

THE PROMOTION OF ENERGY-EFFICIENT INDUSTRIAL TECHNOLOGIES VIA CADDET

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ABSTRACT

The Centre for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET) is an International Energy Agency program responsible for collecting and disseminating information on demonstrated, energy-efficient and renewable energy technologies. CADDET disseminates the results of such demonstrations to its 15 member countries through quarterly newsletters, brochures, analysis reports, and a database of information on more than 1,600 demonstration projects. Many of these demonstrations provide performance data on energy-efficient industrial technologies.

INTRODUCTION

Many energy-efficient industrial technologies have been documented in demonstration projects to be technically feasible and economically attractive. Examples include various heat recovery and thermal storage systems, high-efficiency motors, and variable speed drives. Widespread adoption of these technologies often is delayed because data about their successful performance does not reach potential users.

The Centre for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET) is an International Energy Agency (IEA)¹ program responsible for collecting and disseminating information on demonstrated, energy-efficient and renewable energy technologies. The center focuses on technologies that have been shown to be cost-effective based on a full-scale "in the field" demonstration, and that have been monitored by a third party to maximize accuracy and credibility. The Center recognizes that tangible evidence of technical and economic acceptability produced by demonstration projects can effectively accelerate the replication of successful technologies.

The United States joined CADDET in 1988, the year that the center was formed. CADDET activities in the U.S. are sponsored by the Office of Technical Assistance within the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy. In 1993 CADDET was expanded into two branches—CADDET Energy Efficiency and CADDET Renewable Energy. The CADDET Energy Efficiency Operating Agent in the Netherlands and the CADDET Renewables Operating Agent in England act as focal points for communications. In the United States, the energy efficiency part of the program is operated for DOE by Oak Ridge National Laboratory (ORNL) and the renewable energy effort is operated for DOE by the National Renewable Energy Laboratory (NREL).

Currently, 15 member countries participate in CADDET on a cost- and task-shared basis. This overview of CADDET activities focuses on the U.S. involvement with the energy-efficiency branch and emphasizes the center's promotion of cost-effective technologies for the industrial sector.

U.S. GOALS FOR CADDET

The United States participates in CADDET as a means of achieving three goals:

- to assist U.S. companies by promoting their energy efficient technologies to potential new markets within and outside the United States.
- to make information on other countries' demonstrated energy technologies available to domestic decision-makers.

¹ The IEA was created in 1974 within the framework of the Organization for Economic Cooperation and Development (OECD). It implements an international energy program of cooperation aimed at reducing the excessive dependence on oil among its 23 member countries, through energy conservation, development of alternative energy sources, and energy research and development.

- to contribute to an international effort to reduce the adverse environmental impacts of fossil fuel consumption.

THE U.S. CADDET NATIONAL TEAM

Member countries have established "national teams" of experts to search for demonstrations of new energy-saving technologies that are suitable for replication in other parts of the world. The teams also assist with the distribution of CADDET information on demonstrated energy technologies to appropriate audiences. The National Team Leader at ORNL coordinates the efforts of the U.S. CADDET National Team and serves as the primary contact point for those interested in the energy-efficiency branch of CADDET.

The U.S. CADDET National Team is made up of representatives from technical, professional, and trade organizations; private industry; utilities; and local, state, and federal agencies. Team members work together to identify demonstration projects appropriate for promotion through CADDET. They also are responsible for helping disseminate CADDET information products to interested audiences.

Organizations represented on the National Team include the following:

- Electric Power Research Institute,
- Gas Research Institute,
- Association of Energy Engineers,
- International Facility Management Association,
- National Association of Manufacturers,
- National Restaurant Association,
- Institute of Electrical and Electronic Engineers,
- Industrial Heating Equipment Association,
- 3M Corporation, and
- American Council for an Energy-Efficient Economy.

CADDET PRODUCTS

CADDET disseminates the results of information on demonstrated, energy-efficient technologies to its 15 member countries through quarterly newsletters, a register of demonstration projects, brochures, and analysis reports.

Newsletters

CADDET produces a quarterly newsletter, which is currently distributed to more than 10,000 subscribers worldwide. Each issue covers a specific technology and features international articles, news items, publication reviews, and meeting notices. The newsletter is intended for individuals and organizations interested in increasing the efficiency with which they consume energy and individuals and organizations involved in the development of energy products, projects, and services, such as manufacturers, consultants, technical companies, research laboratories, and policy makers.

Special issues of the CADDET Energy Efficiency Newsletter that have been dedicated to industrial technologies are listed in Table 1.

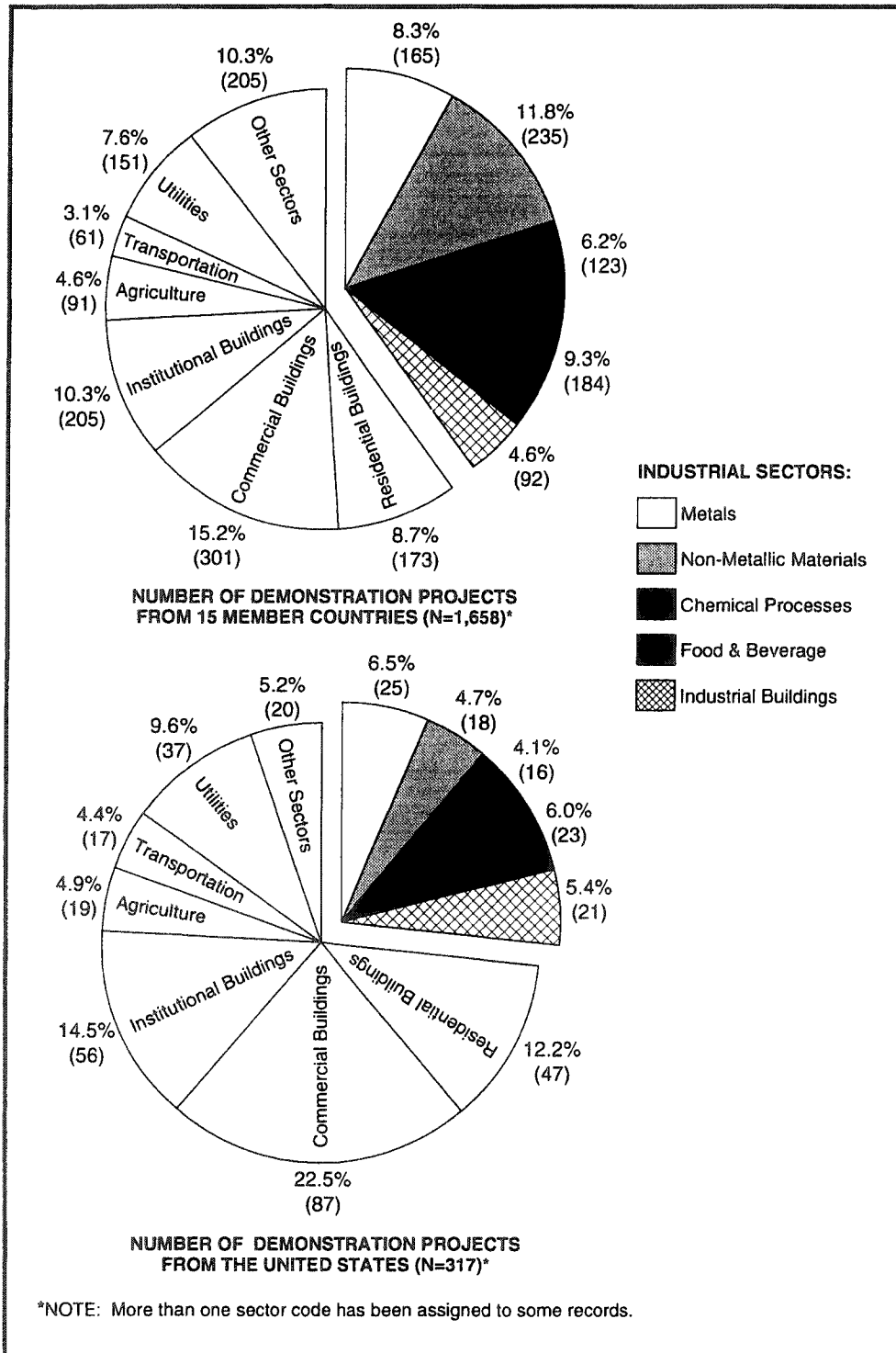
Table 1. Special Issues of CADDET Newsletters Dedicated to Industrial Topics

Industrial Topic	Newsletter Issue
Industrial Combined Heat and Power Generation	No. 1, March 1991
Process Integration	No. 2, June 1991
Energy Efficiency in the Pulp and Paper Industry	No. 3, September 1994
Energy Efficiency in the Industrial Scale Production of Foods and Beverages	No. 4, December 1994

Register

At the heart of the CADDET operation is a computerized register of information. Each member country is responsible for preparing Register database entries covering demonstrations in their countries. The CADDET energy-efficiency Register contains information on more than 1,600 technology demonstration projects, including records from all the CADDET member countries (Figure 1).

Figure 1. CADDET Energy-Efficiency Demonstration Projects by End-Use Sector



Forty percent of the demonstrations included in the CADDET Register describe demonstrations of energy-efficient industrial technologies. The non-metallic materials industries are the sector most frequently covered by these industrial demonstration projects. The next largest segment of the register covers residential and commercial buildings. Agriculture, transportation, utilities, and other end uses are also represented, but to a lesser degree.

A total of 317 entries describe U.S. demonstrations of energy-efficient technologies. Approximately 27% of the U.S. entries describe demonstrations of energy-efficient industrial technologies. The metals and food and beverage industries are the industrial sectors covered most frequently among the U.S. entries.

The United States has led the way in promoting CADDET via the Internet by making all U.S. Register entries available on the World Wide Web. During its first five months on the "Web", the Register was accessed more than 900 times. As a result of this success, CADDET information on the Internet will likely be expanded to include the entire Register database and the full text of selected technical brochures. The URL address for access to the U.S. CADDET Register on the Internet is <http://www.ornl.gov/CADDET/caddet.html>. The general public can also purchase the databases directly from the CADDET Operating Agent.

Brochures

Selected demonstrated energy technology projects from the Register are summarized in colorful CADDET brochures. Each brochure describes the technology being demonstrated, the setting, the cost of the project, energy savings data, and contacts for additional information. Many of the brochures describe award-winning and cost-effective technologies. U.S. National Team members recommend and provide supporting information for the preparation of the U.S. brochures.

Over two hundred brochures on energy efficiency topics have been published by CADDET. Table 2 characterizes the brochures dealing with industry, which equates to almost 40% of the brochures.

Table 2. CADDET Brochures Covering Industrial Demonstrations

Industrial Energy Efficiency Topic	Number of CADDET Brochures on this Topic	Example of a Brochure Topic
Food and Beverage	12	New Plate Evaporator at Sugar Refinery Saves Energy
Metals	17	New Simulation Program Predicts Quality of Castings
Pulp, Paper and Printing	12	Heat Recovery after Catalytic Combustion in Printing
Textiles and Soft Goods	7	Heat, Electricity and Water Savings in a Tannery
Concrete, Masonry and Building Materials	7	Energy Saving Production Unit for Roof Tiles
Chemicals	11	An Ice Pond System for Industrial Process Cooling
Plastics and Composites	4	Heat Recovery from Plastic Injection Moulding Machines
Other Goods	6	Integrated Lacquering Line at a Bicycle Factory
Industrial Processes	10	High Efficiency Motors for Fans and Pumps
Total	86	

The most frequently covered industrial topics are metals; food and beverage; and pulp, paper, and printing. An example of the available information can be seen by looking at CADDET Result Brochure Number 135, "An Ice Pond System for Industrial Process Cooling." This brochure describes an ice pond demonstration at an operating fermentation plant in Rochester, New York. The demonstration delivered process cooling at less than 20% of the operating energy costs associated with conventional mechanical systems. The system proved to be commercially viable for reliable, low cost, non-chlorofluorocarbon (CFC) industrial refrigeration applications. Operational energy savings of 89% over conventional mechanical systems were demonstrated.

Analyses

The most in-depth of the CADDET products are the analysis reports. These reports use experts from all CADDET member countries to compare the technical and economic results of selected demonstration projects on a particular technology. The overall objective of each analysis is to make comparisons and draw conclusions from data gathered through the CADDET network. Thirteen analysis reports have been produced to date. Six of these have addressed industrial energy-efficiency technologies (Table 3).

Table 3. CADDET Analysis Reports Covering Industrial Topics

Industrial Energy Efficiency Topic	Analysis Report Number and Date
Small-Scale Cogeneration	#1: September 1989
Heat Transformers in Industrial Processes	#2: December 1989
Gas-Turbined-Based Combined Heat and Power in Industry	#9: April 1993
Industrial Ventilation	#10: July 1993
Process Heating in the Metals Industry	#11: October 1993
Industrial Drying Technologies	#12: July 1994

Marketing and Customer Feedback

CADDET's mission has expanded beyond identifying and analyzing information about demonstrations of new energy-saving technologies. To disseminate more effectively the information it collects, CADDET has increased its use of marketing techniques to target audiences that would benefit most from the information. Also, it evaluates and documents the performance of the program. Each National Team performs marketing and evaluation projects such as subscriber surveys, exhibits at trade shows, and targeted mailings.

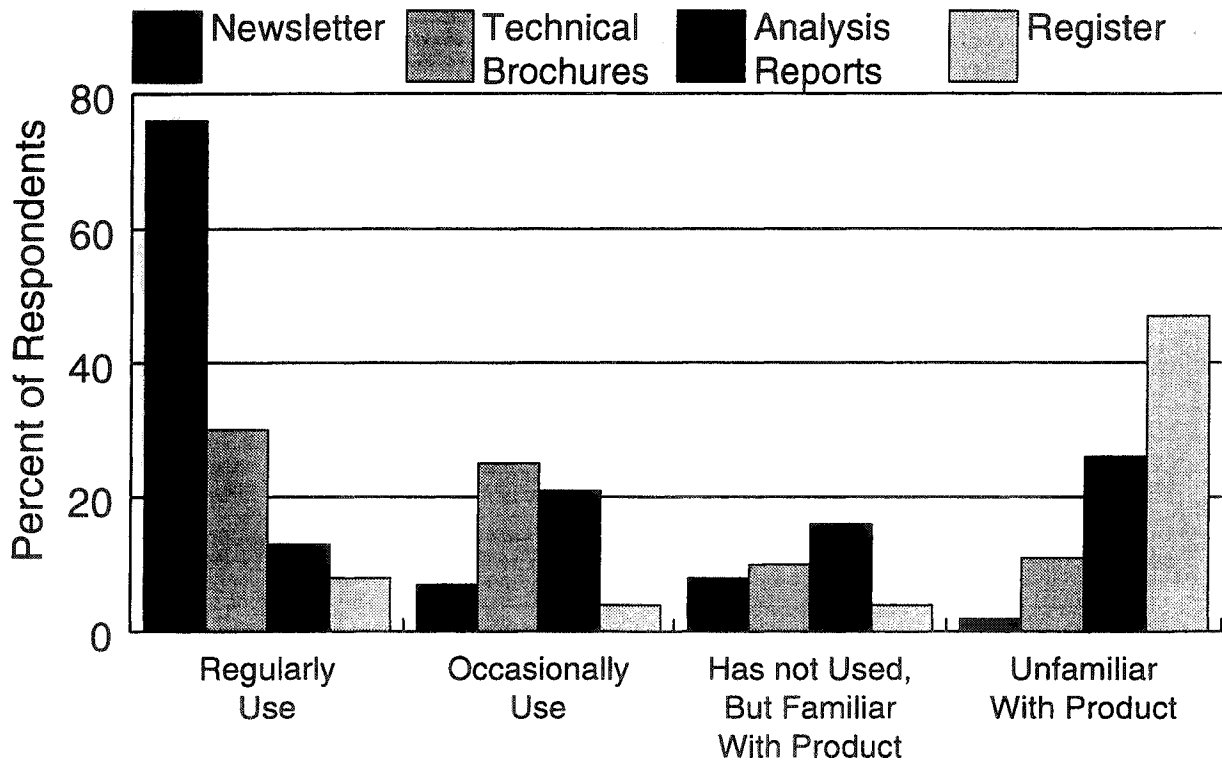
Last year, NOVEM conducted a survey of CADDET customers to assess the value of each of its products. Altogether, 204 customers responded to the survey. Approximately 20 of these were from the United States, and the remaining respondents were from other CADDET member countries.

The survey indicated that the energy-efficiency newsletter is CADDET's best-known product (Figure 2). It is read on a regular basis by nearly 80% of the 204 respondents. At the other extreme, approximately half of the respondents were unfamiliar with the Register of data on demonstration projects, and few respondents had ever used the Register. By placing the U.S. Register entries on the Internet, the U.S. National Team has increased substantially the use of its Register information by customers from around the world.

A subsequent survey of U.S. subscribers to the CADDET energy-efficiency newsletter corroborated the success of this CADDET product. A subscriber survey was enclosed with the September 1994 issue of the newsletter. One-third of the subscribers responded. The results indicated the following.

- Ninety-six percent of the respondents felt that the newsletter provided useful information.
- Forty percent of the respondents thought that the CADDET Newsletter had provided a specific direct benefit for their organization.

Figure 2. Results of an International Survey of CADDET Customers (N=204)



In addition to these statistics, the survey generated specific feedback from individual customers. Table 4 presents quotations from individual newsletter subscribers.

Table 4. What U.S. CADDET Newsletter Subscribers are Saying: A Selection of Quotations

Quotation	Customer
We use the newsletter as an overview of research and efficiency improvement potential for all sectors of the economy.	Boeing Company, Seattle, Washington
We use many of your articles in training our energy systems engineers.	General Electric-ISE, Evansville, Indiana
CADDET has provided leads on advanced industrial technology applications. We have used these to identify alternative approaches that our customers can use.	Pacific Gas & Electric Company, San Francisco, California
Geothermal and renewable resource articles have given us contacts in Denmark, Finland and elsewhere. We have made site visits and shared findings.	State of Oregon Department of Energy, Salem, Oregon
Enables me to impart current information to students.	College of Architecture and Planning, University of Tennessee, Knoxville, Tennessee

Two recent specific CADDET success stories can also illustrate the benefits of the program. After the publication of a Norwegian Special Issue of the CADDET Newsletter containing an article titled "Best Saver Shower Head," the

manufacturer of the shower head received approximately 50 requests for additional information from all over the world. Aside from several small orders, Dutch utilities ordered 300,000 units for DSM programs. The inventor has been inspired by this success and has developed a new energy and water efficient shower head, "Multi Shower," with improvements in comfort compared with the "Best Saver." The new product has also now been successful.

A recently published U.S. CADDET Demo brochure No. 23, "*Turbine Generator Uses Clean Gas from Sawdust Combustion*," also resulted in a success story. The Aerospace Research Corporation demonstrated a continuous wood-burning process that supplies clean gas to drive a turbine for electricity generation. Since the brochure's publication, Aerospace has received inquiries from Ireland, England, India, the Philippines, and Central America, among other countries. Before installing the system overseas, the company will demonstrate a commercial version of the technology in the U.S. Negotiations are underway with the Allegheny-Clarion Valley Development Corporation of Foxburg, PA, to install a LM1500 (9500 KW) demonstration system and production facilities in the Clarion Valley.

HOW TO PARTICIPATE

Individuals can participate in CADDET either as suppliers of information for possible inclusion in CADDET products or as users of CADDET information. Many customers participate both as suppliers and users of information on demonstrated technologies.

- **Suppliers:** Contribute information to U.S. National Team leaders on successfully demonstrated energy technologies to review for a potential CADDET product.
- **Users:** Request CADDET products and either use the information directly for their own purposes or distribute copies to others who could benefit from the information.

Table 5 provides the names and addresses of three CADDET contacts in the United States who can provide further information.

Table 5. Contacts for Further Information

For General Information about CADDET	To Supply Information to CADDET	To Obtain Specific CADDET Products
Marilyn A. Brown Energy Efficiency and Renewable Energy Program Oak Ridge National Laboratory P.O. Box 2008 Oak Ridge, TN 37831-6186 Phone: 615-574-5204, Fax: 615-576-7572 E-mail: brownma@ornl.gov.	Julia Shaver Information Management Services Division Oak Ridge National Laboratory P.O. Box 2008 Oak Ridge, TN 37831-6302 Phone: 615-574-6966, Fax: 615-574-9672 E-mail: J4U@ornl.gov	Melissa K. Voss Energy Division Oak Ridge National Laboratory P.O. Box 2008 Oak Ridge, TN 37831-6070 Phone: 615-574-1013, Fax: 615-574-9338 E-mail: vossmk@ornl.gov