October 23, 2017

To: Sarah Mangelsdorf, Provost and Vice Chancellor for Academic Affairs

From: Ian Robertson, Dean of the College of Engineering

Re: Final Summary of the Program Review for the Environmental Chemistry and Technology Graduate Program

The Environmental Chemistry and Technology (ECT) Graduate Program review was completed by a review committee chaired by: George Huber, Professor of Chemical and Biological Engineering, with members: Steve Loheide, Associate Professor, Civil and Environmental Engineering, Christopher Rutland, Professor, Mechanical Engineering, and Nicole Perna, Professor of Genetics.

The review committee was charged with assessing the strengths and weaknesses of the program and recommendations for future directions. The College of Engineering APC discussed and approved the review committee report on October 18, 2017. Based on my review of their report and the APC response, I am providing the following executive summary of the program review:

Overview

Strengths of the ECT Program include a strong multi-disciplinary program that trains students in applying chemistry to environmental and engineered systems, graduate students who are very satisfied with the program and engaged with faculty, graduates who have gone on to academic positions, and faculty who are research active.

Weaknesses of the ECT Program include no full-time full professors, facilities that are in need of renovation, facilities that are geographically located far from the engineering campus, and a lack of administrative support and limited engagement from senior faculty that raise program sustainability concerns.

Recommendations

We recommend developing a strategic plan through Civil and Environmental Engineering and the dean’s office about the sustainability of resources that the ECT program will have available. This strategic plan should address how to increase the ranks of senior faculty associated with the
program, especially in the area of air quality, and identify viable future program directions. We also recommend developing plans to renovate facilities, integrate the facilities into the engineering campus, and resolve conflicts in shared laboratories.

Attachments
Review Committee Report

Copies:
James P. Hurley, Graduate Program Chair, Environmental Chemistry and Technology Graduate Program
George Huber, Professor of Chemical and Biological Engineering
Jocelyn Milner, APIR
Bill Karpus, Graduate School
Sarah Kuba, Associate Academic Planner, Academic Planning and Institutional Research
Marty Gustafson, Assistant Dean for Academic Planning and Assessment, Graduate School
Jake Blanchard, Executive Associate Dean, College of Engineering
Darryl Thelen, Associate Dean for Research and Graduate Affairs, College of Engineering
Laura Albert, Assistant Dean for Graduate Affairs, College of Engineering
Review Committee Members

- George W Huber, Professor, Chemical and Biological Engineering (Chair)
- Steven P Loheide, Associate Professor, Civil and Environmental Engineering
- Christopher Rutland, Professor, Mechanical Engineering
- Nicole T Perna, Professor, Genetics (Graduate Faculty Executive Committee Representative)

Review Process

1. After reviewing the material sent by the ECT department, the committee prepared a list of questions about the ECT program and an agenda for the ECT meeting. The committee met in person on August 25th and had a more in-depth discussion about the ECT program. The committee sent this list of questions to ECT on August 25th.

2. On August 28th, the committee visited the Water Science and Engineering Laboratory and toured the facility. The committee met first with Christopher Worley (the only staff in the ECT program). Then the committee met individually for 45 minutes with Professors James Hurley (ECT program chair), Matthew Ginder-Vogel (assistant professor) and Christina Remucal (assistant professor). Professor Hurley has a 25% appointment in ECT. Professor Ginder-Vogel and Remucal are the only two full-time core faculty (defined as faculty who have 100% appointments in ECT) in this program at the time of the interview. A third core full-time faculty (Greeshma Gadikota) was starting as an assistant professor in September and was not interviewed. Professor James Schauer, who has recently started a new position as the director of the Wisconsin State Laboratory of Hygiene, was also not interviewed. Professor Schauer has a 10% appointment in ECT. In addition, there are nine additional faculty affiliated with the ECT program. All the faculty have their full-time tenure homes in other departments (primarily CEE). After meeting with the core faculty, we then met with 1 MS student and 5 PhD students in the program.

3. We had a meeting on September 26th with Professor David Noyce, the department chair of Civil and Environmental Engineering (CEE).

Overview of the program

The Environmental Chemistry and Technology (ECT) program offers both MS and PhD degrees. The program was established in 1962 as the Water Chemistry program. The focus of the program was to provide training for graduate students in
the application of chemistry to aquatic systems. In the 1960 and 70s this program grew rapidly due to environmental concerns about pollutants in the aquatic system. Several of the graduates in the program went on to positions in academia and government environmental regulatory agencies. In the 1990s the program expanded their research focus to other environmental problems and identified air pollution chemistry as a priority. The program then changed their name to the Environmental Chemistry and Technology program. The program fills a unique niche of the analysis of applied environmental chemistry problems in both natural and engineered systems. The faculty and graduate students that we interviewed felt that this was the only program where their unique skill set (including analytical chemistry, air chemistry, water chemistry, soil science modeling, and environmental technology) could be utilized to solve applied environmental problems.

The program is part of the CEE Department and is housed in the Water Science and Engineering Laboratory (near Memorial Union). ECT currently has three full time core faculty: Matthew Ginder Vogel (assistant professor), Christina Remucal (assistant professor) and Greeshma Gadikota (assistant professor). There are two part time core faculty: James Hurley (25% appointment) and James Schauer (10% appointment). There are 9 other affiliate faculty in the program. These affiliate faculty have their core homes in chemistry, CEE, CBE, soil science, geoscience and biological systems engineering, and in the Wisconsin State Laboratory of Hygiene. Three core faculty retired from 2007-2011. In 2017 one core faculty member (James Schauer) became head of the Wisconsin State Laboratory of Hygiene now having only a 10% appointment in ECT. The strategic plan is to hire one more full time faculty member in the next two to five years.

From 2012-2015 the program awarded 7 PhD and 3 MS degrees. In 2015 the program has 13 PhD students and 2 MS students with a projected plan that this number will grow to 20 in 2016/17. Two thirds of the graduate students are women in the program. Most of the graduate students we interviewed had BS degrees in chemistry from smaller colleges. Of the graduates from 2005-2016 46% are in academia 22% are in the private sector 14% are in public sector agencies and 11% are in non-profits. The starting salary after graduate school ranged from $50,000-70,000 for 58% of the graduates.

The program has one full time staff member (Christopher Worley) who helps with facilities, safety and running the laboratory that is paid 50% on soft money.
In 2010 the ECT program was ranked by the National Research Council with Civil, Biological Systems and Environmental Engineering Departments. Three programs at UW were included in this ranking including ECT, CEE and Geological Engineering. Out of 130 programs ECT was ranked between 11-43 based on the S-ranks. Using research criteria (which includes publications, citation rates and grants), ECT was ranked between 5-30. For the US News and World Reports graduate rankings the ECT programed is combined with the CEE department in the Environmental Engineering programs. In the latest US News and World Report ranking the environmental engineering at UW Madison was ranked 12th.

ECT Strengths
1. This program fills an important societal need in environmental chemistry. The program is multi-disciplinary and has a good breadth of application. The program provides a good bridge for science students who want to apply chemistry knowledge to environmental and engineered systems. The program also allows other faculty, outside ECT, who have interests in environmental chemistry to become affiliates, mentor graduate students, and collaborate on environmental issues.
2. A large number of graduates have gone onto academic positions. Most go onto teach at smaller colleges, while others have gone on to positions at Research 1 institutions (Berkeley)
3. ECT faculty are publishing at a higher rate and have more citations than other CEE faculty.
4. The graduate students are genuinely excited about this program and receive attention from the faculty. The graduate students felt a strong sense of community in this program. Most feel connected with the faculty and to each other (but see concerns below about whether this extends beyond participants in the core building).
5. There have been no major safety incidents. The building manager knows about past safety issues and trains the students in the building. SOPs and CHPs are up to date (according to building manager).
6. The two assistant professors are publishing, receiving grants and doing well in their field.
7. The graduate students get real world training on state of the art analytical tools for environmental testing of air and water. Some of this occurs through connections that the faculty have with both on- and off-campus research programs, agencies and facilities such as the State Laboratory of Hygiene. New analytical tools and sensors are being developed and utilized in this program for air and water testing.
8. The program provides graduate classes in environmental chemistry that are important to other graduate programs including CEE, CBE, and chemistry. Twenty five non-ECT graduate students and 34 undergraduate students took ECT graduate classes in 2016-17. The 5 ECT graduate classes had a total enrollment of 83 students.

ECT Program Concerns
1. This program has no full-time full professors. Full professors were replaced by assistant professors and one full professor recently left the program.
2. There is a perceived lack of administrative support by ECT faculty. There is no full time administrative support in the water chemistry building. The faculty do get administrative support from CEE. (According to the CEE department chair) Faculty in ECT get the same administrative support as other CEE faculty. The staff in CEE are all located in Engineering Hall.
3. The facilities are very old. There has been some recent renovation of the graduate student area. There are additional plans to continue to renovate the buildings and laboratories. This renovation is being funded by CEE and the College of Engineering.
4. There is confusion about the graduate handbook for the ECT program. Graduate students expressed some confusion about several of the rules required for graduation. ECT uses the CEE handbook for academics, WSEL and tracking forms for meetings with APC. There is a lack of support for putting together a graduate handbook specifically for ECT students. None of this information is available electronically to the students.
5. ECT lacks a mechanism by which it can request the hiring of new faculty directly if a critical need arises. Rather, the strategic hiring plan for the program is tied to that of CEE, which may or may not perceive the same needs as the ECT program faculty. CEE needs to continue and augment efforts to ensure ECT program faculty and students feel fully integrated into the department given their distributed locations, recent leadership changes, and preponderance of junior faculty.
6. On the laboratory tour there were some minor safety violations which represent a relaxed safety culture. Some students not wearing proper eyewear in laboratories. The building laboratory manager wore shorts. The laboratory manager did not enter any laboratories with shorts.
7. The facilities are a 15-20 minute walk from the rest of the engineering campus. This department is isolated from the rest of Engineering. This can cause
problems when seminar speakers come and when engineering students want to take ECT classes.

8. The median time to a PhD degree was high (6.5 years in 2013, 6.4 years in 2014, 5.0 years in 2015 and 7.0 years in 2016). It should be noted that prior to this time period the median time to a PhD was 4.4 years. [ECT’s note: Though limited data on recent years was provided by a source other than our self-study, the ten-year median time to a Ph.D. is not high. It is 4.4 years and a full year shorter than our peer institutions. The additional data provided to the committee gives the appearance of 7.0 years as the norm. That was due to limited graduates in 2014-16 (reflecting faculty retirements and transition). Since our report, three Ph.D.’s have been awarded (students of Remucal and Ginder-Vogel), averaging 4.6 years to completion.]

9. There are concerns about the sustainability of this program. If more senior faculty do not become involved and more administrative help is not given to this program it is possible that successful junior faculty will leave for other programs.

10. The program’s written program level learning goals are primarily a restating of the graduate school’s minimal expectations and not specific to the ECT program. There is no assessment plans. (ECT response: Program concern 10 (p. 4) is not warranted by the information provided to the committee. Our faculty developed an extensive Ph.D. assessment plan and has reported twice on our outcomes (Nov. 2016 to Grad School; Sept. 2017 to Engineering). The Ph.D. assessment plan was provided in the self-study appendices and contains details of our learning goals and our assessment, with details down to the course level. Perhaps the committee received a plan from UW Engineering that was developed for us as a template, but our detailed EC&T-centric learning goal assessment plan was submitted to the Graduate School in June 2016.)

11. Students not housed in the Water Science and Engineering Laboratory are physically separated from the majority of the students in the program and are not as connected with the program.

Recommendations
1. This program should increase its ranks at the senior professor level. The program has no full-time full professors. They should especially consider the area of air chemistry, now that Jamie Schauer currently has a 10% appointment in the program.

2. The program should make a graduate handbook or make sure all there students are aware of the CEE graduate handbook. The graduate students were confused
about the requirements for this program. (Currently the ECT academic planning committee is drafting a student handbook.) The program should consider developing more specific program level learning goals and an assessment plan.

3. The program should develop a clear strategic plan through CEE and the dean’s office about the sustainability of resources that they will have available.

4. A clear plan is needed about the facilities for this program. How will they raise the funds for a new building or renovating a building? How will they be integrated into the engineering campus? The water chemistry building is in a very beautiful location next to Lake Mendota and Memorial Union. However, it is far from the engineering campus and the chemistry building. The program should take measures to ensure that ECT faculty and students remain connected across facilities, and with CEE.

5. All the laboratories are shared. There is no clear plan about facility rules and ownership. This is likely to cause conflict in the future.

6. The program should work through a self-evaluation exercise and determine viable future directions. For example, it would seem promising to expand to become a multi-disciplinary hub for campus wide water initiatives.

7. The program should strive to decrease the median time to a PhD to 5 years. They should put policies in place that will help the graduate students be more successful (in publications, presentations) in a shorter time. (ECT’s note: Given the information provided above, Recommendation 7 (p. 4) has been met for the ten-year window (4.4 years) and in the current track of Ph.D.’s since the report has been submitted (4.7 years).)
Students with an Appointment of 33% or Higher

This visualization was created by the Graduate School. Questions should be directed to Peter Kinsley, peter.kinsley@wisc.edu.
PhD Time-to-Degree Metrics, Peer Comparison

This visualization was created by Academic Planning and Institutional Research (APIR), Office of the Provost, UW-Madison. Questions should be directed to Sara Lazenby, sara.lazenby@wisc.edu.