Chapter Ind 18

RENEWABLE ENERGY FINANCIAL INCENTIVE CODE

SUBCHAPTER I—SCOPE, PURPOSE AND DESIGN

Ind 18.001 Scope. The renewable energy system direct payment law's declaration of policy (ch. 313, Laws of 1977) states that "it is in the interest of the state to use renewable, in-state sources of energy which do not pollute the environment and which diversify the supplies of energy now used in this state." It is the purpose of the law "that the expedient development of alternative sources of energy not now economically competitive should be fostered by providing temporary state financial incentives . . . which encourage the use of such sources." Cogeneration facilities as defined in s. Ind 18.10 (6) are also within the scope of the program.

(1) DEPARTMENT DUTIES. Sections 71.09 (12) and 101.57 (5), Stats., provide that the department of industry, labor and human relations, in consultation with the department of administration, establish performance standards for renewable energy systems to:

(a) Produce the maximum practical amount of energy;

(b) Conform, where feasible, with national performance standards;

(c) Produce present value energy savings which, within 15 years, but not sooner than 4 years, pay for the cost of the design, construction, equipment and installation of the renewable energy system; and

(d) Not hamper individual development of innovative renewable energy systems.

(2) APPLICATION OF RULES. All renewable energy systems, as defined in s. Ind 18.10 (28) shall comply with the requirements of this chapter in order to qualify for financial incentives. Those systems for which a state financial incentive pursuant to s. 101.57, Stats., is not sought need not comply with the requirements of this chapter.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; am. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.002 Purpose. The purpose of this chapter is to establish the criteria the department will use for certifying renewable energy systems for individual, unincorporated businesses, schools, churches, nonprofit corporations, cities, towns, municipalities, partnership, cooperative and corporate/franchise benefits, as specified in the law. Compliance with the criteria shall be demonstrated by the submission of the necessary documentation required by s. Ind 18.31. Energy conservation expenditures are not included under the program.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; am. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.01 Health and safety. This chapter is not a health and safety code or a design manual, but specifies minimum requirements for renewable energy systems applying for state benefits. The requirements of this chapter do not relieve responsibility for compliance with any health or safety codes. Where conflict between requirements occur, health and safety requirements shall govern.

Note: All renewable energy systems may be subject to applicable portions of other Wisconsin administrative codes (i.e., chs. Ind 50-64—buildings and heating, ventilating and air conditioning code; chs. Ind 20-25— uniform dwelling code; ch. H 62—design, construction, inspection, supervision and installation of plumbing; ch. ILHR 16 Wisconsin Electrical Code; ch. Ind 17—Solar Energy Code; chs. 41-42, Boiler and Pressure Vessel Code; and related codes) and National Codes (i.e., Recommended Requirements to Code Officials for Solar Heating, Cooling and Hot Water Systems; and other related codes.)

Note #2: Chapter Ind 17 is currently being developed.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; am. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.02 Design. Renewable energy systems shall be designed using recognized engineering techniques and principles. Where feasible, renewable energy systems shall comply with national standards applicable to such systems.

Note 1: The department recommends conformance with the following standards: (1) "Uniform Solar Energy Code," 1976 (available from International Association of Plumbing and Mechanical Officials, 5032 Alhambra Ave., Los Angeles, California 90032); (2) "Heating and Air Conditioning Systems Installation Standards for One and 2-Family Dwellings and Multi-Family Housing Including Solar" (available from Sheet Metal and Air Conditioning Contractor's National Association, Inc., 8224 Old Courthouse Road, Tysone Corner, Vienna, Virginia 22180); (3) "Methods of Testing to Determine the Thermal Performance of Solar Collectors," ASHRAE 93-77; (4) "Methods of Testing Thermal Storage Devices Based on Thermal Performance," ASHRAE 94-77; (5) "Methods of Testing to Determine the Thermal Performance of Liquid Type Low Temperature Collectors" ASHRAE 96-80, (ASHRAE publications available from ASHRAE Publications Sales Department, 1791 Tullie Circle, N.E., Atlanta, Georgia 30329); (6) "Recommended Requirements to Code Officials for Solar Heating, Cooling and Hot Water Systems." (Available from U.S. Department of Energy, Office of Solar Applications for Buildings, Washington, DC 20585); (7) "Wisconsin Administrative Code, Chapter Ind 17—Solar Energy Code; (8) "National Solar Collector Rating, Certification and Labeling Program Standards." (Available from the Solar Rating and Certification Corporation, 1001 Connecticut Avenue, N.W., Suite 800, Washington, DC 20036.)

Note 2: The department may amend this list and recommend new standards for solar, wind and waste conversion systems as they become available.

Note 3: Chapter Ind 17 is currently being developed.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; am. Register, October, 1982, No. 322, eff. 11-1-82.

SUBCHAPTER II—DEFINITIONS AND STANDARDS

Ind 18.10 Definitions. (1) "Active thermal solar energy system" means a system which uses equipment to collect, store or distribute solar thermal energy provided that the components used to collect the thermal energy are not used for other purposes.

(2) "Alcohol fuel" means methyl or ethyl alcohol that is used as a fuel, either by itself, blended or injected with other fuels or water or both, for displacement of fossil fuels.

(3) "Alcohol fuel production manufacturing equipment" does not include materials, supplies, buildings or building components; nor does it include equipment, tools or implements used to service or maintain the production equipment; nor does it include pollution control equipment.

(4) "Alcohol fuel production system" means manufacturing equipment that produces for the owner's own use or for sale an alcohol fuel from raw materials other than coal or another nonrenewable fossil fuel and that makes effective use of the energy resource used to power the production.

(5) "Approved" means acceptable to the department.

(6) "Auxiliary energy system" means a conventional energy system, or component thereof, which supplies all of the energy required by the load that cannot be supplied by the renewable energy system.

(7) "Cogeneration facility" means an electric power plant or a fuel-burning installation, or a portion of an electric power plant or a fuel-burning installation, which provides a new or expanded capacity for producing electric or mechanical power and any other form of useful energy which is used for commercial, industrial, space-cooling or space-heating purposes, including a steam or hot water generation and handling system, an electric or mechanical turbine and generation system and any associated environmental control systems, but excluding a fuel supply system, a steam or hot water delivery system, a building or any foundation or other support system.

(8) "Conventional energy system" means an energy system supplied with conventional fuels or energy derived from conventional fuels.

(9) "Conventional fuels" means cordwood or any depletable fuel or energy resource exclusive of waste, such as coal, petroleum products, natural gas or propane or electricity generated by conventional fuels, hydro-power or nuclear materials.

(10) "Cooperative" is as defined in s. 185.01 (1) or (2), Stats.

(11) "Corporate" is as defined in s. 180.02 (1) or (2), Stats.

(12) "Department" means the department of industry, labor and human relations, unless otherwise specified.

(13) "Design life" means the period during which a renewable energy system or component thereof is expected to perform its intended function and operate correctly without requiring replacement or major overhaul.

(14) "Direct utilization active air system" means an active space heating system providing heated air directly to the space through the use of minimal duct-work and no thermal storage. This definition applies only to collectors mounted on an enclosing element of the space being served.

(15) "Discount rate" means the estimated rate of return on the best alternative investment.

(16) "Earth sheltered building" means a building having in contact with the earth at least 50% of the area of the enclosing walls of the topmost story.

(17) "Earth sheltered passive solar energy system" means an earth sheltered building which incorporates south facing glazing. Thermal storage or moveable insulation for use on the glazing or both is required.

(18) "Energy conservation devices" means devices used to conserve conventional fuels and which do not use a renewable energy source. These items are not eligible for the program.

(19) "Equipment" means a mechanical, electrical, chemical or storage device, but does not mean a biological organism.

(20) "Fuel inflation rate" means the estimated annual percentage increase in the cost of fuel, and includes the general economic inflation rate.

(21) "Heat pump, cooling or heating" means a mechanical, chemical or electrical system designed to utilize alternately or simultaneously the heat extracted at a low temperature and the heat rejected at a higher temperature for cooling and heating functions, respectively.

(22) "Individual" means human individuals, unincorporated businesses, schools, churches, nonprofit corporations, cities, towns and municipalities.

(23) "Listed" means tested and listed by Underwriters' Laboratories or other approved nationally recognized testing facility.

(24) "Inflation discount factor" means a factor which combines the fuel inflation and discount rates for a specified number of years into a single number. That number is used in determining the fuel savings over the design life of the renewable energy system.

(25) "Load" means the energy requirements of a building, structure, device, system or process.

(26) "Natural person" means a human individual.

(27) "Noncombustible" means material in the form in which it is used, which meets one of the requirements specified in pars. (a) or (b) listed below. Materials used adjacent to or in contact with heat-producing applications, warm air ducts, plenums and chimneys shall be classified as noncombustible only on the basis of the requirements specified in par. (a). Noncombustible does not apply to the flame-spread characteristics of interior finish or trim materials. No material shall be classed as noncombustible building construction material which is subject to increase in combustibility or flame-spread classification (FSC) beyond

the limits herein established through the effects of age, moisture or other atmospheric conditions.

(a) Materials which pass the test procedure of ASTM E-136 for defining noncombustibility of elementary materials when exposed to a furnace temperature of 1,372° F. for a minimum period of 5 minutes, and do not cause a temperature rise of the surface or interior thermocouples in excess of 54° F. above the furnace air temperature at the beginning of the test and which do not flame after an exposure of 30 seconds.

(b) Materials having a structural base of noncombustible material as defined in par. (a), with a surfacing not more than ⅛ inch thick which has a flame-spread classification (FSC) not greater than 50 when tested in accordance with the method of test for surface burning characteristics of building materials (ASTM E-84).

Note: The federal trade commission does not consider ASTM E-84 as an accurate indicator of the performance of cellular plastics used in building construction under actual fire conditions, and that it is only valid as a measurement of the performance of such materials under specific, controlled test conditions. The 25 flame-spread rating is not intended to reflect hazards presented by such products under actual fire conditions. The federal trade commission considers that under actual fire conditions, such products, if allowed to remain exposed or unprotected, will under some circumstances produce rapid flame spread, quick flashover, toxic or flammable gases, dense smoke and intense and immediate heat and may present a serious fire hazard.

(28) "Passive thermal solar energy system" means a system which collects, stores and distributes solar thermal energy and which also provides usable or livable area to the building. The system must include thermal storage or moveable insulation to cover the collectors. Automated moveable insulation and air movement systems may also be used in the system.

(29) "Photovoltaic solar energy system" means a solar energy system that converts radiant solar energy directly into electrical energy.

(30) "Premium fuel" means gasoline, kerosene, natural gas, liquefied petroleum, fuel oil, burner oil and diesel oil or any other nonrenewable fossil fuel, except coal and electricity generated by such premium fuels.

(31) "Renewable energy system" means a solar system, a waste conversion energy system, a wind energy system, or an alcohol fuel production system, not including any equipment which would be present as part of a conventional energy system (see s. 101.57 (8) (a), Stats.).

Note: The original definition for "renewable energy system" from the law has been amended twice since January 1, 1979, (effective date of ch. Ind 18). As of October 1, 1981, the costs incurred for active solar swimming pool systems, alcohol fuel production facilities and cogeneration facilities are no longer eligible for benefits. As of July 1, 1982, the costs incurred for waste conversion systems are no longer eligible for benefits.

(32) "Solar assisted heat pump" means a heat pump which utilizes solar energy to increase its coefficient of performance.

(33) "Solar energy system" means the equipment (active thermal, passive thermal or photovoltaic) which converts and then transfers or stores solar energy into usable forms of energy for space heating or cooling, crop drying, electricity generation or hot-water heating.

(34) "Waste" means the solid, liquid, or gas byproducts of a residential institutional, commercial, industrial or agricultural processes that may be used as, or processed to become, a fuel, but does not mean heat.

(35) "Waste conversion energy system" means the equipment which converts wastes into usable forms of energy, but does not include conventional-fuel-consuming devices or solid-fuel-consuming devices for residential purposes or energy conservation devices.

(36) "Waste conversion energy equipment" means equipment used in processing and converting waste energy but does not include materials, supplies, buildings or building components, nor does it include equipment or tools used to service or maintain energy equipment. It does not include transportation or pollution abatement equipment.

(37) "Waste heat" means the by-product of a conventional fuel energy device. Waste heat is not considered a renewable fuel.

(38) "Wind energy system" means the equipment which converts and then transfers or stores energy from the wind into usable forms of energy, but does not include vehicles which utilize wind power.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.11 Adopted standards. (1) ADOPTION OF STANDARDS BY REFERENCE. Renewable energy systems and components shall comply with the following adopted reference standards as required by the applicable equipments of this chapter:

(a) American Society of Heating, Refrigeration and Air Conditioning Engineers, ASHRAE Publications Sales Department, 1791 Tullie Circle, N.E., Atlanta, Georgia 30329; METHODS OF TESTING TO DETERMINE THE THERMAL PERFORMANCE OF SOLAR COLLECTORS, ASHRAE 93-77.

(b) American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, Pennsylvania 19103; SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS, ASTM E84-80; NONCOMBUSTIBILITY OF ELEMENTARY BUILDING MATERIALS, ASTM E136-79; HOT-SURFACE PERFORMANCE OF HIGH-TEMPERATURE THERMAL INSULATION, ASTM C411-61 (R 1975).

(c) National Technical Information Service, U.S. Dept. of Commerce, Springfield, VA 22161; PROVISIONAL FLAT PLATE SOLAR COLLECTOR TESTING PROCEDURES; FIRST REVISION, NBSIR 78-1305A.

(d) Solar Rating and Certification Corporation, 1001 Connecticut Avenue, N.W., Washington, DC 20036; TEST METHOD AND MINIMUM STANDARDS FOR CERTIFYING SOLAR COLLECTORS, ISCC 80-1; OPERATING GUIDELINES FOR CERTIFYING SOLAR COLLECTORS, ISCC 80-2.

(e) Underwriters' Laboratories, Inc., 333 Pflingsten Road, Northbrook, Illinois 60062; FACTORY MADE AIR DUCT MATERIAL AND AIR DUCT CONNECTORS, UL Standard No. 181-1981.

(2) CONSENT TO INCORPORATE. Pursuant to s. 227.025, Stats., the attorney general and the revisor of statutes have consented to the incorporation by reference of these standards.

(3) FILING AND AVAILABILITY OF STANDARDS. (a) Copies of the standards in reference are on file in the offices of the department, the secretary of state, and the revisor of statutes.

(b) Copies of the standards may be obtained, at a reasonable cost, from the organizations listed in sub. (1).

History: Cr. Register, October, 1982, No. 322, eff. 11-1-82.

SUBCHAPTER III—ELIGIBILITY AND BENEFITS

Ind 18.20 General eligibility criteria. This section sets forth the eligibility requirements, which shall be met before a renewable energy system or facility, where applicable, may be considered for certification for benefits under the renewable energy resource and cogeneration facility system incentive program.

(1) INDIVIDUAL APPLICANTS. Individuals owning a renewable energy resource system shall be eligible for incentives provided all of the following conditions are satisfied:

(a) The system must be complete and in operation and paid for prior to application for benefits;

(b) The system is installed on in-state property owned by the applicant;

(c) The cost of the system is greater than $500.00;

(d) Owner's primary residence is in the state for individuals incurring system costs from March 1, 1980, through December 31, 1985, only;

(e) Only costs incurred in the period April 20, 1977, through December 31, 1985, are eligible;

1. 'Exception': Costs for alcohol fuel production facilities incurred by individuals from January 1, 1980, through September 30, 1981, only, are eligible.

2. 'Exception': Costs for swimming pool heating systems incurred by individuals from April 20, 1977, through September 30, 1981, only, are eligible.

3. 'Exception': Costs for waste conversion system incurred by individuals from April 20, 1977, through June 30, 1982, are eligible.

(f) Application for benefits must be submitted within 4 years of December 31, of the last year in which costs were incurred for individuals initially incurring costs from Janaury 1, 1979, through June 30, 1982;

(g) Application for benefits must be submitted within one year of December 31 of the last year in which costs were incurred for individuals initially incurring costs after June 30, 1982, through December 31, 1985;

(h) Applications for benefits shall be submitted by December 31, 1984, for costs incurred between April 20, 1977, and December 31, 1978; and

(i) A claimant, who has filed a timely claim pursuant to pars. (f) or (h), may file an amended claim with the department within 4 years of the last date of a claim per as specified in pars. (f) or (h).

(2) CORPORATION OR COOPERATIVE APPLICANTS. Corporations or cooperatives owning a renewable energy resource system or cogeneration facilities or both shall be eligible for incentives provided all of the following conditions are satisfied:

(a) Systems and facilities must either be installed on the corporation's or cooperative's in-state property, or be installed on in-state residential property under a leasing agreement between the corporation or cooperative and the owner of the residential property. This provision applies to cooperatives incurring costs from May 22, 1980, through December 31, 1985, and to corporations incurring costs from January 1, 1980, through December 31, 1985;

(b) The system or facility must be completed and in operation and paid for prior to application for benefits;

(c) The corporation or cooperative is subject to the Wisconsin tax imposed upon, or measured by, the corporation's net income. This requirement applies to cooperatives incurring system costs solely from May 22, 1980, through December 31, 1985, and to corporations incurring system costs solely from January 1, 1980, through December 31, 1985;

(d) 1. For corporations only, costs incurred from April 20, 1977, through December 31, 1985, are eligible.

2. For cooperatives only, costs incurred from May 22, 1980, through December 31, 1985, are eligible.

3. For corporations, costs for alcohol fuel production system and cogeneration facilities incurred from January 1, 1980, through September 30, 1981, only, are eligible.

4. For cooperatives, costs for alcohol fuel production system and cogeneration facilities incurred from May 22, 1980, through September 30, 1981, only, are eligible.

5. For corporations, costs for waste conversion systems incurred from April 20, 1977, through June 30, 1982, only, are eligible.

6. For cooperatives, costs for waste conversion systems incurred from May 20, 1980, through June 30, 1982, only, are eligible; and

(e) Application for benefits must be submitted within 4 years of December 31 of the last year in which costs were incurred for corporations or cooperatives incurring costs from January 1, 1979, through December 31, 1985.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.21 Benefits. Systems meeting certification requirements of subch. IV shall be eligible for benefits as set forth in this section.

Note: See Appendix A for additional information regarding property tax exemption for active solar and wind energy systems.

(1) INDIVIDUALS. (a) Individuals, as defined in s. Ind 18.10, may receive a direct refund from the department.

(b) The amount of the refund shall be equal to a percentage of the eligible system costs.

(c) The percent eligible shall be as specified in Table 18.21-1. The dates on which costs were incurred determines the percent of those costs which will be refunded. The installation shall be completed before the applicant can apply for the benefits.

(d) The maximum amount of eligible system cost for individuals upon which the refund may be calculated is $10,000 per system.

(e) Individuals may receive benefits for each separate system owned.

(2) BUSINESS PARTNERSHIPS. (a) Business partnerships shall be eligible for individual benefits as specified in Table 18.21-1.

(b) Each partner may claim the refund for up to $10,000 of system costs per system.

(c) The total claimed by the partnership shall not be base on more than $50,000 in system costs per system.

(d) The dates on which costs were incurred determine the percent of those costs which will be refunded. The installation shall be completed before the applicant can apply for the benefits.

TABLE 18.21-1

Individual or Partnership

Renewable Energy System Type	Dates Between Which Eligible Costs Must Be Incurred			
	4/20/77 - 1978[1]	1979 - 1981[2]	1982 - 1983[2]	1984 - 1985[2]
Solar [3,4]	30% (20%)[5]	24% (16%)[5]	18% (12%)[5]	12% (8%)[5]
Wind	30%	24%	18%	12%
Waste Conversion	30%	24%	18%[6]	N/A
Alcohol		Beginning 1/1/80 24% Ending 9/30/81		
Cogeneration	Not applicable			

[1] Benefit is in the form of a tax credit for costs incurred during this period. This section applies to natural persons only.

[2] Partnership benefits are available for this period.

[3] Active solar swimming pool systems are not eligible for benefit after September 30, 1981.

[4] The higher percentage applies to active or passive solar energy system additions made to buildings entered on tax roll prior to April 20, 1977. The lower percentage applies to projects involving buildings entered on tax roll after April 20, 1977.

[5] Percentage indicated in parenthesis ( ) applies to systems installed on buildings entered on tax roll after April 20, 1977.

[6] Cost incurred before July 1, 1982, only are eligible.

(3) CORPORATIONS AND COOPERATIVES. (a) Corporations and cooperatives, as defined in s. Ind 18.10, shall receive a direct refund from the department or a tax credit as specified in Table 18.21-2.

TABLE 18.21-2

Corporation or Cooperatives

	Dates Between Which Eligible Costs Must be Incurred		
	Corp.		Coop.
	4/20/77 - 12/31/79 [4]	1/1/80 - 12/31/85 [4]	5/22/80 - 12/31/85 [4]
Solar, Wind, Waste Conversion	1	2	2
Alcohol	—	2, 3	2, 3
Cogeneration	—	2, 3	2, 3

[1] Tax Credit: No limit on amount of eligible system costs.
Choice of one of the following:
a. First year deduction;
b. Five year amortization;
c. Depreciated over life of system.

[2] Direct Refund: Refund amount is equal to 10% of eligible system costs. Maximum amount of eligible system costs is $1,000,000.00.

[3] Alcohol and cogeneration systems are not eligible after September 30, 1981.

[4] The dates refer to taxable years.

[5] Waste conversion system costs incurred after June 30, 1982, are not eligible.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.22 Limitations. The following limitations apply to renewable energy resource systems or cogeneration or both, as noted:

(1) DIRECT REFUND ELIGIBILITY. If a Wisconsin tax benefit pursuant to s. 71.04 or 71.09, Stats., has been received, those systems are not eligible for direct refunds unless an eligible addition to the system has been made.

(2) COST OF SYSTEM ADDITIONS. Cost of additions to an operating system must equal at least $500.00 before an additional refund may be granted, but, the total eligible system cost may not exceed $10,000.

(3) NUMBER OF CLAIMS PER YEAR. Only one claim per year per system may be made for systems for which costs were first incurred prior to July 1, 1982.

(4) NUMBER OF CLAIMS PER SYSTEM. (a) Only one claim shall be accepted for systems for which costs were first incurred after June 30, 1982.

(b) Costs for system additions submitted after the system certification has been granted shall not be eligible.

(5) SUBSEQUENT OWNERS. (a) Subsequent owners may not claim benefits for a system previously certified and for which first costs were in-

curred prior to July 1, 1982, unless additions are made after purchase from the previous owner and the additional cost is at least $500.00

(b) Subsequent owners of systems for which first costs were incurred after June 30, 1982, may apply for benefits provided the previous owner had not received benefits and the application is filed within one year of December 31 of the last year in which costs for the system were incurred.

(6) OWNERS COSTS. Profit on dealer or installer owned systems, cost for personal labor, labor of members of the immediate family, and interest costs are not eligible system costs.

(7) GRANT MONIES. System costs that are paid by a federal, state or local grant or other public funds are not eligible. Allowable system costs in excess of the grant, but not exceeding the maximum eligible system cost may be used as the basis upon which to calculate the amount of the refund.

History: Cr. Register, October, 1982, No. 322, eff. 11-1-82.

SUBCHAPTER IV—CERTIFICATION REQUIREMENTS

Ind 18.30 Certification criteria. (1) SYSTEM FIRST COSTS INCURRED PRIOR TO JULY 1, 1982. Renewable energy resource systems owned by individuals eligible under s. Ind 18.20 (1) and renewable energy resource systems or cogeneration facilities or both owned by corporations and cooperatives eligible under s. Ind 18.20 (2) shall be certified by the department provided the system produces present value savings within either a 25 year period, or the system's design life, whichever comes first, but not sooner than 4 years, for system for which first costs were incurred prior to July 1, 1982.

(2) SYSTEM FIRST COSTS INCURRED AFTER JUNE 30, 1982. Certification for systems for which first costs were incurred after June 30, 1982, shall be granted provided the system produces present value savings within either a 15-year period or the system's design life, whichever comes first, but not sooner than 4 years.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.31 Documentation. (1) GENERAL. The information specified in Table 18.31-1 and this section shall be submitted to the department at the time of the certification request.

TABLE 18.31-1

System Submittal Information

TYPE OF INFORMATION	APPROVED * SYSTEMS	NONAPPROVED SYSTEMS
Energy Savings	x	x
Cost and Purchase Data	x	x
Present Value Calculations	x	x
Photographs	x	x
Schematic Drawings		x
Durability		x

* See s. Ind 18.33

(a) If an energy savings analysis is not available from the manufacturer, an appropriate method developed by the dealer, distributor, installer or applicant may be accepted by the department.

Note: Owners of approved and manufactured systems will typically be using an analysis technique supplied by the manufacturer.

(b) Owners of non-approved systems or of manufactured systems, where an energy savings estimate is not available, may request from the department, calculation forms for the specific type of system. The following forms are available:

SBD-5467 — Active Solar Space and Domestic Water Heating
SBD-5468 — Active Solar Domestic Water Heating
SBD-5469 — Wind Energy System
SBD-5470 — Active Solar Swimming Pool Heating
SBD-5471 — Passive Solar Space Heating
SBD-5472 — Earth Sheltered Passive

Note #1: These forms can be obtained by writing:

Renewable Energy Section
P. O. Box 7969
201 East Washington Avenue
Room 101
Madison, Wisconsin 53707

Note #2: The completion of these calculation forms also satisfies the requirements specified in sub. (2).

(2) ENERGY SAVINGS INFORMATION. As estimate of the annual usable energy output and estimated annual energy savings of the system shall be submitted.

(a) *Solar energy systems.* Specific site information such as type and cost of the conventional fuel, size of the load, tilt and orientation of the solar collectors, and similar information shall be detailed in the analysis. The analysis method shall be representative of typical recognized methods of predicting the energy savings of the renewable energy system. This information shall be verified by reference to the ASHRAE 93-77 collector efficiency curve test for solar systems, or other information such as actual operating data for the specific system may be acceptable.

(b) *Wind energy systems.* The estimate of annual usable energy output shall be based on an analysis which takes into account the average wind speed at the site, output versus wind speed, and mounting height of unit.

(c) *Waste conversion energy systems.* 1. The type of usable waste produced by the system shall be indicated, if applicable.

2. The amount of waste to be produced per year, the unit fuel value, the type and cost of the displaced fuel, and the cost of the system shall be indicated.

(d) *Alcohol fuel production systems.* 1. The type, proof, and quantity of alcohol to be produced shall be indicated.

2. The system shall meet one of the following effective energy use criteria:

a. The principal energy resource used to power the production of the alcohol fuel shall not be premium fuel; or

b. If the principal energy resource used to power the production of the alcohol fuel is a premium fuel and all of the raw material is a waste product, the average energy content of the alcohol fuel produced by the facility shall be greater than the average total energy content of the premium fuel used in the collection, handling, processing, transportation, storage and conversion to alcohol fuel of the waste; or

c. If the principal energy resource used to power the production of the alcohol fuel is a premium fuel and part of the raw material is not a waste product, the average energy content of the alcohol fuel produced by the facility shall be greater than the average energy content of the premium fuel used in the development or growing, collection, handling, processing, transportation, storage and conversion to alcohol fuel of the raw material.

(e) *Cogeneration facilities.* Information showing compliance with minimum conversion efficiency standards shall be submitted.

(3) COST AND PURCHASE INFORMATION. Receipts, sales contracts, or other items verifying the first costs and date of purchase for the design, construction, equipment and installation of the system shall be submitted. The information shall indicate that the costs have been paid in full.

(4) PRESENT VALUE CALCULATIONS. (a) Present value calculations using a discount rate of not less the 7% and fuel inflation rates as listed in Table 18.31-2 shall be submitted.

TABLE 18.31-2

Type of Fuel	Fuel Inflation Rate *
Gas	15%
Fuel oil, propane, LP gas	15%
Electricity	12%
Other	10%

* These values are maximum; lower values may be used.

Note: See Appendix B for a sample calculation; the department will accept other comparable methods.

1. The analysis shall account for all maintenance and replacement part costs over the design life of the system.

2. The net cost of the system, as reduced by the benefits provided under this program or any current federal program, shall be used in showing present value savings.

(b) The following information shall also be submitted in support of the present value calculations:

1. 'Waste conversion systems.' The annual savings resulting from the utilization of the waste based on the delivered cost of the displaced fuel and the delivered cost, expressed in dollars per 1,000,000 BTU of the waste product. These benefits shall show payback of the system's original cost of construction plus operating and maintenance, using a present value analysis within a 25 year period but not sooner than 4 years.

2. 'Alcohol fuel production systems.' a. Unit fuel value, system cost, energy input per unit of alcohol produced and type and cost of fuel used for heat input.

b. The amount of annual profit or fuel savings to the producer resulting from the sale or use or both of alcohol produced. The delivered cost of the displaced fuel and the delivered cost of the alcohol shall be used to determine if the system will be certified, when the product is used by the producer. The sale price and the production cost shall be used to determine if the system will be certified, if the product is sold to others.

c. A present value analysis, using the annual profit or fuel savings shall be submitted. The analysis shall show present value savings in no sooner than 4 years and not later than 25 years.

3. 'Cogeneration facilities.' Information showing present value savings in not less than 4 years but not more than 25 years.

(5) PHOTOGRAPHIC INFORMATION. Photographs of the system shall be submitted, showing the inside and outside applications of the system.

(6) SCHEMATIC DRAWING. A schematic drawing illustrating how the system functions shall be submitted to the department. The drawing shall also include the following information:

(a) *Active Solar Energy System.* 1. The drawing shall illustrate all plumbing and air handling components including, but not limited to, safety devices, fluid backflow preventers, duct construction, pressure and temperature relief valves, heat exchangers, expansion tanks and all other valves and connections in the system.

2. The specific properties of the heat transfer fluid, such as type, toxicity and flammability shall be documented. A cross section of the solar collector and the storage facility shall be submitted, if not already on file.

Note: Systems which connect to potable water are subject to the provisions of ss. H 62.19 and H 62.24, Wis. Adm. Code, and are subject to the approval of the plumbing bureau, division of safety and buildings, DILHR.

(b) *Passive solar energy systems, including earth sheltered.* 1. Building plans, elevations, sections and details to describe the system shall be submitted.

2. Location and quantity of glazing; the size, type and capacity of the thermal storage mass; and the method of heat distribution, if used, shall also submitted.

(c) *Wind energy systems.* The drawing shall illustrate the tower structure, including footings, all major components including, but not limited to, the location of all electrical, hydraulic or mechanical controls, switches or safety devices, as applicable.

(d) *Waste conversion energy systems.* The drawing shall illustrate materials handling systems, plant facility layout, product and by-product handling systems, heating, electrical and fuel systems.

(7) DURABILITY INFORMATION. (a) The durability of all manufactured renewable energy system major components shall be documented.

(b) 1. Except as provided in subd. 2., the materials, workmanship and corrosion resistance shall be proven to be durable and reliable for a minimum of one year of service use.

2. The durability of solar collectors shall be demonstrated to be for a minimum of 5 years.

(c) The major components of the listed renewable energy system types shall include, but not be limited to the following:

1. 'Active solar energy system.' Major components of active solar energy systems include solar collectors, heat exchangers, and thermal energy storage devices. Such devices as pumps, valves and control mechanisms are not considered major components.

2. 'Passive solar energy systems, including earth sheltered'. Major components of passive solar energy systems, including earth sheltered, include glazing, air movement equipment and thermal storage mediums other than conventional construction.

3. 'Wind Energy Systems'. Major components of wind energy systems include the blade assembly, generation equipment, tower, synchronous inverter, AC inverter, energy storage devices and any interface equipment required by the utility to make the interconnection possible.

4. 'Photovoltaic Solar Energy Systems'. Major components of photovoltaic solar energy systems include generation equipment, AC inverter, energy storage devices and any interface equipment required by the utility to make the interconnection possible.

History: Cr. Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.32 Special provisions for active solar energy systems. (1) COLLECTOR CONSTRUCTION. (a) 1. Except as provided in subds. 2. to 4., air collector components exposed to air circulated to occupied spaces shall be noncombustible or have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50, when tested in accordance with ASTM E84-80. The sustained design outlet temperature of collectors handling air circulated to occupied spaces shall not exceed 250° F. Higher outlet air temperatures may be used when connected to duct material approved or listed and installed for higher temperature use.

2. Air type solar collectors which have combustible components other than wood that are exposed to air circulated to occupied spaces may be of combustible construction provided that:

a. The inlet and outlet to the collector or collector array includes U.L. listed leakage rated dampers, which will prevent the movement of smoke to occupied spaces. The dampers shall be activated by a U.L. listed smoke detector, rated for use in supply ducts, located in the outlet duct from the collector or collector array.

b. In addition to the requirements of subpar. a., the smoke detector shall have an audible alarm installed in the living area.

3. Systems meeting the definition of s. Ind 18.10 (14) need not comply with the requirements of this section, if the glazed area per collector or system does not exceed 80 square feet per building.

4. Collector components not exposed to air circulated to occupied spaces may be of combustible construction provided that the combustible components are not subject to elevated temperatures. The use of fire-retardant treated wood shall not be acceptable.

(b) 1. Except as provided in subd. 2., the collector materials, for collectors in which liquid is the heat transfer medium, shall be capable of withstanding the maximum conditions of use encountered in the system in which they are used. Conditions shall not exceed those which are established by the manufacture of the material or the industry association and which are acceptable to the department. Documentation based upon results of approved tests conducted by a recognized laboratory or documentation certified by a Wisconsin registered architect, professional engineer or designer is also acceptable.

2. The collector may be constructed of combustible material provided the combustible materials are not subject to temperatures above 200° F. The use of fire-retardant treated wood shall not be acceptable.

Note #1: Long term exposure (years) of wood to temperatures above 212° F. can result in auto-ignition of the wood.

Note #2: The use of combustible materials in a solar collector may not meet the requirements of chs. Ind 50-64, Wis. Adm. Code. The use of combustible materials may be limited or prohibited depending upon the class of construction of the building.

(2) THERMAL STORAGE. (a) Except as provided in par. (b), materials exposed to the air passage in thermal storage systems shall be noncombustible or shall have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 when tested in accordance with ASTM E 84-80.

(b) Combustible materials, other than wood, may be used when a U.L. listed smoke detector is installed with an audible alarm located in the living area.

(3) SUPPLY AND RETURN AIR DUCTS. (a) Supply and return air ducts shall be noncombustible construction.

(b) Class 1 air ducts tested and installed according to UL 181 and listed by Underwriters Laboratories are acceptable. Duct air temperatures may not exceed 250° F.

Note: UL 181 requires class 1 ducts to have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50, when tested in accordance with ASTM E84-80.

(c) Flexible ducts shall be fabricated from material approved for such use. The construction shall be approved by the department. Duct air temperatures may not exceed 250° F.

(4) DUCT AND PIPE INSULATION. Duct and pipe insulation in concealed spaces where such spaces are used for the transfer of air, shall have a flame spread rating of not over 25 without evidence of continued progressive combustion, and a smoke developed rating no higher than 50, when tested in accordance with ASTM E84-80.

(5) INSULATING MATERIALS. Insulating materials shall be capable of withstanding conditions of use encountered in the system in which they are used. Conditions of use shall not exceed those which are established by the manufacturer and accepted by the department, or those based on

results of tests, performed by a recognized laboratory, which are conducted in accordance with ASTM C411 or other approved tests and which reflect actual conditions of use. The ASTM C411 test temperature shall be at least 250° F. and the material shall not flame, smoulder, glow or smoke.

History: Cr. Register, October, 1982, No. 322, eff. 11-1-82.

Ind 18.33 Optional approval of manufacturered equipment. A manufacturer of renewable energy systems or system components has the option of applying for a system or major component approval. Major components of renewable energy systems shall include, but are not limited to, solar collectors, heat exchangers, thermal energy storage devices, wind turbine generators and pressure vessels. Such devices as pumps, valves, and control mechanisms are not considered major components.

(1) APPLICATION AND LIMITATION. (a) Systems or system components or both for which a material approval is desired shall conform to the requirements of this section.

(b) All approvals shall be in effect until January 1, 1986. If the equipment, materials or design of the system or components are changed, then new data shall be submitted by the manufacturer for review and reapproval.

(2) PROCEDURE. (a) An approval number shall not be issued until the fees as specified in s. Ind 69.09 (2) are received.

Note: Approval number fees pursuant to s. Ind 69.09 (2) are specified in Appendix D.

(b) The information and supporting data specified in subs. (3) through (7) shall be submitted to determine whether an approval number should be issued.

(3) PERFORMANCE DOCUMENTATION. (a) *General.* The performance of the renewable energy system and system components shall be documented by design data, test results, or other substantiating evidence. Such substantiating documentation shall be verified by an accredited testing laboratory, a certifying agency, or a Wisconsin registered architect, engineer or designer.

Note: See Appendix E for listing of accredited testing laboratories.

(b) *Solar collector testing.* 1. The minimum testing requirements for solar collectors are the thermal performance, time constant and angle incidence modifier tests specified in the ASHRAE 93-77 standard and the 30-day stagnation test as specified in the NBSIR 78-1305A standard.

2. Except as provided in subd. 3., solar collectors shall be certified by the Solar Rating and Certification Corportation and shall conform to the Interstate Solar Collector Certification Corporation Standards ISCC 80-1 and 80-2.

3. Collectors which have successfully completed the tests listed in subd. 1. prior to the establishment of the SRCC program, need not be tested by the SRCC in order to receive a material approval.

(c) *Wind powered systems.* 1. The output of wind powered electrical generation systems shall be verified by tests performed by an independ-

ent laboratory, manufacturer's data or data provided by a registered architect or professional engineer.

2. Output at various wind speeds shall be indicated, including minimum and maximum wind speeds at which the unit is designed to operate.

3. Annual average output as a function of annual average wind speed at a designated height shall be indicated.

(4) DURABILITY AND RELIABILITY DOCUMENTATION. (a) Except as provided in par. (b), the durability of manufactured renewable energy systems and system components shall be demonstrated by the manufacturer to be at least one year.

(b) Solar collectors shall be shown to be durable for at least 5 years.

(c) Wind powered system components shall be shown to be able to resist all wind loadings pursuant to s. Ind 53.12, and design temperatures encountered within the state as specified in s. Ind 64.04.

(d) Compliance with the durability and reliability minimum requirements shall be demonstrated by design data, test results or other substantiating evidence. Such substantiating evidence shall be verified by an accredited testing laboratory, a certifying agency, or a Wisconsin registered architect, engineer or designer.

(e) A copy of the manufacturer's product warranty may be submitted that shows compliance with the minimum requirements of this subsection.

(5) MAINTENANCE MANUAL. A copy of the maintenance manual for individual component and system shall be submitted.

(6) SYSTEM AND COMPONENT DESCRIPTION DOCUMENTATION. The manufacturer shall submit the following information applicable to the system or component to be approved:

(a) *Product description.* 1. A description of the function of the system or component.

2. Assembly drawings.

3. Bill of materials and specifications.

4. Any use restrictions or application limits of the system or components;

(b) *Structural analysis.* 1. A structural analysis indicating the dead, live, hail impact, wind and hydrostatic load ratings of the system or component.

2. An analysis of the loads which result on a structure from the installation of the system or component;

(c) *Electrical schematic drawings.* Electrical schematic drawings or circuit diagrams, which indicate the wiring, controls and safety devices of the system or component;

(d) *Fluid flow schematic drawings.* Fluid flow schematic drawings, which detail fluid transfer operations, equipment and controls;

(e) *Safety considerations.* A description of the safety considerations and precautions; and

(f) *Additional information.* Additional information as may be required by the department to determine compliance with the requirements of this chapter.

(7) LIFE CYCLE COST ANALYSIS. (a) The manufacturer shall submit a detailed analysis demonstrating that the renewable energy system produces present value savings within a 15 year period.

(b) The following factors, if applicable, shall be considered in the analysis required in par. (a):

1. The amount of energy available (solar radiation, average wind speed, amount of waste material);

2. The amount of useful energy produced per month, year and design life;

3. The average annual load;

4. The percent of the load supplied by the renewable energy system;

5. The design life of the system;

6. The conventional and renewable energy costs;

7. The first cost of the design, construction, installation and equipment of the alternative [renewable] energy system, reduced by the expected state and federal benefits; and

8. The discount rate and fuel inflation rates specified in s. Ind 18.31.

History: Cr. Register, October, 1982, No. 322, eff. 11-1-82.

APPENDIX A

PROPERTY TAX EXEMPTION INFORMATION

If an active solar energy system or a wind energy system has been certified, it may be eligible for the property tax exemption as set forth in s. 70.111 (18), Stats. Passive solar thermal energy systems as defined in s. Ind 18.10 (25), are not eligible.

Systems which were certified by December 31, 1980, will not be subject to taxation for calendar years 1981 through 1995.

In general, systems certified in any calendar year will be exempt from property tax for the next year and any succeeding year through 1995. Systems certified prior to 1980 will be eligible for exemption for years 1981-1995 only.

Applications must be received before December 31, to be eligible for a property tax exemption for the next year. Once certified by the department, it is the responsibility of the applicant to contact his local assessor to remove the active solar or wind equipment from the property tax rolls.

For the purpose of the property tax exemption *only*, the following noninclusive listing of systems, eligible for the exemption per the definition of active solar thermal energy system (s. Ind 18.10 (1)) and wind energy system (s. Ind 18.10 (35)) are as follows:

ACTIVE SOLAR SYSTEMS	WIND SYSTEMS	OTHER
Swimming Pool Heating		Photovoltaic System
Domestic Water Heating		Trombe Wall Heating System
Space Heating	Mechanical Energy System	Water Wall Heating System
Crop Drying		
Solar Attic Systems	Electrical Energy System	

INELIGIBLE SYSTEMS
(Including those using mechanical air movement equipment)

Passive Solar Sunspace Direct Gain	Passive Solar Greenhouse Atriums	Passive Solar Skylights

APPENDIX B

SYSTEM CERTIFICATION INFORMATION

SAMPLE CALCULATIONS

This example will serve to illustrate the calculation procedure used to determine if the system being reviewed meets the payback requirements of the program.

The example is based on a system installed on a residence entered on the tax rolls prior to April 20, 1977. The system cost was $10,000, the backup fuel is electricity; the design life of the system is 25 years; the estimated cost of maintenance over 25 years is $200; first year fuel savings is $150.00; State benefits are $2,400 and Federal are $4,000. With the above information the present worth of the fuel savings to be realized over the design life of the system may be determined. This is done by multiplying the dollar value of the fuel saved for the first year by the inflation discount factor (IDF).

$$IDF = \left[\frac{1}{D-I}\right] \times \left[1 - \left(\frac{1+I}{1+D}\right)^{N}\right] \quad \text{where}$$

D = Discount rate (7% or more)
I = Fuel inflation rate (from Table 18.31-2)
N = Design life of the system in years (cannot exceed the maximum allowable payback period)

In this example the IDF is:

$$IDF = \left[\frac{1}{(.07 - .12)}\right] \times \left[1 - \left(\frac{1 + .12}{1 + .07)}\right)^{25}\right] = 42.64$$

INFLATION DISCOUNT FACTORS

FUEL TYPE	I	YEARS 25	20	15	10
Elec.	.12	42.64	29.86	19.68	11.58
Fossil Fuels	.15	63.32	40.37	24.36	13.21
Other	.10	33.21	24.62	17.13	10.62

Taking this value (42.64) times the dollar value of the first year energy savings, gives the present worth of the savings (PWS) resulting from the use of the system through its design life.

(FS) × (IDF) = Present worth of fuel savings over the design life of the system.

($150) × (42.64) = $6,396.00

In order to be certified, the total cost of the design, construction, installation and equipment of the renewable energy system, less state and federal refunds and credits, plus any maintenance costs, must be less than the present worth savings. (FS) × (IDF) must be greater than (A+B).

If the system cost plus the maintenance cost is less than present worth savings, the system may be certified provided all other program requirements are met.

A = Cost of system minus benefits (state and federal)

$10,000 – ($2,400 * + $4,000 *) = $3,600

B = Maintenance

$200

($3,600 + $200) is less than $6,376.00)

System meets payback requirements.

Using this procedure, it can be seen that a system costing more than $10,000 must be evaluated using the actual total cost, even though only the first $10,000 is eligible for benefits. Payback will be calculated as follows:

System Cost:		$13,000.00		
Fuel Savings (FS):		$150.00		
Maintenance:		$200.00		
IDF:		42.64		
(FS)	×	(IDF)	=	PWS
$150.00		42.64		$6,396.00
(A + B) minus		(Benefits) *	=	
($13,000 + $200)	–	($6,400)	=	$6,800.00

Since the cost of the system ($6,800.00) is greater than the value of savings ($6,396.00), the system does not payback and will not be certified.

Persons owning more than one system may receive benefits for each system. Eligible amounts are based on a maximum of $10,000 per system. If one system was $13,000 and one $7,000, the total eligible cost for both systems is $17,000 not $20,000.

* These amounts will change as state and federal programs change.

APPENDIX C

ELIGIBILITY INFORMATION

ACTIVE SOLAR ENERGY SYSTEMS—ELIGIBLE SYSTEM COSTS

Costs for design and installation of all types of systems are eligible except for owner designed and owner installed systems.

Active Solar Space Heating and Cooling. All solar related components which are involved with collecting, storing or moving heat from solar collection devices to storage and/or load, and which are not part of a conventional fuel backup system, are eligible for benefits. These include solar collectors, ductwork, piping, fans, pumps, controls, heat exchangers and thermal storage devices such as rock bins, water tanks and eutectic salt storage.

Domestic Hot Water Heating Systems. All solar related components are eligible for benefits. In a system with 2 hot water tanks, where one is used for storage of solar heated water and the other is an auxiliary heating tank, only the solar heated water storage tank is eligible. Where the conventional hot water tank has been removed and replaced with a single tank capable of storing solar heated water and equipped with an auxiliary heating coil, the entire tank is eligible.

Active Solar Swimming Pool Heating Systems. Eligible components are collectors, piping and controls. If a solar heating system is being added to an existing pool, the pump is not eligible unless a new pump is needed to overcome increased resistance due to the addition of collectors. In the case of a new pool which is being equipped with a solar heating system at the time of construction, the pump and filter are then uniquely designed for the solar heating system, and are eligible for direct refunds. Pool blankets are generally not eligible for direct refunds because they typically cost less than the $500 minimum and pay back in less than 4 years. Pool cleaning equipment is not eligible because it is not directly related to the solar heating system. Active solar swimming pool heating systems are not eligible after September 30, 1981.

Active Solar Assisted Heat Pump Systems. Heat pumps are eligible provided the coils are arranged so that heat to be applied to a load is derived from a renewable source. A coil must be located in either a solar collector or a storage facility heated by a renewable source. The heat pump must be the primary system operating from a solar heated source and not operate as a conventional back-up system. The conventional electrical back-up resistance units integral with the heat pump or installed in the duct system are *not* eligible.

All solar-assisted heat pump systems must show a present value savings within a 15 year period when compared to a conventional heat pump system and/or the same heat pump without solar input.

ACTIVE SOLAR ENERGY SYSTEMS—INELIGIBLE SYSTEM COSTS

Humidifiers. A humidifier is a mechanism that adds moisture to the air by evaporating water. It runs on electricity, and is not a required renewable energy system component.

Evaporative Coolers. These mechanisms operate under the principle that evaporation is a cooling process. The heat required to vaporize a liquid is extracted from the air, resulting in cooling of the air. Again, these are conventional energy devices and are not renewable energy systems.

Furnaces and Wood Burners. Any furnace, heater or fireplace that relies on a conventional fuel as defined in s. Ind 18.10 (8) is not eligible. Specifically, cord wood is not a renewable fuel. However, wood wastes, such as wood chips, are considered a renewable fuel.

Water Softener Units. These are devices which reduce the concentration of dissolved minerals, or "hardness", of water used for domestic purposes. Water softeners are conventional water conditioning devices and are not eligible for benefits.

Heat pumps. Ground water heat pumps are considered geothermal energy systems and are *not* eligible for this program. Heat pumps utilizing waste heat are *not* eligible.

Heat Recovery Systems. Waste heat recovery systems are considered energy conservation systems rather than renewable energy systems.

PASSIVE SOLAR ENERGY SYSTEMS—ELIGIBLE SYSTEM COSTS

Passive solar systems involve the use of south facing glazing (glass or transparent plastic) as a solar collector, thermal mass such as concrete, masonry or water walls for heat storage, and movable insulation.

All building elements and components used to capture and store solar energy are eligible system costs. This includes but is not limited to, thermal storage mass, which is illuminated by the sun, such as concrete, masonry, water or phase change material; all south facing glazing including frames and mullions; moveable insulation used to cover glazing during the night; any exceptional structure needed as a result of inclusion of passive elements; any fans, blowers, ducts, pumps, piping and controls used to provide positive distribution of heat as well as any storage facility in addition to or in place of illuminated mass and any insulation associated with the storage; dark tiles on illuminated storage mass. The amount of high density storage mass which is needed to store the heat collected is the amount which will be considered eligible for benefits.

Installation and design costs, for work done by persons other than the system owner or the owner's immediate family, are also eligible.

Glazing material may be glass, plastic, fiberglass, polycarbonate or other transparent material. The use of these materials is regulated if they are used on buildings subject to the Wis. Adm. Building and Heating, Ventilating and Air Conditioning Code. (Chapters Ind 50-64.)

To be considered a passive solar system, the area of glazing in the building must be in excess of 8% of the floor area of the building. The excess glazing must be located on the south side of the building.

Further, glazed areas must be provided with night insulation for the glazing and/or be placed to allow heat gained to be stored in high density storage material illuminated by sunlight passing through the

glazing. The system may include provisions for a positive means of air distribution to move solar heated air to other areas of the building or remote storage.

Positive means of distribution does not include openings such as patio doors, etc., for movement of heated air to conditioned space. Convective loops which demonstrate the capacity to move air effectively will be considered on an individual case basis. Only those portions of the distribution system that are provided solely due to the use of a passive system are eligible for refund.

TYPICAL PASSIVE SOLAR ENERGY SYSTEMS

South Facing Glazing. South facing glazing or windows used as solar collectors are eligible for a direct refund as long as there is sufficient thermal mass to absorb and store daytime radiation, or movable insulation to prevent nighttime radiation losses. Glazing without thermal mass, insulation, or positive means of heat distribution, and not part of a total passive solar system is not eligible.

Greenhouse. System components that are eligible for benefits include glazing, framing members and foundations used to enclose south facing areas for purposes of entrapping solar heated air which is circulated through the building. Fans and ductwork used to air circulation are eligible up to the point where they are integrated with a conventional system. Typically, the back wall is thermal mass, which absorbs radiation and transfers some to an adjoining space. Greenhouses not directly attached to a building that requires space heating, are not eligible.

Trombe Wall. This is a south facing wall of a building which is composed of a thermal mass wall and exterior glazing set a minimal distance apart. The glazing acts as a "heat trap" for solar radiation. The exceptional wall construction and glazing are eligible for benefits, along with vents, fans, movable insulation, controls, and any other equipment peculiar to the solar system. During insolation, radiation heats the trapped air and is absorbed as thermal energy by the wall. Heat is transferred by the wall to the adjoining space. If the wall has upper and lower vents, cool air from the building flows in through the lower vent, is heated, rises by natural convection and the warmed air flows out the upper vent back into the building. A variation which can be used for summer cooling has a top vent located between the glazing and mass wall. The bottom wall vent is kept closed, and at nightime, hot air from the building flows through the upper wall vent out the top vent to the cool night air. Trombe walls are considered active solar thermal energy systems for the purpose of property tax exemption. (See s. Ind 18.10 (1))

Water Thermal Storage Wall. Such a wall acts as thermal mass. Typical containers for water in such an application are metal, plastic, and concrete with waterproof lining. A water wall transfers heat to the adjoining space by convection, whereas masonry transfers heat by conduction. Water thermal storage walls are considered active solar thermal energy systems for the purpose of property tax exemption. (See s. Ind 18.10 (1))

Skylights. Skylights and clerestories are eligible for benefits if they are used with thermal mass or movable insulation as part of a total passive system. Clerestories are vertical skylights constructed so that they maximize winter radiative gains and minimize summer gains. Costs of roof modifications needed to install skylights and/or clerestories in existing buildings are eligible.

Atrium. An atrium is a separate area, like a courtyard, located in the center of a building. Typically it is floored with dirt or concrete which acts as thermal mass. In order to be eligible for benefits, the atrium must be located in a building which requires space heat, be roofed with glazing to trap the heated air, and have some means of letting heated air into the building during the day and isolating the building air from the atrium air at night.

Sunspace. A sunspace is a south facing enclosed living space, with glazing on the south and possible east and west sides of the structure. It is an indirect gain solar system in which the solar radiation enters the sunspace and is converted to heat and is then transferred to the main living area. The sunspace must include either thermal mass or insulation on the glazing to be eligible. The length of the sunspace must not be less than the depth. The entire cost for the structure is eligible except for electrical, plumbing and decorative trim items, such as wallpaper and similar items.

PASSIVE SOLAR ENERGY SYSTEMS—INELIGIBLE SYSTEM COSTS

The costs of structural elements which provide shade, such as awnings, eaves and wing walls are not eligible. These are considered good architectural practices rather than part of a total passive system.

The costs of thermal mass not within the insulated envelope of the building are not eligible. Such applications result in significant nighttime and weather heat losses.

The costs of glazing with no thermal mass or movable insulation and not part of a total passive system are not eligible.

The costs of uninsulated curtains or drapes are not eligible. These are considered conventional devices, and, therefore, are not eligible for benefits.

The costs of dark paint on exterior surfaces or conventional interior surfaces not used as thermal mass are not eligible.

Swimming pools do not qualify as thermal mass even when the pool is indoors. They are primarily used for another purpose. Also, circulating air warmed by an indoor pool system is not advisable because of the high concentration of chlorine gas in the enclosed air surrounding a pool.

The costs of building insulation which is not part of a total passive solar system are not eligible.

EARTH SHELTERED PASSIVE SOLAR ENERGY SYSTEMS—ELIGIBLE SYSTEM COSTS

Earth sheltered passive solar energy systems are defined in s. Ind 18.10 (16). The total cost of the passive solar system eligible for program

benefits will be based upon the maximum amount of radiation entering the building. High density thermal mass (floor, walls and ceiling), plus other items pertinent to the operation of the passive solar system, such as fans and night insulation are also considered to be part of the system.

Eligible components include south facing glazing and frames; fans or other methods of moving heat to other parts of the building; night insulation; and dark tiles on storage mediums. Design and installation costs for work done by persons other than the system owner or owner's immediate family are eligible.

The amount of mass which may be eligible for refund is dependent upon the amount of energy collected by the south facing glazing. Form SBD-5472 is available for use in determining the amount of mass which is eligible.

The costs of earth moving and building insulation, other than night insulation for glazing, are not eligible system costs.

ACTIVE AND PASSIVE SOLAR ENERGY SYSTEMS—DETERMINATION OF ANNUAL USABLE ENERGY OUTPUT

The annual usable energy output from active solar energy systems must be based on operating data, or an acceptable analysis technique which considers load characteristics, (including inlet water temperature for domestic water heating systems), collector efficiency, storage capacity if present, collector orientation and the amount and distribution of solar radiation typically available. Actual operating data must be corrected to 30 year average degree day data basis before comparisons are made between fuel bills before and after the solar installation.

The annual usable energy contribution from passive solar energy systems is determined using actual operating data or a method of analysis which considers building load, the area, type, orientation, tilt and shading (due to building elements) of south facing glazing, and the amount and distribution of solar radiation typically available. Actual operating data must be corrected to 30 year average degree day data before comparisons are made between fuel bills before and after the solar installation.

Load Estimation. Load estimation for space heating applications may be based on either heat loss calculations based on conduction loss and infiltration (using ASHRAE or other recognized analysis), or on actual records of heat used in previous years. Data from actual operation must be corrected to 30 year average degree day basis before comparison is made. For domestic hot water systems 20-25 gallons/person/day may be assumed to be the load.

Collector Efficiency. Collector efficiency is determined by acceptable test procedures (ASHRAE 93-77) conducted by an accredited laboratory, design data, or operating data.

Solar Radiation. Information regarding the amount and distribution of solar radiation is available in the document "Monthly Average Solar Radiation on Inclined Surfaces for 261 North American Cities" available from:

Engineering Experiment Station
University of Wisconsin—Madison
Madison, Wisconsin 53706

Methods of Analysis. Methods of analysis which are acceptable to the department, such as F-Chart, must be submitted in support of claimed annual usable energy output.

Degree Day Data. This information is available from the local utilities.

WIND ENERGY SYSTEMS—ELIGIBLE SYSTEM COSTS

A wind energy system is a device that uses blades rotated by the wind to convert the kinetic energy of the wind into electrical or mechanical energy. All wind energy related system components are eligible for benefits up to the point where the wind system connects with a conventional system including any interface equipment required by the utility to make the interconnection possible. This includes the blade assembly, tower, energy storage devices (such as batteries), generators, turbines, wiring, pumps, controls, AC inverter, synchronous inverter, fuse box, DC breakers and battery chargers.

Electrical Systems. In this type of system, an electrical generator is powered by the motion of the blade shaft. Typically, the generator produces alternating currect electricity, which is used in most applications. Excess energy produced during low usage periods can be handled in 2 ways: first, by storing excess energy which can then augment the electrical supply to the load, when the windmill cannot provide the total requirements; or second, by using a synchronous inverter, which can feed excess energy back into the utility line. The synchronous inverter also acts as a "backup" during low wind periods by mixing the proper amount of utility electricity with the windmill output.

Mechanical Systems. Traditional uses of wind energy are pumping water and grinding corn. When the wind turns the blades, the rotating blade shaft is used to power a pump or other mechanical device. Water pumped to the surface can be used immediately, or stored for later use. Wind generated electricity is sometimes used to power a compressor.

WIND ENERGY SYSTEMS—INELIGIBLE SYSTEM COSTS

Sailboats, iceboats, and other wind-powered vehicles or devices are not eligible for benefits.

WIND ENERGY SYSTEMS—DETERMINATION OF ANNUAL USABLE ENERGY OUTPUT

An estimate of the annual usable energy output must be submitted. Information indicating average wind at the site and an indication of the output of the system versus wind speed must be submitted. Wind speed information is based on actual data gathered at the site, or on data from nearest meteorological recording station, provided it has been corrected to reflect actual height of installation above ground level.

WASTE CONVERSION ENERGY SYSTEMS—ELIGIBLE COMPONENTS

Waste energy systems that convert waste products into fuel for on-site usage are eligible for benefits. One example is grinding wood wastes into wood chips for use as a fuel, or using sawdust directly, to fire a boiler used for space heating. Another application is the coversion of animal wastes into methane gas for use by the system's owner. Systems that convert wastes into fuels that are sold as a retail product, or are not used for the individual's or corporation's personal energy needs, are not eligible for benefits. The fuel produced must be one which must undergo combustion in order to be utilized.

If an existing conventional energy system is modified to allow it to utilize a nondepletable fuel or nondepletable energy resource, the cost of the modification and the cost of the equipment needed to produce the alternative fuel is eligible for benefits.

If new equipment normally used in a conventional energy system is employed in a renewable energy system and is supplied solely with a nondepletable fuel or nondepletable energy resource, the cost of that equipment is eligible for benefits.

WASTE CONVERSION SYSTEMS—INELIGIBLE SYSTEM COSTS

Woodburning stoves, furnaces or fireplaces for residential applications are not eligible for benefits. These have long been used for the burning of cord wood, and are considered conventional devices.

Small scale (home) trash compactors, and waste transportation equipment (forklifts, dump trucks and similar vehicles) are not eligible for benefits.

APPENDIX D

FEE INFORMATION

Pursuant to s. Ind 69.09 (2), Wis. Adm. Code, the fee for the optional approval of manufactured renewable energy equipment and systems as specified in s. Ind 18.33 is as follows:

$540.00 per product line

Pursuant to s. Ind 69.01 (2), Wis. Adm. Code, the above fees will be in effect from July 1, 1982, to June 30, 1983. Effective July 1, 1983, and thereafter, the fee will be adjusted by the same percentage amounts, and on the same effective dates, as changes occur in the pay rate of employes of the state of Wisconsin. Information regarding the fee adjustments can be obtained by contacting the Renewable Energy Section, Division of Safety and Buildings, Department of Industry, Labor and Human Relations.

APPENDIX E

ACCREDITED TESTING LABORATORIES

Accredited Laboratories for Testing Solar Equipment

LABORATORY	ITEMS ACCREDITED TO LIST
1. Approved Engineering Test Laboratories Attn: Mr. Scott Pederson Saugus Laboratory 20988 Golden Triangle Road Canyon Country, CA 91351 805/259-8184	Liquid & Air Collectors
2. DSET, Inc. Attn: Bill Putman Box 1850 Black Canyon Stage Phoenix, AZ 85029 602/465-7356	Liquid & Air Collectors
3. Florida Solar Energy Center Attn: Mr. James D. Roland 300 State Road 401 Cape Canaveral, FL 32920 305/783-0300, Ext. 164	Liquid Collectors
4. Lockheed Palo Alto Research Laboratory Attn: Dr. Roger Wedel Lockheed Solar Collector Test Facility Dept. 52-32, Building 205 3201 Hanover Street Palo Alto, CA 94304 415/493-4411, Ext. 45507	Liquid Collectors
5. New Mexico State University Physical Science Laboratory Attn: Mr. Bill Stevens Box-3-PSI Las Cruces, NM 88003 505/522-4400	Liquid & Air Collectors
6. Shock Hydrodynamics Division Whittaker Corporation Attn: Dr. Emil Lawton 4710-4716 Vineland Avenue North Hollywood, CA 91602	Liquid Collectors
7. Solar Energy Analysis Laboratory Attn: Dr. James R. Clinton 4325 Donald Avenue San Diego, CA 92117 714/270-3781	Liquid Collectors
8. Testing Division NORCO Facility Wyle Laboratories Attn: Mr. Larry M. Broderick P.O. Box 160 1841 Hillside Road Norco, CA 91760 714/737-0871	Liquid Collectors
9. WYLE Laboratories Attn: Mr. David R. Reese 7800 Governors Drive, W Huntsville, AL 35807 205/837-4411, Ext. 315	Liquid & Air Collectors