Non-traditional and Broad Energy Education:

Results from the 2012 Census of U.S. Four Year Colleges and Universities

A study conducted by the Council of Energy Research and Education Leaders of the National Council for Science and the Environment



Shirley Vincent, David Blockstein, Stevenson Bunn, and Sarah Stevens

January 2013

National Council for Science and the Environment
Improving the scientific basis for environmental decisionmaking

National Council for Science and the Environment

The National Council for Science and the Environment (NCSE) is a not-for-profit organization that improves the scientific basis for environmental decision-making.

NCSE brings together individuals, institutions and communities to advance environmental science, education, and their applications in five strategic areas:

- Strengthening Education and Careers;
- Communicating Science to the Public;
- The annual National Conference on Science, Policy and the Environment;
- Science Solutions to Specific Environmental Challenges; and
- Advancing Policy that Improves the Connection between Science and Decision-making.

The Council of Energy Research and Education Leaders

The Council of of Energy Research and Education Leaders (CEREL) is a multidisciplinary membership organization made up of heads of academic energy research and education centers, institutes, and programs. It provides the means for leaders in energy research, education, and communication to collaboratively use knowledge about energy to improve education, decision-making, and, more generally, the well-being of society. The three main areas of activity for CEREL are:

- Research – advocating for support of university-based energy research as well as generally advancing, informing, and elevating the national debate about energy
- Education – sharing approaches to preparing the future workforce
- Collaborating for success – engagement, education and outreach, and communication

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Members of the NCSE University Affiliate Program (listed at back of report) receive services and collaborate to advance environmental and sustainability programs on their campuses. These include:

- Membership in the Council of Environmental Deans and Directors;
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- Opportunities for multi-institutional collaborations to secure federal funding;
- Exclusive access to information on federal funding for environmental research and education;
- Complimentary participation in the National Conference on Science, Policy and the Environment;
- Campus-wide subscriptions to online environmental and energy news services: Greenwire, Environment & Energy Daily, and E&E News PM;
- Opportunities for internships available through new online Environmental Internship Clearinghouse;
- Sabbatical opportunities; and
- Special reports and studies.

This report is a product of NCSE's ongoing academic program research and is distributed as a service to members of the Council of Energy Research and Education Leaders.

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Background

The Council of Energy Research and Education Leaders (CEREL) is a multidisciplinary membership organization made up of heads of academic energy research and education centers, institutes, and programs. It provides the means for leaders in energy research, education, and communication to collaboratively use knowledge about energy to improve education, decision-making, and, more generally, the well-being of society.

CEREL includes the full range of institutions, programs, people and perspectives that comprise the energy field. In the academic arena this includes public and private institutions of every size and academic orientation, including education, research, and communication issues. The National Council for Science and the Environment (NCSE) is the secretariat for CEREL, providing staffing and services, organizing meetings, and carrying out analysis and other projects.

Although CEREL encompasses the full range of the energy field, including traditional energy sources and issues, this report focuses on a subset of academic energy programs; those that focus on non-traditional energy or energy more broadly.

During the spring and summer of 2012, NCSE conducted a census of environmental and sustainability academic programs at four-year colleges and universities in the United States. A total of 1562 public and not-for-profit and 76 for-profit schools (many with multiple campuses) were reviewed. The census was conducted by reviewing the websites and catalogs of the institutions.[1]

This report focuses on a subset of academic energy programs: those that focus on non-traditional energy or energy more broadly.

The census included degree programs with an explicit interdisciplinary or broad approach to the environment or sustainability, degree programs in disciplines and professional fields with formal specializations in the environment or sustainability; minors and certificate programs covering environmental and sustainability topics; and college and university centers and institutes focused on the environment or sustainability.

This report presents the findings of the census on non-traditional and broad energy (NTBE) academic programs. For the purposes of the census, NTBE academic programs are defined as those that focus on energy sources not currently commonly and widely used in the United States (non-traditional energy) or those that focus on energy broadly. The census included programs focused on renewable and alternative energy, energy and sustainability, energy in the context of business/organization management, energy efficiency, energy policy and law, and energy public affairs and planning. Not included are programs that focused on traditional energy sources such as fossil fuels, hydroelectric power, or nuclear energy or programs that could not be identified by name.

[1] Four Carnegie classes were included: Doctorate-granting Universities, Master's Colleges and Universities, Baccalaureate Colleges, and four-year Tribal Colleges. Associate's Colleges, Special Focus Institutions and two-year Tribal Colleges were not included. See http://classifications.carnegiefoundation.org/ for more information on the Carnegie Classification system.

Summary of Results

Despite the importance of energy to society and societal interest in new sources of energy, interdisciplinary energy education is in its infancy. **Only 132 of the 1,638 (8%) U.S. colleges and universities included in the census offer NTBE academic programs,** and although all Carnegie classification types of four-year colleges and universities offer NTBE academic programs, most are found at publicly-funded doctoral/research universities.

NTBE academic programs are defined as those that focus on energy sources not currently commonly and widely used in the United States or those that focus on energy broadly.

There are only **37 interdisciplinary or general NTBE degree programs** (in contrast to 1,851 interdisciplinary environmental and sustainability degree programs) offered at a total of 25 universities (18 are doctoral degree-granting universities). These degree programs cover a wide diversity of topics, predominately energy science and technology, alternative energy, and energy policy, but also environmental sciences, management, sustainability, systems and other topics. These programs are also split relatively evenly between undergraduate (49%) and graduate programs (32% masters, 19% doctoral).

The census identified 164 degree programs in disciplinary or professional fields with formal NTBE specializations (concentrations, tracks, focus areas) within their degree programs, including a variety of engineering and technology disciplines, business administration, interdisciplinary environmental fields (environmental science, studies, management, policy), policy studies, public affairs; law, sustainability, geosciences, agriculture and a few other academic areas.[2] **Half (49%) are in engineering and technology disciplines**, including 82% of the doctoral level degrees and 48% of the degrees at the master's level. Other disciplines and fields include interdisciplinary environmental fields (13%), business administration (11%), sustainability (2%), public policy/affairs (8%), and a few others. These programs are also relatively evenly split between undergraduate (43%) and graduate programs (47% masters, 10% doctoral); but include more master's programs.

A total of **109 NTBE minors and certificate programs were identified.** Most (64%) are designed for undergraduates. NTBE minors and certificates cover a diversity of topics including sustainability, environment, climate, engineering and technology, alternative/renewable energy, management/economics, general energy studies, energy and water or natural resources, energy policy, energy systems, the built environment and energy and energy law.

NTBE programs are located in varied administrative locations. Overall, most NTBE programs are offered by departments (44%), with smaller proportions offered by schools or divisions within a college (3%) or by primary level schools, divisions or colleges (12%). Substantial proportions of NTBE academic programs are offered by programs that span academic units (26%) or by centers and institutes (15%). In this regard they are similar to interdisciplinary environmental and sustainability academic programs. Interdisciplinary and general NTBE degree programs and NTBE minors and certificate pro-

[2]Each NTBE specialization within a degree is counted as a degree program.

grams are more likely to be located in centers and institutes than disciplinary and professional degree programs with NTBE specializations. Programs spanning academic units are prevalent locations for all three types of NTBE programs (Table 1).

Table 1. Administrative locations of NTBE academic programs

Administrative Location	Interdisciplinary and general NTBE degree programs N=37	Degree programs in disciplines and professional fields with NTBE specializations N=164	NTBE minors and certificate programs N=109	All programs N=310
Department	35%	46%	43%	44%
Program that Spans Units	33%	29%	19%	26%
School/Division within a College	0%	4%	3%	3%
Primary Level School/Division/ College	5%	14%	11%	12%
Center/Institute	27%	7%	24%	15%

NTBE programs are found at higher education institutions in **39 states plus the District of Columbia** with the largest number of programs offered in states with larger numbers of four-year colleges and universities–NY, PA, CA, TX and MI. Some states in the west and states in the Great Lakes host relatively larger numbers of institutions offering NTBE programs whereas some southern states and states in the Great Plains and Appalachia offer no programs. Programs are rare in minority-serving institutions (only four minority-serving institutions offer NTBE programs) but are offered by about a quarter (28%) of land grant institutions.

What kinds of non-traditional and broad energy academic programs exist and where are they administratively located?

The census identified 37 interdisciplinary or general NTBE academic degree programs, 164 degree programs in disciplines and professional fields with NTBE specializations, and 109 minor and certificate NTBE programs. The results for each of these three categories are presented in this chapter.

Interdisciplinary/General Non-traditional and Broad Energy Degree Programs

Of the 37 interdisciplinary or general NTBE programs, almost half are baccalaureate programs (49%), about a third are master's programs (32%), and the remainder are doctoral programs (19%). These programs cover a number of topics: energy science and technology (32%), alternative and renewable energy (24%), energy policy (30%), energy and environment (27%), energy management (8%), energy and sustainability (8%), and energy systems (5%) (Table 2).

Table 2. Interdisciplinary/general NTBE degree programs by energy topic covered

Energy Topic	Bachelor's N=18	Master's N=12	PhD N=7	Total/Proportion N=37
Science/Technology	7	3	2	32%
Alternative/Renewable Energy/Bioenergy	5	3	1	24%
Energy Policy	4	4	3	30%
Energy and Environment	4	3	3	27%
Energy Management	2	1	0	8%
Energy and Sustainability	3	0	0	8%
Energy Systems	0	1	1	5%
Total/Proportion	49%	32%	19%	*

*Totals/proportions will not add to 100% since some degree programs fall within more than one category

The administrative locations for these NTBE degree programs exhibit high diversity; including a wide variety of departments, programs that span academic units, centers and institutes, and locations in either a school or college (Tables 3 and 4). The most common academic locations are departments (35%), programs that span academic units (33%) and programs offered by degree-granting centers and institutes (27%). More graduate programs are offered through centers and institutes. Two departments, six programs, three centers and institutes and one school include "energy" in their names.

Table 4 lists the interdisciplinary and general NTBE degree programs, their home institutions, and their administrative locations. All but three degree programs are offered by doctoral/research universities or large master's institutions.

Table 3. Administrative location for interdisciplinary and general NTBE academic programs

Administrative Location	Bachelor's N=18	Master's N=12	PhD N=7	Total/Proportion* N=37
Department	7	4	2	35%
Program that Spans Units	8	3	1	33%
School/Division within a College	0	0	0	0%
Primary Level School/Division/College	2	0	0	5%
Center/Institute	1	5	4	27%
Total/Proportion	49%	32%	19%	100%

Table 4. Interdisciplinary/general NTBE degree programs

Institution	Control	Academic Unit	Degree Programs
Doctoral/Research Universities - Very High Research			
Boston University Boston, MA	Private	Department of Geography and Environment; College of Arts and Sciences	• MA Energy and Environmental Analysis
Carnegie Mellon University Pittsburgh, PA	Private	Department of Civil and Environmental Engineering and Department of Engineering and Public Policy; Carnegie Institute of Technology	• MS Energy Science, Technology and Policy
Iowa State University Ames, IA	Public	Bioeconomy Institute	• MS/PhD Biorenewable Resources and Technology
Johns Hopkins University Baltimore, MD	Private	Environmental Studies Program; School of Arts and Sciences Advanced Academic Programs	• MS Energy Policy and Climate
Pennsylvania State University University Park, PA	Public	Department of Energy and Mineral Engineering; College of Earth and Mineral Sciences	• BA Energy and Sustainability Policy
Stanford University Stanford, CA	Private	Graduate Program in Earth, Energy, and Environmental Sciences; School of Earth Sciences	• MS/PhD Earth, Energy and Environmental Sciences
University of California-Davis Davis, CA	Public	Energy Graduate Group; Institute for Energy Studies	• MS/PhD Energy Science and Technology • MS/PhD Energy Policy and Management
University of Delaware Newark, DE	Public	Center For Energy and Environmental Policy	• BS/Master of/PhD Energy and Environmental Policy
University of Illinois-Urbana-Champaign Champaign, IL	Public	Center for Advanced Bioenergy Research	• Professional Science Master in Bioenergy
University of Pennsylvania Philadelphia, PA	Private	Department of History and Sociology; School of Arts & Sciences	• BS Science, Technology & Society: Energy, Environment and Technology
		Integrated Program in Energy Research; School of Arts and Sciences and School of Engineering and Applied Science	• BS Energy and Engineering (dual major)

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Table 4. Interdisciplinary/general NTBE degree programs (continued)

University of Rochester	Private	Department of Chemical Engineering; School of Engineering and Applied Sciences	• MS Alternative Energy
Doctoral/Research Universities - High Research			
Michigan Technological University Houghton, MI	Public	Department of Social Sciences; College of Arts and Sciences	• PhD Environmental and Energy Policy
Northeastern University Boston, MA	Private	Energy Systems Program; Graduate School of Engineering	• MS Energy Systems
Southern Illinois University-Carbondale Carbondale, IL	Public	Department of Agribusiness Economics; College of Agricultural Sciences	• BA Energy and Environmental Policy
Syracuse University Syracuse, NY	Private	Department of Physics; College of Arts and Sciences	• BA Energy and Its Impacts
University of Wyoming Laramie, WY	Public	School of Energy Resources	• BS Energy Resource Science
Doctoral/Research Universities			
Illinois State University Normal, IL	Public	Department of Technology; College of Applied Science and Technology	• BS Renewable Energy
North Carolina A & T State University Greensboro, NC	Public	Department of Energy and Environmental Systems; College of Arts and Sciences	• PhD Energy and Environment Systems
SUNY College of Environmental Science and Forestry Syracuse, NY	Public	Department of Forest and Natural Resources Management	• BS Sustainable Energy Management
Master's Colleges and Universities - Large			
Creighton University Omaha, NE	Private	Energy Technology Program; College of Arts and Sciences	• BA Sustainable Energy • BS Energy Science
New York Institute of Technology-Old Westbury Old Westbury, NY	Private	Department of Energy Management; School of Engineering and Computing Sciences	• MS Energy Management
University of Michigan-Flint Flint, MI	Public	Department of Earth and Resource Science; College of Arts and Sciences	• BS Energy and Sustainable Systems
Western Illinois University Macomb, IL	Public	Interdisciplinary Studies Program; Honors College	• BS Renewable Energy and Biofuels Technology • BS Renewable Energy and Wind Technology • BS Renewable Energy Policy, Planning, and Management
Master's Colleges and Universities - Medium			
Aspen University	Private For Profit (online only)	College of Professional Studies	• BS Alternative Energy

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Table 4. Interdisciplinary/general NTBE degree programs (continued)

Baccalaureate Colleges – Arts and Sciences			
Harrisburg University of Science and Technology Harrisburg, PA	Private	Integrative Sciences Program; Undergraduate Education	• BS Integrative Sciences: Environmental Science and Renewable Energy
Baccalaureate Colleges – Diverse Fields			
Everglades University Boca Raton, FL	Private	Alternative and Renewable Energy Management Program	• BS Alternative and Renewable Energy Management

Disciplinary and Professional Field Degree Programs with NTBE Specializations

The census identified 164 degree programs in a variety of disciplines and professional fields with NTBE specializations (formal concentrations, tracks, or focus areas within a degree). Graduate programs predominate; almost half of these degree programs are master's programs (47%), 10% are doctoral programs; the remaining 43% are baccalaureate programs.[3] The degree programs cover a range of disciplines and professional fields but the majority are in various areas of engineering and technology (49%), followed by business administration and management (11%), environmental studies/science/systems (9%), policy studies and public affairs (8%), law (7%), environmental policy and management (4%), sustainability (2%), geosciences (2%), agriculture/biofuels production (4%), and a few other disciplines and fields (4%) (Table 5).

Table 5. Disciplinary/professional degrees with NTBE specializations

Disciplinary/Professional Field	Bachelor's N=70	Master's N=77	PhD N=17	Total/Proportion N=164
Engineering/Technology	29	37	14	49%
Business Administration/Management	9	9	0	11%
Environmental Studies/Science/Systems	13	1	0	9%
Policy/Public Affairs	1	12	0	8%
Law	0	9	3	7%
Environmental Policy/Management	4	4	0	4%
Sustainability	4	0	0	2%
Geosciences	2	1	0	2%
Agriculture/Biofuels	5	1	0	4%
Other (Economics, Planning, Chemistry, Built Environment, Physics)	3	3	0	4%
Proportion of Total	43%	47%	10%	100%

The administrative locations for the degree programs with NTBE specializations exhibit considerable diversity and include a wide variety of departments, programs than span academic units, centers

[3] Each specialization within a degree program is counted as a degree program for the purposes of this report.

and institutes, and locations in a school or division within a college, or housed within a primary level school or college (Table 6). Most of these degree programs are offered by departments (46%) or by programs than span academic units (29%). A smaller proportion of programs are administratively housed in a school or college (14%). A few are offered by a school/division within a college (4%), or through a degree-granting center or institute (7%).

Several universities offer five or more of these degree programs; these include Pennsylvania State University (12), Stanford University (11), University of Texas at Austin (8), Columbia University (7), Washington University in Saint Louis (7), and George Washington University (5).

Table 6. Administrative location for disciplinary/professional field degrees with NTBE concentrations

Administrative Location	Bachelor's N=70	Master's N=77	PhD N=17	Total/Proportion N=164
Department	33	32	11	46%
Program that Spans Units	22	23	2	29%
School/Division within a College	5	2	0	4%
Primary Level School/Division/College	6	16	0	14%
Center/Institute	4	4	4	7%
Proportion of Total	43%	47%	10%	100%

Only a few of the academic units/programs include "energy" in their name: three departments—the Department of Energy and Mineral Engineering (Pennsylvania State University), the Department of Energy Resources Engineering (Stanford University), and the Department of Energy, Environmental & Chemical Engineering (Washington University in Saint Louis), one institute—the Energy Systems Engineering Institute (Lehigh University), one school—the School for Engineering of Matter, Transport and Energy (Arizona State University), and thirteen programs than span units. The majority are located in engineering departments or schools, or in schools of business, law, and public policy (Table 7).

Table 7. Disciplinary and professional degree programs with NTBE specializations

Institution	Control	Academic Unit	Degree Programs
Doctoral/Research Universities - Very High Research			
Arizona State University Tempe, AZ	Public	School for Engineering of Matter, Transport and Energy; Schools of Engineering	• BSE Mechanical Engineering: Energy & Environment • PSM Solar Energy Engineering & Commercialization
		Institute for Design and the Arts	• MS Built Environment: Energy Performance & Climate Responsive Architecture
		School of Sustainability	• BS Sustainability: Sustainable Energy, Materials and Technology

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Table 7. Disciplinary and professional degree programs with NTBE specializations (continued)

Columbia University New York, NY	Private	Department of Earth and Environmental Engineering; School of Engineering and Applied Science	• MS Earth Resources Engineering: Sustainable Energy
		School of International and Public Affairs	• Master of International Affairs in Energy and Environment: Environmental Policy Management • Master of International Affairs in Energy and Environment: Sustainable Energy Policy • Master of International Affairs in Energy and Environment: International Energy Management • Master of Public Affairs in Energy and Environment: Environmental Policy Management • Master of Public Affairs in Energy and Environment: International Energy Management • Master of Public Affairs in Energy and Environment: Sustainable Energy Policy
Cornell University Ithaca, NY	Private	Department of Chemical and Biomolecular Engineering; College of Engineering	• Master of Engineering Chemical Engineering: Energy Economics and Engineering
		Department of Earth and Atmospheric Sciences; College of Engineering	• Master of Engineering: Earth-Energy Systems • PhD Engineering: Earth-Energy Systems
Duke University Durham, NC	Private	Division of Environmental Sciences and Policy; Nicholas School of the Environment	• Master of Environmental Management: Energy and Environment (PSM option)
Florida State University Tallahassee, FL	Public	Department of Mechanical Engineering; College of Engineering	• MS Sustainable Energy Engineering
George Washington University Washington, DC	Private	Environmental and Energy Law Program; School of Law	• Master of Laws in Environmental and Energy Law: Energy and Environmental Law • Master of Laws in Environmental and Energy Law: Environmental Law • Master of Laws in Environmental and Energy Law: Government Procurement and Environmental Law • Master of Laws in Environmental and Energy Law: International Environmental Law
		Environmental Resource Policy Program; College of Arts and Sciences	• MA Environmental Resource Policy: Renewable Energy
Indiana University-Bloomington Bloomington, IN	Public	School of Public and Environmental Affairs	• Master of Public Affairs: Energy
Montana State University Bozeman, MT	Public	Sustainable Food and Bioenergy Program; Department of Health and Human Sciences; College of Education, Health and Human Development; and Department of Land Resources and Environmental Sciences; Department of Plant Sciences and Plant Pathology; Department of Animal and Range Sciences; College of Agriculture	• BS Sustainable Food & Bioenergy Systems: Sustainable Crop Production
Ohio State University (The) Columbus, OH	Public	City and Regional Planning Section; School of Architecture; College of Engineering	• Master of City and Regional Planning: Energy, Environment and Sustainability

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Table 7. Disciplinary and professional degree programs with NTBE specializations (continued)

Oregon State University Corvallis, OR	Public	Bioresource Research Program; College of Agricultural Sciences	• BS Bioresource Research: Bioproducts and Energy
Pennsylvania State University University Park, PA	Public	Department of Energy and Mineral Engineering; College of Earth and Mineral Sciences; College of Business	• BS Energy Business and Finance: Energy Systems • BS Energy Business and Finance: GIS
		Department of Energy and Mineral Engineering; College of Earth and Mineral Sciences	• BS Energy Engineering • MS/PhD Energy and Geo-Environmental Engineering • MS/PhD Energy and Mineral Engineering: Energy Management and Policy • MS/PhD Energy and Mineral Engineering: Fuel Science
		Department of Chemical Engineering; College of Engineering	• BS/PhD Chemical Engineering: Energy and Fuels Engineering
		Department of Geosciences; College of Earth and Mineral Sciences	• BS Earth Science and Policy: Energy
Purdue University West Lafayette, IN	Public	School of Chemical Engineering; College of Engineering	• BS Chemical Engineering: Energy and Environment
Rice University Houston, TX	Private	Policy Studies Program; School of Social Sciences	• BA Policy Studies: Energy Policy Studies
Stanford University Stanford, CA	Private	Atmosphere/Energy Program; Department of Civil and Environmental Engineering; School of Engineering	• BS Engineering: Atmosphere/Energy • BS Environmental Engineering: Atmosphere/Energy • MS/PhD Civil and Environmental Engineering: Atmosphere/Energy
		Department of Energy Resources Engineering; School of Earth Sciences	• BS/MS/PhD Energy Resources Engineering • Master of Engineering: Energy Resources Engineering
		Public Policy Program; Institute for Economic Policy Research; School of Humanities and Sciences	• MA Public Policy: Environmental and Energy Policy • Master of Public Policy: Environmental and Energy Policy
		Earth Systems Program; School of Earth Sciences	• BS Earth Systems: Energy, Science and Technology
Tulane University of Louisiana New Orleans, LA	Private	School of Law	• Master of Laws in Environmental and Energy Law
University of California-Berkeley Berkeley, CA	Public	Center for Law, Energy and the Environment, School of Law	• Juris Doctor/Master of Laws/ Doctor of Laws Energy and Clean Technology Law Focus
University of California-Davis Davis, CA	Public	Department of Environmental Science and Policy; College of Agricultural and Environmental Sciences	• BA/BS Environmental Policy Analysis and Planning: Energy Policy
University of California-Irvine Irvine, CA	Public	Department of Mechanical and Aerospace Engineering; School of Engineering	• BS Mechanical Engineering: Energy Systems and Environmental Engineering
University of Colorado-Boulder Boulder, CO	Public	Environmental Engineering Program; College of Engineering and Applied Science	• BS Environmental Engineering: Energy

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Table 7. Disciplinary and professional degree programs with NTBE specializations (continued)

University of Delaware Newark, DE	Public	Environmental Science and Studies Program; Department of Geography; College of Earth, Ocean and Environment	• BS Environmental Science: Sustainable Energy Technology
University of Houston Houston, TX	Public	Global Energy Management Program; Department of Finance; College of Business	• Bachelor of Business Administration: Global Energy Management
		College of Law	• Master of Laws: Energy, Environment, and Natural Resources Law
University of Illinois-Chicago Chicago, IL	Public	Department of Mechanical and Industrial Engineering; College of Engineering	• Master of Engineering: Energy Engineering
University of Michigan-Ann Arbor Ann Arbor, MI	Public	Energy Systems Engineering Program; Interdisciplinary Professional Programs; College of Engineering	• Master of Engineering: Energy Systems Engineering
University of Oklahoma Norman, OK	Public	Energy Management Program; College of Business	• Bachelor of Business Administration: Energy Management
		College of Law	• Master of Laws: International Energy, Natural Resources and Indigenous People Law
University of Southern California Los Angeles, CA	Public	Department of Civil and Environmental Engineering; School of Engineering	• PhD Environmental Engineering: Energy and the Environment
		Environmental Studies Program; College of Letters, Arts and Sciences	• BA/BS Environmental Studies: Sustainability, Energy and Society
University of Tennessee Knoxville, TN	Public	Center for Interdisciplinary Research and Graduate Education; College of Arts and Sciences; the College of Agricultural Sciences and Natural Resources; the College of Engineering; and the Oak Ridge National Laboratory	• PhD Energy Science and Engineering
University of Texas-Austin Austin, TX	Public	Department of Electrical and Computer Engineering; School of Engineering	• MS Electrical and Computer Engineering: Energy Systems and Renewable Energy Technical Core
		Department of Chemical Engineering; School of Engineering	• BS Chemical Engineering: Energy Technologies
		Department of Materials Science and Engineering Program; School of Engineering and Texas Materials Institute	• MS/PhD Materials Science and Engineering: Clean Energy Materials
		Department of Geological Sciences; School of Geosciences	• MA Energy and Earth Resources
		School of Business	• Master of Business Administration: Clean Technology • Master of Business Administration: Energy Finance
		School of Public Affairs	• Master of Global Policy Studies: International Energy, Environment and Technology

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Table 7. Disciplinary and professional degree programs with NTBE specializations (continued)

University of Wisconsin-Madison Madison, WI	Public	Department of Geological Engineering; College of Engineering and College of Letters and Science	• BS Geological Engineering: Energy, Minerals, and Mining
		Department of Mechanical Engineering; College of Engineering	• Master of Engineering: Energy Systems
		Public Affairs Energy and Environmental Policy Graduate Program; School of Public Affairs	• Master of International Public Affairs: Energy and Environmental Policy • Master of Public Affairs: Energy and Environmental Policy
Washington University in Saint Louis Saint Louis, MO	Private	Department of Earth & Planetary Sciences; College of Arts and Sciences	• BS Environmental Earth Sciences: Climate and Energy
		Department of Energy, Environmental & Chemical Engineering; College of Arts and Sciences	• Master of Engineering Energy, Environmental and Chemical Engineering: Advanced Energy Technologies • Master of Engineering Energy, Environmental & Chemical Engineering: Energy and Environmental Management • Master of Engineering Energy, Environmental and Chemical Engineering: Energy and Environmental Nanotechnology • Master of Engineering Energy, Environmental and Chemical Engineering: Environmental Engineering Science • Master of Engineering Energy, Environmental and Chemical Engineering: Technology for Environmental Public Health and International Development • PhD Energy, Environmental & Chemical Engineering
Wayne State University Detroit, MI	Public	Alternative Energy Technology Program; College of Engineering	• MS Technology: Alternative Energy Technology
Yale University New Haven, CT	Private	School of Forestry and Environmental Studies	• Master of Environmental Management: Energy and the Environment
Doctoral/Research Universities- High Research			
Lehigh University Bethlehem, PA	Private	Energy Systems Engineering Institute; College of Engineering and Applied Science	• Professional Master of Engineering: Energy Systems Engineering
New Mexico State University Las Cruces, NM	Public	Department of Engineering Technology and Surveying Engineering; College of Engineering	• BS Mechanical Engineering Technology: Renewable Energy Technology
Northern Illinois University DeKalb, IL	Public	Institute for the Study of the Environment, Sustainability, and Energy	• BA Environmental Studies: Energy Studies
Oklahoma State University Stillwater, OK	Public	Department of Plant and Soil Sciences; College of Agricultural Sciences and Natural Resources	• BS Plant and Soil Sciences: Bioenergy Production
Temple University Philadelphia, PA	Private	Department of Mechanical Engineering; College of Engineering	• BS/MS Mechanical Engineering: Energy Systems

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Table 7. Disciplinary and professional degree programs with NTBE specializations (continued)

Texas Tech University Lubbock, TX	Private	Wind Science and Engineering Research Center	• BS Engineering: Wind Energy
		College of Business	• Bachelor of Business Administration: Energy Commerce
University of Colorado-Denver Denver, CO	Public	School of Business	• MS Global Energy Management
University of Dayton Dayton, OH	Private	Department of Mechanical and Aerospace Engineering; College of Engineering	• MS Engineering: Renewable and Clean Energy
University of Denver Denver, CO	Private	Environmental Policy and Management Program; University College Professional and Continuing Studies	• Master of Applied Science in Environmental Policy and Management: Energy and Sustainability
University of Idaho Moscow, ID	Public	Department of Biological Agricultural Engineering; College of Agricultural and Life Sciences	• BS/MS/PhD Biological and Agricultural Engineering: Bioenergy • Master of Engineering: Biological and Agricultural Engineering: Bioenergy
University of Maine Orono, ME	Public	School of Economics; College of Natural Sciences, Forestry & Agriculture	• BA Economics: Renewable Energy • BS Economics: Renewable Energy
University of Massachusetts-Lowell Lowell, MA	Public	Energy Engineering Program; College of Engineering	• Master of Engineering: Energy Engineering: Renewable Solar • PhD Energy Engineering: Renewable Solar
University of North Dakota Grand Forks, ND	Public	Sustainable Energy Engineering Graduate Program; School of Engineering & Mines	• Master of Engineering: Sustainable Energy Engineering • MS Sustainable Energy Engineering
		Interdisciplinary Engineering Doctorate Program; School of Engineering and Mines	• PhD Engineering: Energy
University of Wisconsin-Milwaukee Milwaukee, WI	Public	College of Engineering and Applied Science	• MS Engineering: Energy
University of Toledo Toledo, OH	Public	Department of Physics and Astronomy; College of Natural Sciences and Mathematics and School of Solar and Advanced Renewable Energy	• MS Physics/Professional Degree in Photovoltaics
West Virginia University Morgantown, WV	Public	Center for Energy and Sustainable Development; College of Law	• JD Law: Energy and Sustainable Development Focus
Wright State University Dayton, OH	Public	Department of Mechanical and Materials Engineering; College of Engineering and Computer Science	• MS Engineering: Renewable and Clean Energy
Doctoral/Research Universities			
Indiana University of Pennsylvania Indiana, PA	Public	Department of Geoscience; College of Natural Sciences and Mathematics	• BS Geology: Energy Resources
Middle Tennessee State University Murfreesboro, TN	Public	Environmental Science and Technology Program; College of Basic and Applied Sciences	• BS Environmental Science and Technology: Energy Technology
North Carolina A & T State University Greensboro, NC	Public	Technology Management Graduate Program; School of Technology	• MS Technology Management: Energy Security and Sustainability
SUNY-Syracuse (College of Environmental Science and Forestry) Syracuse, NY	Public	Division of Environmental Science	• BS Environmental Science: Renewable Energy

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Table 7. Disciplinary and professional degree programs with NTBE specializations (continued)

University of Tulsa Tulsa, OK	Private	Energy Management Program; College of Business	• BA/BS Management: Energy Management • Master of Business Administration: Energy Management
Master's Colleges and Universities - Large			
Appalachian State University Boone, NC	Public	Department of Technology and Environmental Design; College of Fine and Applied Arts	• MS Technology: Appropriate (Sustainable) Technology • MS Technology: Building Energy Engineering • MS Technology: Renewable Energy Engineering
California State University-Chico Chico, CA	Public	Department of Geological and Environmental Sciences; College of Natural Science	• BS Environmental Science: Energy and Earth Resources
Ferris State University Big Rapids, MI	Public	Energy Systems Engineering Program; College of Engineering Technology	• BS Energy Systems Engineering
Lincoln Memorial University Harrogate, TN	Private	School of Business	• BS Business Administration: Energy Management
Maharishi University of Management Fairfield, IA	Private	Sustainable Living Program	• BS Sustainable Living: Renewable Energy
Marylhurst University Marylhurst, OR	Private	Department of Business Administration	• Master of Business Administration: Renewable Energy
Oklahoma City University Oklahoma City, OK	Private	School of Business	• MS Energy Management • MS Energy Legal Studies
Rensselaer Hartford Graduate Center Hartford, CT	Private	School of Management and Technology	• MS Management: Sustainability and Clean Energy Management
		Department of Engineering and Science	• MS Engineering Science: Energy, Environment, and Sustainable Design
Saint Francis University Loretto, PA	Private	Department of Mathematics, Engineering, and Computer Science; School of Sciences	• BS Environmental Engineering: Renewable Energy
San Jose State University San Jose, CA	Public	Department of Environmental Studies; College of Social Sciences	• BS Environmental Studies: Energy and the Environment
Southeast Missouri State University Cape Girardeau, MO	Public	Department of Industrial & Engineering Technology; School of Polytechnic Studies	• BS Technology Management: Sustainable Energy Systems Management
University of Central Missouri Warrensburg, MO	Public	School of Environmental, Physical & Applied Sciences; College of Science and Technology	• BS Chemistry: Alternative Energy
University of Michigan-Flint Flint, MI	Public	Department of Earth and Resource Science; College of Arts and Sciences	• BS Environmental Science and Planning: Energy and Sustainable Systems
Master's Colleges and Universities - Medium			
Arizona State University- Polytechnic Campus Mesa, AZ	Public	Department of Engineering Technology; College of Technology and Innovation	• BS Electronics Engineering Technology: Alternative Energy Technologies • BS Electronics Engineering Technology: Electric Power and Energy Systems

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Table 7. Disciplinary and professional degree programs with NTBE specializations (continued)

Humboldt State University Arcanta, CA	Public	Department of Environmental Resources Engineering; College of Natural Resources and Sciences	• BS Environmental Resources Engineering: Energy Resources • MS Environmental Systems: Energy, Technology and Policy
		Department of Environmental Science and Management; College of Natural Resources and Sciences	• BS Environmental Sciences: Energy and Climate
Kettering University Flint, MI	Private	Department of Mechanical Engineering	• MS Engineering: Sustainable Energy and Hybrid Technology
Minnesota State University-Moorhead Moorhead, MN	Public	Department of Physics & Astronomy; College of Social & Natural Sciences	• BS Sustainability: Energy Sustainability
Richard Stockton College of New Jersey Pomona, NJ	Public	Sustainability Program; School of Natural Science and Mathematics	• BS Sustainability: Energy
Master's Colleges and Universities - Small			
Franklin Pierce University Rindge, NH	Private	College of Graduate and Professional Studies	• Master of Business Administration: Energy and Sustainability Studies
Baccalaureate Colleges – Arts and Sciences			
Excelsior College Albany, NY	Private	School of Business and Technology	• Master of Business Administration: Renewable Energies Technology Management
Gettysburg College Gettysburg, PA	Private	Department of Environmental Studies	• BA/BS Environmental Studies: Energy and the Environment
Union College Schenectady, NY	Private	Environmental Science, Policy and Engineering Program; Department of Geology	• BS Environmental Science: Energy • BA Environmental Policy: Energy and Sustainability
Baccalaureate Colleges – Diverse Fields			
John Brown University Siloam Springs, AR	Private	Department of Engineering; Division of Engineering and Construction Management	• BS Engineering: Renewable Energy
Keystone College La Plume, PA	Private	Division of Natural Sciences and Mathematics	• BS Environmental Resource Management: Petroleum and Alternative Energy Sources
Oregon Institute of Technology Klamath Falls, OR	Public	Renewable Energy Engineering Program; College of Engineering, Technology and Management	• BS/MS Renewable Energy Engineering
Unity College Unity, ME	Private	Center for Sustainability and Global Change	• BS Business: Sustainable Energy Management
University of Minnesota-Crookston Crookston, MN	Public	Agricultural Systems Management Program; Department of Agriculture and Natural Resources	• BS Agricultural Systems Management: Biofuels & Renewable Energy
Baccalaureate/Associates Colleges			
Pennsylvania College of Technology Williamsport, PA	Public	Electrical Technology Program; School of Construction and Design Technologies	• BS Electrical Technology: Renewable Energy Technologies

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Table 7. Disciplinary and professional degree programs with NTBE specializations (continued)

SUNY-Canton (College of Technology) Canton, NY	Public	School of Engineering Technology	• Bachelor of Technology: Alternative and Renewable Energy Systems
SUNY-Cobleskill (College of Agriculture and Technology) Cobleskill, NY	Public	Center for Environmental Science and Technology; School of Agriculture and Natural Resources	• Bachelor of Technology: Environmental and Energy Technologies
Vermont Technical College Randolph Center, VT	Public	Sustainable Design and Technology Program	• BS Sustainable Design and Technology: Renewable Energy

NTBE Minor and Certificate Programs

The census identified 109 NTBE minors and certificate programs.[4] The programs are almost equally divided into minors (53%) and certificates (47%). Most (64%) of these programs are designed for undergraduate students—29% of certificates and all but three minors are undergraduate programs.

The three graduate minors are a doctoral level minor in Energy Analysis and Policy jointly offered by the Nelson Institute for Environmental Studies and the La Follette School of Public Affairs at the University of Wisconsin-Madison, a graduate minor in sustainable energy offered by the Energy Institute at Cornell University, and a graduate minor in Energy and Mineral Engineering offered by Department of Energy and Mineral Engineering, College of Earth and Mineral Sciences at Pennsylvania State University (Table 8). Certificate programs are predominantly designed for post-graduates. Of the 51 certificate programs, 28 (55%) are graduate level, and 8 (16%) are professional certificates designed for continuing education.

Table 8. NTBE minor and certificate programs

Program Type	Undergraduate N=70	Graduate N=31	Professional N=8	Total/Proportion N=109
Minors	55	3	0	53%
Certificates	15	28	8	47%
Proportion of Total	64%	29%	7%	100%

The NTBE minors and certificates cover a range of topics (Table 9). Sustainability/environment/climate (31%), alternative/renewable energy (27%), and energy engineering/technology/science (25%) are the most common topics covered. Smaller proportions of programs include management/economics (22%), general energy studies (11%), resources/water (4%), energy policy (5%), systems (5%), wind, solar, and nuclear energy (2-4%), built environment (3%), and energy law (3%). The prevalence of topics included is similar for programs at all three levels—undergraduate, graduate and professional.

[4] Seven certificate programs provide more than one option; each option is counted as one certificate program. Three certificate programs offer undergraduate, graduate and professional certificate options; two offer undergraduate and graduate options; one offers undergraduate and professional options.

Table 9. NTBE minor and certificate program topics*

Energy Topic	Undergraduate N=70	Graduate N=31	Professional N=8	Total/Proportion N=109
Sustainability/Environment/Climate	24	6	4	31%
Alternative/Renewable Energy	20	7	2	27%
Engineering/Technology/Science	17	7	3	25%
Business Administration/ Management/Economics	16	7	1	22%
Energy Studies/General	10	2	0	11%
Resources/Water	4	0	0	4%
Energy Policy	3	2	0	5%
Systems	3	1	1	5%
Wind Energy	2	1	1	4%
Solar Energy	2	1	0	3%
Nuclear Energy	0	1	1	2%
Built Environment	3	0	0	3%
Energy Law	0	3	0	3%
Total/Proportion	64%	29%	7%	*

*Totals/proportions will not add to 100% since some programs fall within more than one category

The administrative locations for the NTBE minors and certificate programs are varied, similar to the other NTBE academic programs covered in this report, and include a variety of departments, programs than span academic units, locations in a school or division within a college or a primary level school or college, or administratively housed in a degree-granting center or institute (Table 10). Most NTBE minor and certificate programs are offered by departments (43%) or by centers and institutes (24%). A smaller number are located within a program that spans units (19%) or are offered by a by a primary level school, division or college (11%). Only a few are offered by a school/division within a college (3%).

Table 10. Administrative location for NTBE minor and certificate programs

Administrative Location	Minors		Certificates			Total/Proportion N=109
	UG N=55	GR N=3	UG N=15	GR N=28	PR N=8	
Department	34	1	4	6	2	43%
Program that Spans Units	8	0	2	6	5	19%
School/Division within a College	2	0	0	1	0	3%
Primary Level School/Division/College	4	0	0	7	1	11%
Center/Institute	7	2	9	8	0	24%
Total	50%	3%	14%	26%	7%	100%

Table 11 lists all the NTBE minors and certificates, their institutions and their administrative locations. Most of the departments offering NTBE minors or certificates are departments of engineering, but there are a few other

types of departments represented: trades and technology, geography, geosciences, science, physical sciences, environmental studies, environmental science, environmental science and management, business administration, and plant, soils and climate. Five departments have "energy" in their name: Energy and Mineral Engineering (Pennsylvania State University); Energy Resources Engineering (Stanford University); Energy, Environmental, and Chemical Engineering (Washington University in Saint Louis); Energy Management (New York Institute of Technology-Old Westbury); and Renewable Energy (John Brown University). Almost all of the programs and centers and institutes include "energy" in their names.

Table 11. NTBE minor and certificate programs

Institution	Control	Academic Unit	Programs
Doctoral/Research Universities - Very High Research			
Boston University Boston, MA	Private	Department of Mechanical Engineering; College of Engineering	• GR Certificate Energy and Sustainability
		Department of Earth and Environment; College of Arts and Sciences; School of Management; College of Engineering	• UG Minor Sustainable Energy
Cornell University Ithaca, NY	Private	Department of Chemical and Biomolecular Engineering; College of Engineering	• UG Minor Sustainable Energy Systems
		Energy Institute; College of Engineering	• GR Minor Sustainable Energy
Duke University Durham, NC	Private	Center for Engineering, Energy & the Environment; Nicholas School of the Environment; Trinity College of Arts and Sciences	• UG Certificate Energy and the Environment
Massachusetts Institute of Technology Cambridge, MA	Private	MIT Energy Initiative	• UG Minor Energy Studies
Pennsylvania State University University Park, PA	Public	Department of Energy and Mineral Engineering; College of Earth and Mineral Sciences	• UG Minor Energy Engineering • UG Minor Energy Business and Finance • UG Minor Global Business Strategies for the Earth, Energy, and Materials Industries • GR Minor Energy and Mineral Engineering
		Department of Geosciences; College of Earth and Mineral Sciences	• UG Minor Energy, Environmental, and Mineral Economics • UG Minor Watersheds and Water Resources: Energy Resources
Princeton University Princeton, NJ	Private	Program in Sustainable Energy; Department of Mechanical and Aerospace Engineering; College of Engineering	• UG Certificate Sustainable Energy
Rensselaer Polytechnic Institute Troy, NY	Private	School of Humanities, Arts and Social Sciences	• UG Minor Energy
Rice University Houston, TX	Private	Department of Civil and Environmental Engineering; Brown School of Engineering	• UG Minor Energy and Water Sustainability

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Table 11. NTBE minor and certificate programs (Continued)

Stanford University Stanford, CA	Private	Department of Energy Resources Engineering; School of Earth Sciences	• UG Minor Energy Resources Engineering
University of California-Berkeley Berkeley, CA	Public	Energy and Resources Group; College of Natural Resources	• UG Minor Energy and Resources
		Center for Law, Energy and the Environment; School of Law	• GR Certificate Energy and Clean Technology Law
University of California-Davis Davis, CA	Public	Department of Biological and Agricultural Engineering; College of Agricultural and Environmental Sciences	• UG Minor Energy Policy • UG Minor Energy Science and Technology
University of Central Florida Orlando, FL	Public	College of Engineering and Computer Science	• UG Minor Energy and Sustainability
University of Colorado-Boulder Boulder, CO	Public	Renewable and Sustainable Energy Institute	• GR/Professional Certificate Renewable Energy
University of Houston Houston, TX	Public	Graduate and Professional Programs; College of Business	• GR Certificate Economics of the Energy Value Chain • GR Certificate Energy Finance and Accounting • GR Certificate Energy Investment Analysis • GR Certificate Energy Risk Management
		Global Energy Management Program; Department of Finance; College of Business	• UG Minor Global Energy Management
University of Nebraska-Lincoln Lincoln, NE	Public	Nebraska Center for Energy Sciences Research	• UG Minor Energy Science
University of Notre Dame Notre Dame, IN	Private	Center for Sustainable Energy	• UG Minor Energy Studies
University of Pennsylvania Philadelphia, PA	Private	Energy and Sustainability Program; School of Engineering and Applied Science; College of Arts and Sciences	• UG Minor Energy and Sustainability
University of Texas-Austin Austin, TX	Public	Center for Global Energy; International Arbitration and Environmental Law; School of Law	• GR Certificate Global Energy, International Arbitration and Environmental Law
		Executive Education; School of Business	• GR Certificate Energy
University of Wisconsin-Madison Madison, WI	Public	Department of Mechanical Engineering; College of Engineering and the Energy Institute	• UG Certificate Engineering: Energy Sustainability
		Institute for Environmental Studies and School of Public Affairs	• GR Minor Energy Analysis and Policy • GR Certificate Energy Analysis and Policy
Washington University in Saint Louis Saint Louis, MO	Private	Department of Energy, Environmental and Chemical Engineering; School of Engineering & Applied Science	• UG Minor Energy Engineering
		International Center for Advanced Renewable Energy and Sustainability	• UG Certificate Renewable Energy and the Environment
Wayne State University Detroit, MI	Public	Alternative Energy Technology Program; College of Engineering	• GR Certificate Alternative Energy Technology

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Table 11. NTBE minor and certificate programs (Continued)

Doctoral/Research Universities - High Research			
Clarkson University Potsdam, NY	Private	Center for Sustainable Energy Systems	• UG Minor Sustainable Energy Systems Engineering
Colorado School of Mines Golden, CO	Public	Center for Renewable Energy Materials Research Science and Engineering	• UG Minor Energy: Renewable Energy
George Mason University Fairfax, VA	Public	School of Physics, Astronomy and Computational Science	• UG Minor Renewable Energy
Lehigh University Bethlehem, PA	Private	Department of Mechanical Engineering and Mechanics; College of Engineering and Applied Science	• UG Minor Energy Engineering
New Mexico State University Las Cruces, NM	Public	Department of Engineering Technology and Surveying Engineering; College of Engineering	• UG Minor Renewable Energy Technologies
Oklahoma State University Stillwater, OK	Public	Biobased Products and Energy Center; College of Agricultural Sciences and Natural Resources	• GR Certificate Biobased Products and Bioenergy
San Diego State University San Diego, CA	Public	Center for Energy Studies	• UG Minor Energy Studies
Southern Methodist University Dallas, TX	Private	Executive Education Programs; School of Business	• GR Certificate Global Enterprise Leadership in the Energy Industry
Syracuse University Syracuse, NY	Private	Department of Mechanical and Aerospace Engineering; College of Engineering and Computer Science	• UG Minor Energy Systems Engineering: Renewable Energy
		College of Engineering and Computer Science	• UG Minor Renewable Energy
		Integrated Learning Majors; College of Arts and Sciences	• UG Minor Energy and its Impacts
Texas Tech University Lubbock, TX	Private	Wind Science and Engineering Research Center	• UG/GR Certificate Wind Energy
		University College and Wind Science and Engineering Research Center	• UG Minor Wind Energy
University of Dayton Dayton, OH	Private	Sustainability, Energy and the Environment Initiative	• UG Minor Sustainability, Energy and the Environment
University of Denver Denver, CO	Private	Environmental Policy and Management Program; University College Professional and Continuing Studies	• UG/GR/Professional Certificate Energy and Sustainability • UG/GR/Professional Certificate Environmental Assessment and Nuclear Power
University of Maine Orono, ME	Public	Department of Mechanical Engineering; College of Engineering	• UG Minor Renewable Energy Science and Technology
		School of Economics; College of Natural Sciences, Forestry & Agriculture	• UG Minor Renewable Energy Economics and Policy
University of Massachusetts-Boston Boston, MA	Public	Center for Sustainable Enterprise and Regional Competitiveness; College of Management and Department of Environmental, Earth and Ocean Sciences; College of Science and Mathematics	• UG Minor Clean Energy and Sustainability • UG/GR Certificate Clean Energy and Sustainability

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Table 11. NTBE minor and certificate programs (Continued)

University of Nevada-Las Vegas Las Vegas, NV	Public	School of Environmental and Public Affairs; College of Urban Affairs	•UG Minor Solar and Renewable Energy • GR Certificate Solar and Renewable Energy
University of Nevada-Reno Reno, NV	Public	Department of Civil and Environmental Engineering; College of Engineering	• UG Minor Renewable Energy
University of Toledo Toledo, OH	Public	Department of Physics and Astronomy; College of Natural Sciences and Mathematics and School of Solar and Advanced Renewable Energy	• UG Minor Renewable Energy (designed for STEM majors)
University of Wisconsin-Milwaukee Milwaukee, WI	Public	Department of Mechanical Engineering; Graduate School of Engineering	• GR Certificate Energy Engineering
Utah State University Logan, UT	Public	Department of Plants, Soils and Climate; College of Agriculture	• UG Minor Climate Change and Energy
Doctoral/Research Universities			
SUNY-Syracuse (College of Environmental Science and Forestry) Syracuse, NY	Public	Department of Environmental Resource Engineering	• UG Minor Renewable Energy
Texas Christian University Fort Worth, TX	Private	Energy Institute; College of Science and Engineering and School of Business	• UG Minor Energy Technology and Management
University of Tulsa Tulsa, OK	Private	Sustainable Energy and Resources Law Program; College of Law	• GR Certificate Sustainable Energy and Resource Law
		Energy Management Program; College of Business	• UG Minor Energy Management
Master's Colleges and Universities - Large			
Alfred University Alfred, NY	Private	Renewable Energy Engineering Program; School of Engineering	• UG Minor Renewable Energy Engineering
Lawrence Technological University Southfield, MI	Private	Department of Mechanical Engineering; College of Engineering	• UG Certificate Alternative Energy Engineering • GR Certificate Energy Engineering • GR Certificate Energy and Environmental Management
Marylhurst University Marylhurst, OR	Private	Department of Business Administration	• GR/Professional Certificate Sustainable Business: Renewable Energy
New York Institute of Technology-Old Westbury Old Westbury, NY	Private	Department of Energy Management; School of Engineering and Computing Sciences	• GR Certificate Energy Technology
Robert Morris University Moon Township, PA	Private	Department of Science; School of Engineering, Mathematics, and Science	• UG Minor Alternative Energy and Sustainability: Business
Saint Francis University Loretto, PA	Private	Renewable Energy Center; School of Business	• GR Certificate Renewable Energy
San Jose State University San Jose, CA	Public	Department of Environmental Studies; College of Social Sciences	• UG Minor Energy Policy and Green Building

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Table 11. NTBE minor and certificate programs (Continued)

University of Southern Maine Portland, ME	Public	Department of Environmental Science; School of Environmental, Health, and Life Sciences; College of Science, Technology, and Health	• UG Minor Applied Energy • UG Certificate Applied Energy
University of Wisconsin-Platteville Platteville, WI	Public	College of Engineering, Mathematics and Science	• UG Minor Renewable Energy
Master's Colleges and Universities - Medium			
Central Washington University Ellensburg, WA	Public	Department of Geography; College of Sciences	• UG Minor Energy Studies
Humboldt State University Arcata, CA	Private	Department of Environmental Science and Management; College of Natural Resources and Sciences	• UG Minor Energy and Climate
Kettering University Flint, MI	Private	Department of Mechanical Engineering	• UG Minor Fuel Cells and Hybrid Technology
Montana State University-Billings Billings, MT	Public	College of Technology	• Professional Certificate Sustainable Energy Technician
Northern Michigan University Marquette, MI	Public	Department of Engineering Technology; School of Technology and Applied Sciences	• UG Minor Alternative Energy
Robert Morris University-Illinois Chicago, IL	Private	Department of Science; School of Engineering; Mathematics, and Science	• UG Minor Alternative Energy and Sustainability
University of Minnesota-Duluth Duluth, MN	Public	Department of Electrical and Computer Engineering; Swenson College of Science and Engineering	• UG Minor Energy Engineering
University of Texas-Permian Basin Odessa, TX	Public	Department of Physical Sciences; College of Arts and Sciences	• UG Minor Energy Studies
University of Wisconsin-Stevens Point Stevens Point, WI	Public	Human Dimensions of Natural Resource Management Discipline; College of Natural Resources	• GR Certificate Energy Education
Master's Colleges and Universities - Small			
Richard Stockton College of New Jersey Pomona, NJ	Public	School of Natural and Mathematical Sciences	• UG Certificate Energy: Physical Science • UG Certificate Energy: Environmental Science
Baccalaureate Colleges – Arts and Sciences			
Excelsior College Albany, NY	Private	Center for Professional Development	• UG Certificate Sustainable and Green Energy: Solar Power Professional • UG Certificate Sustainable and Green Energy: Principles of Green Buildings • UG Certificate Sustainable and Green Energy: Nature Guiding • UG Certificate Sustainable and Green Energy: Green Supply Chain and Building Professional • UG Certificate Sustainable and Green Energy: Alternative Energy Specialist

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Table 11. NTBE minor and certificate programs (Continued)

Green Mountain College Poultney, VT	Private	Environmental Studies Program	•UG Certificate Sustainable and Green Energy: Alternative Energy Specialist
Union College Schenectady, NY	Private	Energy Studies Program; Department of Mechanical Engineering, College of Engineering	• UG Minor Energy Studies
Baccalaureate Colleges – Diverse Fields			
John Brown University Siloam Springs, AR	Private	Department of Renewable Energy; Division of Engineering and Construction Management	• UG Minor Renewable Energy
Montana State University-Northern Havre, MT	Public	Sustainable Energy Technology Program; College of Technical Sciences	• Professional Certificate Sustainable Energy Technology
Montana Tech of the University of Montana Butte, MT	Public	Department of Trades and Technology; College of Technology	• Professional Certificate Energy Technology - Wind
Pennsylvania State University-Berks Reading, PA	Public	Division of Engineering, Business, and Computing	• GR/Professional Certificate Energy Systems

How many colleges and universities host non-traditional and broad energy programs?

The 2012 NCSE census identified 132 colleges and universities that host non-traditional and broad energy (NTBE) academic programs. Of these, 27 offer interdisciplinary and general NTBE degree programs, 82 offer formal NTBE specializations in traditional disciplinary or professional field degree programs, and 68 offer NTBE minors and certificates.

Thirty-nine states and the District of Columbia have one or more higher education institutions that offer at least one NTBE academic program (Figure 1; Table 12). Five states have more than six institutions hosting NTBE programs—Pennsylvania (13), New York (12), California (9), Texas (7) and Michigan (8). All of these are among the states with the largest number of colleges and universities. Another seven states have four to six institutions hosting NTBE academic programs—Illinois (6), Colorado (5), Massachusetts (5), Montana (4), Oklahoma (4), Ohio, (4) and Wisconsin (4). Of these twelve states, Montana has the highest proportion of state four-year institutions hosting NTBE academic programs (40%) followed by Colorado (26%), Michigan (20%) and Oklahoma (17%). The proportions for the remainder range from 8-11%. Another twenty-seven states and the District of Columbia have between one and three institutions hosting NTBE programs.

States with the largest number of four-year colleges and universities, states that border the Great Lakes, and some western states have more colleges and universities hosting NTBE programs. Alaska, Hawaii, four states in the South, two in Appalachia and two in the Great Plains have no institutions hosting NTBE programs.

Figure 1. Number of U.S. four-year institutions hosting NTBE academic programs by state

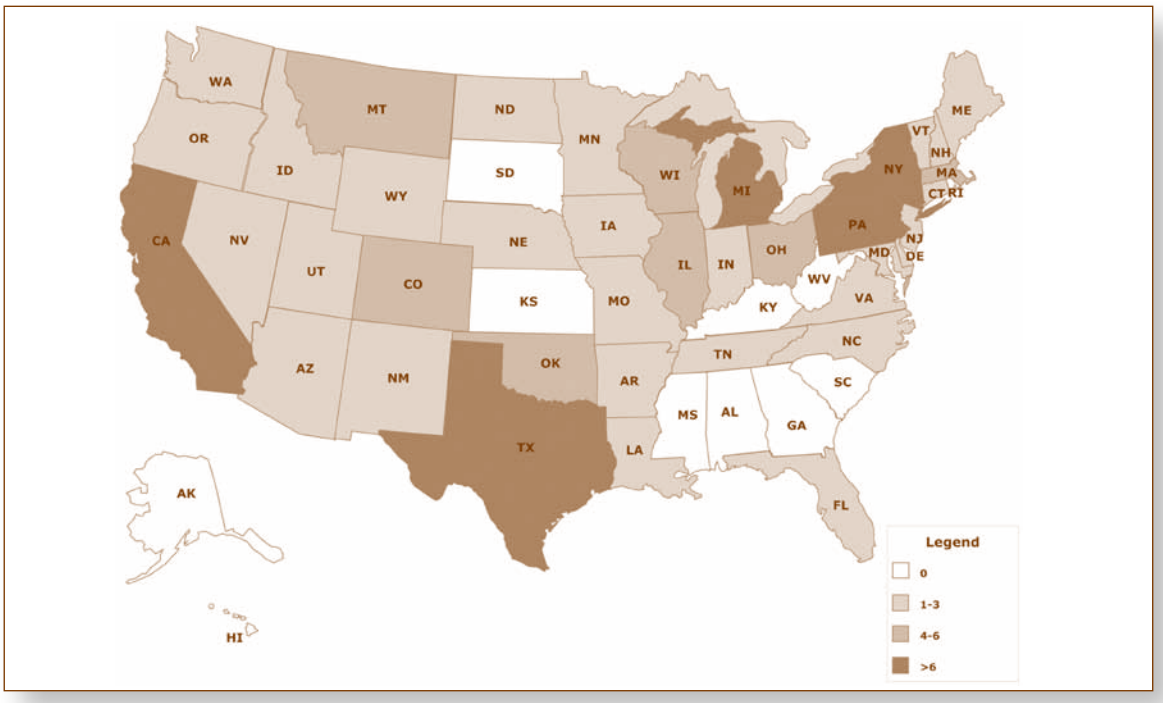


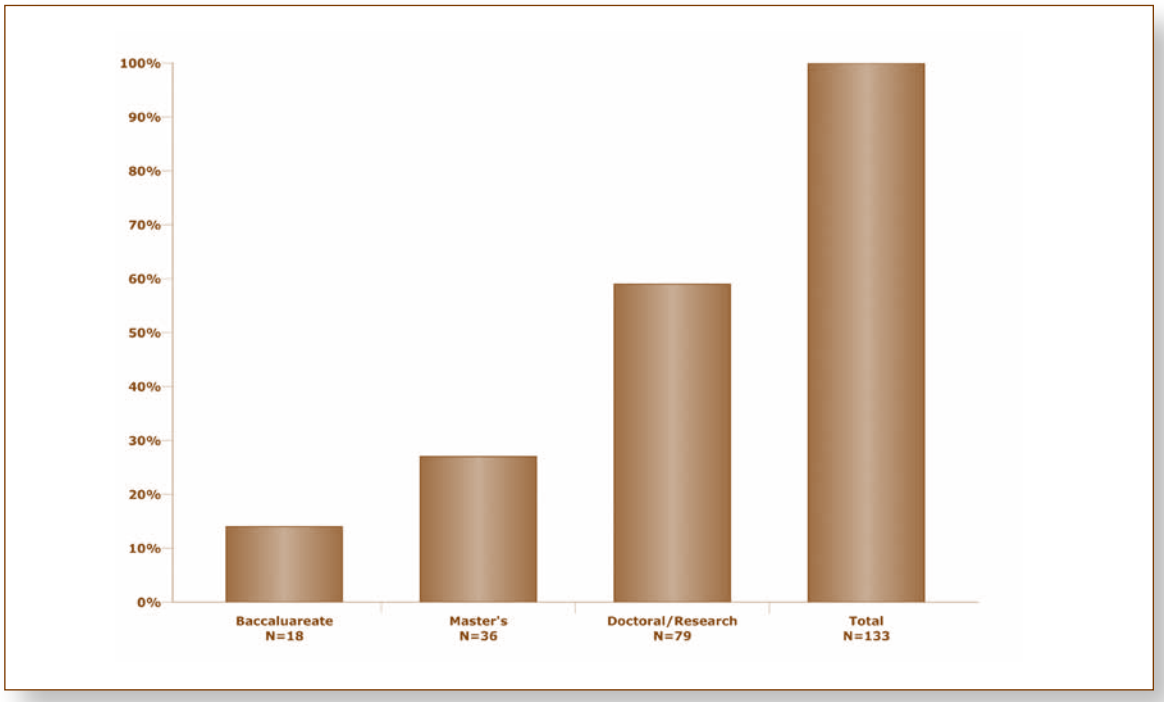
Table 12. U.S. institutions with NTBE programs by state

State	Number of institutions	State	Number of institutions
Alabama	0	Montana	4
Alaska	0	Nebraska	2
Arizona	2	New Hampshire	1
Arkansas	1	New Jersey	2
California	9	New Mexico	1
Colorado	5	New York	12
Connecticut	1	Nevada	2
Delaware	1	North Carolina	3
District of Columbia	1	North Dakota	1
Florida	3	Ohio	4
Georgia	0	Oklahoma	4
Hawaii	0	Oregon	3
Idaho	1	Pennsylvania	13
Illinois	6	Rhode Island	0
Indiana	3	South Carolina	0
Iowa	2	South Dakota	0
Kansas	0	Tennessee	3
Kentucky	0	Texas	7
Louisiana	1	Utah	1
Maine	3	Vermont	2
Maryland	1	Virginia	1
Massachusetts	5	Washington	2
Michigan	8	West Virginia	0
Minnesota	3	Wisconsin	4
Mississippi	0	Wyoming	1
Missouri	3		
		Total	132

NTBE academic programs are offered by colleges and universities in all nine Carnegie classification categories for four-year institutions. Most institutions (59%) hosting NTBE academic programs are classified as doctoral/research universities, 27% are master's colleges and universities and 14% are baccalaureate colleges (Figure 2).[5] The proportion of colleges and universities hosting NTBE academic programs ranges from 2% of smaller master's institutions to 35% at doctoral/research universities with very high levels of research.

[5] RU/VH = research university/very high research; RU/H = research university/high research, DRU = doctoral/research university, Mas L = large master's college/university, Mas M – medium master's college/university, Mas S – small master's college/university, Bac/A&S = baccalaureate arts and sciences college, Bac/Div = baccalaureate diverse fields college, Bac/Ass = baccalaureate/associates college.

Figure 2. Institutions hosting NTBE programs by Carnegie class type



The number and types of NTBE academic programs offered by an individual institution range from a single minor or certificate to multiple academic programs including interdisciplinary or general NTBE degree programs, formal NTBE specializations in disciplines and professional fields, and NTBE minors and certificates. Some institutions have greater numbers of NTBE academic program offerings. Examples include:

Interdisciplinary NTBE Degree Programs:
The University of California at Davis and The University of Delaware

- **The University of California at Davis** offers innovative interdisciplinary MS and PhD degrees in Energy Science and Technology and MS and PhD degrees in Energy Policy and Management through its Energy Graduate Group and Institute for Energy Studies.
- **The University of Delaware** offers pioneering interdisciplinary BS, MS, Master of Energy and Environmental Policy and PhD Environment Energy and Policy through its Center for Energy & Environmental Policy.

NTBE Specializations in Disciplinary and Professional Degrees:
Stanford University and University of Texas at Austin

- **Stanford University** offers ten NTBE degrees in public policy and engineering. The Stanford Institute for Economic Policy Research in the School of Humanities and Sciences offers an MA and Master of Public Policy in Environmental and Energy Policy. The Department of Energy Resources Engineering in the School of Earth Sciences offers BS, MS, Master of Engineering, and PhD degrees in Energy Resources Engineering. The Department of Civil and Environmental

Engineering in the School of Engineering offers BS, MS, and PhD degrees in Environmental Engineering: Atmosphere/Energy. The Earth Systems Program in the School of Earth Sciences offers a BS in Earth Systems: Energy, Science and Technology.

- **The University of Texas at Austin** offers eight NTBE degrees in business management, public policy, geosciences and engineering. The School of Business offers Master of Business Administration degrees in Clean Technology and Energy Finance. The School of Public Affairs offers the Master of Global Policy Studies in International Energy, Environment and Technology. The Department of Geological Sciences in the School of Geosciences offers an MA in Energy and Earth Resources. The Department of Materials Science in the School of Engineering and the Texas Materials Institute offers MS and PhD degrees in Materials Science and Engineering: Clean Energy Materials. The Department of Electrical and Computer Engineering in the School of Engineering offers a BS in Electrical and Computer Engineering: Energy Systems and Renewable Energy Technical Core. The Department of Chemical Engineering in the School of Engineering offers a BS in Chemical Engineering: Energy Technologies.

NTBE Minors and Certificates: The University of Houston and Excelsior College

- **The University of Houston** offers an NTBE undergraduate minor and four graduate certificates in business. The College of Business offers an undergraduate minor in Global Energy Management and graduate certificates in Economics of the Energy Value Chain, Energy Finance and Accounting, Energy Investment Analysis and Energy Risk Management.
- **Excelsior College** offers five NTBE professional certificates (undergraduate or graduate) in Sustainable and Green Energy: Solar Power Professional, Sustainable and Green Energy: Principles of Green Buildings, Sustainable and Green Energy: Nature Guiding, Sustainable and Green Energy: Green Supply Chain and Building Professional, and Sustainable and Green Energy: Alternative Energy Specialist.

Overall NTBE Academic Programming: Pennsylvania State University

- **Interdisciplinary NTBE degree.** Pennsylvania State University offers an online interdisciplinary BA degree in Energy and Sustainability Policy through the Department of Energy and Mineral Engineering in the College of Earth and Mineral Engineering.
- **NTBE Specializations in Disciplinary and Professional Degrees.** Pennsylvania State University offers twelve NTBE engineering and technical degrees; including degrees that include an additional focus on business and finance or policy and management. The Department of Energy and Mineral Engineering in the College of Earth and Mineral Engineering offers BS degrees in Energy Engineering and in Energy Business and Finance: Energy Systems or Energy Business and Finance: GIS; MS degrees in Energy and Geo-Environmental Engineering, Energy and Mineral Engineering: Energy Management and Policy, and Energy and Mineral Engineering: Fuel Science, and PhD degrees in Energy and Geo-Environmental Engineering, Energy and Mineral Engineering: Energy Management and Policy, and Energy and Mineral Engineering: Fuel Science. The Department of Chemical Engineering in the College of Engineering offers BS and PhD degrees in Chemical Engineering: Energy and Fuels Engineering. The School of Construction Design and Technology offers a BS in Electrical Technology: Renewable Energy Technologies. The Department of Geosciences in the College of Earth and Mineral Sciences offers a BS in Earth Science and Policy: Energy.

- **NTBE Minors.** Pennsylvania State University offers six NTBE undergraduate minors in engineering and technical fields. The Department of Energy and Mineral Engineering in the College of Earth and Mineral Engineering offers minors in Global Business Strategies for the Earth, Energy, and Materials Industries, Energy Business and Finance, Energy Engineering, and Energy and Mineral Engineering. The Department of Geosciences in the College of Earth and Mineral Sciences offers minors in Energy, Environmental, and Mineral Economics and Watersheds and Water Resources: Energy Resources.

Institutional Diversity

Publicly-funded institutions predominate, comprising 62% of the 132 institutions hosting NTBE academic programs. Private not-for-profit institutions comprise 38%, and one for-profit institution hosts an academic energy program—Aspen University of Colorado, an online-only institution. Interestingly, the institutions offering interdisciplinary and general NTBE energy programs and NTBE minors and certificates are evenly split between publicly-funded and private not-for-profit institutions, while for degree programs in disciplines and professional fields with NTBE specializations, most institutions are publicly funded (65%).

Only a handful of institutions offering NTBE academic programs fall within the special categories of four-year institutions that serve minorities (Table 10). Two are minority-serving institutions (MSI): Robert Morris University-Illinois and North Carolina A & T University which is also designated as an HBCU (historically black college or university). Two institutions—New Mexico State University, and the University of Texas, Permian Basin—are Hispanic-serving institution. John Brown University and the Maharishi University of Management provide an explicit faith-based education.

Twenty-three institutions hosting NTBE academic programs are land grant institutions, comprising about a third (28%) of all land grant institutions (Table 13).[6]

[6] All special categories are included in the Carnegie classification data with the exception of institutions offering an explicit faith-based education. These institutions were classified based on their website content not their historical or current affiliation with a religious organization. Many, but not all HBCU and HSI schools are also classified as MSI institutions; federally recognized as Title IV colleges and universities.

Table 13. Special category institutions hosting NTBE academic programs

Institution	MSI	HBCU	HSI	Faith	Land Grant
Cornell University					√
Iowa State University					√
John Brown University				√	
Maharishi University of Management				√	
Montana State University					√
New Mexico State University			√		√
North Carolina A & T University	√	√			√
Ohio State University (The)					√
Oklahoma State University					√
Oregon State University					√
Pennsylvania State University					√
Purdue University					√
Robert Morris University-Illinois	√				
University of California at Berkeley					√
University of California at Davis					√
University of Dayton					
University of Delaware					√
University of Idaho					√
University of Illinois at Urbana-Champaign					√
University of Maine					√
University of Nebraska-Lincoln					√
University of Nevada, Reno					√
University of Tennessee					√
University of Texas, Permian Basin			√		
University of Wisconsin-Madison					√
University of Wyoming					√
Utah State University					√
Washington State University					√

NCSE University Affiliate members 2012-2013

Alabama A&M University
Alabama State University
Allegheny College
Antioch University New England
Arizona State University
Arkansas State University
Ball State University
Bard College
Barnard College
Benedictine University
Bentley University
Bethune-Cookman University
Boston College
Boston University
Bowdoin College
Brandeis University
Brown University
Bryn Mawr College
Bucknell University
Case Western Reserve University
Chatham University
Clark University
Clarkson University
Clemson University
Colby College
Colgate University
College of Charleston
College of Menominee Nation
College of Saint Benedict/St. John's University
College of Wooster
Colleges of the Fenway
Colorado College
Colorado State University
Columbia University
Cornell University
Dartmouth College
Dickinson College
Doane College
Drexel University
Duquesne University
Evergreen State College, The
Flagler College
Florida A&M University
Florida Atlantic University
Franklin & Marshall College
Frostburg State University
George Mason University
George Washington University
Guilford College
Hartwick College
Haverford College
Hendrix College
Heritage University
Howard University
Illinois Institute of Technology
Indiana University at Bloomington
James Madison University
Johns Hopkins University
Kean University
Kentucky State University
Lafayette College
Lehigh University
Lewis & Clark College
Lewis University
Louisiana State University
Macalester College
Manhattan College
Marywood University
Michigan State University
Middlebury College
Monmouth University
Moravian College
Morgan State University
Mount Holyoke College
New College of Florida
North Carolina A&T State University
North Carolina State University
Northeastern University
Northern Arizona University
Northern Illinois University
Ohio State University, The
Old Dominion University
Oregon State University
Pace University
Pennsylvania State University
Pomona College
Portland State University
Purdue University
Reed College
Robert Morris University
Rutgers-The State University of New Jersey
Salisbury University
Salish Kootenai College
Sewanee, The University of the South
Siena College
Skidmore College
Smith College
South Dakota State University
Southern New Hampshire University
Stetson University
SUNY-College of Environmental Science and Forestry
Swarthmore College
Temple University
Texas A&M University
Towson University
Tufts University
Unity College
University of Alabama
University of Arizona
University of Arkansas, Fayetteville
University of Alaska, Anchorage
University of California, Berkeley
University of California, Davis
University of California, San Diego
University of California, Santa Barbara
University of Central Florida
University of Cincinnati
University of Colorado, Boulder
University of Connecticut
University of Delaware
University of the District of Columbia
University of Georgia
University of Hawaii at Manoa
University of Idaho
University of Illinois at Urbana-Champaign
University of La Verne
University of Louisville
University of Maryland-Center for Environmental Science
University of Maryland-College Park
University of Massachusetts, Boston
University of Michigan
University of Minnesota, Twin Cities
University of Montana, Missoula
University of Nebraska-Lincoln
University of Nevada, Reno
University of North Florida
University of North Texas
University of Pennsylvania
University of Redlands
University of Rhode Island
University of Rochester
University of South Carolina
University of South Florida
University of Southern California
University of Tennessee
University of Texas at Austin
University of Toledo
University of Tulsa
University of Utah
University of Vermont
University of Wisconsin-Extension
University of Wisconsin-Madison
University of Wisconsin-Platteville
University of Wisconsin-Stout
University of Wisconsin-Whitewater
University of Wyoming
Vassar College
Vermont Law School
Villanova University
Wake Forest University
Warren Wilson College
Washington State University
Wayne State University
Wesleyan University
Western Washington University
West Virginia University
Wheeling Jesuit University
Willamette University
Winthrop University
Worcester Polytechnic Institute
Yale University

Council of Energy Research and Education Leaders (CEREL) Members 2012-2013

Institution	Representative	Program
Arizona State University	Stephen Goodnick	Arizona Institute for Renewable Energy
Ball State University	Robert Koester	Center for Energy Research/Education/Service (CERES)
Desert Research Institute	Alan Gertler	Division of Atmospheric Sciences
Florida A&M University	Samuel L. Donald	College of Engineering Sciences, Technology, and Agriculture (CESTA)
Florida International University	Andres Gil	
George Washington University	Lee Paddock	School of Law
Indiana University - Purdue University at Indianapolis	Peter Schubert	Lugar Center for Renewable Energy
Kyoto University	Takeshi Yao	Department of Nuclear Engineering
North Carolina A&T State University	Keith Schimmel	Energy & Environmental Studies
North Carolina State University	William E. Winner	College of Natural Resources
Pennsylvania State University	Tom Richard	Institutes of Energy & the Environment
South Dakota State University	Bill Gibbons	Agricultural Experiment Station
Southern Illinois University	Tomasz Wiltowski	Coal Research Center
Stanford University	Franklin M. Orr	Precourt Institute for Energy
State University of New York - Buffalo	Kenneth Tramposch	Office of the Vice President for Research
The Ohio State University	Kate Bartter	Institute for Energy and the Environment
University of California, Berkeley	Susan Jenkins	Energy Biosciences Institute
University of California, Davis	Bryan Jenkins	Energy Institute
University of California, Los Angeles	Mohamed Abdou	Center for Energy Science and Technology Advanced Research
University of Colorado, Boulder	Stein Sture	Office of the Vice Chancellor of Research
University of Illinois at Urbana-Champaign	Hans Blaschek	Center for Advanced Bioenergy Research
University of Kentucky	Rodney Andrews	Center for Applied Energy Research
University of La Verne	Jonathan Reed	
University of Maryland - College Park	Eric Wachsman	University of Maryland Energy Research Center
University of North Carolina at Chapel Hill	David McNelis	Institute for the Environment
University of Pennsylvania	Andrew Huemmler	School of Engineering and Applied Science
University of the District of Columbia	Sabine O'Hara	College of Agriculture, Urban Sustainability & Environmental Sciences
University of Toledo	Nagi G. Naganathan	Center of Excellence in Advanced Renewable Energy and the Environment
University of Wisconsin - Madison	Scott Patrick Williams	Energy Institute
University of Wyoming	K. J. Reddy	School of Energy Resources
Wayne State University	Steve Salley	Alternative Energy Technology Program
West Virginia University	Timothy R. Carr	Dept. of Geology & Geography
Worcester Polytechnic Institute	Isa Bar-On	Mechanical Engineering Department

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