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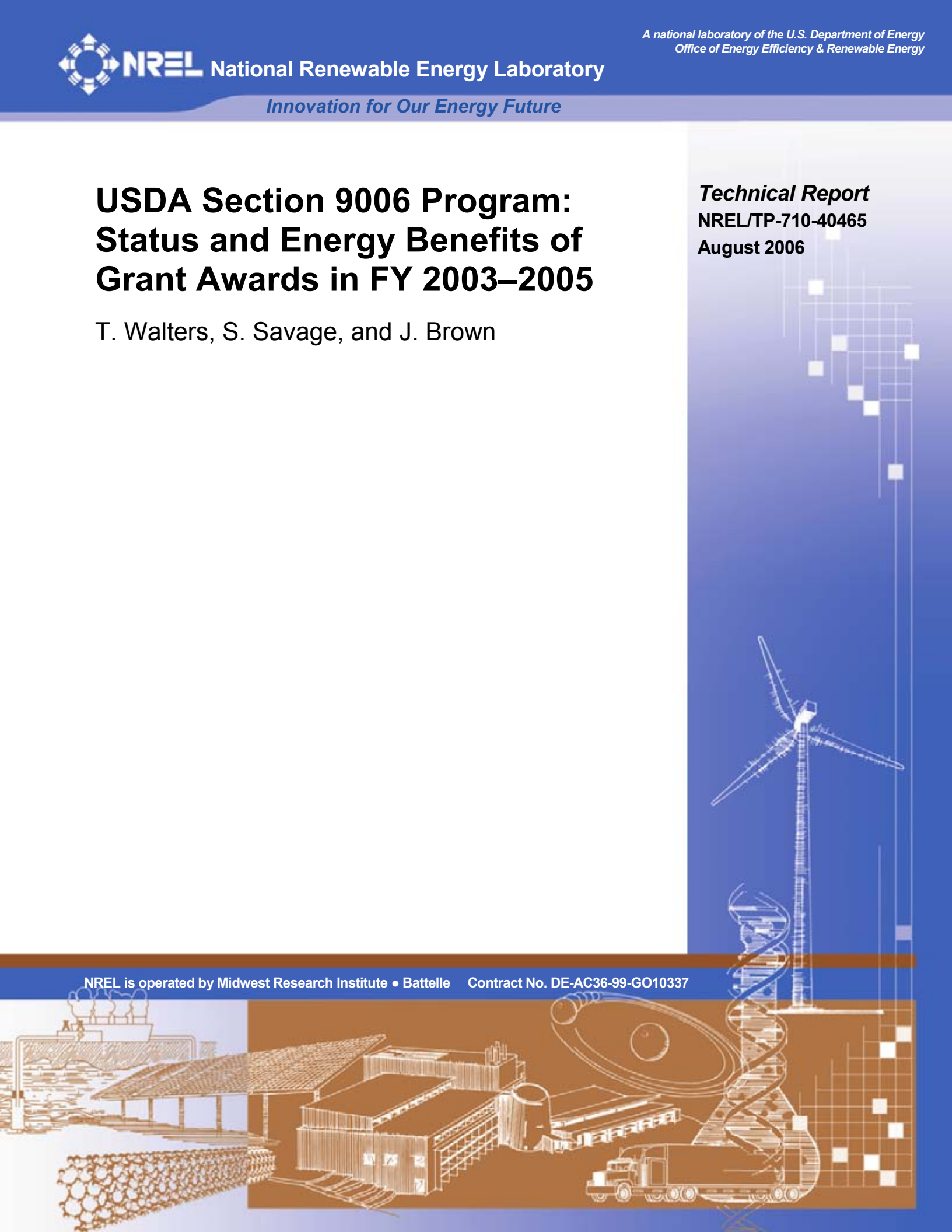
Office of Energy Efficiency & Renewable Energy

USDA Section 9006 Program: Status and Energy Benefits of Grant Awards in FY 2003–2005

T. Walters, S. Savage, and J. Brown

Technical Report
NREL/TP-710-40465
August 2006



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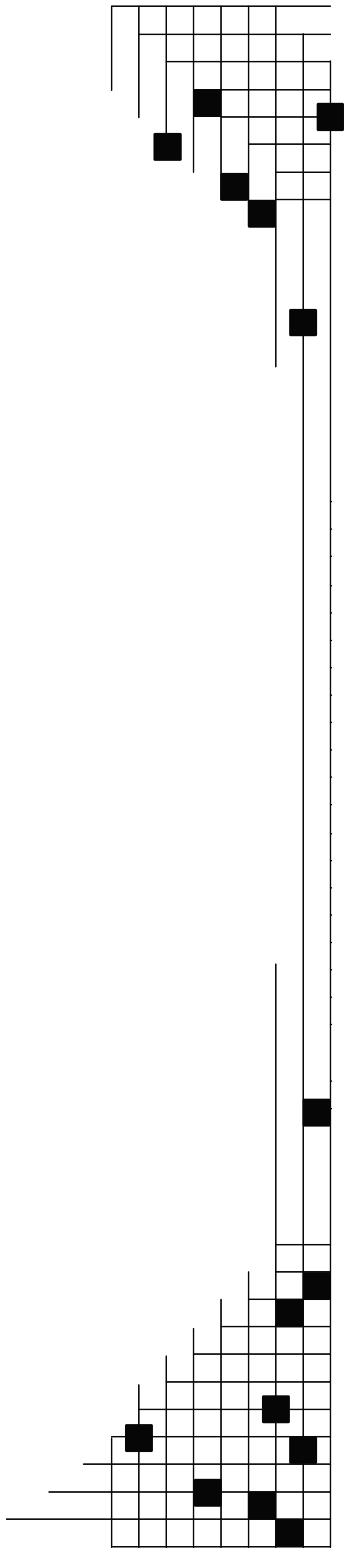

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Executive Summary

At the request of the U. S. Department of Agriculture (USDA) Rural Development, the National Renewable Energy Laboratory conducted a review of projects awarded in the Section 9006 Program: Renewable Energy Systems and Energy Efficiency Improvements Program. This report quantifies federal and private investment, outlines project status based on recent field updates, and calculates the effects on energy and emissions of energy efficiency and renewable energy projects awarded grants in FY 2003, FY 2004, and FY 2005. In addition, this report provides an overview of the program challenges and modifications in the first three years of operation.

The Section 9006 program was designed to provide farmers, ranchers, and rural small businesses with financial assistance in purchasing renewable energy systems and energy efficiency improvements. This program has had an inherently ambitious goal—to create and expand a market for energy efficiency and renewable energy technologies in rural America. Overall, status data reviewed in this report show the program has achieved a wide range of success.

Awards

In the first three years of the program, nearly 800 applications were received, resulting in 435 grant awards to rural energy projects in 37 states. Of these awards, 412 projects in 36 states are still active, with a total investment by USDA of $63,922,488.[1] The total projects awarded range from $10,000 to multi-million dollar facilities. Forty-two percent of projects qualify as small projects (less than $200,000 total project costs), and in total the program has leveraged more than $762,000,000 in total project value.

During the first three years of operation, the 9006 program increased dramatically in popularity. During the first year of operation, the quantity and quality of applications submitted were generally much lower than expected. To address these issues, USDA embarked on a program outreach effort in FY 2004 and FY 2005 to leverage partnerships and expand applicant resources. The results of these efforts are evident in the dramatic increase in both the number and quality of applications received in subsequent years. The number of small renewable projects is still quite low, but USDA improvements to the program final rule, published in July 2005, are expected to increase the awards to small renewable energy projects.

Based on current active projects to date, there is a 12:1 leverage on total project investment versus USDA grant funds obligated. Total obligated funds over the first three years of the program grants equate to nearly $64 million, leveraging $762 million of total project investment. This ratio is considerably higher than originally anticipated at the beginning of the program.

[1] Active projects include projects that have been completed or are still in pre-construction or construction phase. Active projects do not include projects that have been are in the process of being cancelled.

Current Status

The applicant commitment to projects is reflected in the fact that 95% of awarded projects are still considered "active," implying that the project has reached completion or is still in the development phase. First year (FY 2003) projects are on a slower pace for completion than projects receiving awards during the second year (FY 2004). This is not unexpected and reflects the challenge that USDA faced in FY 2003 with low quality and quantity of applications. The slower completion rate is a result of the balance that USDA struck with the first year of awards between care with taxpayer funds and willingness to support early adopters.

Table E1. Status of All Awarded Projects, FY 2003-2005

Award Year	Grants Awarded	% of Projects Completed	% of Projects Remaining Active	Funds Obligated to Active Projects	Total Active Project Costs
FY 2003	114	40%	89%	$19,108,273	$395,393,354
FY 2004	167	47%	95%	$22,592,347	$165,021,594
FY 2005	154	32%	99%	$22,221,868	$202,148,695
Total	**435**	**40%**	**95%**	**$63,922,488**	**$762,563,643**

Energy efficiency projects have the highest completion rates overall. Because these projects tend to be of smaller size and have lower requirements for external agreements and permits, this completion rate is as expected. Most of the active projects that have not yet entered the construction phase are either large wind turbines or anaerobic digesters. Many of these projects face typical development issues, including financing, interconnection, power purchase agreements, and equipment procurement.

Program Benefits

The 9006 Program has had an immediate and direct impact on renewable energy production and energy savings in rural America. The combined energy production and savings from the active projects accounts for more than 17 trillion Btu of energy per year. This production and savings is the equivalent to roughly 3 million barrels of oil or enough energy to power 124,000 homes or fuel 181,000 cars for an entire year. This also equates to significant emission benefits resulting in the avoidance of more than 1 million metric ton of carbon equivalent per year, providing a significant benefit for the environment.

Lastly, although this report does not attempt to quantify the impact, there has been significant rural economic impact from the projects awarded thus far. In several instances, the 9006 program has had a noticeable effect on certain technology market segments in rural areas. Specifically, awards have coincided with a major increase in the development of anaerobic digesters for on-farm use and in the development of "community-scale" wind facilities.

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Definitions

Anaerobic Digester	A renewable energy system that uses animal waste and other organic substrates to produce thermal or electrical energy via anaerobic digestion.
Bioenergy	A renewable energy system that produces fuel, thermal energy, or electric power from a biomass source, other than an anaerobic digester project.
Btu	A unit used to measure quantity of heat, defined as the quantity of energy necessary to raise the temperature of 1 lb. of water 1° Fahrenheit. British thermal unit.
EERE	Energy efficiency and renewable energy technologies.
Energy Efficiency Improvement	Improvements to a facility, building, or process that reduces energy consumption, or reduces energy consumed per square foot, including passive improvements that reduce energy loads, such as improving the thermal efficiency of a storage facility, and active improvements that directly reduce energy consumption, such as replacing existing energy-consuming equipment with high efficiency equipment.
Geothermal-Direct Use	A system that uses thermal energy directly from a geothermal source.
Geothermal-Electric	A system that uses geothermal energy to produce high pressure steam for electric power production.
Hybrid Renewable Energy Project	A project that includes more than one type of renewable energy technology.
Hydrogen Project	A renewable energy system that produces hydrogen; or a renewable energy system that uses mechanical or electric power or thermal energy from a renewable resource using hydrogen as an energy transport medium.
Interconnection Agreement	The terms and conditions governing the interconnection and parallel operation of the grantee's or borrower's electric generation equipment and the utility's electric power system.
kW	A unit of electrical power equal to 1000 watts or 1 kilowatt.
kWh	The work performed by 1 kilowatt of electric power in 1 hour. The unit on which the price of electrical energy is based. A 1000 watt light bulb operating for 1 hour would use 1 kWh.
MMBtu	Million British thermal units.
MGPY	Million gallons per year.
MW	Unit of electrical power equal to 1 million watts.
MWh	A measure of energy production or consumption equal to 1 million watts produced or consumed for 1 hour

Renewable Energy	Energy derived from a wind, solar, biomass, or geothermal source; or hydrogen derived from biomass or water using wind, solar, biomass, or geothermal energy sources.
Renewable Energy System	A system that produces or produces and delivers usable energy from a renewable energy source.
Solar, Large	Large solar systems are those for which the rated power of the system is larger than 10 kilowatts (kW). Large solar systems are either stand-alone (off grid) or interconnected to the grid (on grid). Large solar thermal systems are those for which the rated storage volume of the system is greater than 240 gallons or that have a collector area of more than 1,000 square feet.
Solar, Small	Small solar electric projects are those for which the rated power of the system is 10 kW or smaller. Small solar electric projects are either stand-alone (off grid) or interconnected to the grid at less than 600 volts (on grid). Small solar thermal projects are those for which the rated storage volume of the system is 240 gallons or smaller, or that have a collector area of 1,000 square feet or less.
Wind, Large	A wind energy project for which the rated power of the individual wind turbine(s) is larger than 100 kW.
Wind, Small	Wind energy system for which the rated power of the wind turbine is 100 kW or smaller and with a generator hub height of 120 feet or less. A small wind system is either stand-alone or connected to the local electrical system at less than 600 volts.

Overall Program Status and Benefits of Awarded Projects

The purpose of this document is to quantify investment, project status, and energy impact of energy efficiency and renewable energy technologies (EERE) resulting from grants in the first three years of the Renewable Energy Systems and Energy Efficiency Improvements Program under Title IX, Section 9006 (FY 2003 through FY 2005).[2] The program was established by the Farm Security and Rural Investment Act of 2002 and currently provides grants and loan guarantees to assist agricultural producers and rural small business with purchasing renewable energy systems and making energy efficiency improvements.[3]

Program Applications and Awards

In the first three years of the program, nearly 800 applications were received, resulting in 435 grant awards to rural energy projects. Of these awards, 412 projects are still active in 36 states, with a total investment by USDA of $63,922,488.[4] Table 1 shows the status as of June 2006 of projects awarded in each fiscal year. The total projects awarded range from $10,000 to multi-million dollar facilities.

Table 1. Status of All Awarded Projects, FY 2003-2005

Award Year	Grants Awarded	% of Projects Completed	% of Projects Remaining Active	Funds Obligated to Active Projects	Total Active Project Costs
FY 2003	114	40%	89%	$19,108,273	$395,393,354
FY 2004	167	47%	95%	$22,592,347	$165,021,594
FY 2005	154	32%	99%	$22,221,868	$202,148,695
Total	**435**	**40%**	**95%**	**$63,922,488**	**$762,563,643**

The 9006 program was implemented during FY 2003 through FY 2005 by a release each year of a Notice of Funds Availability (NOFA). The NOFA, and thus the program rules, changed in each year. The final program rules, 7 CFR Part 4280, were published on July 18, 2005, and will be used in future fiscal years to administer the program. Many of the recommendations or issues identified in this report have been addressed in the final program rules.

Statutory requirements for the program dictate that grant recipients must demonstrate financial need for the award. As such, the grant award (capped at 25% of project costs and $500,000 for renewable energy projects and $250,000 for energy efficiency projects), is typically a sizable portion of the overall project costs. On average, the projects leverage grant funds at a 12:1 ratio. The bulk of projects to date (93%) are less than $3 million in total project costs; 42% are small projects with total project costs under $200,000. Table 2 shows the median total project costs

[2]Although guaranteed loans are also part of the 9006 program, only two loans have been awarded during the first three years; they were issued in 2005. This report does not address those two projects.
[3]www.rurdev.usda.gov/rbs/farmbill/index.html
[4]Active projects include projects that have been completed or are still in pre-construction or construction phase. Active projects do not include projects that have been are in the process of being canceled.

and grant awards. Overall, the median total project cost was $386,000, and the median grant award was $87,425.

Table 2. Median Total Project Costs and Grant Awards

Award Year	Awards	Median Total Project Cost	Median Grant
FY 2003	114	$870,482	$141,872
FY 2004	167	$236,200	$51,900
FY 2005	154	$228,710	$29,975
Total	**435**	**$386,000**	**$87,425**

During the first three years of operation, the 9006 program increased dramatically in popularity. The funding cycle during FY 2003 saw a small but diverse number of projects. The quantity and quality of applications received were not as hoped, and USDA could not award all of the available FY 2003 program funds. Several program design issues were identified following the FY 2003 award cycle. Those are addressed later in this report (see FY 2003 Award Cycle).

A substantial effort by USDA in program outreach was undertaken in both FY 2004 and FY 2005. In addition to USDA, the U.S. Department of Energy's (DOE) Wind Powering America initiative and the U.S. Environmental Protection Agency's (EPA) AgStar program for anaerobic digesters actively promoted the 9006 program. The USDA State Office also partnered on outreach efforts with DOE Regional Offices, many state energy offices, and non-profit organizations. The results of these efforts are evident in the dramatic increase in both the number and quality of applications received in subsequent years. Figure 1 indicates the number of total applications received in FY 2005 increased by a factor of 2.6 compared to FY 2003.

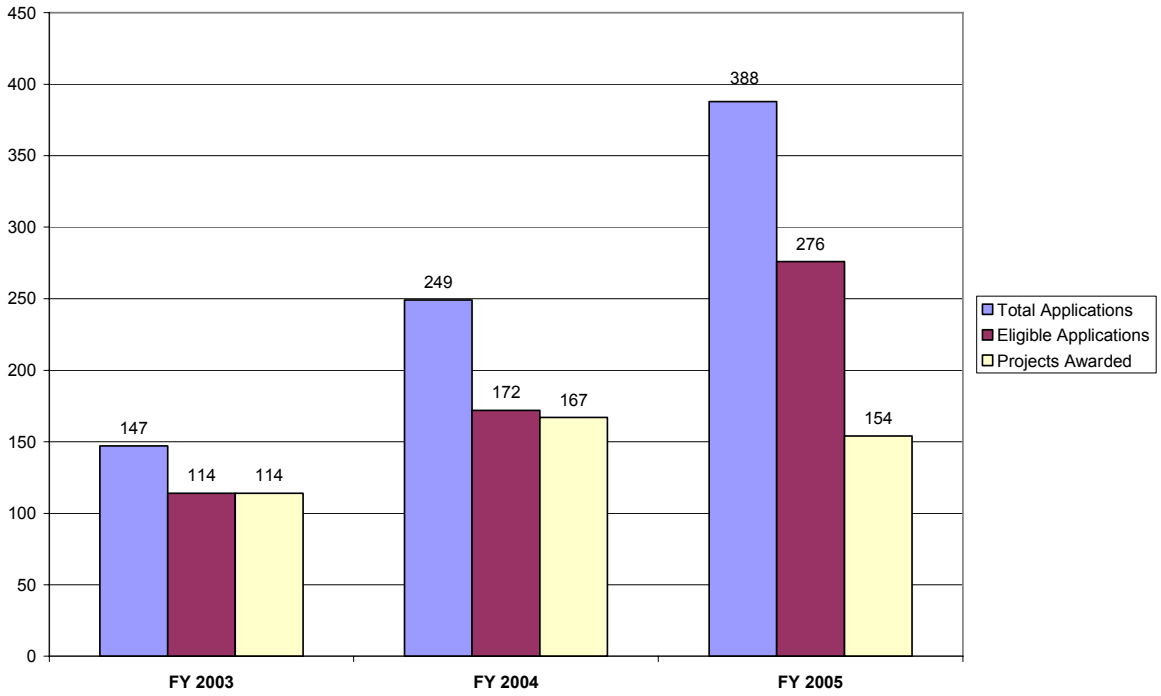

Figure 1. Summary of applications received, FY 2003-2005.

As shown in Figure 2, the number of applications received for small projects has also steadily increased. This trend is expected to continue in FY 2006 and FY 2007, as new simplified application processes outlined in the final rule make the program more accessible to projects with total costs of less than $200,000.

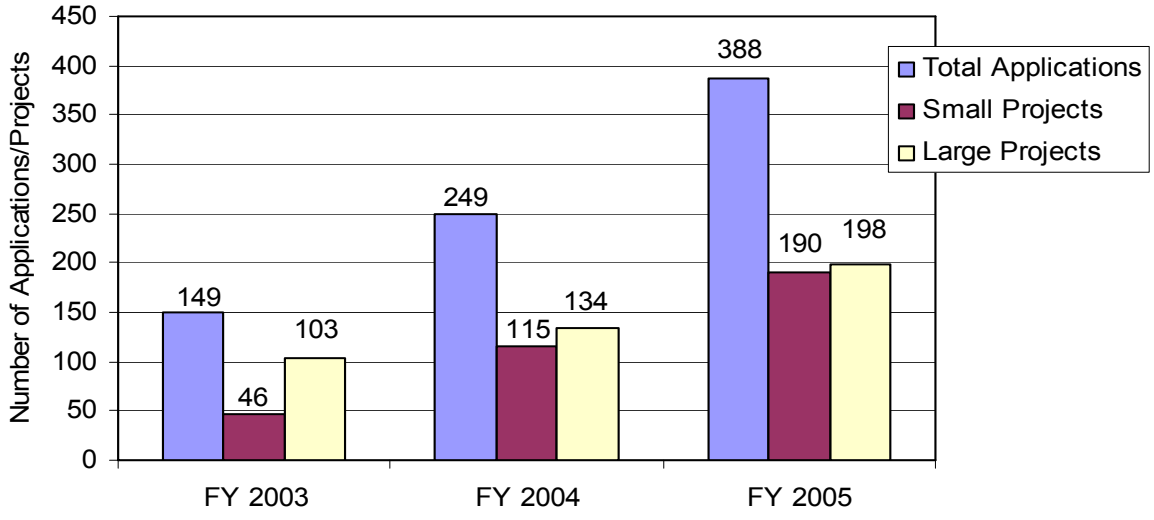

Figure 2. Summary of applications received by size, FY 2003-2005.

Equally important was the parallel increase in the number of applications determined to be eligible for program funding. In FY 2003, many applications lacked technical integrity or did

not meet the eligibility criteria. USDA decided to loosen qualifications for eligibility in order to utilize the available funds. However, original standards were met by an increased number of projects in both FY 2004 and FY 2005. Interviews with technical reviewers for applications in each of the years have indicated that the quality of applications has increased significantly from year to year. Although this is likely attributable to many factors, two factors often mentioned by stakeholders are increased outreach from USDA and an increased familiarity with the program and technologies at the USDA State Offices.

As outreach improved through the years, so has the geographic diversity of project awards. Figure 3 shows the distribution of awards by state. Projects have been awarded in 37 states, with a large number of those awarded in Midwestern agricultural states, such as Nebraska, Iowa, Wisconsin, and Minnesota. Awards have not been awarded exclusively to those states; states such as New York, Washington, California, and Idaho have also received a significant number of awards. A number of factors have affected this distribution, including access to technical assistance, involvement of state USDA offices, and availability of state incentive programs for renewable energy and energy efficiency.

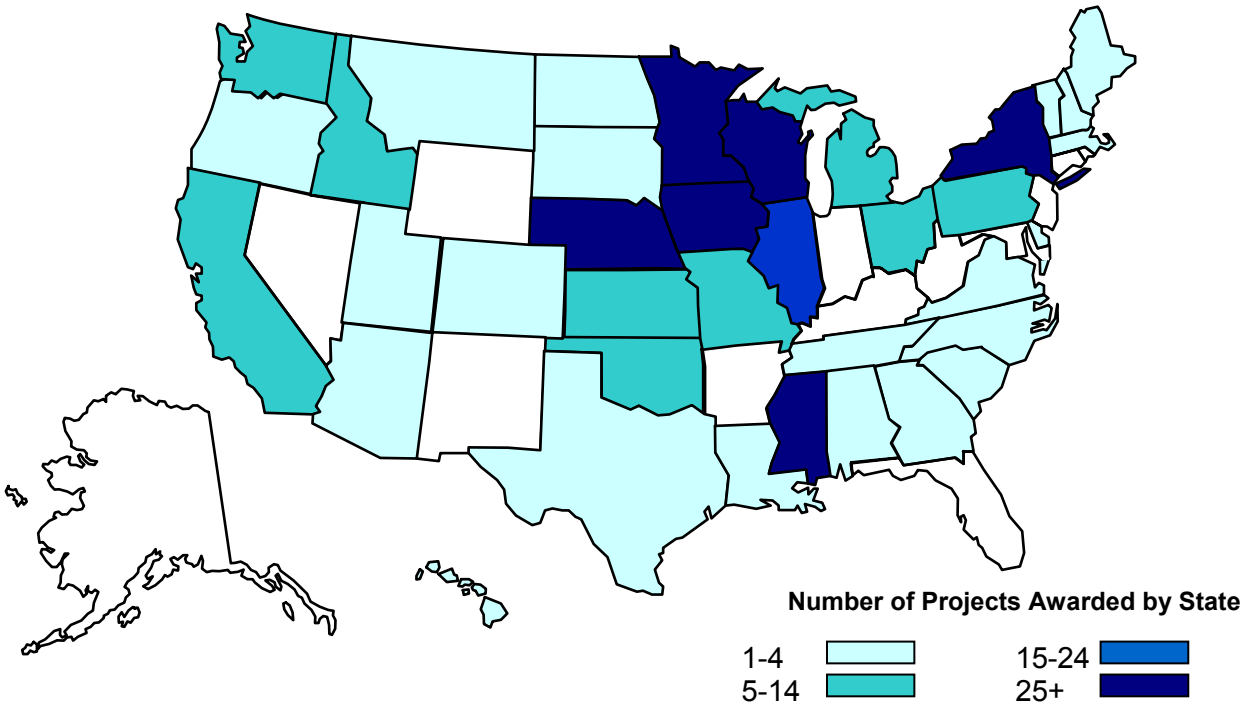

Figure 3. Distribution of awards by state, FY 2003-2005. Although a large number of projects were awarded in the Midwest, states in other regions such as California, Idaho, New York, and Washington also received a substantial number of awards.

Status of Grant Awards

As part of the grant agreement with USDA, awardees must provide quarterly updates on the status of their project development until it is operational. This report provides project status based on the input from quarterly reports that USDA State Offices input into a central database by June 15, 2006. Energy benefits are derived from original project estimates included with the application. For more information, see Appendix B.

For purposes of this report, the term "complete" means that the project is operational and "under development" means that the project is in one of the phases of development. This term encompasses projects that are still in the design or permitting phase as well as projects that are under construction or in the start-up or shakedown process. Active projects include projects that are complete or under development. In some cases, project funding has been "canceled," either for failing to meet certain eligibility criteria or in response to the awardees decision to forego the project.

As can be seen in Table 1, 95% of the projects awarded under the 9006 program are still active, meaning they are either complete or still under development. Considering that a range of economic issues, bankruptcies, changes in ownership, technical or market barriers, or changes of business plans can account for a project not moving forward, this is an encouraging number. Table 3 shows the specific phases of the awarded projects by year.

Table 3. Development Status of Awarded Projects FY 2003-2005

		Active		
FY	Canceled	Complete	Under Development	Total Awarded
2003	16	46	52	114
2004	6	79	82	167
2005	1	50	103	154
2003-2005	**23**	**175**	**237**	**435**

A clear trend is that small projects are completed sooner. This is as expected, because the project lead time, including financing, permitting, equipment procurement, and other development issues, is considerably longer for a multi-million dollar facility than a small-scale project. For FY 2003, 40% of projects are completed and operational, while for FY 2004, 47% of projects are completed. This seems unusual at first, given the fact that FY 2003 projects have had an additional year for completion. However, several circumstances existed in the FY 2003 award cycle that led to increased project development work for many awardees during that year. In addition, very small projects (less than $40,000) were ineligible in the first year of the program. As a result, this lower completion rate is not unexpected.

Most of the projects that are still in the pre-construction phase are either utility-scale wind turbines or anaerobic digesters. Anaerobic digesters seem to have particular difficulty moving from pre-construction to construction phase. EPA's AgStar program is currently conducting research to determine key barriers remaining for these types of activities. Energy efficiency projects have the highest completion rates. These projects tend to be smaller and have lower

requirements for external agreements and permits; therefore, they face fewer barriers to completion.

Few projects from FY 2005 are completed because funding for those projects was not obligated until September 2005. Nearly one-third of awarded projects are completed, consisting mostly of energy efficiency projects. Further information on year-specific and technology-specific issues is available in the following sections of this report.

Benefits of Grant Awards

To determine the estimated energy benefits of the awarded projects, the National Renewable Energy Laboratory (NREL) calculated annual energy either produced or saved for each project. Energy numbers were converted to million British thermal units (MMBtu) for all projects for reporting purposes. Table 4 summarizes the expected annual energy impact for active projects once they are operational. To determine what annual energy benefits are already accruing from this program, the energy estimates for completed projects are also listed.

The combined energy production and savings from these active projects account for more than 17 million MMBtu of energy per year. This is the equivalent to about 3 million barrels of oil or enough energy to power 124,000 homes or fuel 181,000 cars for a year. Although the completed projects to date only account for a fraction of that amount, slightly more than 2 million MMBtu per year, this is expected because smaller projects are completed first. As larger projects come online over the next couple years, the larger energy numbers will be attained.

Table 4. Summary of Annual Energy Impact During the First Three Years of the 9006 Program MMBtu/year (MWh/year)

FY 2003-2005	Total	Produced	Saved	Fuel	Electric	Heat
Active	17,114,606 (5,016,004)	16,860,241 (4,941,454)	254,364 (74,550)	12,627,696 (3,700,966)	3,998,599 (1,171,922)	488,310 (143,115)
Completed	2,063,194 (604,688)	1,990,416 (583,358)	72,777 (21,330)	1,330,224 (389,866)	493,990 (144,780)	238,980 (70,041)

Of note, these are annual energy numbers. Although project life varies by technology and project, 20 years of project life is a reasonable assumption. Accounting for this assumption, the overall energy benefits of this program will likely be at least 20 times the values in the table.

Table 4 delineates energy benefits in two ways: (1) energy produced and saved and (2) forms of energy produced and saved. The numbers for energy produced and energy saved are based on the technology, not the end use of the energy. A small wind system, for example, is considered to be producing energy even if that energy might offset on-farm use and result in savings in the form of reduced energy purchases by the farmer from the local utility. The table shows that the vast amount of program energy benefits will be for energy production rather than energy savings. This finding reflects the program history of funding primarily renewable energy projects.

The next columns (Fuel, Electric, Heat) in Table 4 delineate the overall energy benefits by showing the form of the energy produced or saved. All projects have been characterized as

producing or saving fuel, electricity or thermal (heat) energy. A majority of the energy benefits accrue from fuel-related projects, most of which are biodiesel or ethanol production facilities. Electric production and savings account for about a quarter of energy benefits.

The 9006 program is cross-cutting in nature and impacts many types of energy efficiency and renewable energy (EERE) technologies. Projects submitted during the applications cycle are divided into 10 EERE classifications: bioenergy, anaerobic digesters, geothermal-electric generation, geothermal-direct use, hydrogen, solar-small, solar-large, wind-small, wind-large, and energy efficiency improvements.

This division of technologies was first used in the FY 2004 NOFA, which detailed different technical requirements for each technology type. These classifications generally have been used for technical reviews and tracking of applications and awards.

Table 5. FY 2003-2005 Active Project Summary

Technology	Active Projects	Active Grants	Estimated Energy Generated/Saved, MMBtu	(MWh)
Anaerobic Digesters	74	$20,411,922	964,662	(282,726)
Bioenergy	35	$7,716,970	8,891,584	(2,605,974)
EE Buildings	118	$3,585,809	221,814	(65,009)
EE Industrial	40	$977,982	31,970	(9,370)
Geothermal	4	$380,283	24,934	(7,308)
Hybrid	9	$2,439,832	4,152,128	(1,216,919)
Solar, Large	8	$1,247,827	12,801	(3,752)
Solar, Small	8	$69,416	35,018	(10,263)
Wind, Large (>100 kW)	92	$26,335,936	2,772,690	(812,629)
Wind, Small (≤100 kW)	24	$691,429	6,880	(2,016)
Total	**412**	**$63,857,406**	**17,114,481**	**(5,015,967)**

Table 5 shows active projects in each of these program areas as well as the estimated energy saved or generated. This table includes a "hybrid" category, which designates applications that combined multiple renewable energy projects or technologies. Program rules allow hybrid projects but prohibit one application from including renewable technologies with energy efficiency improvements. Figure 4 shows the distribution of active projects by number of applications.

Energy efficiency projects in the building sector received the highest total number of grant awards. Building efficiency technologies include improved insulation, high efficiency heating and cooling units, and high efficiency circulation units. Industrial efficiency technologies include improvements to industrial processes or systems including refrigeration units, grain dryers and irrigation pumps. These awarded projects were typically small, with total project costs averaging just under $125,000. Although energy efficiency projects account for 38% of active projects, they only account for 7% of the grant funds awarded to active projects. This relatively small investment, though, leads to more than 250,000 MMBtu in energy savings each year.

Awards for small projects in other technologies have been limited. Small solar, small wind, and geothermal-direct use projects combined account for less than 5% of the total number of active projects and total committed dollars.

Anaerobic digesters, large wind, and bioenergy projects represent the three largest categories receiving grant funding. These projects are capital intensive and attract a complex group of engineering, banking, and economic development entities. They also create a substantial amount of energy generation potential. Wind and bioenergy projects alone represent more than 11 million MMBtu of annual energy generation; anaerobic digester projects contribute another 1 million MMBtu. In addition to energy generation, digester projects can provide additional economic benefits by helping farmers meet environmental compliance standards.

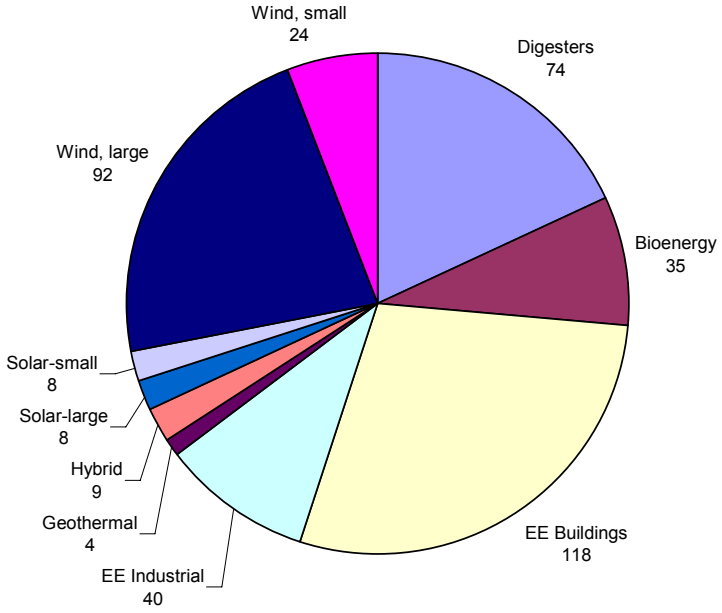

Figure 4. Number of active projects by technology, FY 2003-2005. Energy efficiency buildings and large wind technologies have the most active projects, followed by anaerobic digesters and energy efficiency industrial.

In addition to energy benefits, projects receiving funding from FY 2003 to FY 2005 will also have a substantial impact on emissions. Using national averages for emissions factors, based on voluntary greenhouse gas reports provided by DOE, data in Table 6 depict the overall emissions benefits in metric tons of carbon equivalent (MTCE) per year. The table shows that 9006 projects funded to date will prevent, on an aggregated basis, more than 1 million MTCE (MMTCE) from entering the atmosphere.

Table 6. Annual Emissions Savings in Million Metric Tons Carbon Equivalent (MMTCE)

Fiscal Year	Fuel	Electric	Heat	Total
2003	700	281,900	13,200	295,800
2004	136,300	220,700	18,800	375,800
2005	145,300	288,400	3,400	437,100
2003-2005	**282,300**	**791,000**	**35,400**	**1,108,700**

Lastly, although this report does not attempt to quantify the impact, there has been significant impact on the rural economy from the projects awarded thus far. In several instances, the 9006 program has had a noticeable effect on certain technology market segments in rural areas. Specifically, program awards have coincided with a major increase in the development of anaerobic digesters for on-farm use and in the development of "community-scale" wind facilities. Before 2003, about 40 anaerobic digesters operated in the United States. Under the 9006 program to date, 15 new anaerobic digester projects are operational, and an additional 59 projects are under development.

As these markets have expanded, applicants have devised innovative business models and approaches to achieve economies of scale and financial efficiency when applying for program dollars. In some cases, these have led to increased income and rural development opportunities. A significant amount of effort and attention has been directed to refining and developing community wind business models, which enable local ownership of one to two utility-scale wind turbines. These business models often use innovative ownership structures such as a "flip" model, which combines local ownership with outside investors. These models allow equity investors to leverage tax credits and depreciation during the early years of operation and local owners to receive cash benefits once these short-term incentives expire. This approach has been successful in creating opportunities for local ownership of renewable energy projects while retaining project income for the rural community.

For example, prior to 2003, there were fewer than 30 community wind projects in operation, the majority of which were installed in states with strong incentives, such as Iowa and Minnesota.[5] The 9006 program has directly contributed to increasing this number. At the end of 2005, more than 80 community wind projects in eight states have been awarded grants through the 9006 program.

Another interesting aggregation model has developed in Mississippi, where more than 75 applications have been submitted during FY 2004 and FY 2005 for energy improvements in poultry operations. These operations were run by small individual farmers for whom rising energy costs can significantly reduce profit margins and, therefore, family income. In support of these poultry operations, university, private, and public partners worked together to identify a template model to apply various energy efficiency improvements. These improvements include

[5] This number was calculated from data obtained from the American Wind Energy Association (http://www.awea.org/projects/). Community projects are those less than 4 MW and more than 1 MW that are not part of a large utility-scale wind farm.

high efficiency heaters, fans, and structurally integrated panels for improved insulation. By aggregating projects and streamlining the engineering approach, recipients could take advantage of economies of scale and shared expertise. This collaborative model highlights how good technical support can increase the number of applications for the program.

The 9006 program has had an immediate and direct impact on renewable energy production and energy savings in rural America. At a time when energy prices are a major concern of agricultural producers and rural small businesses, this program offers an opportunity to pursue innovative energy solutions that result in energy independence and an improved bottom line. The following sections describe accomplishments achieved and lessons learned, by fiscal year, during the first three years of the program (FY 2003, FY 2004, and FY 2005).

FY 2003 Award Cycle

Background

USDA announced the availability of funds in FY 2003 in early April–less than one year after the 2002 Farm Bill was signed into law. This first-of-its-kind program for the federal government brought a host of new technologies and new technical issues to USDA. USDA was successful in making the program available in FY 2003, but the review and award processes raised numerous issues, which USDA has addressed in subsequent years.

Overall in FY 2003, USDA awarded grants to 114 projects in 24 states for $21.7 million. Figure 5 shows the distribution of awards by state. These grants leveraged total project costs of $694 million. Despite having $22.8 million in funding available, USDA was not able to use all of the funding in the first year because of inadequate technical information in many applications.

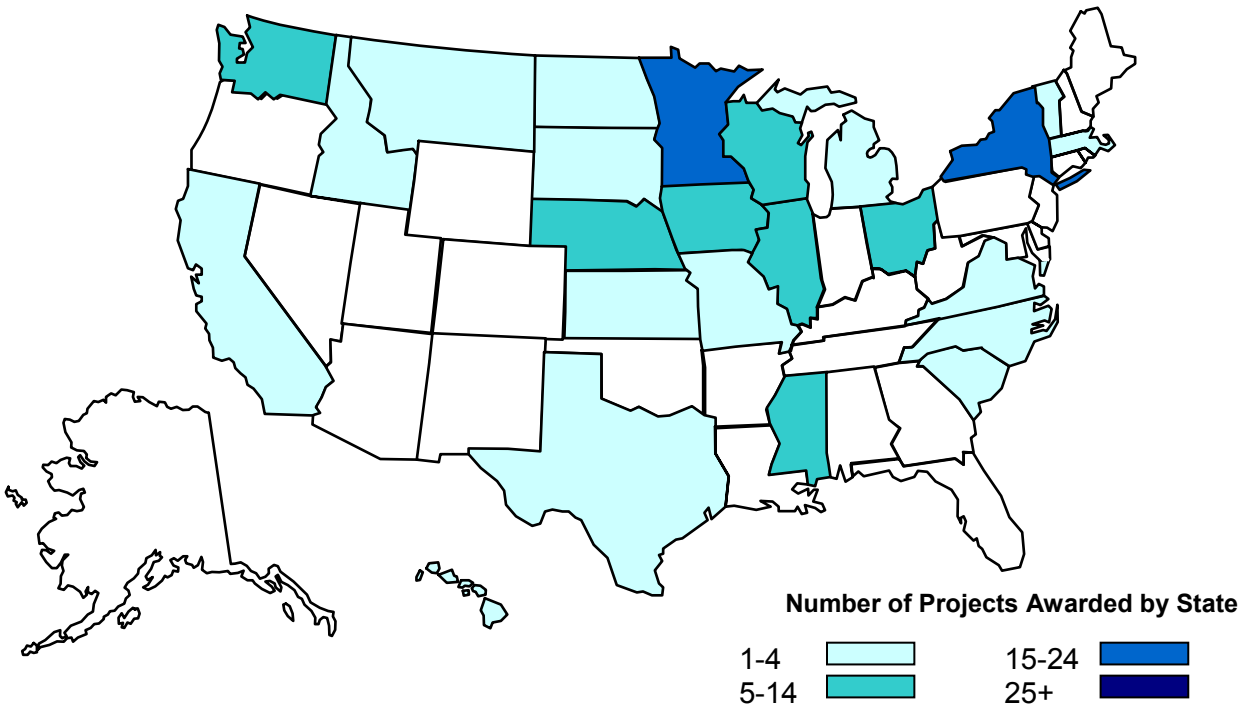

Figure 5. Distribution of awards by state, FY 2003. The largest number of grants was awarded in Minnesota and New York.

In general, the quality and quantity of applications submitted to the 9006 program in its first year were much lower than expected. A variety of reasons were identified for this result, which are discussed in the Key Issues section. However, this situation is not unusual for new programs that have had limited opportunity for outreach and education.

Because of the lack of quality applications, USDA was faced with the difficulty of using all available funds. USDA management made a key decision in the award process. Rather than have a substantial amount of the program funding revert to the Treasury, USDA worked with State Offices and technical reviewers to determine which projects had potential for success despite the fact that they did not initially meet eligibility criteria. If projects were deemed to have potential, but needed further documentation, technical design, resource assessment, or other resolvable issues, then the projects were reclassified as eligible with conditions. In this manner, USDA relaxed the initial application requirements to allow projects with incomplete applications or in earlier stages of development to qualify.

This strategy allowed USDA to obligate almost all of its FY 2003 funding. For each project granted a conditional award, the awardee agreed to meet the conditions before receiving grant funds. As a result, no taxpayer funds were distributed to projects that could not meet the required conditions. However, these awarded projects were in earlier stages of design or development and had greater obstacles to overcome than projects awarded in subsequent years. Three years later, some of these projects are still having difficulty overcoming these obstacles.

Current Status

Table 7 shows the number of awards by technology as well as the median grant award and total project costs. The number of projects receiving funding is distributed equitably among large wind, energy efficiency, and digesters. Nearly the same number of small wind and bioenergy projects received funding. The technology receiving the fewest number of projects in FY 2003 was solar. In 2003, low prices for electricity and gas made the economics of these projects very difficult.

Table 7. Median Total Project Costs and Grant Awards by Technology, FY 2003

Technology	Awards	Median Grant Award	Median Total Project Cost
Digesters	31	$200,000	$1,179,357
Bioenergy	13	$500,000	$500,000
EE Buildings	24	$43,345	$175,690
EE Industrial	n/a	n/a	n/a
Geothermal-Direct	0	-	-
Hybrid	6	$500,000	$31,352,266
Solar, Large	4	$85,931	$343,723
Solar, Small	2	$14,553	$58,212
Wind, Large	25	$192,900	$1,838,144
Wind, Small	9	$16,850	$67,400
All Technologies	**114**	**$141,872**	**$870,482**

Bioenergy and hybrid projects had the highest median grant award. Three of the hybrid projects awarded in FY 2003 had a large biofuel facility component, which increased total project costs. Small solar and wind had the smallest median grant award and total project costs. This result is expected because these are generally smaller projects.

Tables 8 and 9 summarize the current status of projects awarded in FY 2003, the first year of the program. Although 46 projects have been reported as complete, there is still a number of projects in the pre-construction or construction phase, and 16 of the FY 2003 awards have been canceled. The low completion rate, less that 50% of total awarded projects, is due to the fact that many first-year projects, especially those that lacked technical integrity, were passed with conditions. Of the awards cancelled, eight were digester projects. State Office reports list lack of third party financing as the primary reason these projects failed. State Office EPA's AgStar program is currently conducting additional research on this problem.

Table 8. Status of FY 2003 Awarded Projects by Technology

		Active Projects		
Technology	**Cancelled**	**Complete**	**Under Development**	**Total Awarded**
Digesters	8	7	16	31
Bioenergy	2	4	7	13
EE Buildings	2	13	9	24
EE Industrial	-	-	-	-
Geothermal	-	-	-	-
Hybrid	0	1	5	6
Solar, Large	1	1	2	4
Solar, Small	0	1	1	2
Wind, Large	2	14	9	25
Wind, Small	1	5	3	9
Total	**16**	**46**	**52**	**114**

Most completed projects are large wind and energy efficiency projects. In the case of the first, the large wind industry is well organized, well financed, and experienced. These three elements combined ensure a high probability for success. Energy efficiency projects also benefit from an industry that is experienced. These projects are straightforward, especially when compared to other, more complex projects, such as large-scale bioenergy proposals. For instance, it is much simpler to replace windows and add insulation than to construct a 30 million gallon per year ethanol facility.

According to field reports from rural energy coordinators, some projects have yet to obtain firm financing. Some technologies, for example anaerobic digesters, are unfamiliar to the banking and investment community, which may affect progress. Other projects, such as community wind, are small and have difficulty attracting the same investment interest as large utility-scale projects.

Table 9. FY 2003 Active Project Summary

Technology	Active Projects	Active Grants	Estimated Energy Generated/Saved MMBtu	(MWh)
Digesters	23	$5,884,959	383,274	(112,331)
Bioenergy	11	$2,462,447	5,267,122	(1,543,705)
EE Buildings	22	$1,275,530	175,258	(51,365)
EE Industrial[6]	0	$0	0	(0)
Geothermal	0	$0	0	(0)
Hybrid	6	$2,112,977	4,125,275	(1,209,048)
Solar, Large	3	$571,461	2,187	(641)
Solar, Small	2	$29,105	109	(32)
Wind, Large	23	$6,601,770	716,414	(209,969)
Wind, Small	8	$170,024	1,923	(564)
Total	**98**	**$19,108,273**	**10,671,562**	**(3,127,656)**

Figure 6 shows the distribution by technology of active projects receiving grant awards in FY 2003.

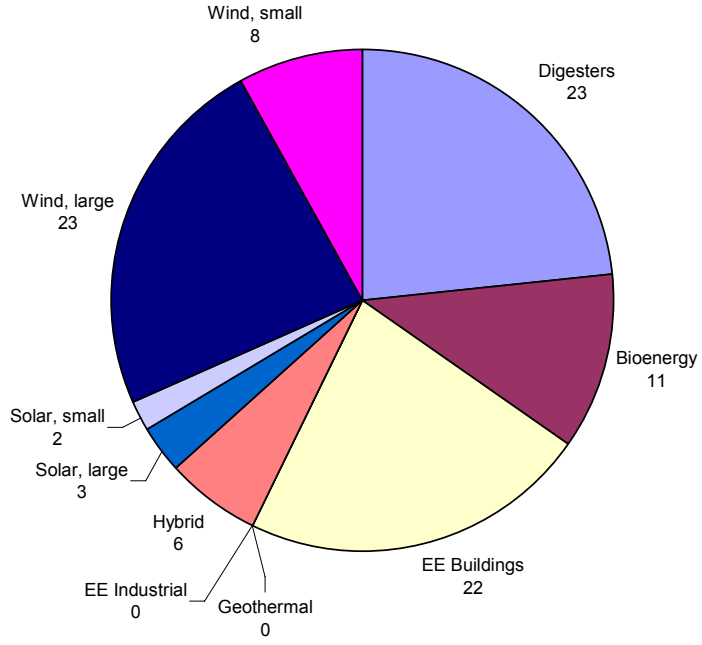

Figure 6. The number of active projects by technology, FY 2003. Wind and digesters led during the first year of funding.

[6] In FY 2003, data were unavailable to distinguish between building and industrial energy efficiency projects.

Key Issues

Several valuable lessons were learned from the FY 2003 award process. At the conclusion of the review cycle, NREL surveyed technical reviewers and external stakeholders to determine primary options for improving the program. USDA began immediately to take steps to address many of these issues. The main suggested actions were:

1. Provide separate technical criteria for different technologies.
2. Decrease the minimum project size from $40,000 to $10,000 to attract more small projects.
3. Increase upfront outreach and engage EERE networks to solicit more applications.
4. Provide more tools and guidance to applicants to improve application quality and consistency.
5. Simplify and streamline the application process, especially for smaller projects.

In FY 2004, USDA took steps to improve or address the first four primary issues. The last of these, simplifying the application process for small projects, was included as part of the final rule governing this program. As noted earlier, the dramatic increase in both the quality and quantity of applications in subsequent years has shown that USDA made significant program improvements after the first year. Because FY 2006 will be the first year for the simplified application process, a review of projects following that cycle will provide information on the success of the rule modification for small projects.

In addition to program design issues in FY 2003, a host of logistical issues arose with application tracking and review. To address this issue, USDA tasked NREL to design a Web-based tracking system to consolidate input from all USDA State Offices, the various technical reviewers, and the USDA National Office. This tool was put in place for the FY 2004 cycle.

Technology Summary

Bioenergy

In 2003, 13 bioenergy projects received funding. These projects were located in Iowa, Illinois, Missouri, Montana, Nebraska, New York, Ohio, and Washington. As of June 2006, only four of these projects are considered complete. Bioenergy systems that convert biomass to electricity or fuels are expensive and complex, sometimes requiring several years to complete. In reviewing reports filed by USDA State Office staff, it is encouraging to note that seven of the 13 projects awarded are in pre-construction or construction phases, and completion can be expected within the next one to two years. It is interesting to note that three of the four bioenergy projects considered complete meet the definition of small projects (less than $200,000 total project costs). This completion time is in line with the common knowledge that large, complex projects often take several years to complete.

Digesters

In 2003, 31 anaerobic digester projects received funding. The projects were located in California, Idaho, Illinois, Michigan, Minnesota, North Carolina, Nebraska, New York, Washington, and Wisconsin. Before 2003, fewer than 10 digesters operated in the United

States.[7] Of the 31 projects awarded funding in FY 2003, seven are completed as of June 2006, and eight have been canceled.

Although biogas production through anaerobic digester technology is well understood, barriers still exist that prevent projects from reaching the completion stage. Difficulty in obtaining permits, financing, engineering, and lengthy construction schedules are all reasons cited in the State Office reports for projects not yet completed. For projects planning to sell electricity to third party off-site entities, grant recipients report difficulty in securing power purchase and interconnection agreements with the local utility. Without these agreements, many of these projects are not economically feasible.

Completed projects generally perform as expected, although one project has been shut down because of operational issues. Successful projects are well-engineered and implement thorough operations and maintenance plans. This result shows that a thorough technical review is helpful. It is anticipated that State Office survey data forthcoming from EPA's Agstar program will help shed light on why many of these digester projects are not progressing beyond the initial planning stage.

Geothermal- Electric
No geothermal-electric projects were awarded in FY 2003.

Geothermal-Direct
No geothermal-direct projects were awarded in FY 2003.

Solar, Large
Four large solar projects were awarded in FY 2003 in California, Hawaii, Illinois, and Texas. Large projects are those that exceed 10 kW in rated output. These projects tend to exceed $1 million in total project costs and are usually more complex to finance and install. Of the four projects awarded in FY 2003, one has been completed, one canceled, and two are still in pre-construction and construction phases. The completed project is a large-scale solar dryer system located in California that does not produce electricity. This project was completed in time to be used for the 2005 crop. The project in pre-construction phase is awaiting additional financing.

Solar, Small
Two small solar projects were awarded in FY 2003 in Hawaii and South Carolina. The Hawaii project is completed, and the South Carolina project has not yet started. According to the South Carolina Rural Energy Coordinator, the project is stalled in discussions between the lender and farmer and may be canceled soon.

Wind, Large
In FY 2003, Section 9006 awarded 25 large wind projects across Iowa, Idaho, Illinois, Massachusetts, Minnesota, New York, Texas, and Virginia. Fourteen have now been completed. In this category of wind projects, the most common large wind projects are community-scale

[7] http://www.epa.gov/agstar

projects of one to two turbines of about 1.5 to 2 MW per turbine. These offer a new source of local revenue to rural communities. This type of project holds the advantage of having local ownership and higher rural economic impact. However, smaller projects often have some disadvantages as compared to very large wind farms. Disadvantages include securing power purchase agreements and interconnection agreements, along with procuring turbines. This situation is a common concern across the country, and unfortunately, community-scale projects are often the hardest hit by the recent wind turbine supply shortage. In some cases, wait times for turbines can reach 36 months.

Wind, Small

Nine small wind projects were funded in FY 2003. One project was canceled. Of the remaining eight, five have been completed; one is in the pre-construction phase, and two are in the construction phase. In contrast to large-scale wind projects, small wind projects awarded in FY 2003 are owned by small rural businesses and were not able to leverage tax incentives for producing renewable energy.

Hybrid

Hybrid is a category not expressly in the regulation but evaluated during application submittal. Hybrid projects include more than one renewable energy technology in a single application. In FY 2003, six hybrid projects received funding. They are located in Iowa, Massachusetts, and Ohio. The Ohio projects combined ethanol production and anaerobic digester technologies. Ground has broken on one of the Ohio projects, and the other two are in pre-construction phase while additional financing is secured. The other three hybrid projects involved solar combined with wind or geothermal technologies; one is completed. Projects under development have completed the solar portions of the project, but have changed wind generators or experienced delays with the geothermal technologies. Although hybrid projects are acceptable, they can be challenging for applicants because any technology proposed must meet technical requirements. If one of the technologies does not pass technical review, the entire application will fail.

Energy Efficiency, Buildings

Of the applications received in FY 2003, 24 applicants received funding for building energy efficiency projects in Iowa, Illinois, Kansas, Mississippi, North Dakota, Nebraska, New York, South Dakota, and Vermont. Of these projects, 13 have been completed, three are in pre-construction phase, and six are under construction. Two were canceled. Building efficiency technologies included improved insulation, high efficiency heating and cooling units, and high efficiency circulation units.

Energy Efficiency, Industrial

No industrial efficiency applications were received in FY 2003.

FY 2004 Award Cycle

Background

FY 2004 was the second award cycle for the 9006 program. One hundred sixty-seven awards were issued in 26 states for $22.8 million, leveraging $165.9 million in project funds. Figure 7 shows the distribution of awards by state.

Several key improvements were made based on lessons learned during the FY 2003 award cycle. These improvements included more extensive outreach and education, a new application tracking system, and a standardized technical review process. In addition, though the final regulation was not issued until July 2005, USDA headquarters and NREL staff developed guidance documents for each of the technical sections (Section A and Section B). These improvements and additional information combined to achieve a significant improvement in the overall quality and quantify of applications.

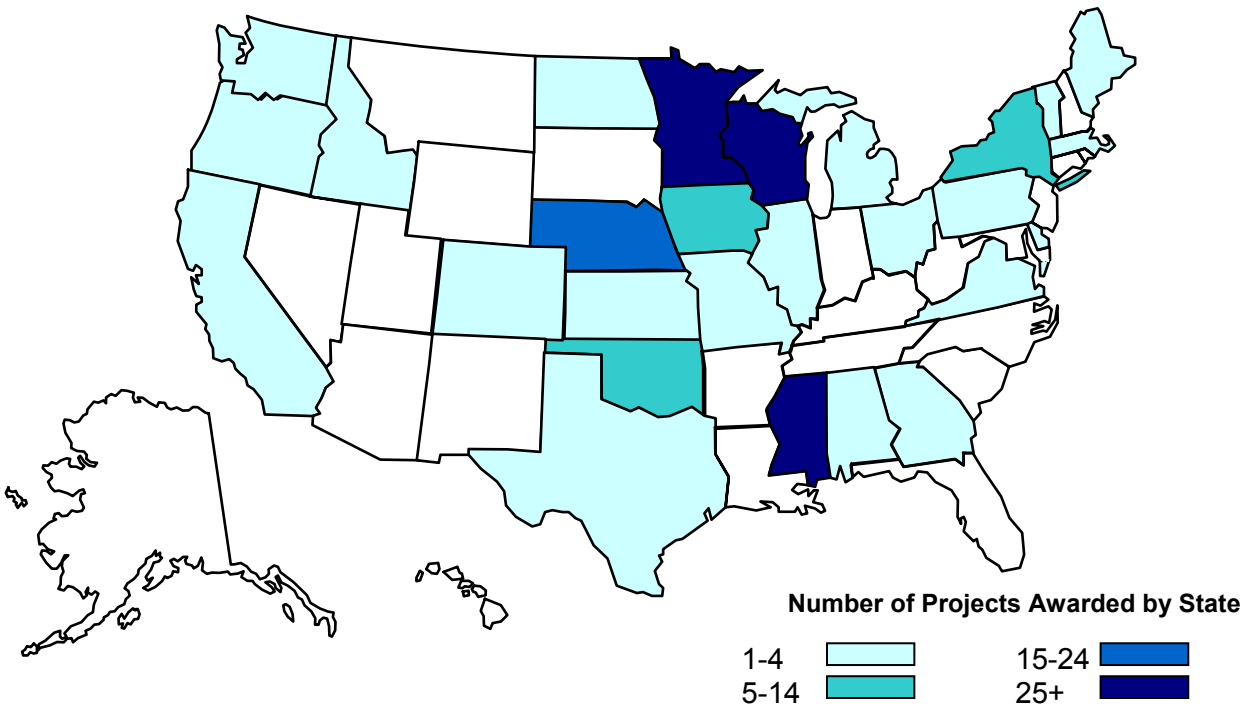

Figure 7. Distribution of awards by state, FY 2004. Similar to FY 2003, Minnesota received a large number of awards, along with Wisconsin, Maine, and Mississippi. Projects in states that did not receive awards in FY 2003, such as Delaware, Georgia, and Pennsylvania, received awards in FY 2004.

USDA began outreach efforts in FY 2004 primarily by developing outreach tools for use by the State Offices, creating a 9006 Program Web site with program information and application tools, and working collaboratively with a range of partners in the traditional EERE network. These included state energy offices, certain technology programs, and a number of non-profit organizations. Of note, the Wind Powering America initiative at DOE made the 9006 program a centerpiece of their outreach efforts. These efforts included educational and outreach materials that provided details on what types of information were expected by technical reviewers to meet the technical requirements.

In addition to the outreach and education efforts, USDA worked with technical experts at NREL and other DOE laboratories to develop technical guidance for applicants. These documents were developed for each technology area to help applicants better understand the requirements of the technical review process. Technical guidance also served to make the technical portions of each application more uniform and easier to compare during the application review process.

USDA and NREL also developed an application tracking system that significantly streamlined the application review process. The tracking system allowed rural energy coordinators to directly enter application information via the Web. This information was then passed on to the application and technical review teams located at USDA headquarters and NREL.

A standardized review process for each technology also was developed by USDA headquarters and NREL. This review process was integrated directly with the application tracking system and enabled rural energy coordinators, USDA headquarters, and reviewers to quickly ascertain the status of a project, as well as quickly and uniformly conduct a technical review.

Current Status

Table 10 shows the number of awards by technology as well as the median grant award and total project costs. Energy efficiency projects in the building and industrial sectors increased significantly between FY 2003 and FY 2004. Many digester projects continued to receive awards as well as large wind and bioenergy projects. Twelve small wind projects received grants, while solar and geothermal projects continued to be few. Unlike FY 2003, digesters and large wind projects had the largest median grant award and total project costs. Small solar projects continued to have the smallest median grant award and total project costs, although many energy efficiency projects also had low median project costs.

Table 10. Median Total Project Costs and Grant Awards by Technology, FY 2004

Technology	Awards	Awards Median Grant Award	Median Total Project Cost
Digesters	37	$225,268	$1,013,072
Bioenergy	13	$190,750	$763,000
EE Buildings	64	$19,546	$86,532
EE Industrial	9	$11,000	$44,815
Geothermal-Direct	2	$142,677	$570,708
Hybrid	2	$63,496	$253,985
Solar, Large	1	$49,886	$530,701
Solar, Small	1	$4,936	$19,745
Wind, Large	26	$248,000	$2,099,904
Wind, Small	12	$17,544	$70,175
All Technologies	**167**	**$51,900**	**$236,220**

Table 11 summarizes the current status of FY 2004 projects and shows that completion rates for FY 2004 are higher than for FY 2003. As expected, many energy efficiency projects have been completed. This industry is mature, and these projects are generally simple to implement. Efficiency projects still under development are nearly all in the construction phase and should be completed sometime in the next year.

Table 11. Status of FY 2004 Awarded Projects by Technology

		Active Projects		
Technology	Cancelled	Complete	Under Development	Total Awarded
Digesters	-	8	29	37
Bioenergy	-	9	4	13
EE Buildings	3	47	14	64
EE Industrial	1	5	3	9
Geothermal-Direct	-	2	-	2
Hybrid	-	-	2	2
Solar, Large	-	-	1	1
Solar, Small	-	1	-	1
Wind, Large	-	1	25	26
Wind, Small	2	6	4	12
Total	**6**	**79**	**82**	**167**

Even though no digester project funding has been canceled from FY 2004, a significant number of projects are still under development. Most of these are still in the pre-construction phase. State Offices continue to cite financing as the key barrier to these projects, but also identify difficulty in obtaining interconnection and power purchase agreements. In contrast to FY 2003, the majority of large wind projects receiving funding in FY 2004 are still under development. Assuming these projects have a timeline of two to three years to reach completion, these projects should be completed within the next year. However, there is a supply shortage of large-scale wind turbine components, and this may be affecting the ability to secure equipment. Several

small wind projects are still trying to secure financing. The same is true for the single large-scale solar project.

Table 12 summarizes the active projects, grant amounts, and estimates of energy generation and savings. In FY 2004, bioenergy projects still accounted for the largest magnitude of energy savings and generation. It is important to note that energy savings and generation numbers are estimates only and that field verification needs to occur once projects reach the completion stage. Even for projects that are completed, the numbers listed for energy savings and generation are based on applicant estimates only.

Table 12. FY 2004 Active Project Summary

Technology	Active Projects	Active Grants	Estimated Energy Generated/Saved MMBtu (MWh)	
Digesters	37	$9,508,946	419,759	(123,024)
Bioenergy	13	$3,136,132	1,455,766	(426,661)
EE Buildings	61	$1,527,260	28,993	(8,497)
EE Industrial	8	$165,972	18,874	(5,532)
Geothermal-Direct	2	$285,353	23,851	(6,990)
Hybrid	2	$126,992	26,404	(7,739)
Solar, Large	1	$49,886	5,586	(1,637)
Solar, Small	1	$4,936	24	(7)
Wind, Large	26	$7,301,540	641,077	(187,889)
Wind, Small	10	$485,330	3,767	(1,104)
Total	**161**	**$22,592,347**	**2,624,101**	**(769,080)**

Figure 8 shows the distribution of active projects awarded in the FY 2004 cycle.

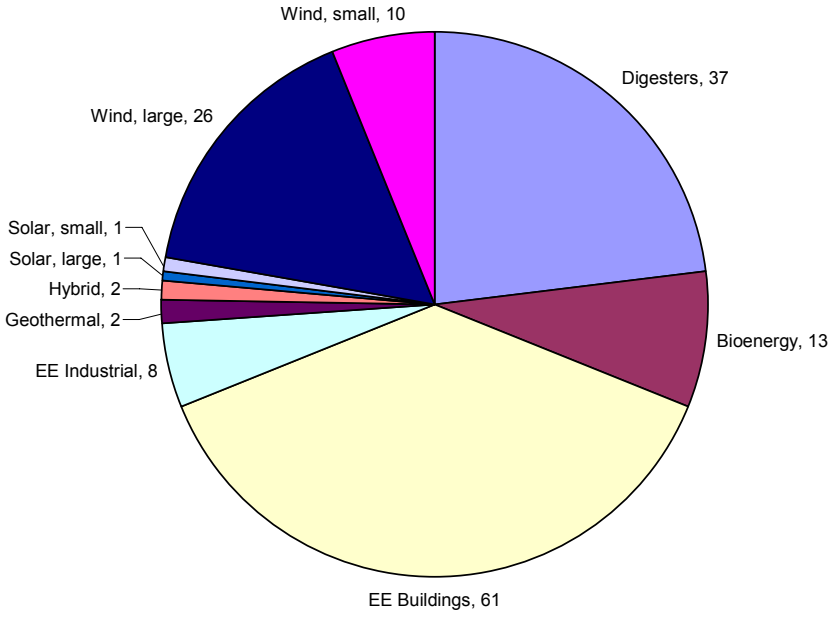

Figure 8. Summary of active projects by technology, FY 2004. Building energy efficiency projects received the largest number of awards during the second year of funding.

Key Issues

Fewer problems were encountered in the FY 2004 than in the previous cycle. However, a few key issues arose during the review process. The biggest issue was related to scoring of the grant applications. Because not all funding was awarded in the first year, no ranking of applications was necessary. However, FY 2004 funding was more competitive, and concerns with the scoring surfaced. First, the scoring system was not "technology-neutral." Some types of projects, particularly large projects, had inherent advantages over others. To remedy this situation, USDA normalized the scores across various technology groups to level the playing field. This resulted in greater diversity of awarded projects and ensured that small projects were treated equally.

It also became evident that while business elements were included in the scoring, there were not provisions for scoring projects based on technical merit. As such, some the best projects technically, or those deemed to have the highest probability of success, were not funded; others that were not as strong technically received awards. USDA modified its scoring criteria in FY 2005 to accommodate a technical merit score.

Another issue repeatedly raised by stakeholders was the limitation on eligibility for rural small businesses. The NOFA in both years had placed additional restrictions on the definition of a small business, and many rural electric coops interested in participating were ruled ineligible. USDA resolved this limitation in the FY 2005 NOFA.

Lastly, although outreach tools had been developed, the applications were not reflecting a broad of geographic diversity, as hoped. As a result, USDA expanded its outreach model beyond simply developing tools for State Offices.

Small projects for energy efficiency were far more prevalent in FY 2004 awards, but small renewable energy projects were still not well represented. It was evident from applications received that the application process for small renewable energy systems was still complicated and unclear to many applicants. The fail rate on small renewable energy system applications, particularly solar applications, was extremely high.

For both outreach and the technical efforts, USDA provided funding in FY 2005. It funded a survey of stakeholders to determine how best to improve outreach and application quality, and it funded the development of outreach and technical improvements.

Technology Summary

Bioenergy

In FY 2004, similar to FY 2003, 13 bioenergy projects received funding. These projects were located in Colorado, Delaware, Iowa, Massachusetts, Mississippi, Nebraska, Ohio, Pennsylvania, and Wisconsin. In contrast to FY 2003, as of June 2006, nine of these projects are already complete, a significant improvement over FY 2003. This improvement is in part due to the increased outreach effort conducted by USDA and NREL regarding technical requirements for applicants. None of the projects have been canceled, and three of the projects are in the construction phase. Only one project is still at the pre-construction phase due to a combination of financing and restructuring of the applicant's business.

The scope and scale of bioenergy projects for FY 2004 was extremely broad. They ranged from high efficiency pellet stoves installed in Wisconsin, to 1 million gallon per year (MGPY) B2/B5 biodiesel (a blend of 2% and 5% biodiesel with 98% and 95% petroleum diesel, respectively) facilities in Pennsylvania.

Digesters

In 2004, 37 anaerobic digesters projects received funding. They were located in California, Georgia, Michigan, Minnesota, New York, Ohio, Pennsylvania, Vermont, and Wisconsin. Nearly all projects involved the production of both electricity and heat, ranging in size from 46 kW to 1.6 MW.

Digesters continue to have a low completion rate and difficulty moving into the construction phase. Of the 37 projects awarded funding, only 11 have reached the completion or construction phase (eight and three, respectively). Twenty-six projects are still in the pre-construction phase. Barriers include last-minute design changes, permitting issues, interconnection and power agreements, financial uncertainties, and emissions regulations from EPA. It is expected that the EPA AgStar-supported study of digester systems receiving awards from 9006 will shed light on the details of these barriers as well as point out keys to success.

Geothermal-Electric
No geothermal-electric projects were awarded in FY 2004.

Geothermal-Direct
Two geothermal-direct projects using ground source heat pump (GSHP) technology were awarded in FY 2004. Both projects, one in Iowa and the other in Pennsylvania, are complete. Both met the "small project" definition (total project costs less than $200,000), which contributed to their quick completion. As well, GSHPs use relatively simple technology and do not require interconnection agreements, complex permitting, and often yield rapid simple payback.

Solar, Large
Only one large solar project (solar thermal) was awarded in FY 2004. This project, located in Mississippi, is 90% complete and was delayed because of Hurricane Katrina. The awardee expects to complete the project this year. Solar thermal projects are similar to geothermal-direct ones in that no interconnection agreements and minimal permitting are required.

Solar, Small
A single small solar project was awarded in FY 2004 for a 2.5-kW solar electric system located in Wisconsin. Total project cost was less than $20,000 and completed in FY 2005. Small solar electric systems are a mature technology and can be considered nearly "off-the-shelf" with respect to installation. The expense of the system is a key barrier to more widespread deployment of this technology. The 9006 program has had a significant impact on the economic viability of these types of projects.

Wind, Large
Twenty-six large wind projects were awarded grants in FY 2004. All but one is in the pre-construction, with expected completion in 2006. One project has been completed, and one is still in the pre-construction phase. Nearly all of the large wind projects submitted in FY 2004 use the community wind business model, which seeks to maximize the tax and grant efficiency of the project. The 9006 program has contributed indirectly to the success of this model; the grant amounts make many of these projects financially attractive to local investors, including farmers and residents of the local community.

In addition to delays from the wind turbine shortage, 22 awardees cite difficulties in obtaining from local utilities power purchase agreements, interconnection agreements, or both. Power purchase and interconnection agreements are critical to the financial success of these projects and represent a significant barrier to widespread adoption of these technologies.

Wind, Small
Twelve small wind projects located in Minnesota, Missouri, New York, Texas, Virginia, Washington, and Wisconsin received funding in FY 2004. Six are now complete, and one is currently under construction. Two projects have been canceled, and three are still in the pre-construction phase while additional financing is secured.

Hybrid

Two projects received funding under this category in FY 2004─a combined solar thermal and solar electric project in Nebraska and a combined solar electric, solar thermal, and biomass boiler in Iowa. The Nebraska project is in the construction phase, and the Iowa system is in pre-construction because of new design considerations. Both of these projects are interesting because they represent a whole system approach by the applicant, which includes multiple sources of renewable energy.

Energy Efficiency, Buildings

Energy efficient building projects continued to receive a high number of awards in FY 2004. They included technologies such as lighting upgrades, high R-value insulation, new windows, and high efficiency heating, ventilation, and air conditioning systems (HVAC). The sixty-four projects receiving funding were located in Illinois, Kansas, Maine, Mississippi, North Dakota, Nebraska, Oklahoma, and Wisconsin. Forty-seven have been completed, and 12 are under construction. Only three projects have been canceled because of financial consideration, and only two are still in pre-construction. Energy efficiency measures at building facilities are extremely cost-effective, offering rapid simple payback and reliable performance.

Energy Efficiency, Industrial

Industrial efficiency applications were awarded for the first time in FY 2004. They included projects in Iowa, Kansas, Nebraska, Washington, and Wisconsin. Industrial efficiency projects included high efficiency refrigeration, irrigation pumps, and grain dryer systems. Of the nine projects awarded, five are complete, three are under construction, and one is canceled.

FY 2005 Award Cycle

Background

FY 2005 was the latest completed award cycle as of the writing of this report. During FY 2005, 154 awards were issued in 32 states for $22.2 million, leveraging $202 million. Figure 9 shows the distribution of awards by state. FY 2005 saw the greatest number of states with projects awarded, with Iowa, Nebraska, and Minnesota having the largest number overall.

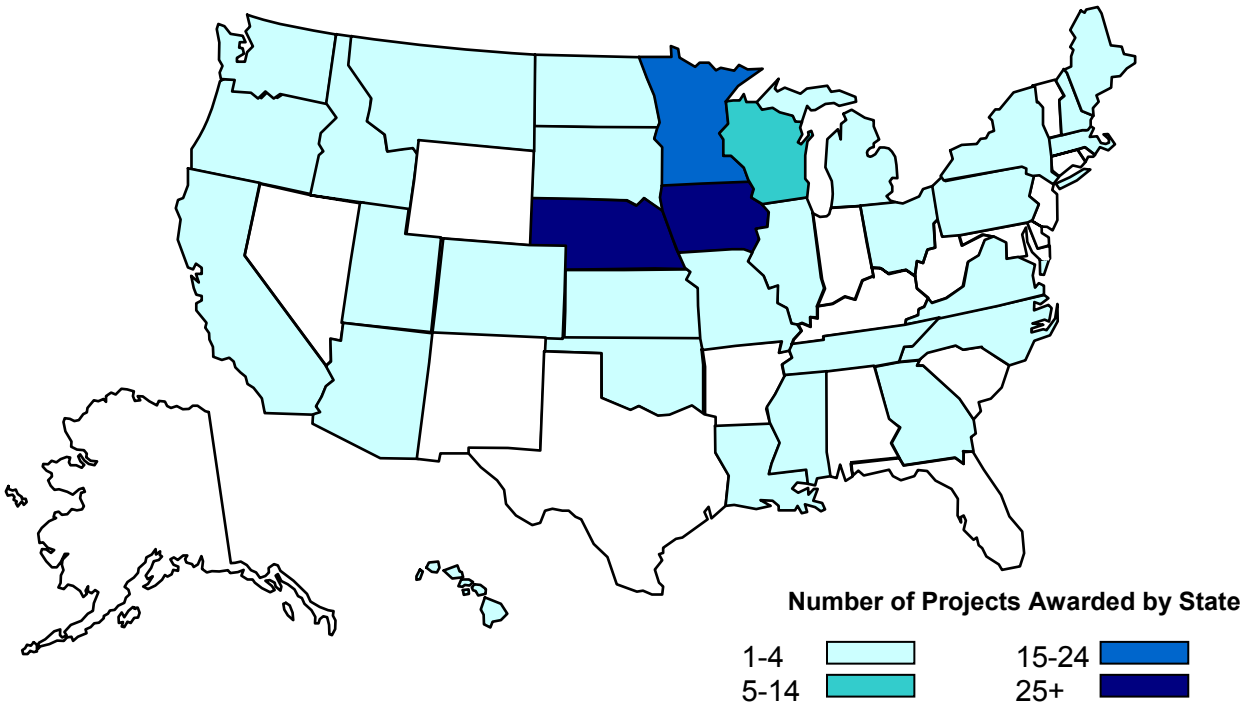

Figure 9. Distribution of awards by state, FY 2005. Although some states, such as Iowa, Minnesota, and Nebraska, continued to receive many awards, FY 2005 saw the greatest number of states with projects awarded.

The only significant changes to the program in FY 2005 were a broader definition of rural small business that could include more rural electric coops and a change to scoring that included a technical merit score.

Key improvements made during the FY 2005 award cycle included continued emphasis on outreach, education and training activities. A pilot outreach model was developed, bringing USDA State Offices together with state energy offices and other in-state energy experts to create

energy teams. After model development in Ohio, Iowa, and Wisconsin, in particular, USDA joined with national partners to increase awareness of the program and expand outreach.

USDA worked closely with State Offices and partnered with DOE Regional Offices to solicit energy stakeholders about outreach needs for tools and resources. This led to the development of a range of outreach products, including brochures, presentations, and sample applications.

On July 18, 2005, the final rule for the 9006 program was published. This occurred after the deadline for FY 2005 grant applications, so the rule did not alter the grant program for the year. It did, however, make guaranteed loans available. Two projects received guaranteed loans in FY 2005.

Current Status

Table 13 shows the number of awards by technology as well as the median grant award and total project costs. The number of funded digester applications dropped substantially in part due to the high number of applications received in FY 2003 and FY 2004. Additionally, many of the earlier projects are still unable to advance past the pre-construction phase. Energy efficiency awards now account for almost half the grants issued, followed by large wind. Digester and bioenergy projects follow. As in previous years, the number of small solar, wind, and geothermal projects are small compared to the other technologies.

Table 13. Median Total Project Costs and Grant Awards by Technology, FY 2005

Technology	Awards	Median Grant Award	Median Total Project Cost
Digesters	14	$456,619	$1,826,476
Bioenergy	11	$118,150	$472,600
EE Buildings	35	$8,515	$34,060
EE Industrial	33	$12,415	$51,750
Geothermal-Direct	2	$47,465	$189,870
Hybrid	1	$199,863	$799,455
Solar, Large	4	$44,178	$214,346
Solar, Small	5	$4,396	$17,586
Wind, Large	43	$257,000	$2,469,000
Wind, Small	6	$17,247	$68,988
All Technologies	**154**	**$49,975**	**$228,710**

Energy efficiency projects, along with small wind and solar projects, continued to have the lowest median grant awards and total project costs. Digesters and large wind projects continued to have the highest median grant awards and total project costs.

Table 14 summarizes the status of awards across technologies for FY 2005 as of June 15, 2006. Because these awards were announced only in late summer of 2005, most of the projects are still under development. Only one project has been canceled. Cancellation was due to change of ownership and financing according to USDA State Office reports.

It is anticipated that large wind projects receiving funding during the FY 2005 grant cycle may have difficulty reaching completion in less than two years. As mentioned in the previous section, there is a world-wide shortage of turbine components. Those familiar with the industry indicate waiting time for components may be as long as two to three years.

Table 14. Status of FY 2005 Awarded Projects by Technology

		Active Projects		
Technology	**Canceled**	**Complete**	**Under Development**	**Total Awarded**
Digesters	-	-	14	14
Bioenergy	-	6	5	11
EE Buildings	-	15	20	35
EE Industrial	1	23	9	33
Geothermal-Direct	-	-	2	2
Hybrid	-	-	1	1
Solar, Large	-	-	4	4
Solar, Small	-	2	3	5
Wind, Large	-	-	43	43
Wind, Small	-	4	2	6
Total	**1**	**31**	**122**	**154**

Table 15 lists dollar amounts and estimated energy savings and generation broken out by technology. Even though only 11 bioenergy projects received awards in FY 2005, bioenergy projects still represent the largest number in terms of energy savings and generation. These projects typically produce motor and distillate fuel as a primary product, and economics dictates that their scale be substantial. Small wind and solar projects continued to be few during FY 2005. To address this issue, USDA created a simplified application process in FY 2006. Figure 10 shows the distribution of active grants awarded by technology in FY 2005.

Table 15. FY 2005 Active Project Summary

Technology	**Active Projects**	**Active Grants**	**Estimated Energy Generated/Saved MMBtu (MWh)**	
Digesters	14	$5,018,017	161,628	(47,370)
Bioenergy	11	$2,118,391	2,168,696	(635,608)
EE Buildings	35	$783,019	17,563	(5,147)
EE Industrial	32	$812,010	13,096	(3,838)
Geothermal-Direct	2	$94,930	1,083	(317)
Hybrid	1	$199,863	448	(131)
Solar, Large	4	$626,480	5,027	(1,473)
Solar, Small	5	$35,375	34,885	(10,224)
Wind, Large	43	$12,432,626	1,415,199	(414,771)
Wind, Small	6	$101,157	1,190	(349)
Total	**153**	**$22,221,868**	**3,818,815**	**(1,119,230)**

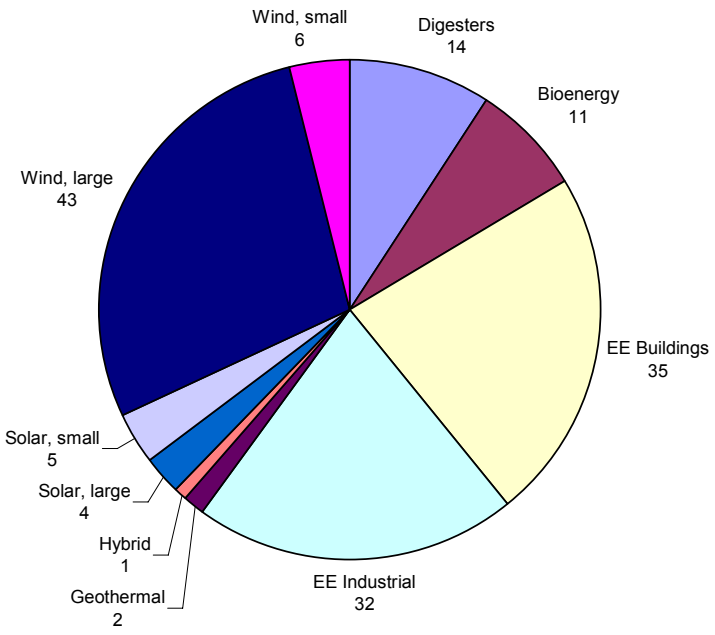

Figure 10. Number of active projects by technology, FY 2005. The number of digesters awarded in FY 2005 dropped from FY 2004 and FY 2003, with industrial and building energy efficiency projects accounting for nearly half the projects awarded.

Key Issues

The FY 2005 grant cycle went smoothly. There were far more applications than previous years, and as such, roughly only 50% of eligible applications received funding. Appeals of decisions were far more prevalent after the FY 2005 cycle than previously, attributed to the greater number of projects that did not receive awards.

A key ongoing concern was that very few small-scale renewable energy projects received awards. Although the number of applications for small projects in some technologies had increased, the increased competition had reduced the number of awards to previous levels. Because the policy focus of the 9006 program was to benefit small rural business and agricultural producers, scoring preferences and a simplified application process that favored these applicants was developed for FY 2006.

Technology Summary

Bioenergy

Eleven bioenergy projects, in Georgia, Iowa, Maine, Michigan, Missouri, North Dakota, South Dakota, Tennessee, Washington, and Wisconsin, received funding in FY 2005. Projects included small pellet stoves, small- and large-scale biodiesel manufacturing facilities, large-scale ethanol plants (16 MGPY), and biomass heating. Five of the 11 projects involved fuel production. Six projects have been completed, while five are still under development.

Digesters
Fourteen digester projects were awarded in FY 2005 in Michigan, New Hampshire, New York, Ohio, Pennsylvania, South Dakota, Washington, and Wisconsin. This number was down from the 21 and 37 projects awarded in FY 2003 and FY 2004. Part of this decrease may be attributed to low completion rates for FY 2003 and FY 2004 projects and limited contractor capacity. Additionally, early adopters of this technology are engaged and followers may be taking a wait-and-see approach before moving forward.

Projects ranged in size from 50-kW projects situated on small farms in New York to a 1-MW project in Washington. According to informal surveys conducted with applicants and digester design firms, digester technology continues to face challenges. These include design, interconnection and power purchase agreements, financial uncertainty, and permitting. All 14 projects are currently under development.

Geothermal-Electric
There were no geothermal electric projects awarded in FY 2005.

Geothermal- Direct
Two geothermal direct projects, in Montana and Nebraska, were funded during the FY 2005 cycle. Both leveraged ground-source heat pump technologies to meet heating and cooling demands at farm operations. Combined they will produce more than 1 MMBtu per year of energy. Both are currently in the pre-construction phase.

Solar, Large
Four large solar projects received funding in FY 2005, including both thermal and electric applications. Projects receiving awards were located in Arizona, California, and Oregon. It is interesting to note that in climates as different as Arizona and Oregon, large-scale solar technologies can still be used to supply energy for rural business applications. Large solar projects totaled 5,000 MMBtu in energy production and savings. Two of these projects are under construction, while two are in the pre-construction phase.

Solar, Small
Five small-scale solar projects were awarded funding in FY 2005, including both solar electric and solar thermal applications. States receiving funding included Hawaii, Massachusetts, and North Carolina. Two are completed, and the remaining three are under development. These projects totaled 34,000 MMBtu in energy production.

Wind, Large
Large-scale wind projects continued to dominate the applications in FY 2005. The popularity of the community-scale wind project model gained traction, and 43 projects received funding. Funds were distributed to Colorado, Iowa, Illinois, Minnesota, and Utah. Nearly all of these projects used a version of the flip business model to maximize financial efficiency of revenues from electricity sales, tax credits, and renewable energy credits. The 43 wind projects, once completed, will provide more than 415,000 MWh of emission-free electricity per year. Most of

these projects are still in the pre-construction phase, waiting for equipment, power purchase agreements with the local utility, or both.

Wind, Small

Small wind projects continued to represent only a few of the award recipients in FY 2005. Six projects received funding and aggregate to 348 MWh of annual energy production. Projects receiving funding were located in Iowa, Idaho and Minnesota. Four projects are completed, while the remaining two projects are still under development.

Hybrid

One hybrid project was awarded in FY 2005 for a combined solar electric and small wind system located in Idaho. This project is under construction.

Energy Efficiency, Buildings

Building efficiency applications continue to receive many awards; 35 grants were issued during the FY 2005 cycle. States receiving funding include Iowa, Kansas, Louisiana, Michigan, Mississippi, North Dakota, Nebraska, Oklahoma, South Carolina, and Wisconsin. Total energy savings for these projects is estimated to be 17,000 MMBtu and include technologies ranging from HVAC upgrades; high performance windows, doors and walls; and advanced energy systems controls. Fifteen projects have been completed, nine are under construction, and three are in the pre-construction phase.

Energy Efficiency, Industrial

Thirty-three industrial efficiency projects were awarded in FY 2005, combining for an estimated 13,000 MMBtu of annual energy savings. High efficiency grain dryers and irrigation systems dominated the award pool and were located in Iowa, Missouri, Montana, Nebraska, Ohio, and Idaho. Twenty-three are complete, and the remaining projects are still under development.

Conclusion

Based on this analysis, there are a number of conclusions about the status and success of the USDA 9006 Program. The Section 9006 program has an ambitious goal—to create and expand a market for energy efficiency and renewable energy technologies in rural America. Overall, this program has had a wide range of success. Any expansion of a market area for these technologies historically has come with a wide range of market barriers and other obstacles. These have certainly existed in this program and are reflected in some of the project completion rates. But the popularity of this program, along with the strong continued commitment of applicants to projects, makes this a successful program.

The energy, emissions, and economic benefits of this program are significant. The active projects from the first three years alone are expected to produce enough energy to power 124,000 homes or fuel 181,000 cars each year for the next two decades. In addition, these projects are expected to reduce emissions by the equivalent of 1 million metric tons of carbon per year. Although this report does not quantify the economic benefits of these projects, the program has had a measurable impact on the markets for several of these EERE technologies.

The applicant commitment to projects is reflected in the fact that 95% of awarded projects are still on track. The program's popularity is seen by the ever increasing number of applications: in FY 2005, USDA received requests for three times as much funding as was available.

Although a significant number of projects have reached completion, there are still a range of standard issues reported that have caused delays or prevented project completion, including change of ownership, farm financial issues and bankruptcies, and changing business plans. As expected, smaller projects are completed sooner than larger, more complex ones. However, in general, the project development timeframes are not unexpected and, especially for FY 2004 and 2005, are consistent with project development timelines currently seen in industry.

The 2003 projects are on a slower pace for completion than 2004. Thirty-one percent of the active 2003 projects are expected to proceed, but still have not broken ground after more than two years. This is not unexpected and probably reflects the balance that USDA struck with the first year of awards between care with taxpayer funds and willingness to support early adopters. As technical requirements were strengthened in subsequent years, it is expected that a higher level of completion is reached in a shorter time period.

In the first three years of the program, there has been about a 12:1 leverage on project costs compared to grant funds committed. This ratio is considerably higher than technical expectations at the beginning of this program and is substantial considering that each awardee has demonstrated financial need and indicated that the project would not go forward without the grant funds. In the long-term, this ratio may decrease as a larger number of small projects

receive funding. Even at the minimum leverage ratio of 4:1,[8] the program will be successful in leveraging taxpayer funds to increase market opportunities for new technologies.

In the first three years, 43% of the grants have gone to small projects (total costs under $200,000). New rules implemented in July 2005, with simplified applications and scoring advantages, encourage these projects. As a result, the number of small project applications is expected to increase. Further data will be available after the FY 2006 program award cycle.

Data in this report were based on limited information provided by USDA State Office staff involved with the projects. Many FY 2003 and FY 2004 projects are still in development. Available technical information from USDA State Office staff members lacked detail to fully evaluate all barriers to project development. If USDA is interested in further details, a technical review of barriers affecting incomplete projects may be warranted. Of note, USDA has provided funds to EPA's AgStar program to analyze digester projects.

USDA has provided some funding for a post-award tracking system. A Web-accessible data base will help State Office staff update and enter data regarding project progress and development. In addition, it will enable easier data retrieval and help USDA identify barriers to project development. Equally important, an on-line data base will enable benefits analysis to be completed in a rapid, cost-effective manner.

A number of methodologies used in this report also will be beneficial in evaluating the guaranteed loan portion of the 9006 program. It is recommended that an evaluation of the guaranteed loan program be conducted once a sufficient sample size is available.

[8] The regulation allows grant awards for up to 25% of total project costs, with a cap at $500,000. It is unlikely that all awarded applications would have total eligible projects costs of less than $2 million.

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Appendix A–Selected Success Stories

State: Wisconsin
Technology: Anaerobic Digester
Grant Amount: $299,580
Yearly Energy Production: 6,652 MMBtu
Project Status Summary: Project is complete. The digester has been in operation for one year and has exceeded performance expectations. Recipients plan to add another generation set, which will increase output even further. They are using the separated solid as bedding, which has been very beneficial, and are working on using other solids to make potting soil. So far, they are happy with the results. There are no noticeable odors, so area residents are appreciative. Farmer's comment, "I think the benefits of a methane digester are very good. I believe the future potential is even better. We need to continue to explore ways to use methane more efficiently to produce higher dollar valued products to keep American ag profitable. I would ask that you please continue to support and fund projects like this one using renewable agricultural products." (Source: Wisconsin USDA Rural Development Office)

State: Mississippi
Technology: Energy Efficiency, Buildings
Grant Amount: $32,629
Yearly Energy Savings: 11,346 gallons of natural gas
Project Status Summary: Project is complete. This was one of five similar energy efficiency projects awarded in the state in FY 2003. Funds were used for energy efficiency improvements to poultry broiler production houses. The greatest savings for this project resulted from reduced natural gas use. Natural gas savings were higher than expected at 37%, with an overall energy savings of 25%. No operational problems have been reported to date, and the recipient is pleased with the overall results. This was one of the first in a series of awarded projects funding energy efficiency improvements in poultry houses (39 similar projects in Mississippi were awarded in FY 2004 alone). Other efficiency projects at poultry houses experienced similar savings and results.
(Source: Mississippi USDA Rural Development Office)

State: Minnesota
Technology: Wind, Large
Grant Amount: $178,201
Yearly Electricity Production: 5,245,609 kWh
Project Status Summary: Project is complete. A 1.65-MW wind turbine was constructed and has been operational since December 2004. This is one of seven community wind projects funded in Minnesota in FY 2003. These projects replicate the successful MinWind model, which significantly increased the number of farmer-owned community wind developments. Electricity is sold to Xcel Energy through an interconnection agreement. State production incentives have contributed to the economic success of this project and other community wind projects.
(Source: Minnesota USDA Rural Development Office)

State: Wisconsin
Technology: Solar, Small
Grant Amount: $4,936
Yearly Electricity Production: 7,665 kWh
Project Status Summary: Project is complete. The recipients experienced some difficulties during installation due to adverse weather. Finding a licensed solar contractor in their area also took longer than expected. These minor setbacks were overcome, and installation was completed in May 2005. After seven months operation, the system had produced around 70% of expected total output. Accounting for line losses and other factors, on average, the system output is around 80% of capacity. In retrospect, they would have preferred to use a dual access tracker, rather than the single access tracker chosen for the project. Overall, they are very pleased with the project results. They noted that the system is often more efficient in colder weather, when snow reflects extra sunlight onto the solar panels, which is a real bonus considering their location.
(Source: Wisconsin USDA Rural Development Office)

State: New York
Technology: Wind, Small
Grant Amount: $12,467
Yearly Electricity Production: 12,480 kWh
Project Status Summary: Project was completed in January 2005. The recipient was described as "ecstatic" once the turbine was up and running. She experienced some problems with the inverter, and the turbine was not operational for one month in the summer of 2005. As a result, fewer kilowatt-hours were produced than expected. However, the amount produced was a very high percentage of total electrical usage on the farm. Savings from the additional electricity production allowed the addition of equipment to the operation, which the recipient could not afford previously. In the future, the 10-kW turbine is expected to replace all of the farm's current electricity use with power from a renewable source. The recipient, quite happy with the turbine, is now a strong advocate for wind power and hopes to encourage others in the community to build turbines of their own.
(Source: New York USDA Rural Development Office)

State: Iowa
Technology: Wind, Large
Grant Amount: $45,450
Yearly Electricity Production: 900,000 kWh
Project Status Summary: Project is complete. The recipient sells power to the local utility to offset electricity costs, which increased significantly following the addition of a hog operation. The physical construction and commissioning of the 450-kW turbine was completed on schedule. The farmer has been very pleased, explaining, "The project really has been a neat family project for our farm. It was just a fun, exciting project." They also hope to expand their operations, noting, "The bottom line is we did it for our business to help control our future… Maybe, if this thing keeps working like it has been…well, maybe three or four years down the

line, we'll be able to add another turbine. After all, we have three potential sites and plenty of high points—ample space to add another turbine."
(Source: Waterloo/Cedar Falls Courier Online & Iowa USDA Rural Development Office)

State: Iowa
Technology: Efficiency, Industrial
Grant Amount: $12,250
Yearly Energy Savings: 1,035 MMBtu
Project Status Summary: Project is completed. With the grant funding, a husband and wife team upgraded their 40-year-old grain-drying facility with more efficient equipment, including new grain bins and fans, doubling the size of their previous facility. The new equipment is in use and no operational problems have been reported. Overall, they are very satisfied with the improvements. The updated equipment saved their farm more than $16,000 in liquid petroleum gas costs in one year. In addition to the energy savings, they also saved time. Last fall, they were able to dry 70,000 bushels of corn in the new facility. In the old facility, where it took one week to dry 3,000 bushels, it would have taken 23 weeks to dry their recent harvest. The wife reported, "My husband was not very supportive of this grant-writing thing. He said it was a big waste of time. I will let you know that I did make sure he realized when we got the grant who did all the work for it."
(Source: Waterloo/Cedar Falls Courier Online & Iowa USDA Rural Development Office)

Appendix B—Methodology

Energy Savings and Generation

Data to support energy savings and generation calculations are taken directly from project data sets for FY 2003, 2004, and 2005.[9] For FY 2003, this consists of an internal project information sheet that NREL developed on all project applications sent to the Lab for technical review. In FY 2004 and FY 2005, USDA State Office staff entered original project and energy data into an NREL managed tracking system. NREL verified certain technology size and type during the review process.

Data were calculated at the project level and rolled up to summary numbers. NREL conducted a verification process on all existing numbers to ensure that they were within anticipated ranges. Any missing data or discrepancies were filled in by researching basic savings or production numbers claimed by the applicant and recorded during the application review process.

For all projects, both energy production and savings data were requested as annual energy (kWh, MMBtu, gallons per year) based on applicant projected generation or savings data. In the case where power rating was entered (e.g., 1.65-MW wind turbine) without supporting energy data (e.g., 5,500,000 kWh/year), a standard capacity factor[10] was developed for each technology. The capacity factors were based on referenced data and advice from NREL technology staff.

Table B1. Assumed Capacity Factor by Technology

Technology Description	Assumed Capacity Factor
Anaerobic Digesters	90%
Biomass (Electric Generation)	90%
Small Solar	35%
Large Solar	35%
Small Wind	30%
Large Wind	35%

For each fiscal year, projects were sorted by technology type, and energy production or savings values were compared within each subgroup to identify outliers and unexpected values. Any unusual data results were subjected to further research and verification. In a few cases, energy savings were offered in dollars per year. In those cases, fuel prices were taken from the Energy Information Administration (EIA) and used as $0.0816/kWh[11] for rural electricity and $0.0095/MMBtu for natural gas, taken from the EIA 2003/4 Midwest residential gas price.

[9] A small percentage, less than 5%, of the projects did not have current data from State Offices. These projects were designated as under development.

[10] Capacity factor is a percentage of time a project is expected to be operating at rated power output. It is the number of hours of operation time per year divided by 8,760.

[11] 2004 commercial average: http://www.eia.doe.gov/cneaf/electricity/epa/epat7p4.html

All energy values were converted to MBtus for inter-comparison. For these calculations, a conversion factor of 3,412 Btu/kWh was used. For fuels, a conversion factor of 130 MMBtu/gallon of biodiesel and 70 MMBtu/gallon of ethanol were used.

Household and vehicle consumption equivalents were based on EIA data for 2001, the latest available. Households used an average of 10,624 kWh in 2001,[12] and each vehicle in the United States traveled about 12,000 miles and used about 592 gallons in that year.[13]

Project status was taken from quarterly surveys conducted by USDA and completed by USDA rural energy coordinators in each USDA State Office. Both direct input and background comments on award status, phase of project development, and obstacles to development were used to complete this report.

Projects for which grant funds have been canceled, or for which surveys indicated were anticipated, were removed from active project summaries and from the overall energy generation and savings estimation calculations. Reporting numbers for FY 2003 and FY 2004 were updated in June 2006 by USDA State Office staff.

Although there are also annual reports required on operational projects, those are not due until after a year of operation. As such, those are only available for a few projects so far, and that information is not included in this report.

Emissions Calculations

For emissions calculations, the report relied on factors and procedures outlined in DOE's Voluntary Reporting of Greenhouse Gases–Form EIA 1605 (2006). These data were cross-correlated with an EPA internal document, "Unit Conversions, Emissions Factors, and Other Reference Data," November 2004. These data are meant for rough estimation purposes only and are estimated to be within +/-20%. Calculating a more refined number would require a detailed analysis on a state-by-state basis and is beyond the scope of this report.

The EIA 1605 form provides the means for voluntary reporting of greenhouse gas emissions, reductions, and sequestration under the Energy Policy Act of 1992 (Public Law 102-486). The form allows parties participating in the voluntary reporting to calculate emissions impacts from a variety of sources and provides emissions coefficients and procedures for estimating values. The report focuses on emissions most affected by human activity, including carbon dioxide (CO_2), methane, nitrous oxide, and halogenated substances. This report calculated only the CO_2 component of emissions savings.

Form 1605 provides instructions and emissions coefficients to determine CO_2 impact on an individual technology basis. Appendix B of the instructions guide to the form contains specific emissions coefficients for a variety of technologies, including motor gasoline, distillate fuel,

[12] http://www.eia.doe.gov/emeu/reps/enduse/er01_us.html
[13] http://www.eia.doe.gov/emeu/rtecs/nhts_survey/2001/index.html

methane, landfill gas, biomass, geothermal, wind, photovoltaics and solar thermal, and wood/wood waste. The emissions factors for calculating CO_2 emissions benefits from technologies supported by the USDA 9006 program are summarized in the tables below. The first three tables are separated into fuel, heat, and electric technologies to account for standardized emission rate factors associated with each technology. NNZ refers to estimated CO_2 emissions that are not reabsorbed into the biological cycle.[14] For each division, an average emissions rate for CO_2 was calculated and applied to the roll-up data for the FY 2003 through FY 2005 cycle.

Table B2. Emissions Factors for Fuels

Type	Baseline	Emissions (lb/MMBtu)	NNZ%	EERE Contribution (lb/MMBtu)	Total (lb/MMBtu)
Biodiesel	Distillate	161,386.	5%	8069.	153,317
Ethanol	Motor Fuel	156,425.	5%	7821.	148,604
Average					**150,960**

Table B3. Emissions Factors for Heat

Type	Baseline	Emissions (lb/MMBtu)	NNZ%	EERE Contribution (lb/MMBtu)	Total (lb/MMBtu)
Wood Heat	Natural Gas	117,080	5%	5,854	111,226
Geothermal Heat	Natural Gas	117,080	0%	0.0	117,080
Solar Heat	Natural Gas	117,080	0%	0.0	117,080
Average					**115,129**

Table B4. Emissions Factors for Electric

Type	Baseline	Emissions (lb/kWh)	NNZ%	EERE Contribution (lb/kWh)	Total (lb/kWh)
Wood Electric	Grid Electric	1.340	5%	0.067	1.273
Geothermal Electric	Grid Electric	1.340	0%	0.000	1.340
Solar Electric	Grid Electric	1.340	0%	0.000	1.340
Wind	Grid Electric	1.340	0%	0.000	1.340
Efficiency	Grid Electric	1.340	0%	0.000	1.340
Average					**1.327**

Digesters are noted in a separate table because of the "double dip" effect in which methane is captured on the front end of the process and grid-based emissions are avoided in the second (near net zero CO_2). In transactions accepted by Chicago Climate Exchange and others,[15] a standard approach to compute emissions benefits resulting from digester projects is to account for the emissions benefits realized from preventing methane from entering the atmosphere (through capture of the manure), add in the benefit realized from producing electricity from a renewable

[14] Sheehan, J. (2002). Life-Cycle Analysis of Ethanol from Corn Stover. 8 pp., NREL Report No. PO-510-31792.
[15] *Monitoring, Reporting and Verification Protocol for the IEUA Anaerobic Digester Project* (January 24, 2006), Prepared for Inland Empire Utilities Agency. Environmental Resources Trust, Inc., Washington, D.C.

resource (manure), and subtract a small component of CO_2 emitting and not reabsorbed into the closed carbon cycle loop.

Table B5. Emissions Factors for Digesters

Type	Capture Emissions (lb/MMBtu)	Electric Emissions (lb/MWh)	NNZ%	EERE Contribution (lb/MWh)	Total (lb/MWh)
Digesters	115,258	1.340	5%	0.067	394,533

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At the request of the U. S. Department of Agriculture (USDA) Rural Development, the National Renewable Energy Laboratory reviewed projects awarded in the Section 9006 Program: Renewable Energy Systems and Energy Efficiency Improvements Program. The purpose of this program is to provide grants to farmers, ranchers, and rural small businesses for purchasing renewable energy systems and energy efficiency improvements. NREL's report quantifies federal and private investment, outlines project status based on recent field updates, and calculates the effects on energy and emissions of renewable energy and energy efficiency projects from USDA grants awarded in FY 2003-FY 2005. Also included is an overview of the program challenges and modifications in the first three years of operation.

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