Financial Assistance

FINANCIAL ASSISTANCE ACCELERATES THE DEVELOPMENT AND DEMONSTRATION OF CLEAN, ENERGY-EFFICIENT TECHNOLOGIES FOR U.S. MANUFACTURERS

Investing in a more energy-efficient and clean U.S. industry

U.S. DEPARTMENT OF ENERGY
OFFICE OF INDUSTRIAL TECHNOLOGIES • ENERGY EFFICIENCY AND RENEWABLE ENERGY

Financial Assistance helps technology innovators develop and deliver clean, energy-saving technologies to the marketplace

In today's competitive world markets, the success of U.S. industry hinges — more than ever — on technological advances. Yet, too often, innovative technologies never reach the marketplace at all, or they fail to connect with the companies that could realize the greatest cost-saving and productivity-enhancing benefits.

Hurdles are particularly steep for innovative technologies whose developers may lack the funds and know-how to move promising ideas from the research bench to the marketplace. In addition, emerging technologies face a tremendous barrier to acceptance in the industrial manufacturing sector unless there are full-scale demonstration results. These significant barriers to entry are what the Office of Industrial Technologies' Financial Assistance is designed to address. Through Financial Assistance, successful participants can receive important financial and technical assistance to speed the development of new energy-saving, environmentally friendly technologies and demonstrate their potential savings and commercial value.

Two OIT programs — Inventions and Innovation and NICE^3 (National Industrial Competitiveness through Energy, Environment, and Economics) —provide independent inventors, technology developers, and industry with easy access to a flexible package of services. Together, these programs issue 35 to 40 new grants each year to address pressing energy and environmental issues. Other services that support moving these technologies to the marketplace are also offered.

The NICE^3 and Inventions and Innovation programs are conducted using competitive solicitations, which are issued on concurrent schedules. Even modest levels of support, provided at the right time, can make a real difference in advancing new technologies.

Services to speed innovation

Financial Assistance focuses specifically on technologies that can potentially improve energy efficiency, reduce wastes, and enhance productivity. Emphasis is placed on technologies that target these nine industries. These technologies are also part of the solution for lowering greenhouse gas emissions and reducing U.S. dependence on fossil fuels to meet basic energy needs. Most important, these innovations can impact bottom-line performance and provide a sustainable competitive advantage.

Beyond providing financial support, the Financial Assistance program helps awardees by facilitating partnerships between technical, commercial, and business sponsors, as well as supplying an array of business planning support.

OIT's five Regional Resource Centers for Innovation are available to help successful participants of the Inventions and Innovation and NICE^3 programs navigate the difficult journey from idea to marketplace. These centers located in key geographic regions help these grantees effectively leverage regional, State, and local resources to find solutions to their specific commercialization needs.

Inventions and Innovation — from mind to market

Where can U.S. industry find answers to its energy-related problems? Independent inventors and small technology-based companies are an important source for novel ideas for energy-saving and energy production technologies. OIT's Inventions and Innovation program is committed to providing inventors and small technology-based companies financial and technical assistance to support the development and deployment of new, innovative energy-related technologies.

To date, more than 500 inventions have received financial support through this program. Nearly 25 percent of them have reached the marketplace, achieving cumulative sales of nearly $710 million. Combined, these inventions have saved enough energy to light 6 million homes for a year (in excess of 0.6 quad).

Two levels of financial assistance are available. Grants of up to $40,000 are awarded for early-stage concept development and feasibility, and grants of up to $100,000 are available for late-stage research, development, and deployment. All grants are awarded through a competitive solicitation process with a focus on ideas that have significant energy savings impact and future commercial market potential.

While the core of the program is financial assistance, Inventions and Innovation also guides inventors through the development and commercialization process by helping them find technical partners, commercial sponsors, business plan resources, and other funding sources. During and after the grant project period, OIT portfolio managers and a network of regional resource providers assist grantees with their technical program management and market development planning.

NICE^3 — demonstrating the potential benefits of new technologies

Demonstration is often a make-or-break intersection on the road to technology commercialization. It can spell the difference between a good idea that gets left by the wayside and a proven, marketable product. Technologies that save energy, reduce waste, and are economically competitive can receive financial assistance to demonstrate their capabilities through the NICE^3 program.

The goal of NICE^3 is to encourage industrial demonstration, deployment, and dissemination of energy-efficient technologies that can affect industrial processes, materials inputs, and waste streams. Technologies that can be transferred across a broad range of applications and across industrial sectors are a key target, especially those that apply to the nine energy-intensive Industries of the Future (see page 4).

State agencies in partnership with industry can submit applications to demonstrate technologies that are ready for commercialization. The proposals should describe how application of the innovative technology would improve energy efficiency, reduce industry costs, and prevent pollution in industries.

Through NICE^3, the State/industry applicant may receive a one-time grant of up to $425,000 of Federal funding (up to $400,000 for the industry and up to $25,000 for the State agency) for up to three years, with the stipulation that the awardee match these funds with a minimum 50 percent project cost-share. Companies that receive NICE^3 grants agree to help commercialize their technologies inside and outside of their companies or agree to share results with other companies.

The competitive position of U.S. industry can be enhanced by adopting cost-effective, energy-efficient, and cleaner manufacturing processes, equipment, and practices.

Many of these projects are commercially available. Fact sheets and success stories are on the NICE^3 Web page at http://www.oit.gov/NICE3.

Financial Assistance helps Industries of the Future boost bottom-line performance

OIT's centerpiece strategy is the Industries of the Future, a partnership process that engages each participating industry in developing its vision of a more resource-productive, energy-efficient future, and in defining technology developments critical to realizing this vision.

Nine major industries — agriculture, aluminum, chemicals, forest products, glass, metalcasting, mining, petroleum, and steel — are participants in the Industries of the Future initiative. These energy-intensive industries account for over 75 percent of the energy consumed by U.S. industry and face significant environmental challenges.

Financial Assistance supports R&D priorities

OIT is working closely with the nine Industries of the Future to help them define their sustainable futures and prioritize their technology needs over the next two decades. This industry-driven strategy is central to helping align Federal R&D and other resources with industry priorities and improving access to a wide array of technical expertise and facilities.

As part of the Industries of the Future process, participating industries identified opportunities to address specific technology and materials needs common to all of the vision industries. The goal of Financial Assistance and other Crosscutting Technology programs is to work with industry partners to conduct cost-shared R&D that has application across all of the vision industries, as well as to provide the tools and technical assistance needed to speed the implementation of energy-efficient, clean manufacturing technologies.

Through the sponsorship of OIT's Financial Assistance program, many technologies are now part of the Industries of the Future R&D portfolios. Based on the industry vision and its priorities, the Financial Assistance program has supported industry efforts by funding innovations and demonstrations that encourage cost savings, improve productivity, and increase competitiveness.

Financial Assistance projects have supported many technologies that have application across many energy-intensive industries:

Agriculture—Plant/crop-based renewable resources

The agriculture industry's vision for 2020 focuses on developing technologies for using plants as source materials for industrial and consumer products such as plastics, paints, and adhesives. This industry has drawn on OIT's financial assistance programs for over 20 years, with significant achievements in energy efficiency and environmental benefits.

Aluminum—Process reuses aluminum chips for wheel manufacturing

Aluminum automobile wheel manufacturer, AAP St. Marys, received a NICE^3 grant to develop an on-site aluminum waste chip recycling process that increases usable aluminum, eliminates jobbing the work offsite, and reduces waste volume and airborne pollutants. The process can also be used by other metal processing and fabricating operations that involve waste metal chips. This kind of technology advance complements the performance targets found in the aluminum industry's *Partnerships for the Future*.

Chemicals—Powder antichip primer coating reduces energy use and eliminates waste streams

Assisted by a NICE^3 grant, Chrysler and its partners developed and implemented an innovative powder antichip painting process that is highly efficient, with a ratio of paint solids deposited to solids used exceeding 90 percent. The new process virtually eliminates solvent use and the resultant emissions, treatment, and incineration as well as paint overspray particulate waste. At Chrysler's Newark, Delaware, plant, energy savings estimated at 40.7 billion Btu per year were realized through smaller spray booths with reduced ventilation requirements, less heated make-up air, and eliminated waste treatment processes. To date, nine Chrysler auto paint shops and four shops at other auto manufacturers have implemented the new process, with estimated total annual cost savings of more than $350,000 per shop. These shops represent how Technical Assistance programs support primary targets within the chemical industry's *Vision 2020*.

Forest Products—Resins created from pulp mill waste replace petroleum-based resins

Assisted by a seed grant from the Inventions and Innovation Program, Lenox Polymers, Ltd., has developed specialty polymers created from renewable wood resources that emit no hazardous materials during production or use, and have durability, flame resistance, and cost advantages over phenolic resins and urea formaldehyde resins. These resins are suitable for use in the foundry, urethane foam, particle board, plywood, construction, furniture, automotive, plastics, and marine industries. Products that improve energy and environmental performance are part of the forest products' *Agenda 2020* research targets.

Partnering for clean and competitive Industries of the Future

Our Nation's strength is based in large part on our access to affordable and reliable energy. As we move into the new millennium, our mission is to develop and deploy new ways to meet our energy needs and improve our environmental quality through use of renewable energy and increased energy efficiency.

Through Industries of the Future, the Office of Energy Efficiency and Renewable Energy is actively engaged with U.S. industry to capture energy and natural resource savings by developing and displaying clean and energy-efficient technologies and practices. Working with the Nation's most energy-intensive industries, we are mapping a vision of the energy future of American industry and developing the technology needed to implement that vision. This profile describes a few of the many ways that the DOE-industry alliance is working toward a more competitive future for U.S. industry and our Nation.

Dan W. Reicher
Assistant Secretary
Energy Efficiency and Renewable Energy

Glass—New furnace technology improves glass fiber production

Vortec Corporation, Collegeville, Pennsylvania, has received an Inventions and Innovation grant to design, engineer, construct, and operate a prototype glass fiber furnace that will reduce energy consumption and improve product quality. The technology uses a revolving doughnut-shaped melter that distributes the molten glass evenly and provides a uniform, energy-efficient melting temperature. Technological innovations enhancing production and energy efficiencies support the glass industry goals outlined in *A Clear Vision for a Bright Future.*

Metalcasting—Sulfur dioxide recovery can eliminate a waste stream

Sulfur dioxide, used as a catalyst in metalcasting, can be recovered and reused instead of discarded. With a cost-sharing grant from NICE^3 and the Ohio Department of Development, Adsorption Research, Inc., is developing a pressure swing adsorption process that recovers up to 99.5 percent of the sulfur dioxide and its carrier gas, while generating no waste streams. The new process can eliminate sulfur dioxide scrubbing and the resulting effluent, preventing as much as 158,000 tons of waste per year in the metalcasting industry and saving as much as 1.23 trillion Btu per year. Such environmental technology projects support the goals of the metalcasting industry's *Beyond 2000*.

Mining—Wireless communications for the mining industry

Assisted by an Inventions and Innovation grant, Transtek, Inc., is developing a wireless communications system for the underground mining industry. The telemetry technology uses electromagnetic field forces to transmit communications through the earth, thereby replacing less reliable hard-wire systems. This technology will be safer, more cost-effective, and flexible, supporting the mining industry's goal to develop technologies that enable global competitiveness, as described in *The Future Begins with Mining*.

Petroleum—Fluid catalytic cracking improvements promise higher yields at lower costs

Process Innovators, in Brighton, Colorado, has received a NICE^3 grant to assist in the development of a low-profile fluid catalytic cracking technology that maximizes product yield and value and reduces the amount of feedstock converted to less useful products such as heavy cycle oil and light fuel gas. The new unit design is 50 feet tall, significantly reducing the initial construction and operating costs of today's 200-foot-high cat crackers. Annual energy savings are estimated at $300,000 for a unit processing 10,000 barrels per day. Technological improvements such as these support the future competitiveness of the petroleum refining industry, which is currently developing an industry-wide vision.

Steel—Environmental engineering reduces steel hazards

Under a NICE^3 grant, Drinkard Metalox, Inc., is developing an electric arc furnace (EAF) dust processor that turns a hazardous steel manufacture by-product, EAF dust, into saleable chemical products using a hydrometallurgical process. This unique technology will be implemented on-site at steel mills, with the potential to eliminate 0.65 million tons of hazardous waste annually, as well as waste storage, transport, and disposal costs. Projects such as these align with the steel industry's *Vision for the 21st Century* goal to improve environmental engineering.

Case Studies

Ultrasonic tank-cleaning technology scrubs the inner surfaces of fluid-filled tanks, pipes, and cylinder interiors without solvents, emissions, or manual labor

Developed by TELSONIC Ultrasonics, the technology involves a tube resonator with an integrated ultrasonic transducer and rod-shaped tubular ultrasonic resonator that vibrate radially 20,000 times per second, creating cavitation bubbles that implode violently to scrub the inside surfaces of tanks, agitator blades, and bottom valves. This technology eliminates solvents and their associated emissions, waste volumes, and disposal costs. It also cleans hollow equipment and is significantly faster than conventional distillation cleaning, thereby reducing downtime and improving productivity. NICE^3 awarded TELSONIC a cost-shared grant, enabling the first U.S. application at DuPont Merck Pharmaceutical Company, where solvent waste was reduced by 80 percent.

Benefits based on 200-gallon system

Direct energy savings	1.175 million Btu per cleaning
Resource savings	100 gallons of solvent per cleaning
Cost savings	$350,000 per year per 200 gallon tank
Payback	Eight cleaning cycles (about 4 weeks)

Hydrochloric acid (HCl) recovery system allows galvanizers and smaller steel manufacturers to reduce hazardous waste and costs

HCl acid, a toxic, corrosive chemical used to clean new steel and remove rust, requires costly transport and disposal. In 1993, NICE^3 awarded Beta Control Systems, Inc., of Beaverton, Oregon, and the Oregon Department of Energy a $97,000 cost-shared grant to help commercialize a recovery system. The Beta recovery technology prefilters the used acid solution, then vaporizes the water and acid to leave ferrous chloride behind, a valuable agricultural product. The water/acid vapor is condensed into HCl, reconcentrated, and recycled back to the pickling tanks.

Benefits per system

Cost savings	Average per-ton cleaning costs reduced from $14 to $3.40
Energy savings	Estimated at 24 billion Btu per year over conventional transportation and disposal energy use, based on 25,000 liters per day (full capacity)
Payback	1.4 years, based on a one-gallon-per-minute system. Life expectancy exceeds conventional systems by three years
Potential revenue	Ferrous chloride, marketable at up to $100 per ton

Case Studies

Industrial dryer control system saves energy, time, product, materials, and costs

Independent inventor John Robinson created a sensor and control device, the Delta T Dryer, that monitors product moisture content inside industrial dryers and readjusts the time and temperature of the drying cycle. This technology improves industrial dryer efficiency by eliminating overdrying, underdrying, and redrying of products such as wood, grains, and textiles. An Inventions and Innovation grant of $83,323 funded demonstrations across various industries, as well as helping to develop customized control mechanisms for different dryers.

Benefits

Improved product quality, consistency, and integrity	
Average energy cost savings	20 to 35 percent
Average production increase	10 percent
Total cumulative energy savings through 1998	2.6 trillion Btu

Aerocylinder prevents compressed air leakage and saves energy

Independent inventors George Bozich and Kenneth Smedberg developed the Aerocylinder, a new type of air cylinder involving stacked air bags. The Aerocylinder performs better than rod and piston cylinders: it prevents compressed air loss, saving energy; it also improves part-forming consistency, requires less maintenance, operates longer between maintenance, and costs less. A 1996 Inventions and Innovation grant of $99,997 helped the inventors develop Aerocylinder and market it to the metal-forming industry. The innovative Aerocylinder can also be applied to mining, forestry, offshore drilling, steel, and other industries.

Benefits

Consistent air pressure	Results in 10 percent productivity and quality improvement
Estimated energy savings	470 barrels of crude oil per stamping press per year

DOE programs encourage innovation in the most energy-intensive industries

The Financial Assistance program is one initiative of a complementary portfolio of programs to promote the development and use of energy-efficient, pollution-preventing technologies.

To help industry access and ensure timely implementation of its technologies and capabilities, OIT is developing an integrated delivery approach for products, services, and emerging technologies. Through this process, companies are made aware of OIT's full portfolio of energy, environmental, and productivity enhancement technologies, matching services to customer needs.

Enabling Technologies

AIM (Advanced Industrial Materials) develops and commercializes new and improved materials to increase energy efficiency, improve productivity, and enhance material longevity and product quality.

The **Combustion** program increases productivity, improves energy efficiency, reduces emissions, and enhances fuel flexibility by developing cost-effective and energy-efficient technologies that are necessary for global competitiveness.

Continuous Fiber Ceramic Composite Materials pursues ceramic composite technologies that improve productivity by utilizing higher process temperatures, extending component and system lifetimes, and reducing downtime.

Sensors and Controls develops and deploys integrated measurement systems for operator-independent control of the manufacturing process. Priority goals are improving technology both in sensors embedded in high-temperature and harsh environmental applications, and in information processing to detect and remedy malfunctions.

Distributed Generation Technologies

Cogeneration improves the efficiency of fuel use and reduces overall emissions. This program supports extensive research, development, and demonstration to meet the technical and market challenges associated with enhancing industrial cogeneration and moderate-size independent power production opportunities.

Technical Assistance

Combined heat and power focuses on overcoming major barriers that currently exist in implementing combined heat and power systems, including complex and costly environmental permitting, unclear environmental regulations, excessive utility fees and rates, and long and varied Federal tax depreciation schedules.

Compressed air system improvements contribute to improving the efficiency and performance of industrial compressed air systems, with the goal of reducing energy use and costs.

Industrial Assessment Centers (IACs) help small and medium-size manufacturers identify opportunities to improve productivity, reduce waste, and save energy through comprehensive industrial assessments. Teams of engineering professors and students from 30 universities across the country conduct the assessments and provide recommendations to manufacturers at no cost.

Motor technology helps increase the productivity and reliability of electric-motor-driven systems, reduce energy costs, and improve the bottom line by providing reliable, unbiased information, tools, and technical assistance.

Steam information, tools, and technical assistance can help industry enhance productivity, cut production costs, and reduce emissions of its industrial steam systems.

Information Resources

Two resources that provide information on all of OIT's products are the IPLocator and the Resource Catalog.

IPLocator (www.oit.gov/locator) provides access to information on federally sponsored R&D projects that are ongoing or recently completed, optimizing the complementary research and development strengths of industry, universities, National Laboratories, and government.

OIT's Resource Catalog, available by calling 202-585-2090, describes over 400 publications and other information products of interest to our customers.

HOW TO GET INVOLVED

Easy access for financial and technical support

Solicitations for NICE^3 and Inventions and Innovation are conducted according to the following schedule:

April 2, 1999 • Deadline for optional pre-proposals

May 3, 1999 • Solicitation opens

July 15, 1999 • Solicitation closes for I&I

September 1, 1999 • Solicitation closes for NICE^3

October 1999 • Evaluations for DOE technical staff and National Selection Panel completed for I&I

November 1999 • Awards announced for I&I

December 1999 • Evaluations for DOE technical staff and a National Selection Panel completed for NICE^3

January 2000 • Awards announcement for NICE^3

Information about upcoming events, workshops, pre-proposals, solicitations, and deadlines is posted on the Internet at http:/www.oit.doe.gov.

Pre-proposal/solicitation order forms can be ordered by calling DOE's Golden Field Office at 303-275-4728 or 303-275-4723.

Additional materials can be obtained by calling OIT's Resource Room at 202-586-2090.

For more information on Financial Assistance, contact:

Sandy Glatt
Inventions and Innovation
Program Manager
202-586-2079
sandy.glatt@ee.doe.gov

Lisa Barnett
NICE^3 Program Manager
202-586-2212
lisa.barnett@ee.doe.gov

U.S. Department of Energy
Office of Industrial Technologies
1000 Independence Avenue, SW
EE-20 Room #5G067
Washington, DC 20585-0121

Please send any comments, questions, or suggestions to webmaster.oit@hq.doe.gov

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