008.

Many of the legislative RDF initiatives required the Department of Commerce to do additional work to determine which types of projects would be eligible for funding. For example, department staff held discussions with stakeholders to help determine the types of projects and issues considered most important within particular industries. In addition, the department developed written research plans based on these discussions. Department staff told us this scoping process required extensive research to ensure that the identified projects did not duplicate work already authorized by the PUC or University of Minnesota.

The Public Utilities Commission and the PUC-established RDF Board did not play a role in the Department of Commerce's solicitation of proposals or project selection.

STATE OF MINNESOTA PUBLIC UTILITIES COMMISSION

October 12, 2010

James Nobles, Legislative Auditor
Office of the Legislative Auditor
658 Cedar Street
St. Paul, Minnesota 551511

Dear Mr. Nobles:

Thank you for the opportunity to respond to the Office of the Legislative Auditor's (OLA) draft report entitled *Renewable Energy Development Fund* (Report). The Public Utilities Commission (PUC) appreciates the thoroughness of the report and the attention it draws to issues of importance to the public. With this report, now is an opportune time for the Legislature and stakeholders to re-examine the purpose of the Renewable Development Fund (RDF) and discuss alternatives for the structure and oversight of the fund. The OLA report provides a solid foundation for exploring these issues.

Several fundamental changes have occurred since the creation of the RDF in 1994 and since the PUC was given authority over expenditures from the fund in 1999:

- The size of the fund has grown substantially, from payments related to the 17 casks at the Prairie Island plant envisioned when the fund was created, to payments related to an estimated 55 casks at both the Prairie Island and Monticello plants by 2013, due to license renewal and the need for more on-site storage.
- The Legislature established renewable energy objectives in 2001 and renewable energy standards in 2007, which require all electric utilities to generate or acquire significant amounts of renewable energy.
- Renewable generation technologies in general have been refined and expanded, and wind generation, the main renewable energy source commercially available when the fund was created, has become more price competitive and is relied on for a larger share of generation capacity.
- As the report points out, the scope of RDF funded activities have been expanded by the Legislature to include projects specifically designated by the Legislature, as well as projects separately approved by the Department of Commerce and the University of Minnesota, in addition to those approved by the PUC.

The PUC agrees with the overall theme of the Report that greater coordination of these various uses of the RDF, and generally increased accountability, should be given serious consideration. A more centralized approval process could be an important strategy by which to accomplish those goals.

The Report offers two possible approaches for a revamped centralized RDF approval process: a) keep the RDF out of the state budget process and require approval of all projects by the PUC; or b) transform the RDF into a special account within the state budget and require approval by the Legislature or a legislative body. The PUC has no recommendation as to which of these the Legislature should choose. However, the PUC does offer comment on the implications of the two options suggested by the Report.

PUC approval:

If the Legislature wants to keep the RDF's original structure, i.e., separate and apart from the state budget process and funded by Xcel ratepayers, then the PUC is the appropriate body to assume the task of project approval. This conclusion is based on the PUC's authority and responsibility for Xcel's overall rates and services. However, there is a risk in this approach that the current "fragmented" structure could be perpetuated because the PUC regulates neither the Department of Commerce nor the University of Minnesota. There is no current statutory language that would compel either of those entities to comply with a PUC decision to approve or not approve certain projects. Nor does the PUC have authority over legislatively designated projects. The main reason the current RDF process with Xcel, the RDF Board and the PUC has worked as well as it has is because the PUC regulates Xcel and can hold it accountable. Statutory language granting the PUC specific authority may be one means of addressing part of this risk. Alternatively, it may be possible to channel approval of all projects through Xcel and then to the PUC.

In any event, it would be very important for the Legislature to provide clarification as to the nature of the approval process it would envision if the PUC is required to approve all RDF projects. In doing so, the Legislature should be mindful that the PUC does not currently have adequate staff resources for detailed management of an approval process for proposals that are typically very technical. If the envisioned process has PUC action as the final, formal step in a process that is largely managed by an RDF-type board, then resources are less of an issue. However, if the Legislature directs the PUC to be more directly involved in managing the process, then resources would be a significant issue. In any case, the PUC would undoubtedly continue to rely on the RDF Board, or an entity very much like it, for project management operations.

Legislative approval:

If the Legislature believes the scope of the RDF has evolved into something with broader implications than originally envisioned and that the Legislature should have a more direct impact on how projects are selected and which ones are approved, then the suggestion of moving what is now the RDF into a special account in the state budget with project approval by a legislative body should be considered. If this option is seriously considered, it should be contingent on a change in the funding mechanism. In other words, the Legislature should consider implementing some sort of state-wide funding mechanism to which *all* electric ratepayers would be required to contribute, rather than leaving the funding burden solely on Xcel electric ratepayers.

The basis for recommending a change in the funding mechanism in this instance is based on two concerns. First, a transfer to the state budget of an Xcel managed fund which is currently supported only by Xcel electric ratepayers, with intent of using those funds to provide benefits to non-Xcel ratepayers, raises potential legal questions. Second is the closely related issue of basic equity; i.e., if the Legislature wishes to provide a broader scope of benefits on these issues to Minnesota residents as a whole, then the funding needed to provide those benefits should not be limited to just Xcel electric ratepayers.

Again, thank you for the opportunity to respond to the draft report. If you have any questions, please contact me (651/201-2220) or Burl Haar (651/201-2222).

Sincerely,

David C. Boyd

David Boyd,
Chairman

Xcel Energy®

414 Nicollet Mall
Minneapolis, Minnesota 55401-1993

October 12, 2010

Mr. James Nobles, Legislative Auditor
Office of the Legislative Auditor
658 Cedar Street
St. Paul, MN 55155

Dear Mr. Nobles:

Thank you for the opportunity to review the Office of the Legislative Auditor's report on the Renewable Development Fund ("RDF") administered by Xcel Energy (the "Company").

Overall, we believe the Legislative Auditor's report is very thorough and presents a fair picture of the status of the RDF Program today. We appreciate the professionalism demonstrated by your staff throughout the Program review process.

In conjunction with the report's findings and recommendations, we believe it is important to recognize the Minnesota Legislature mandated establishment of the Fund as part of compromise legislation authorizing the dry cask storage of spent nuclear fuel at the Prairie Island nuclear power plant. In essence, the Minnesota Legislature provided policy direction to dedicate a certain portion of the Company's resources for a specific purpose, the advancement of renewable-based electric energy generation. In many respects, the RDF statute is like other policy directives from the Legislature that specify how the Company should deploy resources such as energy conservation requirements. We continue to believe the most appropriate way to administer RDF resources is by the Company with the oversight of the Minnesota Public Utilities Commission.

Again, thank you for the professional approach and courtesy your staff has extended during the RDF Program review process. Please contact me at 612-330-6732 if you have any questions or would like further information about RDF Program activities.

Sincerely,

James R. Alders
Director, Regulatory Administration

UNIVERSITY OF MINNESOTA

Institute on the Environment

1954 Buford Avenue
St. Paul, MN 55108
612-626-9553

October 11, 2010

James R. Nobles
Legislative Auditor
140 Centennial Building
658 Cedar Street
Saint Paul, MN 55155-1603

Dear Mr. Nobles,

We want to thank you and your team for taking the time to meet with us last Friday regarding the draft OLA Renewable Development Fund (RDF) report findings. We appreciate the thoroughness of your report and the constructive advice you presented. Your team's draft report was extremely well researched and well written, and we know that a significant amount of time and energy was spent in your examination of the RDF program. Thank you for this effort.

Naturally, we have some thoughts that we would like to share with you in response to your draft report, which we outline below.

1) Immediate Tasks for IREE to Implement. First of all, your report raised a number of excellent points that we can act on in the very near future. Specifically, we acknowledge several administrative issues you have raised, and will immediately:

- Make sure to explicitly acknowledge the RDF funding in all of our IonE / IREE collateral materials, including our website and web pages;
- Increase the awareness and clarity of IREE project results and impacts by working to better translate scientific and technical terminology into laymen's terms; and
- Post all of the final IREE project reports on our web-site.

We expect that all of these actions will take effect in the coming weeks and months.

2) Larger Issues. We also welcome your comments on the larger issues surrounding the ultimate purpose of RDF-supported programs, and how they relate to the mission of IREE.

Specifically, we agree with your proposal to clarify the purpose of the RDF portfolio, and to increase the input from legislative leaders and ratepayers in shaping the overall mission of RDF-supported programs, including IREE. This is an excellent long-term goal, and we are happy to assist in any way possible.

In the meantime, we believe that the current legislation for IREE is quite clear, and that we have been following it faithfully. As your report indicated, we have maintained a rigorous adherence to IREE's renewable energy investment mandate, as set forth by the Minnesota Legislature, and have executed these programs carefully and deliberately.

Another issue that was raised in the report is whether the RDF is intended to support renewable *energy* (including different modes of generation, storage, transmission and utilization) or renewable *electricity* alone. While we realize that there are differing opinions on this, we strongly believe that a broader renewable energy R&D portfolio (including a strong focus on electricity-related issues, among other topics) is most prudent, especially given the current economic and environmental challenges facing Minnesota. We believe that a more narrow focus on electricity alone is not sufficient to best serve Minnesota, and our many different economic sectors, over the long term. However, we remain open-minded on this front, and look forward to future conversations on this topic.

3) Recommendations for the Reorganization of the RDF. Regarding your two administrative recommendations for the future of the RDF, we would like to respectfully suggest a third alternative.

Naturally, we agree that the RDF would benefit from increased collaboration, coordination, and streamlining among the different component programs. That is an excellent observation, and we agree completely. However, rather than scrapping the current system and creating an entirely new RDF bureaucracy from scratch, which would take a "one size fits all" approach to the entire portfolio, we believe that a third approach would work best.

Specifically, we recommend that the Legislature adopts a process by which current programs be linked through a new, overarching governing board, made up of legislative leaders and ratepayer representatives. Such a board would guarantee legislative oversight of the whole RDF portfolio, and provide guidance on many critical issues – including questions of mission, vision, implementation and portfolio balance.

We believe that this approach would maintain the strengths of the existing programs (especially IREE, which your report indicated was doing an excellent job in selecting complex R&D projects for funding, and stewarding our portion of the RDF portfolio) and address your concerns regarding improved collaboration, coordination, streamlining and accountability across the RDF programs.

Furthermore, this legislative oversight would continue to allow for appropriate mission differentiation (especially in complex R&D areas, where expert reviews are absolutely necessary) and enable each funding entity to build upon their strengths. The new oversight board would *enhance* the current programs (while maintaining our current strengths) and provide the needed communication, collaboration, and accountability to ensure Minnesota's renewable energy investments are as strong and effective as possible. Ultimately, this new oversight structure would help accelerate the development of next stage technologies and

commercialization projects, resulting in improved energy security, environmental performance and job creation across Minnesota.

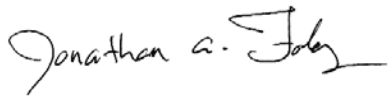
As you know, it has taken IREE a number of years to develop and refine a rigorous and effective process for soliciting and selecting scientific investments in renewable energy across the University of Minnesota system. We believe that a core strength of our program lies in the use of national "superstar" peer reviewers to assess the scientific and technical merit of each proposal. In our proposed hybrid model, there would be a significant role for citizens (i.e. Xcel Energy ratepayers) and legislators to provide input on the overall portfolio direction and balance. However the complexity of renewable energy R&D demands deeper scientific and technical knowledge than a typical citizen could be expected to possess. Our hybrid model would preserve the strengths of the IREE process (especially the insights of technical experts in selecting individual R&D projects), while providing for more citizen and legislative guidance to the overall portfolio.

In short, we believe that we should take advantage of all the past experiences developed by IREE in advancing the RDF portfolio, and not "throw the baby out with the bathwater." Maintaining the strength of IREE, while simultaneously adding a clearer oversight and coordination mechanism, would seem to be in the best interests of the RDF and the State of Minnesota.

Thank you again for taking the time to meet with us. We look forward to future dialogues with you about the future of the RDF and renewable energy projects in Minnesota.

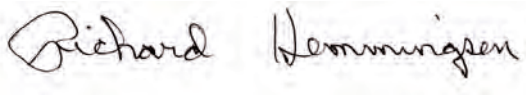
Please let us know if we can provide any additional information, or aid you in your review in any way.

Sincerely,



Jonathan Foley, Ph.D.
Director, Institute on the Environment (IonE)
McKnight Presidential Chair, and
Professor of Ecology, Evolution and Behavior

Sincerely,



Richard A. Hemmingsen
Director, Initiative for Renewable Energy
and the Environment (IREE)

cc: Joel Alter, Legislative Auditor
Rod Larkins, IREE Associate Director
Dawne Brown White, IonE Chief of Staff

Forthcoming Evaluations

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Directory of Regulated Occupations in Minnesota, February 1999
Occupational Regulation, February 1999

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Professional/Technical Contracting, January 2003
State Employee Health Insurance, February 2002
State Archaeologist, April 2001

Health
Financial Management of Health Care Programs, February 2008
Nursing Home Inspections, February 2005
MinnesotaCare, January 2003
Insurance for Behavioral Health Care, February 2001

Human Services
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Human Services Administration, January 2007
Public Health Care Eligibility Determination for Noncitizens, April 2006
Substance Abuse Treatment, February 2006
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Child Care Reimbursement Rates, January 2005
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Economic Status of Welfare Recipients, January 2002

Housing and Local Government
Preserving Housing: A Best Practices Review, April 2003
Managing Local Government Computer Systems: A Best Practices Review, April 2002
Local E-Government: A Best Practices Review, April 2002
Affordable Housing, January 2001

Jobs, Training, and Labor
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E-Verify, June 2009
Oversight of Workers' Compensation, February 2009
JOBZ Program, February 2008
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Prevailing Wages, February 2007
Workforce Development Services, February 2005
Financing Unemployment Insurance, January 2002

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Public Libraries, March 2010
Economic Impact of Immigrants, May 2006
Gambling Regulation and Oversight, January 2005
Minnesota State Lottery, February 2004

Transportation
State Highways and Bridges, February 2008
Metropolitan Airports Commission, January 2003

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