



U.S. Department of Energy

Programs in Utility Technologies

***WIND ENERGY
CONTRACT LIST
FISCAL YEAR 1990***

MASTER

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Introduction

The federal Wind Energy Program performs applied research in the sciences of wind turbine dynamics and the development of advanced components and systems. These efforts have resulted in major advances in the development and commercialization of wind technology as an alternative energy source.

In the past, a summary was prepared each year to provide an overview of the government-funded activities within the federal Wind Energy Program. Tasks conducted in-house by participating national laboratories or under contract by industrial, academic, and other research institutes were highlighted.

This year's document is more concise than the summaries of previous years. The FY 1990 contract overview comprises a list of all subcontracts begun, ongoing, or completed during FY 1990 (October 1, 1989, through September 30, 1990).

Under each managing laboratory, projects are listed alphabetically by project area.

For additional information on the federal Wind Energy Program, the reader is encouraged to consult the *Wind Energy Program Overview, Fiscal Years 1990–1991* (DOE/CH10093-101); the *Wind Energy Technical Information Guide*; and the *Five Year Research Plan, 1985–1990*.

Organizational Relationships

The federal Wind Energy Program is conducted by the U.S. Department of Energy (DOE) and is assigned to the Assistant Secretary for Conservation and Renewable Energy. Day-to-day research activities are managed by the National Renewable Energy Laboratory (NREL) in Golden, Colorado; Pacific Northwest Laboratory (PNL) in Richland, Washington; and Sandia National Laboratories in Albuquerque, New Mexico.

FY 1990 Contract List

National Renewable Energy Laboratory

National Renewable Energy Laboratory

Contract No. Contract Period Title	Contractor (Principal Investigator) NREL Contact	Funding \$ (Source)	Selected FY 1991 Milestones (NREL contact has more information)
Advanced Components			
DE-AC03-83CH10093 01/01/87-09/30/90 Advanced Blades	Contractor: National Renewable Energy Laboratory (J. Tangler) 1617 Cole Boulevard Golden, CO 80401 Subcontractors: Alternative Energy Institute West Texas State University (V. Nelson) Canyon, TX 79016 Michigan Technological University Mechanical Engineering Department (S. Yang) Houghton, MI 49931 Phoenix Industries (J. Frerotte) 1200 Bruce Street Crookston, MN 56716 R. Thresher	Total Funding \$1,978,700 (DOE) FY 90 Funding \$375,000 (DOE)	Define structural characteristics for advanced composite blades to achieve competitive cost (November 1990).
DE-AC02-83CH10093 10/01/89-09/30/90 Airfoil Testing	National Renewable Energy Laboratory (B. Smith) 1617 Cole Boulevard Golden, CO 80401 R. Thresher	Total Funding \$610,000 (DOE) FY 90 Funding \$610,000 (DOE)	Complete thick-airfoil blade atmospheric tests (September 1991).

National Renewable Energy Laboratory

Contract No. Contract Period Title	Contractor (Principal Investigator) NREL Contact	Funding \$ (Source)	Selected FY 1991 Milestones (NREL contact has more information)
DE-AC03-83CH10093 01/01/87-09/30/90 Advanced Turbine Development	Contractor: National Renewable Energy Laboratory (S. Hock) 1617 Cole Boulevard Golden, CO 80401 Subcontractors: Atlantic Orient Corporation (R. Sherwin) P.O. Box 1097 Norwich, VT 05055 Northern Power Systems (C. Coleman) One North Wind Road Moretown, VT 05660 R. Lynette and Associates (R. Lynette) 7353 148th Avenue Redmond, WA 98052 R. Thresher	Total Funding \$1,568,200 (DOE) FY 90 Funding \$405,000 (DOE)	Release solicitation for Advanced Turbine Near-Term Product Development (September 1991).
DE-AC02-83CH10093 10/01/88-09/30/90 Advanced Turbine Studies	National Renewable Energy Laboratory (S. Hock) 1617 Cole Boulevard Golden, CO 80401 R. Thresher	Total Funding \$552,000 (DOE) FY 90 Funding \$285,000 (DOE)	Complete design review of advanced turbine conceptual designs (July 1991).

National Renewable Energy Laboratory

Contract No. Contract Period Title	Contractor (Principal Investigator) NREL Contact	Funding \$ (Source)	Selected FY 1991 Milestones (NREL contact has more information)
Aerodynamics			
DE-AC02-83CH10093 01/01/87-09/30/90 Combined Experiment	Contractor: National Renewable Energy Laboratory (C. Butterfield) 1617 Cole Boulevard Golden, CO 80401 Subcontractor: RANN Inc. (A. Eggers) 260 Sheridan Avenue Suite 414 Palo Alto, CA 94306 R. Thresher	Total Funding \$2,667,000 (DOE) FY 90 Funding \$661,000 (DOE)	Complete Combined Experiment Phase I data analysis and prepare the final report (April 1991).
DE-AC02-83CH10093 01/01/87-09/30/90 Inflow and Response Research	Contractor: National Renewable Energy Laboratory (N. Kelley) 1617 Cole Boulevard Golden, CO 80401 Subcontractor: University of Massachusetts Department of Mechanical Engineering (R. Kirchoff) Amherst, MA 01003 R. Thresher	Total Funding \$1,749,900 (DOE) FY 90 Funding \$530,000 (DOE)	None.

National Renewable Energy Laboratory

Contract No. Contract Period Title	Contractor (Principal Investigator) NREL Contact	Funding \$ (Source)	Selected FY 1991 Milestones (NREL contact has more information)
Structural Dynamics			
DE-AC02-83CH10093 01/01/87-09/30/90 Analytical Codes for Dynamic Response	Contractor: National Renewable Energy Laboratory (A. Wright) 1617 Cole Boulevard Golden, CO 80401 Subcontractors: Oregon State University Department of Mechanical Engineering (R. Wilson) Corvallis, OR 97331 University of Utah Mechanical Engineering Department (C. Hansen) Salt Lake City, UT 84112 R. Thresher	Total Funding \$1,366,100 (DOE) FY 90 Funding \$429,500 (DOE)	Complete Yaw Dyn yaw dynamics code (February 1991). Complete validation of teetered rotor version of the Force and Loads Analysis Program structures code (August 1991).
DE-AC02-83CH10093 10/01/89-09/30/90 Fatigue Testing	National Renewable Energy Laboratory (R. Osgood) 1617 Cole Boulevard Golden, CO 80401 R. Thresher	Total Funding \$505,000 (DOE) FY 90 Funding \$505,000 (DOE)	Initiate first full-blade dynamic fatigue test in cooperation with industry (July 1991).
DE-AC02-83CH10093 01/01/87-09/30/90 Structural Dynamics and Fatigue	Contractor: National Renewable Energy Laboratory (W. Musial) 1617 Cole Boulevard Golden, CO 80401 Subcontractor: Southern University Department of Mechanical Engineering (I. Graham) Baton Rouge, LA 70813 R. Thresher	Total Funding \$2,228,700 (DOE) FY 90 Funding \$395,000 (DOE)	None.

National Renewable Energy Laboratory

Contract No. Contract Period Title	Contractor (Principal Investigator) NREL Contact	Funding \$ (Source)	Selected FY 1991 Milestones (NREL contact has more information)
Supporting Research			
DE-AC02-83CH10093 01/01/87-09/30/90 Support to Industry Standards Development	Contractor: National Renewable Energy Laboratory (D. Dodge) 1617 Cole Boulevard Golden, CO 80401 Subcontractor: American Wind Energy Association (R. Sherwin) 777 North Capitol Street Washington, DC 20002 R. Thresher	Total Funding \$497,000 (DOE) FY 90 Funding \$140,000 (DOE)	Award FY 1991 American Wind Energy Association Standards subcontract (April 1991).
DE-AC02-83CH10093 01/01/87-09/30/90 Cooperative Research Programs	Contractor: National Renewable Energy Laboratory (D. Dodge) 1617 Cole Boulevard Golden, CO 80401 Subcontractors: Atlantic Orient Corporation (R. Sherwin) P.O. Box 1097 Norwich, VT 05055 Bergey Wind Power (M. Bergey) 2001 Priestly Avenue Norman, OK 73069 Northern Power Systems (C. Coleman) One North Wind Road Moretown, VT 05660 R. Thresher	Total Funding \$1,303,100 (DOE) FY 90 Funding \$130,000 (DOE)	Release solicitation for cooperative work with industry (March 1991). Complete development of simple field instrumentation package (September 1991).

National Renewable Energy Laboratory

Contract No. Contract Period Title	Contractor (Principal Investigator) NREL Contact	Funding \$ (Source)	Selected FY 1991 Milestones (NREL contact has more information)
DE-AC02-83CH10093 01/01/87-09/30/90 Electrical/Control Theory	Contractor: National Renewable Energy Laboratory (P. Carlin) 1617 Cole Boulevard Golden, CO 80401 Subcontractor: Electrotek Concepts, Inc. (J.C. Smith) 480 San Antonio Road Mountain View, CA 94040 R. Thresher	Total Funding \$1,542,900 (DOE) FY 90 Funding \$395,000 (DOE)	None.
DE-AC02-83CH10093 10/01/89-09/30/93 University Research Program	National Renewable Energy Laboratory (D. Dodge) 1617 Cole Boulevard Golden, CO 80401 R. Thresher	Total Funding \$350,000 (DOE) FY 90 Funding \$350,000 (DOE)	None.
DE-AC02-83CH10093 01/01/87-09/30/90 Wind-Hybrid Research	Contractor: National Renewable Energy Laboratory (P. Carlin) 1617 Cole Boulevard Golden, CO 80401 Subcontractor: University of Massachusetts Mechanical Engineering Department (R. Kirchhoff) Amherst, MA 01003 R. Thresher	Total Funding \$1,273,100 (DOE) FY 90 Funding \$290,000 (DOE)	None.

FY 1990 Contract List

Pacific Northwest Laboratory

Contract No. Contract Period Title	Contractor (Principal Investigator) PNL Contact	Funding \$ (Source)	Selected FY 1991 Milestones (PNL contact has more information)
Atmospheric Fluid Dynamics			
DE-AC06-76RLO1830 10/88-09/90 Improved Calibration and Use of Anemometers	Colorado State University Fluid Mechanics and Wind Engineering Program Civil Engineering Department (J.R. Connell) Fort Collins, CO 80523 V.R. Morris	Total Funding \$211,000 (DOE) FY 90 Funding \$40,000 (DOE)	Complete the final technical report (June 1991).
DE-AC06-76RLO1830 10/88-10/90 Characterization of Turbulence in Complex Terrain	Pacific Northwest Laboratory (L.L. Wendell) P.O. Box 999 Richland, WA 99352 L.L. Wendell	Total Funding \$210,000 (DOE) FY 90 Funding \$178,000 (DOE)	Complete installation at four California sites and one Vermont site (May 1991). Complete first phase analyses and release Request for Proposal for Phase II sites (September 1991).
DE-AC06-76RLO1830 10/87-09/90 Comprehensive Summary of Wake and Array Loss Research	Pacific Northwest Laboratory (D.L. Elliott) P.O. Box 999 Richland, WA 99352 L.L. Wendell	Total Funding \$267,000 (DOE) FY 90 Funding \$54,000 (DOE)	Complete the final technical report (September 1991).
DE-AC06-76RLO1830 10/87-09/90 Evaluation and Improvement of Micrositing Flow Models	Pacific Northwest Laboratory (J.C. Barnard) P.O. Box 999 Richland, WA 99352 L.L. Wendell	Total Funding \$227,000 (DOE) FY 90 Funding \$62,000 (DOE)	Publish the results of study in the open literature (May 1991).
DE-AC06-76RLO1830 10/87-09/90 Turbulence Measurement and Analyses at the 34-m VAWT Test Bed	Pacific Northwest Laboratory (J.R. Connell) P.O. Box 999 Richland, WA 99352 V.R. Morris	Total Funding \$204,000 (DOE) FY 90 Funding \$30,000 (DOE)	None.

Pacific Northwest Laboratory

Contract No. Contract Period Title	Contractor (Principal Investigator) PNL Contact	Funding \$ (Source)	Selected FY 1991 Milestones (PNL contact has more information)
DE-AC06-76RLO1830 10/89-09/90 Wind Electric Potential Estimates	Pacific Northwest Laboratory (D.L. Elliott) P.O. Box 999 Richland, WA 99352 L.L. Wendell	Total Funding \$100,000 (DOE) FY 90 Funding \$100,000 (DOE)	Complete the digitized map of environmental exclusion areas (July 1991). Complete the wind electric potential analyses showing the resource distribution over individual states (September 1991).
DE-AC06-76RLO1830 10/87-09/89 Wind Variability Research for Improved Energy Capture	Pacific Northwest Laboratory (C.I. Aspliden) P.O. Box 999 Richland, WA 99352 L.L. Wendell	Total Funding \$368,000 (DOE) FY 90 Funding \$62,000 (DOE)	Assess utility company concerns with intermittency of the wind energy resource in their service areas (August 1991). Complete draft report on forecast accuracy requirements and current level of technology (September 1991).

FY 1990 Contract List

Sandia National Laboratories

Sandia National Laboratories

Contract No. Contract Period Title	Contractor (Principal Investigator) Sandia Contact	Funding \$ (Source)	Selected FY 1991 Milestones (Sandia contact has more information)
Advanced Components			
DE-AC04-76DP00789 Ongoing Advanced Airfoil Design	Contractor: Sandia National Laboratories (D.E. Berg) P.O. Box 5800 Albuquerque, NM 87185 Subcontractor: Ohio State University Aeronautical & Astronautical Department (G. Gregorek) 2300 West Case Road Columbus, OH 43220 D.E. Berg	Total Funding \$630,000 (DOE) FY 90 Funding \$60,000 (DOE)	Conduct 34-m test bed vortex generator tests (March 1991).
DE-AC04-76DP00789 Ongoing Fatigue Life Controller Algorithm Studies	Sandia National Laboratories (H.J. Sutherland) P.O. Box 5800 Albuquerque, NM 87185 H.J. Sutherland	Total Funding \$390,000 (DOE) FY 90 Funding \$40,000 (DOE)	Refine control algorithms for test bed milestone (August 1991).
DE-AC04-76DP00789 Ongoing Smart Controls/Expert Systems	Sandia National Laboratories (L.L. Schluter) P.O. Box 5800 Albuquerque, NM 87185 H.M. Dodd	Total Funding \$90,000 (DOE) FY 90 Funding \$40,000 (DOE)	Complete initial expert system model (June 1991).
DE-AC04-76DP00789 Ongoing WECS System Performance Model	Sandia National Laboratories (H.M. Dodd) P.O. Box 5800 Albuquerque, NM 87185 H.M. Dodd	Total Funding \$110,000 (DOE) FY 90 Funding \$50,000 (DOE)	Improve Wind Energy Conversion System model including site-specific effects (June 1991).

Sandia National Laboratories

Contract No. Contract Period Title	Contractor (Principal Investigator) Sandia Contact	Funding \$ (Source)	Selected FY 1991 Milestones (Sandia contact has more information)
DE-AC04-76DP00789 Ongoing Variable Speed Testing	Contractor: Sandia National Laboratories (W.A. Stephenson) P.O. Box 5800 Albuquerque, NM 87185 Subcontractor: U.S. Department of Agriculture Agricultural Research Service (R.N. Clark) P.O. Drawer 10 Bushland, TX 79012 H.M. Dodd	Total Funding \$1,715,000 (DOE) FY 90 Funding \$350,000 (DOE)	Complete variable speed structural response comparisons (February 1991). Test Fairings effects (March 1991). Define Bug-Effects Program (May 1991).
DE-AC04-76DP00789 Ongoing Advanced Turbine Designs	Sandia National Laboratories (H.J. Sutherland) P.O. Box 5800 Albuquerque, NM 87185 H.M. Dodd	Total Funding \$50,000 (DOE) FY 90 Funding \$50,000 (DOE)	Put a major agreement with U.S. industry in place and start cooperative efforts (January 1991).

Sandia National Laboratories

Contract No. Contract Period Title	Contractor (Principal Investigator) Sandia Contact	Funding \$ (Source)	Selected FY 1991 Milestones (Sandia contact has more information)
Aerodynamics			
DE-AC04-76DP00789 Ongoing Turbulence-Induced Aerodynamic Loads	Contractor: Sandia National Laboratories (D.E. Berg, G.F. Homicz) P.O. Box 5800 Albuquerque, NM 87185 Subcontractors: Institut de Recherche d' Hydro-Quebec (B. Masse) 1800 Montee Ste-Julie Varenes, Quebec, JOL 2 P.O. CANADA Iowa State University Aerospace Engineering Department (R.G. Rajagopalan) 404 Town Engineering Building Ames, Iowa 50011 Texas Tech University Mechanical Engineering Department (J.W. Oler) P.O. Box 4289 Lubbock, TX 79409 D.E. Berg	Total Funding \$870,000 (DOE) FY 90 Funding \$270,000 (DOE)	Complete Finite Difference Model of Turbulence (April 1991). Complete final double multiple steam tube report (May 1991).
Structural Dynamics			
DE-AC04-76DP00789 Ongoing Vibration Analysis and Suppression	Sandia National Laboratories (P.S. Veers, T.G. Carne) P.O. Box 5800 Albuquerque, NM 87185 P.S. Veers	Total Funding \$80,000 (DOE) FY 90 Funding Included in WECS Structural Models	Conduct field modal tests on commercial Wind Energy Conversion System (February 1991). Determine blade damping from experiments (May 1991).
DE-AC04-76DP00789 Ongoing WECS Structural Models	Sandia National Laboratories (P.S. Veers, C.R. Dohrman) P.O. Box 5800 Albuquerque, NM 87185 P.S. Veers	Total Funding Unknown FY 90 Funding \$350,000 (DOE)	Compare frequency and time codes with data (December 1990). Complete VAWT-SDS code document (September 1991).

Sandia National Laboratories

Contract No. Contract Period Title	Contractor (Principal Investigator) Sandia Contact	Funding \$ (Source)	Selected FY 1991 Milestones (Sandia contact has more information)
DE-AC04-76DP00789 Ongoing Metal Blade Fatigue	Sandia National Laboratories (H.J. Sutherland, J.A. VanDenAvyle) P.O. Box 5800 Albuquerque, NM 87185 H.J. Sutherland	Total Funding \$90,000 (DOE) FY 90 Funding \$40,000 (DOE)	Complete initial characterization of 34-m test bed damage gauge results (August 1991).
DE-AC04-76DP00789 Ongoing Composite Blade Fatigue	Contractor: Sandia National Laboratories (E.D. Reedy) P.O. Box 5800 Albuquerque, NM 87185 Subcontractor: Montana State University (J. Mandell) Bozeman, MT 59717 H.J. Sutherland	Total Funding \$400,000 (DOE) FY 90 Funding \$200,000 (DOE)	Complete initial bonded joint tests (March 1991). Provide results from initial coupon tests (June 1991).
DE-AC04-76DP00789 Ongoing Advanced Fatigue Models	Sandia National Laboratories (H.J. Sutherland, L.L. Schluter) P.O. Box 5800 Albuquerque, NM 87185 H.J. Sutherland	Total Funding \$1,460,000 (DOE) FY 90 Funding \$200,000 (DOE)	Incorporate uniaxial fiberglass model into LIFE2 code (July 1991).
DE-AC04-76DP00789 Ongoing Structural Reliability Analysis	Sandia National Laboratories (P.S. Veers) P.O. Box 5800 Albuquerque, NM 87185 P.S. Veers	Total Funding \$50,000 (DOE) FY 90 Funding \$50,000 (DOE)	Publish fatigue reliability report (January 1991).
DE-AC04-76DP00789 Ongoing Utility Interfacing	Sandia National Laboratories (W.A. Stephenson) P.O. Box 5800 Albuquerque, NM 87185 H.M. Dodd	Total Funding \$23,000 (DOE) FY 90 Funding \$23,000 (DOE)	Conduct initial testing with Sandia/U.S. Department of Agriculture/Southwestern Public Service (August 1991).

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This contract list is one of a series of documents on programs in utility technologies sponsored by the U.S. Department of Energy. Individual contract lists are available for each of the following programs:

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Wind Energy

Copies of any of these documents can be obtained by writing:

National Renewable Energy Laboratory
Technical Inquiry Service
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