

**Board of Regents, State of Iowa****REQUEST TO IMPLEMENT A NEW BACCALAUREATE, MASTERS,  
DOCTORAL OR FIRST PROFESSIONAL DEGREE PROGRAM**

THE PURPOSE OF ACADEMIC PROGRAM PLANNING: Planning a new academic degree program provides an opportunity for a Regent University to demonstrate need and demand as well as the university's ability to offer a quality program that is not unnecessarily duplicative of other similar programs offered by colleges and universities in Iowa.

Institution: **Iowa State University**

Departments involved: Aerospace Eng., Geological and Atmospheric Sciences, Agronomy, Electrical & Computer Eng., Materials Science Eng., Industrial & Manufacturing Systems Eng., Sociology, Economics, Statistics, Journalism & Communications, Civil, Construction & Environmental Eng., Mechanical Eng.

CIP Discipline Specialty Title: **Engineering, Other**

CIP Discipline Specialty Number (six digits): **14.9999**

Level: B                      M                      **D**                      FP

Title of Proposed Program: **Wind Energy Science, Engineering, and Policy (WESEP)**

Degree Abbreviation (e.g., Minor, B.S., B.A., M.A.): Ph.D.

Approximate date to establish degree: Month August                      Year 2012

Contact person(s): (name, telephone, and e-mail)

John Jackman, 294-0126, [jkj@iastate.edu](mailto:jkj@iastate.edu)

Jim McCalley, 294-4844, [jdm@iastate.edu](mailto:jdm@iastate.edu)

Please provide the following information (use additional pages as needed).

1. Describe the proposed new degree program, including the following:
  - a. A brief description of the program and a statement of objectives including the student learning outcomes and how the learning outcomes will be assessed;

**This program is an interdisciplinary Ph.D. program that will prepare graduates for wind energy related careers in industry, academia, and government institutions. The primary objective is to develop students' capability to conduct successful research on interdisciplinary problems that occur in wind energy. This will be achieved through a unique integration of engineering, science, and policy-related disciplines including education and research activities.**

### ***Learning outcomes***

Upon completion of this program, graduates will be able to

- 1) Use their expertise in wind energy to formulate research problems and develop and execute research plans that address significant issues in wind energy;
- 2) Manage the research process including the mentoring of research staff;
- 3) Analyze and interpret research results using context relevant methods;
- 4) Write well reasoned and competitive research proposals; and
- 5) Communicate their results at technical and non-technical levels through journal publications, conference proceedings, popular and scientific publications, and public presentations.

### ***Assessments***

Learning outcomes will be assessed include both formative and summative procedures.

#### ***Formative assessment***

The domain knowledge of students in graduate courses will be assessed using examinations, assignments, and group projects. The results of these assessments will be used to improve student performance and learning outcomes.

#### ***Summative assessment***

The preliminary examination, dissertation and final examination will be used to assess individual achievement in terms of an integrated representation of student knowledge. This assessment will focus on knowledge acquired by students and the skills applied to solve open-ended research problems.

- b. The relationship of the proposed new program to the institutional mission and how the program fits into the institution's, college's, and department/program's strategic plan;

This program is consistent with ISU's mission –

***“Iowa State will lead in developing more sustainable ways to produce and deliver safe and nutritious food, water, materials, and energy; integrate the protection of plant, animal, and human health; and care for our environment.”***

This program directly addresses ISU's strategic plan priority -

***“Iowa State will be internationally known for faculty, staff, and students who address the challenges of the 21st century.”***

WESEP is integral to the College of Engineering's strategic plan –

***“We will improve the human condition through research that addresses grand challenges and builds upon our core***

***competencies in energy, health, computing, green technology, and infrastructure.”***

- c. The relationship of the proposed new program to other existing programs at the institution; describe how the proposed program will enhance other programs at the university.

**Given the high degree of collaboration between and among departments and colleges, it is expected that this program will help foster further interdisciplinary research in wind energy and will cultivate a stimulating research environment that will enhance ISU’s research capabilities. It will help to provide interdisciplinary bridges between the activities of the colleges of Agriculture and Life Sciences, Engineering, and Liberal Arts and Sciences.**

- d. The relationship of the proposed new program to existing programs at other colleges and universities in Iowa, including how the proposed program is different or has a different emphasis than the existing programs; and

**Currently there are no Ph.D. programs in wind energy in Iowa. The University of Iowa (U Iowa) has an M.S. program in Industrial Engineering with a focus on wind power management. While a few courses in this M.S. program may have similarities with those in the WESEP Ph.D. program, the U Iowa M.S. program does not have as much emphasis on wind energy. At best, it is complementary to the proposed WESEP Ph.D. program at ISU.**

- e. Special features or conditions that make the institution a desirable, unique, or appropriate place to initiate such a degree program.

**This program leverages the strengths of three colleges at ISU, namely, Engineering, Ag & Life Sciences, and Liberal Arts & Sciences along with multiple centers and laboratories that conduct wind energy related research including the Center for Nondestructive Evaluation (CNDE), the Power Systems Research Center (PSERC), the Electric Power Research Center (EPRC), the Iowa Energy Center (IEC), the Institute for Transportation (InTrans), the Wind Energy Manufacturing Laboratory (WEML), the Wind Engineering and Experimental Aerodynamics Lab, the Climate Science Program (CS), and the Iowa Environmental Mesonet. The proposed program taps the campus strengths in engineering and climate science (CNDE, PSERC, EPRC, IEC, InTrans, CSP), and blends it with ISU’s known expertise in agriculture, rural life, economics, legal, regulatory, and policy residing in the Center for Agricultural and Rural Development (CARD).**

- f. Does the proposing institution have personnel, facilities, and equipment adequate to establish and maintain a high quality program?

The program is supported by faculty from the Colleges of Engineering, Ag & Life Sciences, and Liberal Arts & Sciences.

On September 1, 2011, ISU received a \$3.15M five-year “IGERT<sup>1</sup>” award from the National Science Foundation (NSF) to support a Ph.D. program in Wind Energy Science, Engineering and Policy. The program funds will be used for course development and support of 28 domestic students. In 2016, the program can be renewed for an additional 5 years. There are 18 ISU faculty members involved in this proposal.

The ISU Wind Energy Initiative was established by the College of Engineering in 2011 to promote research collaborations in wind energy and currently includes 36 faculty members. The college allocated \$500,000 over three years to support the development of major research proposals and has recruited a new faculty member in 2011 to support the initiative.

Facilities and equipment to be utilized for this program include the Wind Energy Manufacturing Laboratory, the Wind Simulation and Testing (WiST) Laboratory, the mesoscale and regional climate models of the CSP, the Iowa Environmental Mesonet archives, the Alternate Energy Grid Infrastructure and Systems Laboratory, and the ISU CNDE. These facilities and their capabilities are further described under question 10 below.

- g. How does student demand for the proposed program justify its development?

We have the following indicators of student demand for a wind energy program at ISU.

**i. Wind energy-dedicated undergraduate course enrollments:**

- AeroE 381, Introduction to Wind Energy. Enrollments for this course were 60 in Spring 2010 and 55 in Spring 2011.
- Engr 340, Introduction to Wind Energy. System Design & Delivery: Although this course was opened for enrollment just a few weeks before the start of Fall 2011 (and therefore unavailable during the normal enrollment period the previous spring), it attracted 27 students.

**ii. Wind energy-dedicated graduate course enrollments:**

- EE 559, Electromechanical wind energy conversion and grid integration. Enrollments in previous offerings of this course included 17 in Spring 2009 and 20 in Fall 2010.
- IE 543X Wind Energy Manufacturing. Enrollment in Spring 2010 was 24.

**iii. Wind energy summer research program: In March 2011, Iowa State won a \$400K award from the NSF Research Experience for Undergraduates (REU) program to conduct a summer research programs in wind energy from 2011-2013. The program only admits**

---

<sup>1</sup> IGERT is the NSF acronym for the “Integrative Graduate Education and Research Traineeship Program.” See [http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=12759](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12759) for information on this program. The announcement for the IGERT award to ISU on wind energy can be found at [http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1069283&WT.z\\_pims\\_id=12759](http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1069283&WT.z_pims_id=12759).

undergraduate students who were interested in pursuing graduate studies. The fact that there were 270 applications for the 11 positions that the funding allowed indicates strong student interest in research and graduate study in wind energy.

- iv. Existing wind energy graduate population at ISU: A significant number of graduate students at ISU are currently working in wind energy-related projects as shown in the table below.

Department	Number of PhD Students	Number of MS Students
ECpE	7	4
CCEE	0	3
IMSE	4	3
AeroE	5	2
MatSE	5	1
ME	1	1
Geological and Atmospheric Sciences	1	0
Econ	2	0
<b>Total</b>	<b>25</b>	<b>14</b>

- v. A Ph.D. program in Wind Energy Science initiated at Texas Tech University in 2007 had an enrollment of 20 students in 2010.

2. Describe the state and/or national workforce need and/or demand for graduates of the proposed program currently and in the near future (provide documentation about the sources of data used to estimate need and demand.)

**US wind power has grown from 3 to 42GW since year 2000, which is the second largest growth of any generation technology nationally. During this same period, Iowa wind power has grown from 0.25 GW to 4GW, which far outstrips the growth of any other Iowa generation technology. The Department of Energy (DOE) has indicated in a recent report<sup>2</sup> that US wind power will reach 300GW by 2030, with Iowa remaining a significant contributor. This same report identified a long-term national need for graduate programs in wind energy, stating that "...the level of US graduate programs is well below similar graduate programs in Europe (Denmark, Germany, etc). At this rate, the United States will be unable to provide the necessary trained talent and**

<sup>2</sup> US Department of Energy, "20% Wind Energy by 2030 Increasing Wind Energy's Contribution to U.S. Electricity Supply," May 2008.

**manufacturing expertise. Unless this trend is reversed, even with major new wind installations in the United States, most of the technology will be imported, and a significant portion of the economic gains will be foreign rather than domestic.”**

**Another recent report<sup>3</sup> indicated that smart-grid technologies, which include wind energy, would create 140,000 permanent high value jobs.**

3. List all other public and private institutions of higher education in Iowa currently operating programs similar to the proposed new degree program. (For comparison purposes, use a broad definitional framework, e.g., such identification should not be limited to programs with the same title, the same degree designation, having the same curriculum emphasis, or purporting to meet exactly the same needs as the proposed program.)

**Currently there are no Ph.D. programs in wind energy in Iowa. The only program having some course work in wind energy is the Ulowa M.S. program in Industrial Engineering with a focus in wind power management. Ulowa has two graduate courses related to wind energy, 58:195 Contemporary Topics: Fundamentals of Wind Turbines and 56:155 Wind Power Management.**

**If the same or similar program exists at another public or private institution of higher education in Iowa, respond to the following questions:**

- a. Could the other institution reasonably accommodate the need for the new program through expansion? Through collaboration?

**No similar program exists in Iowa.**

- b. With what representatives of these programs has there been consultation in developing the program proposal? Provide a summary of the response of each institution consulted.

**Both Uoflowa and UNI have been contacted. Uoflowa Provost Barry Butler has responded with a strongly supportive letter. UNI has also provided a letter of support.**

- c. Has the possibility of an inter-institutional program or other cooperative effort been explored? What are the results of this study? (Consider not only the possibility of a formally established inter-institutional program, but also how special resources at other institutions might be used on a cooperative basis in implementing the proposed program solely at the requesting institution.)

**Although the Ulowa does not have a Ph.D. program in WESEP, they do have MS and Ph.D. students working on topics in wind energy as part of their degrees in a traditional discipline. There has been discussion about mutual benefits resulting from research collaboration and/or**

---

<sup>3</sup> “The U.S. Smart Grid Revolution: KEMA’s Perspectives for Job Creation,” 2008, available at [http://www.smartgridnews.com/artman/uploads/1/KEMA\\_s\\_Perspectives\\_for\\_Job\\_Creation.pdf](http://www.smartgridnews.com/artman/uploads/1/KEMA_s_Perspectives_for_Job_Creation.pdf).

**course sharing arrangements with Ulowa. We will continue to pursue these discussions.**

4. Estimate the number of majors and non-majors students that are projected to be enrolled in the program during the first seven years of the program.
- a. Undergraduate

Undergraduate	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Majors							
Non-Majors							

- b. Graduate

Graduate	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Majors	6	11	22	25	30	35	40
Non-Majors	20	18	15	15	15	15	15

- c. What are the anticipated sources of these students?

**We are intent on recruiting and retaining excellent students. To achieve this goal, we will recruit at the MS level and at the undergraduate level, using the ISU “direct-entry” facility for the latter group. We will rely heavily, but not only, on the NSF \$3.1M IGERT award money to recruit these students as it provides significant financial incentives (IGERT fellows must be paid \$30K/year rather than the more customary half-time RA rate of about \$20K/year). We will have four distinct mechanisms for recruiting IGERT fellows:**

- (i) **Recruit via an in-place agreement with the University of Puerto-Rico at Mayaguez (UPRM) to support four UPRM MS students as IGERT fellows in the second year of their UPRM MS program and then in their first year in the WESEP Ph.D. program.**
- (ii) **Recruit from targeted schools: These schools include the historically black colleges of University of Arkansas-Pine Bluff, Prairie View A&M (Prairie View, TX) and Bethune-Cookman University (Daytona Beach, FL), that have explicitly expressed their support of our efforts to recruit for this program. The ISU Graduate College has pledged to assist this IGERT in attracting a diverse and talented student pool. In return the WESEP faculty will participate in recruiting trips with travel support from the Graduate College. Other potential recruitment venues include Midwestern schools with high quality science and/or engineering programs that do not offer Ph.D. degrees, including Rose-Hulman (IN, #1), Milwaukee School of Engineering (WI, #11), Kettering University (MI, #17), Bradley (IL, #27), and Valparaiso (IN, #27).**
- (iii) **Recruit from a WESEP summer REU site: As indicated in question 1-g above, we have established an NSF Research Experiences for Undergraduate (REU) site for WESEP with activities to be held each summer of 2011, 2012, and 2013. The REU is an excellent**

recruiting program as it accepts only highly successful undergraduates from around the nation who have explicit interests in pursuing graduate study in wind energy. The 2011 offering was highly successful, and we expect to receive several graduate applications from these students.

- (iv) **Recruit from the ISU campus:** WESEP faculty will engage the best ISU undergraduate and MS students to participate in WESEP activities through supervision of undergraduate researchers, the McNair Scholars, (a program which prepares underrepresented students for doctoral studies), and senior design teams. In addition, ISU is in the process of developing an undergraduate minor in wind energy. Student interest in this program is very high. The five courses that comprise this program have already been taught. We expect this program to provide us with rich opportunities to recruit highly qualified ISU undergraduate students. Other campus resources will be utilized to create a comprehensive recruiting plan, including the nationally recognized Program for Women in Science and Engineering, the ISU Honors Program, and AKΣ (Women in Technical Studies). The Leadership through Engineering Academic Diversity program, which has relationships with several institutions, will be tapped to help recruit qualified students that remain under-represented in engineering areas.

**M.S. or Ph.D. students majoring in a program other than WESEP but who want to enhance their knowledge in wind energy are considered non-majors. Already on campus, most of them are expected to participate in wind energy-related courses and research activities. Initially, the number of non-major students will be relatively high; it is expected to decrease in years 1 and 2 as students are recruited into the WESEP Ph.D. program. We believe a reasonable steady-state number of non-major students is about 15.**

5. If there are plans to offer the program away from the campus, briefly describe these plans, including potential sites and possible methods of delivery instruction.
- N/A**
6. Has the proposed program been reviewed and approved by the appropriate campus committees and authorities? List them:

**The following departments, colleges, and committees have reviewed and approved the proposal.**

**Aerospace Engineering**

**Agronomy**

**Civil, Construction and Environmental Engineering**

**Economics**

**Electrical and Computer Engineering**

**Geological and Atmospheric Sciences**



**Greenlee School of Journalism and Communication**  
**Industrial and Manufacturing Systems Engineering**  
**Materials Science Engineering**  
**Mechanical Engineering**  
**Natural Resource Ecology and Management**  
**Sociology**  
**Statistics**

**Note: EEOB reviewed the proposal but was not interested in participating.**

**College of Engineering**  
**College of Liberal Arts and Sciences**  
**College of Agriculture and Life Sciences**

**Graduate College Curriculum Committee**  
**Graduate Council**  
**Faculty Senate Curriculum Committee**  
**Academic Affairs Council**

7. List date the program proposal was submitted to the Iowa Coordinating Council for Post High School Education (ICCPHSE) and the results of listserv review. (THIS WILL BE FILLED IN BY THE PROVOST OFFICE.)
8. Will the proposed program apply for accreditation? When?

**The proposed Ph.D. program will be reviewed for accreditation along with all ISU graduate programs during the next regularly scheduled visit by the Higher Learning Commission, an independent corporation and one of two commission members of the North Central Association of Colleges and Schools (NCA), which is one of six regional institutional accreditors in the United States. The Higher Learning Commission accredits degree-granting post-secondary educational institutions in the North Central region. This visit will occur in 2016.**

9. Will articulation agreements be developed for the proposed program? With whom?  
**No.**
10. Describe the faculty, facilities, and equipment that will be required for the proposed program.

**Faculty:** There are 17 founding faculty for this program, listed in the table below.

<b>Name</b>	<b>College</b>	<b>Discipline</b>	<b>Expertise</b>
1.Jim McCalley	COE	Electrical Engr	Pwr systems, plnng
2.John Jackman	COE	Ind. & Mfg. Sys Engr.	Manufacturing
3.Partha Sarkar	COE	Aerospace Engr	Aerodynamics
4.Gene Takle	CALS	AtmSci, AeroE, Agrnmy	Wind/climateScience
5.D. Aliprantis	COE	Electrical Engr	Pwr elctrncs&gen
6.Bruce Babcock	CALS	AgEcon,CntrAgRralDev	Ag econ, Policy
7.Carmen Bain	CALS	Sociology	SocScience of tech
8.Nicola Elia	COE	Electrical Engr	Control systems
9.Bill Gallus	LAS	AtmSci	Wind science
10.Mike Kessler	COE	Materials Science Engr	Composites
11.Catherine Kling	LAS	Economics	Env econ & policy
12.Bill Meeker	LAS	Statistics	Reliability
13.Frank Peters	COE	Ind. & Mfg. Sys Engr.	Manufacturing
14.Lulu Rodriguez	LAS	Journalism & comm	Communications
15.Sri Sritharan	COE	Civil, Const & Env Engr	Tower/foundation
16.Judy Vance	COE	ME, VR Application Ctr	Virtual reality
17.Lizhi Wang	COE	Ind. & Mfg. Sys Engr.	Incentive desgn,OR

#### **Facilities and equipment:**

Existing laboratory facilities will be used in this program including but not limited to the Wind Energy Manufacturing Laboratory, the Wind Simulation and Testing Laboratory, the mesoscale and regional climate models of the CSP, the Iowa Environmental Mesonet archives, the Alternate Energy Grid Infrastructure and Systems Laboratory, and the CNDE.

The Wind Energy Manufacturing Laboratory (WEML) is the newest and largest laboratory space in the Industrial and Manufacturing Systems Engineering (IMSE) department. This new facility contains over 2500 sq. ft. of space including high-bay space, climate control, and offices for graduate and undergraduate research assistants. Smaller scale wind turbine blades, on the order of 9meters long (~29 feet), can be easily accommodated in this facility.

A world-class Wind Simulation and Testing (WiST) Laboratory occupies a space of 11,000 sq. ft. in the Department of Aerospace Engineering in Howe Hall. The WiST Lab is a state-of-the-art experimental facility for conducting research, education, consulting and outreach in the area of wind-structure interaction. It is a one-of-a-kind facility for applications in wind engineering, aeronautics and industrial aerodynamics. It includes a wind tunnel with two test sections, aerodynamic and atmospheric boundary layer along with gust generation capability. It also includes two other wind tunnels and a large tornado-microburst simulation facility with translation capability.

The Climate Science Program (CSP) provides access to four different mesoscale models and 4 regional climate models for short-term wind forecasting and wind climate change analysis.

The Iowa Environmental Mesonet archives 500 MB of weather observations per day and serves out 1 TB of data daily to 15,000 users.

The Alternate Energy Grid Infrastructure and Systems (AEGIS) Laboratory is equipped with a real time digital simulator, a state-of-the-art computing platform capable of simulating power systems in real-time and with high fidelity. It also has several dynamometers, which provide the capability to test and validate a range of electric motors and power electronics systems.

The ISU Center for Nondestructive Engineering (CNDE) has equipment to perform ultrasonic, x-rays, and vibrothermonic testing which can facilitate health monitoring of wind turbines.

The above facilities will support the development of four new interdisciplinary courses in WESEP. Two of these courses, required of all WESEP Ph.D. students, will be broad, introductory courses that will introduce students to the full spectrum of science, engineering, and policy issues that pertain to wind energy. The other two courses will be advanced courses of which each WESEP Ph.D. student would take one following completion of the introductory courses as well as a group of (already existing) core courses.

The recent NSF EPSCoR award to ISU, Ulowa, and UNI for renewable energy includes a wind farm testbed that can serve as a research facility for the WESEP PhD program and support validation of high-resolution wind farm simulation models.

11. From where will the financial resources for the proposed program come (list all that apply, e.g., department reallocation, college reallocation, grants, new to the university)?

SOURCES	TOTAL AMOUNT
NSF IGERT award*	\$3,152,063

\*

In addition to student support, this award allocates \$124K to support the program director and \$94K to support secretarial assistance in administering the five year program. It also contains \$83K to support faculty in creating four new courses.

12. Estimate the total costs/total new costs (incremental increases each year in expenditures) that will be necessary for the next seven years as a result of the new program:

The table below indicates total costs and total new costs beyond those that will be supported by the NSF IGERT award. It also assumes the NSF IGERT award will be renewed for years 6-10. There are two types of activities associated with the cost information provided below: (1) the

cost of staffing courses estimated at \$20K/course; (2) the cost of staffing the Director of Graduate Education, estimated at \$5K/year.

	TOTAL COSTS	TOTAL <u>NEW</u> COSTS
Year 1	0	0
Year 2	\$45K	\$45K
Year 3	\$85K	\$40K
Year 4	\$85K	0
Year 5	\$85K	0
Year 6	\$85K	0
Year 7	\$85K	0

### Supplemental materials

(to be used at Iowa State University in the review of the proposal):

13. Program requirements, including:

Students are required to take a set of 11 courses and participate each semester in a 1-credit seminar course. Of the 11 courses, 2 are introductory wind energy courses, 8 are core courses, and 1 is an advanced specialization course in wind energy. The seminar course will address research methods and communications in science and engineering. Students are also required to pass a qualifying examination in the first 18 months of their program, a preliminary examination generally taken by the end of year 3, and a final oral defense with written dissertation to complete the program.

Initially, a new student's home department will be the same as the WESEP DOGE for administrative purposes. Within the first year of study students will select a home department associated with their major professor.

Of the 8 core courses, we require each student to take 5 courses from a primary thrust area, providing disciplinary depth, and 3 courses from a secondary thrust area, providing interdisciplinary breadth. Students can take additional courses within the other thrust areas as needed for their research, but this requirement ensures students are research-capable in 2 thrust areas.

#### Thrust areas

1. Wind resource characterization and aerodynamics of wind farms
2. Wind energy conversion system and grid operations
3. Manufacturing, construction, and supply chain
4. Turbine reliability & health monitoring
5. Economics, policy and public perception

The requirements for the Ph.D. are a minimum of 72 graduate credits of course work and research.

**Required Courses**

	<b>Credits</b>
<b>WESEP501</b>	<b>3</b>
<b>WESEP502</b>	<b>3</b>
<b>Advanced Specialization (WESEP 511 or WESEP 512)</b>	<b>3</b>
<b>Primary Thrust Area</b>	<b>12</b>
<b>4 courses</b>	
<b>Secondary Thrust Area</b>	<b>9</b>
<b>3 courses</b>	
<b>At least 1 thrust area 5 course*</b>	<b>3</b>
<b><u>Research (699A)</u></b>	<b><u>39</u></b>
<b>Total</b>	<b>72 Graduate Credits</b>

\* If the primary or secondary thrust area is area 5, then this course can come from any area.

a. prerequisites for prospective students;

**Bachelor of Science from a calculus-based undergraduate curriculum**

b. language requirements;

**None**

c. courses and seminars presently available for credit toward the program;

**Wind resource characterization and aerodynamics of wind farms**

AER E 541 Incompressible flow aerodynamics

AER E/ME 546 Comp fluid mechanics/heat transfer

AER E 570 Wind engineering

AER E 572 Turbulence

AgEds 451 Agricultural law

Agon 505 Environmental biophysics

EE 553 Power system operation

EnSci 381/382 Environmental systems I, II

Mteor 507 Mesoscale meteorology

Mteor 605 Micrometeorology

**Wind energy conversion system and grid operations**

AER E 422 Aeroelasticity  
 AER E 541 Incompressible flow aerodynamics  
 AER E /ME 546 Comp fluid mechanics/heat transfer  
 AER E 580 Wind turbine aerodynamics  
 EE 552 Power system planning  
 EE 553 Power system operation  
 EE 554 Power system dynamics  
 EE 556 Power electronic systems  
 EE 577 Linear systems  
 EE 578 Nonlinear systems  
 IE 510 Network analysis  
 IE 534 Linear programming  
 IE 631 Nonlinear programming  
 IE 632 Integer programming  
 ME 517 Advanced machine design  
 ME 543 Introduction to random vibrations and nonlinear dynamics

**Manufacturing, construction, and supply chain**

AER E /EM 514 Advanced mechanics of materials  
 AER E 522 Design and Analysis of Composite Materials  
 AER E 525 Finite element analysis  
 CE 460 Foundation engineering  
 CE 533 Structural steel design II  
 CE 534 Reinforced concrete design II  
 CE 535 Prestressed concrete structures  
 CE 541 Dynamic analysis of structures  
 CE 561 Applied foundation engineering  
 IE 503 Intro to sustainable production systems  
 IE 514 Production scheduling  
 IE 541 Inventory control & production planning  
 IE 543 Wind energy manufacturing  
 IE 546 Geometric variability in manufacturing  
 IE 549 Computer aided design & manufacturing  
 ME 520 Material & manufacturing in design  
 ME/EM 564 Fracture and fatigue  
 MSE 554 Polymer composites & processing  
 MSE 569 Mechanics of composite/combined materials  
 SCM 522 Supply chain planning & control systems

**Turbine reliability & health monitoring**

EM/MSE 550 Fundamentals of NDE  
 EM 551 Fundamentals of ultrasonic NDE engineering  
 MSE/EE 588 Eddy current NDE

Stat 500 Statistical methods  
 Stat 506 Spatial statistics  
 Stat 511 Statistical methods  
 Stat 533 Reliability  
 Stat 542 Theory of probability and statistics I  
 Stat 543 Theory of probability and statistics II  
 Stat 551 Time series analysis

**Economics, policy & public perception**

Econ 501 Microeconomics  
 Econ 537 Commodity markets: analysis and strategy  
 Econ 580 Intermediate environmental /resource economics  
 Econ 581 Advanced environmental economics  
 JIMC 547 Science communication  
 JIMC 560 Risk perception and communication  
 Soc 415 Sociology of technology  
 Soc 549 Sociology of the environment

d. proposed new courses or modifications of existing courses;

**WESEP 501 Wind Energy Resources (3-0) Cr. 3. Prereq: Graduate standing**  
**Forecasting, wind measurement and analysis, site placement, aerodynamic principles associated with blade design, power generation technologies, power electronic topologies used in wind energy conversion, collection circuits, and grid operation with high wind penetration.**

**WESEP 502 Wind Energy Systems (3-0) Cr. 3. Prereq: Graduate standing**  
**Systems approach to wind turbine design, manufacturing, installation, integrated with wind economics and policy issues. Topics include manufacturing practices used to produce wind turbines, construction practices, sensing and inspection technologies used in monitoring wind farm health, and the impact of policy making on the wind energy industry.**

**WESEP 511 Wind Energy System Design (3-0) Cr. 3. Prereq: WESEP 501 and 502**  
**Advanced design, control, and operation of wind plants. Topics include electromechanical energy conversion systems, aerodynamic and aeroelastic loads, optimal control of wind farms, life cycle management strategies, tall tower design, prediction of component residual life.**

**WESEP 512 Wind Energy System Deployment (3-0) Cr. 3. Prereq: WESEP 501 and 502**  
**Advances in manufacturing, construction, reliability, supply chain, economics and policy for wind energy. Topics include sensor optimization,**

**reliability analysis, advanced automation, fabric layup, transportation infrastructure planning, markets and public policy, and risk attitudes and perceptions.**

e. thesis and non-thesis options in master's programs;

**N/A**

f. implications for related areas within the university;

g. admissions standards for graduate programs

**Admission standards will require an undergraduate GPA of at least 3.0 (B average) and a B.S. degree from a calculus-based undergraduate curriculum. A calculus-based undergraduate curriculum is one in which students take the equivalent of two years of calculus, covering differential and integral calculus, multivariable and vector calculus, and differential equations, and one year of physics, covering mechanics, thermodynamics, electric circuits, electromagnetics, and optics. The GRE will not be required. Applicants who do not meet these general standards will be evaluated on an individual basis.**

14. Attach to the program proposal memos from the department chair(s), the college dean(s), and other appropriate persons, agreeing to the allocation of new resources and/or the reallocation of resources as described in the Regents questions
15. Attach to the program proposal, letters of support, recommendations, and statements when appropriate:
  - a. from programs at the other Regents universities
  - b. from programs and departments at ISU which are associated with the proposed program or have an interest in the proposed program

**Notes:**

1. The CIP Specialty name and number is found at:  
<http://nces.ed.gov/pubs2002/cip2000/>



## Interoffice Communication

**Date:** November 9, 2011

**To:** Professor John Jackman  
Director of Graduate Education (DOGE)  
PhD program in Wind Energy Science, Engineering and Policy (WESEP)

**From:** Dr. Richard Wlezien  
Professor and Vance and Arlene Coffman  
Endowed Department Chair in Aerospace Engineering



**Subject:** RE: Support for the proposed PhD program in WESEP

I have reviewed the two documents that you have forwarded, namely, (1) Interdepartmental Wind Energy Science, Engineering, and Policy Major Governance Document, and (2) Request to Implement a New Baccalaureate, Masters, Doctoral or First Professional Degree Program, for establishing a PhD program in Wind Energy Science, Engineering and Policy (WESEP).

This interdepartmental and interdisciplinary program proposes to produce highly needed PhD graduates who can make significant contributions to the wind energy research community. The PhD program will prepare graduates for wind energy related careers in the industry, academia, and government institutions in Wind Energy. This is a very unique graduate degree program that does not exist in Iowa and possibly elsewhere in the nation in its proposed form.

The aerospace engineering department graduate committee, chaired by Professor Zhi J. Wang, is responsible for the AerE graduate curriculum and graduate program related issues in the department. I am glad to say that this committee has reviewed this proposal for the new PhD program in WESEP and fully endorse it. As Department Chair of a participating department, I strongly support the development and approval of the PhD Program in WESEP at ISU and I wish you success in directing this program.

IOWA STATE UNIVERSITY  
OF SCIENCE AND TECHNOLOGY

Department of Agronomy  
*Crop, Soil, and Environmental Sciences*  
1126 Agronomy Hall  
515 294-3064  
FAX: 515 294-8146

e-mail: [teloynac@iastate.edu](mailto:teloynac@iastate.edu)

October 28, 2011

Professor John Jackman  
Director of Graduate Education (DOGE)  
Ph.D. program in Wind Energy Science, Engineering and Policy (WESEP)

RE: Support for establishment of the Ph.D. program in WESEP

Dear Prof. Jackman:

As the Director of Graduate Education of the Department of Agronomy, I have reviewed the two documents provided for establishing a Ph.D. program in Wind Energy Science, Engineering and Policy (WESEP):

- 1) Governance Document and
- 2) Request to Implement a New Baccalaureate, Masters, Doctoral or First Professional Degree Program.

This interdisciplinary program proposes to educate needed Ph.D. graduates for the industry, academia, and government institutions in Wind Energy. Such a program does not exist in Iowa and the proposed program helps to bridge a gap in training such engineers, researchers, and governmental officials for the ongoing and future development of wind energy in Iowa.

The Agronomy Department Graduate Advisory Council, which represents the agronomy faculty, reviewed the proposal for the new Ph.D. program. This council, which I chair, unanimously supports it. The proposal was also reviewed at a faculty meeting this morning, and is strongly supported by Agronomy Department Chair Kendall Lamkey. This indicates there is strong endorsement from the faculty of the Agronomy Department for the Ph.D. program in Wind Energy Science, Engineering and Policy.

I wish you great success in establishing and running the program.



Thomas E. Loynachan  
Director of Graduate Education  
Department of Agronomy

**IOWA STATE UNIVERSITY**  
OF SCIENCE AND TECHNOLOGY

College of Engineering  
Department of Civil, Construction  
and Environmental Engineering  
Ames, Iowa 50011-3232  
Phone: (515) 294-5238  
FAX: (515) 294-8216  
Email: sri@iastate.edu

December 16, 2011

Professor John Jackman  
Director of Graduate Education (DOGE)  
PhD program in Wind Energy Science, Engineering and Policy (WESEP)

Dear Prof. Jackman:

RE: Support for establishment of the PhD program in WESEP

As the Director of Graduate Education of the Department of Civil, Construction and Environmental Engineering, I wish to inform you that our faculty reviewed the following two documents

- 1) Governance Document and
- 2) Request to Implement a New Baccalaureate, Masters, Doctoral or First Professional Degree Program

for establishing a PhD program in Wind Energy Science, Engineering and Policy (WESEP and voted in favor of the adoption of the proposed Ph.D. in Wind Energy Science, Engineering, and Policy to the College of Engineering Curriculum Committee.

The CCEE department realizes that the interdisciplinary program proposes to produce highly needed PhD graduates for the industry, academia, and government institutions in Wind Energy. For this reason, the CCEE Interim Department Chair Terry Wipf also strongly supports the proposed plan. These positive outcomes may be interpreted as strong endorsement from the faculty of CCEE for the PhD program in Wind Energy Science, Engineering and Policy.

My best wishes in establishing and successfully running the proposed PhD program.

Yours sincerely,



Sri Sritharan  
Wilson Professor of Engineering and  
Director of Graduate Education

cc: Professor Terry Wipf, Interim Chair of CCEE

Vitalij K. Pecharsky  
Director of Graduate Education (DOGE)  
Department of Materials Science and Engineering  
tel: 515-294-8220; 515-294-5485  
email: zhengdao@iastate.edu

November 9, 2011

Professor John Jackman  
Director of Graduate Education (DOGE)  
PhD program in Wind Energy Science, Engineering and Policy (WESEP)

RE: Support for the establishment of PhD program in WESEP

Dear Prof. Jackman:

The Graduate Studies Committee (GSC) of the Department of Materials Science and Engineering (MSE) at its meeting on October 7, 2011 has considered the following documents

- 1) Governance Document and
- 2) Request to Implement a New Baccalaureate, Masters, Doctoral or First Professional Degree Program

for establishing a PhD program in Wind Energy Science, Engineering and Policy (WESEP). The interdisciplinary program proposes to prepare PhD graduates for the industry, academia, and government institutions in Wind Energy. Such a program does not exist in Iowa and the proposed program should help to bridge a gap in training such engineers, researchers, and governmental officials for the ongoing and future development of wind energy in Iowa.

The MSE GSC unanimously supports your proposal. Our department chair – Prof. Richard LeSar is also supporting the establishment of the program. For your information, the MSE Graduate Studies Committee believes that the program can be improved by implementing the following minor changes:

- Include MSE 457X/557X (Chemical and Physical Metallurgy of Rare Earth Metals) as an elective
- Include MatE 363X (Materials for Wind Energy) with an extra component, such as a modeling project, as an elective
- We note that electrical energy storage component is missing in the list of courses. We suggest that you consider developing a new graduate course on this subject
- A requirement of a multidisciplinary seminar would be useful for the students in the program

- The primary thrust area would benefit from a clearer definition in the documents that we reviewed
- The long time goal(s) for this program, especially after the support expires, should be broadened to energy systems.

I wish you great success in establishing and running the program.

Vitalij K. Pecharsky

A handwritten signature in blue ink, appearing to read "Vitalij K. Pecharsky". The signature is fluid and cursive, with the first name being the most prominent.

Director of Graduate Education  
Department of Materials Science and Engineering

October 21, 2011

Professor John Jackman  
Director of Graduate Education (DOGE)  
PhD program in Wind Energy Science, Engineering and Policy (WESEP)

**RE: Support for establishment of the PhD program in WESEP**

Dear Prof. Jackman:

As the Director of Graduate Education of the Department of Electrical and Computer Engineering, I have reviewed the two documents

- 1) Governance Document and
- 2) Request to Implement a New Baccalaureate, Masters, Doctoral or First Professional Degree Program

for establishing a PhD program in Wind Energy Science, Engineering and Policy (WESEP). The interdisciplinary program proposes to produce highly needed PhD graduates for the industry, academia, and government institutions in Wind Energy. Such a program does not exist in Iowa and the proposed program helps to bridge a gap in training such engineers, researchers, and governmental officials for the ongoing and future development of wind energy in Iowa.

The ECpE department Graduate Committee, which represents the ECpE faculty, reviewed the proposal for the new PhD program. This committee, which I chair, unanimously supports it. The proposal was also reviewed by ECpE Department Chair David Jiles, who also strongly supports it. These indications may be interpreted as strong endorsement from the faculty of ECpE for the PhD program in Wind Energy Science, Engineering and Policy. I wish you great success in establishing and running the program.

Sincerely Yours,



Zhengdao Wang  
Director of Graduate Education  
Department of Electrical and Computer Engineering  
Iowa State University  
tel: 515-294-8362 email: zhengdao@iastate.edu

# IOWA STATE UNIVERSITY

College of Engineering  
Department of Industrial and  
Manufacturing Systems Engineering  
3004 Black Engineering Building  
Ames, Iowa 50011-2164  
Tel. 515 294-1682  
FAX 515 294-3524  
[www.imse.iastate.edu](http://www.imse.iastate.edu)

## Memorandum

Date: December 15, 2011

Subject: Support of Wind Energy Science, Engineering, and Policy Ph.D. Proposal

To: John Jackman

From: Janis P. Terpenny  
Department Chair and Joseph Walkup Professor

This memo is to relay the vote and endorsement of the Wind Energy Science, Engineering, and Policy Ph.D. proposal. The faculty in Industrial and Manufacturing Systems Engineering have reviewed the proposal and voted to support the program. As department chair, I also give my full support from the department and our commitment to support its success.

A handwritten signature in black ink that reads "Janis P. Terpenny". The signature is written in a cursive style with a large, looping initial "J".



**IOWA STATE UNIVERSITY**  
OF SCIENCE AND TECHNOLOGY

College of Engineering  
Mechanical Engineering Department  
2025 Black Engineering Building  
Ames, Iowa 50011-2161  
515/294-1423  
FAX 515/294-3261  
<http://www.me.iastate.edu/>

October 21, 2011

Professor John Jackman  
Director of Graduate Education (DOGE)  
PhD program in Wind Energy Science, Engineering and Policy (WESEP)

RE: Support for establishment of the PhD program in WESEP

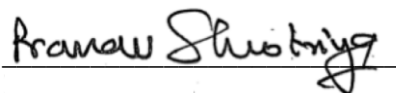
Dear Prof. Jackman:

As the Director of Graduate Education of the Department of Mechanical Engineering, I have reviewed the two documents (listed below) that you forwarded for establishing a PhD program in Wind Energy Science, Engineering and Policy (WESEP)

- 1) Governance Document and
- 2) Request to Implement a New Baccalaureate, Masters, Doctoral or First Professional Degree Program

The interdisciplinary program proposes to produce highly needed PhD graduates for the industry, academia, and government institutions in Wind Energy. Such a program does not exist in Iowa and the proposed program helps to bridge a gap in training such engineers, researchers, and governmental officials for the ongoing and future development of wind energy in Iowa.

The ME department Graduate Committee and faculty have reviewed the proposal for the new PhD program. The faculty unanimously supports it. The proposal was also reviewed by ME Department Chair Ted Heindel, who strongly supports it. These indications may be interpreted as strong endorsement from the faculty of ME for the PhD program in Wind Energy Science, Engineering and Policy. I wish you great success in establishing and running the program.



Pranav Shrotriya  
Associate Professor  
Associate Chair for Graduate Studies and Research  
Department of Mechanical Engineering  
Iowa State University of Science and Engineering



October 25, 2011

Professor John Jackman  
Director of Graduate Education (DOGE)  
PhD program in Wind Energy Science, Engineering and Policy (WESEP)

RE: Support for establishment of the PhD program in WESEP

Dear Professor Jackman:

As the Chair of the Department of Sociology, I have reviewed the pertinent documents for establishing a PhD program in Wind Energy Science, Engineering and Policy (i.e., Governance Document and Request to Implement a New Baccalaureate, Masters, Doctoral or First Professional Degree Program).

The proposed interdisciplinary program addresses a critical need to produce PhD graduates trained in sciences related to wind energy to serve the industry and academic and government institutions. Such a program does not exist in Iowa and the proposed program helps bridge a gap in training engineers, researchers, and governmental officials for the ongoing and future development of wind energy in Iowa.

The Department of Sociology Graduate Curriculum Committee has reviewed and approved the proposal for the Wind Energy Science, Engineering and Policy program. I wish you great success in establishing and running this program.

Sincerely,

Paul Lasley, Professor and Chair  
Department of Sociology

IOWA STATE UNIVERSITY  
OF SCIENCE AND TECHNOLOGY

College of Liberal Arts and Sciences  
Greenlee School of Journalism  
and Communication  
114 Hamilton Hall  
Ames, Iowa 50011-1180  
515 294-4340  
FAX 515 294-5108

Dr. John K. Jackman  
Department of Industrial and Manufacturing Systems Engineering  
3004 Black Engineering Bldg.  
Ames, IA 50011-2164

Oct. 21, 2011

Dear Dr. Jackman:


This letter is to endorse and strongly support the proposal to establish a doctoral program in Wind Energy Science, Engineering and Policy at Iowa State University. I and members of our Graduate Steering Committee have discussed this proposal. We appreciate that the proposal recognizes the role of communication in the effort to make Iowa a leader in clean energy. We see this proposed PhD program as a strategic move to establish Iowa State as the national and international hub for the harnessing of wind power for our energy needs. The Greenlee School is excited to be a part of this interdisciplinary endeavor.

The current proposal includes two relevant Greenlee School courses – Risk Communication (JI MC 560) and Science Communication (JI MC 547). We consider that these two courses would be relevant to the goals of the proposed PhD program, and we welcome graduate students from this new PhD to both courses. As the program unfolds, and as the involvement of our own professors deepens, it may be possible to offer a special seminar or other coursework as well. Greenlee School faculty members have been involved in communication issues leading to conservation and energy sustainability for many years. This opportunity to become engaged in teaching and research in this new vital area will increase our focus in this area that is so important to the priorities of the university as well as the state of Iowa.

Although our major does not currently have its own PhD program (we have a proposed PhD of our own in Science, Technology and Risk Communication that has been approved by the Faculty Senate and now is on the Provost's desk), our faculty have worked with PhD students as major professor through the Human Computer Interaction Interdisciplinary PhD program. Our faculty members also have served on PhD committees in many other majors. We see no conflict between the proposed PhD in WESEP and our own PhD proposal; in fact, they represent complementary efforts to strengthen the university's capacity to address key state priorities such as energy sustainability.

We are ready to participate in research efforts that aim to develop a public that is literate about wind science and engineering. We also offer our assistance in assessing the public's understanding of and attitudes toward this innovation. We look forward to assisting this program in developing a strong communication dimension.

Sincerely,



Eric Abbott  
Professor  
Director of Graduate Education  
Greenlee School of Journalism and Communication

*Interoffice Communication*

**DATE:** October 5, 2011

**TO:** Prof. John Jackman  
COE and IMSE

**FROM:** Neal Iverson, Professor and Chair  
Geological and Atmospheric Sciences (GEAT)

**RE:** Proposed Ph.D. program in WESEP

I have looked over the WESEP governance document and the request to the Board of Regents to develop the new program. Our faculty has also reviewed the documents. The faculty of GEAT and I fully approve of this timely new program in wind energy.

IOWA STATE UNIVERSITY  
OF SCIENCE AND TECHNOLOGY

Department of Economics  
Heady Hall  
Ames, Iowa 50011-1070  
515 294-6741  
FAX 515 294-0221

November 16, 2011

Professor John Jackman  
Director of Graduate Education  
Ph.D. program in Wind Energy Science, Engineering, and Policy

Dear Professor Jackman:

I read your proposal for a new interdisciplinary Ph.D. program in Wind Energy Science, Engineering, and Policy. I have also consulted with Sergio Lence, a colleague of mine here in Economics and a member of the Graduate College Curriculum Committee. Prof. Lence briefed me on some of the points he raised when the proposal was discussed by the committee last Thursday. I am generally sympathetic to his concerns about the current draft, but I understand that there are plans to revise it along the lines he suggested, and I am happy to trust that committee's judgment of the acceptability of the revisions.

I think that this program will help to serve a critical national need for experts qualified to undertake interdisciplinary research related to the ongoing development of wind energy in the United States. I certainly have no objection to the proposed new program. There is a chance that it would lead to increased enrollments in the four graduate-level economics courses that would be available for credit in the program. That would be a welcome development from our perspective.

Thanks for your work on this and good luck with your program development efforts going forward.

Regards,



John R. Schroeter  
Professor  
Director of Graduate Education  
Interim Chair

## Jackman, John K [IMSE]

---

**From:** Blodgett, Sue [ENT]  
**Sent:** Friday, February 03, 2012 4:59 PM  
**To:** Jackman, John K [IMSE]  
**Subject:** NREM interest in WESEP

3 February 2012

Dear John,

The Natural Resource Ecology and Management (NREM) Department has reviewed your 'Request to Implement a Ph.D. program entitled, Wind Energy Science, Engineering, and Policy' (WESEP). Thank you very much for including NREM in your request. Faculty that conduct research in the area of wind energy impacts on wildlife are very interested in participating in this program.

The faculty voted unanimously to accept your invitation to include NREM as one of the departments involved in this proposal

Thank you very much.

Sincerely,



Sue Blodgett, Chair

Sue Blodgett, Chair  
Entomology (ENT) and Natural Resource Ecology and Management (NREM) Departments  
339 Science II  
Iowa State University  
Ames, IA 50011  
(515) 294-1739  
[sblodg@iastate.edu](mailto:sblodg@iastate.edu)



OFFICE OF THE EXECUTIVE  
VICE PRESIDENT AND PROVOST

111 Jessup Hall  
Iowa City, Iowa 52242-1316  
319-335-3565 Fax 319-335-3560  
www.provost.uiowa.edu

November 9, 2011

Professor John Jackman  
Iowa State University  
3004 Black Engineering  
Ames, IA 50011-2164

Dear Professor Jackman,

I am writing this letter in support of the establishment of a PhD program at Iowa State University (ISU) in Wind Energy Science, Engineering and Policy (WESEP). As an academician and active member of the state and national wind energy community, I believe the establishment of such a program at ISU is timely and will compliment other educational, research and industrial partnership activities throughout Iowa. ISU is ideally suited for WESEP given its strength in the academic sub-disciplines that comprise the interdisciplinary WESEP program. Furthermore, their recent NSF IGERT award is proof of national recognition for the faculty's ability to deliver the required academic content. As co-chair of the American Wind Energy Association's (AWEA) Research and Development Committee, member of the AWEA Education Committee, and Advisor to the AWEA Board of Director's, I can state that WESEP fills a national need for focused wind energy graduate programs.

Since 2006, approximately one-third of all new electric generating capacity installed in the U.S. was derived from wind. Furthermore, the U.S. Department of Energy (DOE) and AWEA completed a feasibility study, "20% Wind Energy by 2030", investigating the possibility and requirements for 20% of the nation's electricity being wind energy produced by 2030. As wind energy in the U.S. continues on its upward growth trajectory, we are likely to see a clustering of activities around a single geographical region. Much like "Silicon Valley" is to the electronics and information technology industries, wind energy's center of excellence in the U.S. will have a nearby supply of highly-educated talent, close partnerships between industry and research universities, an entrepreneurial spirit, and a welcoming business climate. Iowa is well positioned to become known as the "Silicon Valley of Wind Energy Technology," and having the WESEP at ISU will be a critical component of Iowa's strategy to be a leader in wind energy.

Through a number of wind-related grants from industry, and federal and state agencies, the level of wind energy activity in Iowa has grown exponentially over the past 5 years. WESEP is designed to establish ISU as the nation's leading center for wind research, education and industrial innovation.

In closing, I enthusiastically endorse the proposal.

Sincerely,

A handwritten signature in black ink that reads "P. Barry Butler".

P. Barry Butler  
Executive Vice President and Provost

November 16, 2011


Dr. John K. Jackman  
Associate Professor  
College of Engineering  
3004 Black Engr  
Ames, IA 50011-2164

Dear Professor Jackman,

I have received a copy of your proposal for a Ph.D. program in Wind Energy from Dr. Shoshanna Coon. After reviewing your proposal, I am writing to confirm my full support of your desire to pursue a Ph.D. program in Wind Energy.

The University of Northern Iowa currently does not have a degree in Wind Energy and I feel the State of Iowa would benefit greatly from your proposal. The benefits of wind energy are far reaching and I wish you the best in your pursuit of this degree option.

Sincerely,



James Maxwell  
Department Head & Professor

c: Joel Haack, Dean, College of Humanities, Arts and Sciences  
Shoshanna Coon, Associate Dean, Graduate College

To: Faculty Senate Academic Affairs Council

From: John Jackman, Jim McCalley

Date: April 17, 2012

Re: Response to College of Liberal Arts and Sciences Curriculum Committee ( LASCC) Comments on Proposal for a new PhD degree in Wind Energy Science, Engineering and Policy (WESEP)

LASCC provided three comments in regards to our proposal for a new PhD degree in Wind Energy Science, Engineering and Policy (WESEP). These three comments are stated below, in italics, followed by our response, in bold.

*1. There seems to be little, if any, coordination between the recently approved "Wind Energy Minor" and the proposed graduate/Ph.D. WESEP degree - Is there an overarching committee for wind-energy curricula that should be integrated and talking with one another to present an organized set of related degrees? This extends to the IGERT-related coordination of that part of the degree proposal and resources from the grant. This is not clearly discussed as to program priorities and timing requirements for the grant to support the start-up of the degree?*

**RESPONSE:**

**The WESEP PhD degree program is administered by a supervisory committee. In addition, a significant amount of WESEP work is done by the admissions committee which is currently comprised of the five IGERT investigators. The Wind Energy Minor is overseen by the Wind Energy Minor Committee (WEMC). We intend that there will be significant overlap between membership of the two WESEP committees and the WEMC, and through this overlap, high awareness among faculty in regards to related activities of the two degree programs. To formalize this, there will be an appointed liaison between the two degree programs who will be a member of one of the WESEP committees and the WEMC. In addition, one of the WESEP committees and the WEMC will include an agenda item in at least one meeting per year dedicated to considering the activities of the other committee.**

*2. What is meant by a "Calculus Based background" with respect to students eligible to apply for this program. Can a music major who took a calculus course be an acceptable candidate? This is imprecisely defined as to preliminary basic requirements for admission to the program, and should be revised to reflect a bit more specificity as to what is meant. Specific degree, course, or other experience requirements would be helpful to define the acceptable candidates for admission to the program.*

**RESPONSE:**

**We have inserted the following language into the proposal, in response to questions 13a and 13g.**

**“A calculus-based undergraduate curriculum is one in which students take the equivalent of two years of calculus, covering differential and integral calculus, multivariable and vector calculus, and differential equations, and one year of physics, covering mechanics, thermodynamics, electric circuits, electromagnetics, and optics.”**

*3. A concern was raised regarding the "Communication of Science" aspect of the proposal. There seems to be no formal course requirements for communications courses relevant to the stated goals of the degree. Where is the communications training coming from, or is this assumed to be part of the research credits? This point is not clearly articulated, or if it is intended to be a course component of the Ph.D. curriculum, it is missing.*

**RESPONSE:**

**Students are required to take a 1-credit seminar course every semester during the degree program. This seminar course will explicitly address communication of science via formal lectures on the**



subject, and it will provide opportunity for students to practice what is addressed via written and oral communications. To this end, the response to question 13 in the proposal has been modified as shown below, in red.

Students are required to take a set of 11 courses and participate each semester in a 1-credit seminar course. Of the 11 courses, 2 are introductory wind energy courses, 8 are core courses, and 1 is an advanced specialization course in wind energy. **The seminar course will address research methods and communications in science and engineering.** Students are also required to pass a qualifying examination in the first 18 months of their program, a preliminary examination generally taken by the end of year 3, and a final oral defense with written dissertation to complete the program.