

Energy Systems Management Assessment Report
ACADEMIC YEAR 2017 – 2018

I. LOGISTICS & PROGRAM LEARNING OUTCOMES

1. Please indicate the name and email of the program contact person to whom feedback should be sent (usually Chair, Program Director, or Faculty Assessment Coordinator).

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2. Were any changes made to the program mission statement since the last assessment cycle in October 2017?

Yes. The previous mission statement was:

The MS in Energy Systems Management provides students with the knowledge, skills, and understanding to find meaningful work in the energy sector and to support the evolution of the low-carbon energy future.

The revised mission statement is:

The MS in Energy Systems Management provides students with the knowledge, skills and networks to be leaders in the transition to a clean energy future.

The changes to the mission statement were based on comments from the last assessment plan as well as a review of the statement in a board meeting in May 2018. The new statement was approved by the internal board.

3. Were any changes made to the program learning outcomes (PLOs) since the last assessment cycle in October 2017?

Yes, changes were made based on 1) A board meeting focused on the PLOS and 2) Comments from Alexandra Amati about the previous version.

The previous PLOs were as follows:

- Utilize principles and processes of whole systems thinking to understand how the electricity and power system impacts and is related to ecological and social systems;
- Demonstrate understanding of the electricity policy and market environments and their impact on energy consumption and production;
- Demonstrate understanding of the human dimension of electricity systems including managing for change, stakeholder engagement, and customer engagement;
- Communicate skillfully through written reports and oral presentations in styles relevant to the energy field;
- Utilize critical analysis to understand why the current electricity generation and distribution system evolved and how to move it towards the 21st century grid.

The ENGY Board (including faculty board members) met in May of 2018 to discuss the PLOs. We started the evening with a discussion of what skills students should be developing for jobs in the renewable energy industry. We then turned to revising the PLOs. The result from this process were the following PLOs:

- Utilize principles and processes of whole systems thinking to understand how the electricity system impacts and is related to ecological and social systems;
- Articulate impacts electricity policy and market environments have on energy consumption and production;
- Formulate strategies to manage change, and engage with stakeholders and customers;
- Communicate skillfully through written reports and oral presentations in styles relevant to the energy field;
- Utilize critical analysis to understand the forces that shape the current electricity system and how to move toward a clean energy future.

These PLOs were approved by the internal board members (many of whom were at the external board meeting).

The PLOs were further revised based on the comments from Prof. Amati on the last assessment plan. Her comments:

The positive: these PLOs are clearly articulated, are led by active verbs, and seem to be clearly and easily measurable. They also seem to cover a wide swath of learning areas.

Suggestions: though 3-5 PLOs are the standard for undergraduate majors, I wonder if for a shorter program like yours they are perhaps too many, as you will need to measure and assess each single one. If you wanted to have only 4 of them, for example, you could embed the skills you have in No. 4 into rubrics used for assessing the remaining ones.

Another point is the language of No. 1: perhaps it is your field's lingo, but to an outsider like me the verbiage is quite obscure, in particular I am not clear what "processes of whole systems thinking" means.

The further revised PLOs are as follows. These still need final approval by the ENGY faculty board at the Nov. 28th meeting.

Program Learning Outcomes

At the end of the program, students will be able to:

- Utilize critical analysis to understand the forces that shape the current electricity system and how to move toward a clean energy future;
- Articulate how the electricity system is related to ecological and social systems;
- Evaluate how electricity policy and market environments impact energy consumption and production;
- Formulate strategies to manage change, and engage with stakeholders and customers.

4. Which particular Program Learning Outcome(s) did you assess for the academic year 2017-2018?

It was the first year of the program so we did not assess any outcomes, focusing instead on developing the appropriate learning outcomes and curriculum needed to deliver these outcomes.

The Assessment Plan from the last report was:

- 1. At the end of the program, in Spring 2019, student will complete an exit interview asking them to assess to what extent they achieved the stated learning outcomes for the program.*
- 2. PLO #2 will be assessed based on the final paper assigned for Energy Industry Strategy and Policy. The course has not been offered yet. It will be offered in spring 2018 for the first time. Assessment of this artifact will take place in spring 2019 during the second time the course is offered so changes can be made to the assignment based on the experience and feedback from the first course offering.*
- 3. During the spring of 2018, the external advisory board and the faculty board will review the PLOs for clarity, consistency with the program's objectives, and separability from each other.*

This is still our current plan although I will acknowledge that Prof. Amati suggested we ‘test-drive’ an assessment rubric during the spring of 2018 on a course artifact. This would have been a good idea but it was not accomplished.

However, we did engage in a review of some of the curriculum and in course renaming. I will quickly summarize a few of the highlights here.

1. After the first time Energy Economics was taught, it became clear that many students were interested in learning more about energy finance. To this end, we developed a new 2-unit course called Renewable Energy Finance. This course was approved by the College Curriculum Committee. The plan had been to replace the Electricity Markets course with this finance course and roll the material from Electricity Markets into Renewable Energy Economics. However, there was quite a bit of material in the Electricity Markets course taught this fall for the first time that the students found valuable and they were exposed to a number of people from the industry in that course, so we may run Electricity Markets again.
2. In order to accommodate students who would like to engage in an internship as part of their final project but who haven’t found an internship when the course starts, we rolled the Master’s Project course and Final Internship course together into a Capstone Project course. This was recently approved by Associate Dean Tzarakis-Foster.
3. We renamed a few of the courses to better express what they cover. The new names have all been approved.

All of these changes were the result from iterative discussions with the wonderful ENGY faculty board.

II. CLOSING THE LOOP

5. **Based on your results, what changes/modifications are you planning in order to achieve the desired level of mastery in the assessed learning outcome? This section could also address more long-term planning that your department/program is considering and does not require that any changes need to be implemented in the next academic year itself.**

From the conversations with the board as well as conversations with other professionals in the field, we determined that the original design of the program is still fairly accurate and the question is really how to best deliver the curriculum to meet the learning outcomes. To that end, we will be doing an anonymous exit survey for the first cohort asking about attainment of learning outcomes. I will also be meeting with individuals and groups who will be pursuing

different careers in energy to see how well the program met their goals and needs for an MS program.

One of the big questions relates to the Quantitive Methods course. The original plan for the content of this course stemmed from an external board meeting in 2016, before the program started. The course description was as follows:

This course will explain and provide practice in a collection of quantitative methods relevant to the energy field. These methods include energy conversions, energy metric modeling, production-cost modeling, constrained optimization, basic math modeling, and load-flow modeling. In addition, the course will cover cost effectiveness testing (used to value and approve energy efficiency programs), the Resource Value Framework, and resource optimization modeling (used to model optimal energy portfolios).

Prof. Jim Williams, who has broad expertise in environmental Science, was hired to teach quantitative methods and he requested to teach a course more in line with what he had been teaching energy students in the past. The faculty board approved these changes. The current course description is:

This course teaches quantitative analysis methods used in the energy field while introducing the fundamentals of energy science and engineering. Students will learn basic problem-solving skills including calculation and estimation methods, unit conversions, and mathematical modeling, applied to renewable and fossil resources and consumption; thermodynamics, energy conversion processes, and energy efficiency; combustion processes, greenhouse gas emissions, and air pollutant emissions; nuclear energy and radiation; and energy-related land and water use.

I believe that this change warrants further consideration. An evaluation of the content of this course will be an important part of the in-person exit surveys we have with our first cohort.

6. What were the most important suggestions/feedback from the FDCD on your last assessment report (for academic year 2016-2017, submitted in October 2017)? How did you incorporate or address the suggestion(s) in this report?

We were given four recommendations and I thought they were all very helpful. In addition to the comments on the Mission Statement, PLOs, and Assessment plan referenced above, the fourth comment was on the curriculum map. Please see the revised curriculum map below which follow these recommendations.

Required Courses Learning Outcomes

I= Introductory D= Developing M = Mastery	Utilize critical analysis to understand the forces that shape the current electricity system and how to move toward a clean energy future	Articulate how the electricity system is related to ecological and social systems	Evaluate how electricity policy and market environments impact energy consumption and production	Formulate strategies to manage change, and engage with stakeholders and customers
ENGY 604-01 Renewable Energy Economics	I	D	D	
ENGY 610-01 Quantitative Methods	I	I	I	
ENGY 612-01 Energy Technologies	D	D	I	
ENGY 624-01 Energy Industry Strategy & Policy	M	D	D	M
ENGY 626-01 Electricity Markets	D		M	
ENGY 630-01 Electricity Systems	M	D	D	
ENGY 632-01 Leadership, Collaboration, Innovation				M
LAW Energy Law	D		D	
ENGY 640-01 Renewable Energy Practicum		D		
ENGY 699-01 Energy Capstone Project	M	M	M	M

7. Assessment plan for 2018-2019

We will still complete the elements of the plan from the previous report that have not been completed yet. As listed above, these include:

1. *At the end of the program, in Spring 2019, student will complete an exit interview asking them to assess to what extent they achieved the stated learning outcomes for the program.*
2. *PLO #2 will be assessed based on the final paper assigned for Energy Industry Strategy and Policy. The course has not been offered yet. It will be offered in spring 2018 for the first time. Assessment of this artifact will take place in spring 2019 during the second time the course is offered so*

changes can be made to the assignment based on the experience and feedback from the first course offering.

One change is that we will assess PLO #3 instead of #2.

As this is a new program, it is a work in progress. We are still working to 1) provide the correct courses for the students; 2) provide them with skills and knowledge within these courses that will be valuable in the rapidly changing energy industry; 3) facilitate the students having access to appropriate electives from other schools and departments; 4) develop our own electives if our enrollment numbers warrant this; 5) decide on whether we should allow for more electives (currently only 4 units are allowed) and have fewer required courses, and 6) find the appropriate instructors for each course.

Some of these items relate to the PLOs. Some to the individual Course Learning Outcomes. Some to delivery. Most of these items will benefit from the assessment process but this will need to be an iterative and dynamic process. We cannot freeze the PLOs while we assess them for five years if really they themselves need to be revised. We are fortunate to have an engaged external advisory board made up of professionals from the public, NGO, and private sector. They are currently developing a mentoring program for the students and a marketing plan.

While I understand the importance of assessing an artifact for a specific PLO each year, the more valuable assessment, I believe, for a new program will be from the exit surveys (anonymous-written and in-person) and from further surveys we will conduct of our graduates one-year and two-years out. The students in the first cohort understand their responsibility in helping the program develop and improve for future cohort and many have been helpful already with their feedback. I expect them to take the exit survey seriously and take time answering the questions.

The question for the graduating students will be as follows. These questions are similar to the questions I developed for the MSEM program that we have used for five year and which have provide useful insights.

1. *To what extent do you think you attained the following MSEM Learning Outcomes? (List of learning outcomes with options: fully, to a large extent, somewhat, minimally, not at all.)*
2. *Were there courses/topics you wish had been offered while you were in the program?*
3. *How satisfied were you with each of the following aspects of the ENGY program? Options: Very satisfied, satisfied, somewhat satisfied, somewhat unsatisfied, not satisfied.*
 1. *Content relevant to 'real world' environmental management issues*
 2. *Quality of faculty instruction*
 3. *Structure of program (evening and weekend classes, half-semester courses)*
 4. *Opportunities throughout the program to develop career relevant skills*
 5. *Overall learning environment/culture*

If not satisfied, please explain.

- 4. Do you feel that the ENGY prepared you for work in your area of interest? Please explain.*
- 5. What were your top three learning experiences in the MSEM Program? (For example, a particular course or assignment, a field trip, interaction with fellow students, etc.)*
- 6. Is there anything else you would like to share about your experience in the MSEM program?*
- 7. What is your employment status post-graduation? Employed, Employed but looking for a different position, unemployed and looking, unemployed and not looking, other (please explain)*

Concluding Note:

Please let me know if I have missed a section in this report. I suspect you would appreciate an assessment rubric for the paper we will be reviewing in the spring. I can create that and provide additional material as needed. I will submit this report as is now as I have already missed the deadline. Thank you for the extension.

I look forward to your feedback.