

Appendix F. Degree Requirements

ENERGY GRADUATE GROUP
M.S. AND Ph.D. DEGREE REQUIREMENTS
Submitted: November 25, 2014
Revised: October 2019
Graduate Council Approval: _____

Master's Degree Requirements

1) Admissions requirements:

Admissions decisions will be made on a case-by case basis according to the three different deadlines for applications. The dates will be published each year at the beginning of the admission cycle:

<u>Priority Deadline:</u>	Priority for consideration for financial support
<u>General Deadline:</u>	Reviewed for admission but not on a priority basis
<u>Final Deadline:</u>	Application only reviewed if the program determines there is additional space available.

Consideration for program admission requires a bachelor's degree, three letters of recommendation, transcripts, GRE General Test scores, TOEFL or IELTS score (*if applicable*) and an Office of Graduate Studies online application with fee by the stated admission deadline. A minimum GPA of 3.0 is required. Most successful applicants also have a TOEFL score of 100 or higher, above the university minimum of 80. However, admissions decisions are made on a case-by case basis based on a holistic review of each candidates application. Meeting some or all of these criteria does not guarantee admission, but merely eligibility. The decision to recommend admission to the Dean of Graduate Studies will be made by the Program Admissions Committee on the basis of available space and the competitiveness of applicants compared to the eligible pool.

Applicants with interest in pursuing research as part of their Master's degree (such as those interested in a thesis-based M.S. Type I degree, as described in Section 2 of this appendix) are strongly encouraged to communicate with potential research advisors (major professors) prior to admission to the program. While formal acceptance into a research group cannot occur prior to admission, contacts should be sufficiently developed such that at least tentative identification of a research advisor can be made as soon after the time of admission as possible.

In addition to completing the "UC Davis Graduate Application" online, the following criteria are required for admission to the Energy Graduate Group:

Undergraduate Degree. Consideration for program admission requires a bachelor's degree from an accredited institution. Strong applicants to the program who intend to pursue a degree in Energy Science & Technology will likely have received an undergraduate degree in engineering, mathematics, the physical sciences, or a related field. Strong applicants to the program who intend to pursue a degree in Energy Policy & Management will likely have received an undergraduate degree in economics, political science, policy, planning, management, or a related field.

Minimum GPA. A minimum GPA of 3.0 in the applicant's undergraduate program and in any prior graduate program is required.

Letters of Recommendation. Applicants will be required to submit three letters of recommendation through the online "UC Davis Graduate Application." Applicants are encouraged to submit professional letters of recommendation, but at least one letter should be from a professor who can assess your potential for advanced academic work.

Statement of Purpose. All applicants are required to complete the Statement of Purpose required on the online "UC Davis Graduate Application."

Personal History Statement. All applicants are required to complete the Personal History Statement required on the online “UC Davis Graduate Application.”

GRE Scores. Applicants will be required to submit official GRE General Test scores from within the last 5 years. This requirement is in addition to self-reporting GRE test scores on the online “UC Davis Graduate Application.” Competitive applicants will report strong overall GRE scores. For the Energy Science & Technology degree track, most successful applicants will have a very strong GRE Quantitative Reasoning score. For the Energy Policy & Management degree track, most successful applicants will have a very strong GRE Verbal Reasoning score.

Application and Fee. All applicants will be required to complete the Office of Graduate Studies online “UC Davis Graduate Application” application and to remit the accompanying application fee by the stated admission deadline.

Faculty Mentor. Applicants may list up to six potential faculty mentors on the basis of their research interests. Applicants are strongly encouraged to communicate with potential research advisors (Major Professors) prior to admission to the Energy Graduate Group.

TOEFL/IELTS Requirements. The program will follow the policies of the UC Davis Graduate Council for evaluation of international applicants. TOEFL or IELTS scores must be submitted to demonstrate English language proficiency for international applicants who have not studied at an institution where the language of instruction was in English. International applicants must meet the Office of Graduate Studies minimum score requirement.

a) **Prerequisites:**

In addition to the admission requirements stated above, applicants are expected to have passed the equivalent of the following UC Davis courses:

All EGG students, regardless of track, must have completed at least one of the following courses in upper division Statistics (or its equivalent) and must have completed the following two courses in Calculus (or their equivalent):

ARE 106	Econometric Theory and Applications	4 units
ECI 114	Probabilistic Systems Analysis for Civil Engineers	4 units
ECN 140	Econometrics	4 units
STA 100	Applied Statistics for Biological Sciences	4 units
STA 103	Applied Statistics for Business and Economics	4 units
STA 104	Applied Statistical Methods: Nonparametric Stats	4 units
STA 106	Applied Statistical Methods: Analysis of Variance	4 units
STA 108	Applied Statistical Methods: Regression Analysis	4 units
MAT 16A, 17A or 21A	Calculus	4 units
MAT 16B, 17B or 21B	Calculus	4 units

*For the **Energy Science & Technology** track, applicants are recommended to have an undergraduate or graduate degree in a Science, Technology, Engineering, or Mathematical field from an accredited institution*

Students will need to be prepared to take the required coursework that often includes prerequisites consistent with undergraduate degrees in engineering or the natural sciences.

*For the **Energy Policy & Management** track, applicants must have completed the following course (or their equivalent):*

ECN 100A or ARE 100A	Intermediate Micro Theory: Consumer and Producer Theory	4 units
ECN 100B or ARE 100B	Intermediate Micro Theory: Imperfect Competition and Market Failure	4 units

b) Deficiencies:

Pre-requisite coursework deficiencies must be taken for a letter-grade and are typically complete in the first year.

2) M.S. Plan I or Plan II

At the Master's level, the Energy Graduate Group will offer students the option of completing either a Plan I or Plan II Master's Degree. The M.S. need not be a terminal degree, but can be part of the path to a Ph.D.

Students will pursue one of the following plans for fulfillment of the requirements for the Master's degree. Students will identify in coordination with the Major Professor which plan they intend to pursue upon enrollment in the program.

Plan I (Thesis). This plan requires a minimum of 36 units of graduate and upper division courses (the 100 and 200 series only), of which at least 18 of the 36 units must be graduate work in the major field. In addition, a thesis is required. This research thesis or project will serve as the capstone requirement for the degree. A maximum of 6 units of EGG 299 research units may count toward this 36 unit requirement for the degree for M.S. Plan I students. The student is subject to guidance by the major program regarding the distribution of their work.

A minimum of three quarters of academic residence is required.

This Plan requires more units than the UC Davis minimum, which are: 30 units of graduate and upper division courses (the 100 and 200 series only), at least 12 of which must be graduate work in the major field.

Plan II (Comprehensive Examination). This plan requires a minimum of 38 units of graduate and upper division courses (the 100 and 200 series only), of which at least 20 units must be graduate courses in the major field. A comprehensive final examination in the major subject, of such nature and conducted in such manner as may be determined by the program concerned, is required of each candidate. No thesis is required. The capstone requirement is fulfilled by the candidate's successful completion of the comprehensive examination.

A minimum of three quarters of academic residence is required.

This Plan requires more units than the UC Davis minimum M.S. Plan II, which are: 38 units of graduate and upper division courses (the 100 and 200 series only), at least 18 of which must be graduate courses in the major field.

3) Course Requirements – Core, Sub-Core, and Electives (minimum of 36 units)

M.S. students will be required to complete four Core Courses, and will be required to enroll in EGG 290 *Energy Seminar* in the Fall Quarter of their first and second years of the program. Additionally, M.S. students will be required to take an additional two courses (minimum of 6 units) from among a list of pre-approved Sub-Core Courses designed to give the student a strong foundation in their chosen degree track (either Energy Science & Technology, or Energy Policy & Management). The remaining units required for the student to achieve the minimum of 36 units required for the degree will be determined by a course of study developed by the student in coordination with their Major Professor that is designed to provide the student with a

specialization within the energy field. Sufficient EGG 299 research units must also be taken so that an M.S. Plan I student can write an acceptable thesis.

a) **Core Courses (14 units)**

EGG 200	Introduction to Energy Science and Technology	4 units
EGG 201	Life-Cycle Analysis of Energy Systems	4 units
EGG 202	Energy and Climate Policy	4 units
EGG 290	Energy Seminar	1 unit (x2)

b) **Sub-Core Foundation Courses (6 to 8 units)**

In addition to the “Core Requirements” above, all students will be required to take at least two courses (minimum 6 units) in a foundation area. At least one course (minimum 3 units) taken to fulfill the Sub-Core foundation requirement must be taken at the graduate level, while the other may be upper division. Students in the Energy Science & Technology track will be required to take courses in Science and Technology to fulfill this requirement. Students in the Energy Policy & Management track will be required to take courses in Policy and Management to fulfill this requirement.

Science and Technology

ABT 212	Path to Zero Net Energy	4 units
ATM 116	Climate Change	4 units
ATM 149	Air Pollution (same as ECI 149)	4 units
CHE 205	Symmetry, Spectroscopy, and Structure	3 units
CHE 226	Principles of Transition Metal Chemistry	3 units
CHE 228C	Solid-State Chemistry	3 units
CHE 228D	Homogenous Catalysis	3 units
CHE 241D	Electroanalytical Chemistry	3 units
DES 136A	Lighting Technology and Design	4 units
EBS 218	Solar Thermal Engineering	4 units
EBS 265	Design and Analysis of Engineering Experiments	5 units
EBS 267	Renewable Bioprocessing	3 units
EBS 270	Modeling and Analysis of Biological and Physical Systems	3 units
ECE 216	Low Power Digital Integrated Circuit Design	3 units
ECE 284	Design and Optimization of Embedded Computing Sys.	4 units
ECI 125	Building Energy Performance	4 units
ECI 241	Environmental Reactive Chemical Transport Modeling	4 units
ECI 246N	Understanding Climate Change: Causes and Conseq.	4 units
ECI 268	Infrastructure Economics	3 units
EME 106	Thermo-Fluid Dynamics	4 units
EME 163	Internal Combustion Engines and Future Alternatives	4 units
EME 164	Intro to Heating, Ventilation and Air Conditioning Systems	4 units
EMS 170	Sustainable Energy Technology: Batteries, Fuel Cell, PV	4 units
EMS 170L	Sustainable Energy Technologies Laboratory	3 units
ENG 160	Environmental Physics and Society	3 units
ETX 203	Environmental Toxicants	4 units
FST 205	Industrial Microbiology	3 units
FST 228	Sustainable Food Systems	3 units
MAE 216	Advanced Thermodynamics	4 units

MAE 217	Combustion	4 units
MAE 218	Advanced Energy Systems	4 units
MAE 258	Hybrid Electric Vehicle System Theory and Design	4 units
MAE 268	Wind Power Engineering	4 units
MAE 269	Fuel Cell Systems	4 units
MAE 271	Advanced Modeling and Simulation of Mechatronic Sys.	4 units
MAE 272	Theory and Design of Control Systems	4 units
MCB 263	Biotechnology Fundamentals and Application	2 units
PHY 200A	Theory of Mechanics and Electromagnetics	4 units
PHY 200B	Theory of Mechanics and Electromagnetics	4 units
PHY 200C	Theory of Mechanics and Electromagnetics	4 units
PHY 210	Computational Physics	3 units
PHY 241	Advanced Topics in Magnetism	3 units
PHY 242	Advanced Topics in Superconductivity	3 units
SSC 222	Global Carbon Cycle	3 units
TTP 289A	Applied Data Analysis	4 units

Policy and Management

ARE 147	Resource and Environmental Policy Analysis	3 units
ARE 175	Environmental Economics	4 units
CRD 245	Political Economy of Urban and Regional Development	4 units
ECI 268	Infrastructure Economics	3 units
ECN 125	Efficiency in Energy Markets	4 units
ECN 215D	Environment and Economic Development	4 units
ENV 200A	Analysis of Environmental Management & Policy	4 units
ENV 200B	Environmental Policy Evaluation	4 units
ENV 200C	Environmental Policy Process	4 units
ENV 201	Environmental Law	3 units
ESP 163	Energy and Environmental Aspects of Transportation	4 units
ESP 167	Energy Policy	3 units
ESP 212A	Environmental Policy Process	4 units
ESP 212B	Environmental Policy Evaluation	4 units
ESP/ARE 275	Economic Analysis of Resource & Environmental Policy	4 units
LDA 201	Theory and Philosophy of the Designed Environment	4 units
LDA 205	Urban Planning and Design	4 units
LDA 217	Ecologies of Infrastructure	4 units
MGT 206	Decision Making and Management Science	3 units
MGT 241	New Product Development	3 units
MGT 250	Technology, Competition, and Strategy	3 units
MGT 251	Management of Innovation	3 units
POL 171	The Politics of Energy	4 units
POL 208	Policy Analysis	4 units
TTP 289A	Energy and Transportation Modeling for Policy Analysis	4 units

c) **Elective Courses (minimum of 17 units)**

M.S. students will develop a coherent course of study with their Major Professor by the end of the student's first quarter of study. This course of study will be designed so that the student can develop a specialization within the energy field through electives. Students may enroll in any of the courses listed above as eligible for the foundation requirement as electives to fulfill their degree requirements, or the student may enroll in other electives subject to the approval of their Major Professor.

Allowing for this flexibility in the course of study will allow the student and their Major Professor to design tailored courses of study that will result in specializations most relevant to the particular student and his/her career objectives. The following are a few examples of the types of specializations within the field that may be expected from EGG students:

- Building energy efficiency; Biomass conversion; Fuel cell engineering; Sustainable transportation policy; Energy economics; Biofuels; Nanosolar manufacturing; Energy systems analysis; among others.

As a result of the diversity of specializations expected within the EGG program, EGG faculty members have chosen not to pre-identify a list of eligible or preferred electives. As the program matures, however, the Executive Committee of the EGG may consider requiring additional specific courses as certain specializations become more common.

d) Research (total required # research units):

Plan I: Up to 6 units of Thesis/EGG 299 Research units can count as part of the 36.

Plan II: No EGG 299 Research units can count as part of the 38.

e) English Language Requirement

Students who have not obtained a previous degree at an approved English-medium institution or demonstrated English-language proficiency through an appropriate exam (e.g. TOEFL) are required to complete appropriate English-language courses, as described in the policy *Graduate Student Course Requirements – English as Second Language* ([GC2018-02](#)). Courses taken in satisfaction of this requirement do not count towards the units required for graduation.

f) **Summary:**

M.S. Plan I students will be required to complete a minimum of 36 units to graduate, at least 18 of which must be at the graduate level in the major field. M.S. Plan II students will be required to complete a minimum of 38 units to graduate, at least 20 of which must be at the graduate level in the major field. All M.S. students will be required to complete 14 units of core coursework, and will be required to complete a minimum of 6 units of additional sub-core coursework to develop a foundation within the student's chosen degree track (either Energy Science & Technology, or Energy Policy & Management). M.S. students will develop a coherent program of study with their Major Professor by the end of the student's first quarter of study. This program of study will be designed so that the student can develop a specialization within the energy field through electives.

Full-time students must enroll for 12 units per quarter including research units. Courses that fulfill any of the program course requirements may not be taken S/U unless the course is normally graded S/U (such as EGG 290 *Energy Seminar*). Once course requirements are completed, students can take additional classes as needed.

Only courses in which A, B, C, or Satisfactory are earned may be counted in satisfaction of degree requirements. A grade-point average of at least 3.0 must be

maintained for all upper division and graduate courses. A course in which you receive a D+ grade or lower does not count towards meeting the unit requirement for the master's degree, but does count in computing the grade point average.

If the GPA falls below the 3.0 minimum, the student is placed on academic probation. If a student is on academic probation for more than two quarters, the student is subject to disqualification upon recommendation by the Graduate Advisor to the Dean of Graduate Studies.

4) Special requirements: None.

5) Advising Structure and Mentoring

The **Major Professor** is the faculty member who supervises the student's research and thesis (M.S. Plan I) or comprehensive examination (M.S. Plan II)) and helps the student to develop their detailed plan of study designed to result in a specialization within the energy field; this person serves as the Chair of the Thesis or Comprehensive Exam Committee. The Major Professor also advises the student on course selection each quarter. The (faculty) **Graduate Advisor**, who is appointed by Graduate Studies to have signatory authority, is a resource for information on academic requirements, policies and procedures, and registration information. The **Graduate Program Coordinator (staff)** assists students with identifying a major professor, identifying appointments, and general university policies. The **Mentoring Guidelines** can be found here:

<https://energy.ucdavis.edu/education/energy-graduate-group/for-current-students/>

The Major Professor and the Graduate Advisor approve all individual programs of study (POS).

6) Committees:

a) **Executive Committee:**

The administration of the EGG program and its activities will be vested in an Executive Committee. The committee will coordinate with the Chair in administering the EGG program and oversee the modification of the EGG program's mentoring guidelines and application within the program. The committee will consist of the Graduate Advisor(s), the Graduate Admissions Advisor, and a third member appointed by the Chair. The Graduate Advisor(s) will serve as the Chair of the Executive Committee. The Graduate Staff Coordinator will be a non-voting member of the Executive Committee. Unless otherwise serving as an active member of the Executive Committee, the Director of the UC Davis Energy and Efficiency Institute will serve as an ex-officio member of the Executive Committee.

The principal responsibilities of the Executive Committee are to:

- (1) Administer the graduate program;
- (2) Nominate Thesis Committee (M.S. Plan I) membership (to include three members, including the Major Professor as Chair, as recommended by the student) to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy;
- (3) Appoint Comprehensive Examination Committees (M.S. Plan II);
- (4) In consultation with the Chair of the EGG program, appoint such standing and ad hoc committees as deemed necessary to properly administer the activities of the Program; and

b) **Thesis Committee (M.S. Plan I)**

The student, in consultation with the Major Professor and the Graduate Adviser, recommends three faculty members to the Executive Committee to serve on their Thesis

Committee. The Major Professor serves as the Chair of the Thesis Committee and must be a faculty member of the Energy Graduate Group. The Executive Committee nominates the Thesis Committee to the Office of Graduate Studies for formal appointment in accordance with Graduate Council Policy. Only members of the Academic Senate or the EGG program have automatic eligibility to serve as members of advanced degree committees.

Members of the Academic Senate who are *not* members of the EGG program can seek exception to serve as Chair of an advanced degree committee; the petition to do so can be obtained from the Office of Graduate Studies.

Individuals who are not members of the Academic Senate or the EGG program can serve on advanced degree committees with written recommendation from the student and approval by the Graduate Adviser and the Office of Graduate Studies; the petition to do so can be obtained from the Office of Graduate Studies. Nomination of an individual who is neither a member of the Academic Senate nor a member of the EGG program to serve as the Chair of an advanced degree committee is approved by the Executive Committee only in the most exceptional circumstances.

c) Comprehensive Examination Committee (M.S. Plan II)

The student, in consultation with the Major Professor and the Graduate Adviser, recommends three faculty members to the Executive Committee to serve on the Comprehensive Examination Committee. The Major Professor serves as Chair of the Comprehensive Examination Committee and must be a faculty member of the EGG program.

d) Graduate Affairs Committee

The Graduate Affairs Committee will be chaired by the Graduate Advisor. The committee will consist of four members, including one graduate student representative, and shall have the following responsibilities:

- (a) To prepare recommendations, as needed, regarding minimum requirements for graduate degrees and other programmatic proposals for consideration by the members of the EGG Program;
- (b) To review and recommend revision, as needed, of the Energy Graduate Group curriculum;
- (c) To review petitions from graduate students

Recommended revisions to the EGG Program curriculum must be approved by simple majority vote of the membership.

g) Student Admissions and Membership Committee

Once the completed application for admission, all supporting material (as described above), and the application fee have been received, the application will be submitted to the Student Admissions and Membership Committee. The Student Admissions and Membership Committee consists of four faculty members. Based on a review of the entire application, a recommendation is made to accept or decline an applicant's request for admission. That recommendation is forwarded to the Dean of Graduate Studies for final approval of admission. Notification of admissions decisions will be sent by the Office of Graduate Studies.

7) Advancement to Candidacy:

Every student must file an official application for Candidacy for the Degree of Master of Science and pay the Candidacy Fee after completing one-half of their course requirements and at least

one quarter before completing all degree requirements; the student is expected to complete all degree requirements by the end of the Spring Quarter of the student's second year of study. The Candidacy for the Degree of Master of Science form can be found online at: <http://www.gradstudies.ucdavis.edu/forms/>. A completed form includes a list of courses the student will take to complete degree requirements. If changes must be made to the student's course plan after s/he has advanced to candidacy, the Graduate Advisor must recommend these changes to the Office of Graduate Studies. Students must have their Graduate Advisor, Thesis Committee Chair (if applicable) and Graduate Program Coordinator sign the candidacy form before it can be submitted to Graduate Studies. If the candidacy is approved, the Office of Graduate Studies will send a copy to: the appropriate Graduate Program Coordinator and the student; the Thesis Committee Chair will also receive a copy, if applicable. If the Office of Graduate Studies determines that a student is not eligible for advancement, the program and the student will be told the reasons for the application's deferral. Some reasons for deferring an application include: grade point average below 3.0, outstanding "I" grades in required courses, or insufficient units.

8) Comprehensive Examination and/or Thesis Requirements:

a) Thesis Requirements (M.S. Plan I):

Thesis Committee: M.S. Plan I students, in coordination with their Major Professor, are expected to form their thesis committee (minimum of three members, including the Major Professor, who will serve as Chair) by the end of their first year of study. The candidate and Major Professor should meet at least once a year with the other members of the thesis committee to discuss progress and any changes in research objectives.

Thesis: Research for the Master's thesis is to be carried out under the supervision of a faculty member of the program and must represent an original contribution to knowledge in the field. The thesis research must be conducted while the student is enrolled in the program. The thesis is submitted to the thesis committee at least one month before the student plans to make requested revisions. All committee members must approve the thesis and sign the title page before the thesis is submitted to the Office of Graduate Studies for final approval. Should the thesis committee determine that the thesis is unacceptable, even with substantial revision, the thesis committee may make a recommendation to disqualify the student from the program to the Dean of Graduate Studies.

The thesis must be filed in a quarter in which the student is registered or on filing fee. Instructions on preparation of the thesis and a schedule of dates for filing the thesis in final form are available from the Office of Graduate Studies; the dates are also printed in the UC Davis General Catalog and in the Class Schedule and Registration Guide issued each quarter. A student must have a GPA of 3.0 or higher for the M.S. degree to be awarded.

b) Comprehensive Examination (M.S. Plan II):

Fulfillment of the Comprehensive Examination is the last requirement of the M.S. Plan II. A student may take the comprehensive examination once they have advanced to candidacy. Consistent with the policy of Graduate Council, most students will sit for the exam at the end of the 5th quarter of study (the end of Winter Quarter in the second year).

The comprehensive examination requirement includes passing a two-hour written/oral exam. The scope of the exam is the candidate's coursework. Typically, the three members of the Comprehensive Examination Committee meet with the student and ask questions related to any courses the student completed to fulfill the M.S. Degree course requirements.

Upon completion of the Comprehensive Examination, the Chair of the Committee must notify the Graduate Coordinator, indicating the following:

- (a) When the student took the Comprehensive Examination;
- (b) The members of the Comprehensive Examination Committee; and,
- (c) The recommendation to pass or not pass.

The Exam committee's unanimous vote is required to pass a student on the exam. If a student does not pass the exam, the committee may recommend that the student be reexamined a second time, but only if the Graduate Advisor concurs with the committee. The second exam must take place within one quarter of the first exam. The format of the second exam is the same as that of the first exam. The examination may not be taken more than twice. A student who does not pass on the second attempt is subject to disqualification from further graduate work in the program.

Once passed, the Master's Report Form (<https://grad.ucdavis.edu/sites/default/files/upload/files/current-students/g315-masters-report-planii.pdf>) is signed by the Program Graduate Advisor and then forwarded to the Office of Graduate Studies. The deadlines for completing this requirement are listed each quarter in the campus General Catalog (available online at the website of the Office of the Registrar). A candidate must be a registered student or in Filing Fee status at the time the program submits the form, with the exception of the summer period between the end of the Spring Quarter and the beginning of Fall Quarter. The program must file the report with the Office of Graduate Studies within one week of the end of the quarter in which the student's degree will be conferred.

9) Normative Time to Degree:

Normative time is the elapsed time (calculated to the near academic quarter) that a student would need to complete all requirements for the degree, assuming that they are engaged in full-time study and making adequate progress. For the Master of Science degree from the Energy Graduate Group, the normative time to advancement to candidacy is 3 quarters and the normative time to advancement to degree is 6 quarters.

10) Typical Time Line and Sequence of Events:

The following table provides an example of a study plan for an M.S. Plan I student focused on energy economics and policy. This student has demonstrated fulfillment of the pre-requisite for STA 102, but not for ECN 100A and ECN 100B. As such, this student addresses this deficiency by taking ECN 100A in the Fall quarter of the first year of study.

For example:

Year One	Fall	Winter	Spring <i>(advancement to M.S. candidacy)</i>
	EGG 200: Fundamentals of Energy Science and Technology (4)	EGG 201: Life Cycle Analysis in Energy Systems (4)	EGG 202: Energy and Climate Policy (4)
	EGG 290: Energy Seminar (1)		ECI 268: Infrastructure Economics (3)
	ECN 100A: Intro to Microeconomic Theory (4)	ECN 100B: Intro to Microeconomic Theory (4)	ENV 201: Environmental Law (3)
	EGG 299: Research (3)	EGG 299: Research (4)	EGG 299: Research (2)

Total Units:	8 units (course work) 1 unit (seminar) <u>3 units (research):</u> 12 units	8 units (course work) 4 units (research) _____ 12 units	10 units (course work) <u>2 units (research):</u> 12 units
Year Two	Fall	Winter	Spring <i>(Thesis completed)</i>
	EGG 290: Energy Seminar (1)	ECN 256: Applied Econometrics (4)	ESP 212B: Environmental Policy Evaluation (4)
	POL 171: The Politics of Energy (3)	ESP 212A: Environmental Policy Process (4)	ESP 275: Economic Analysis of Resource and Environmental Policy (4)
	ECN 125: Efficiency in Energy Markets (4)	EGG 299: Research (4)	EGG 299: Research (4)
	EGG 299: Research (3)		
Total Units:	7 units (course work) 1 unit (seminar) <u>4 units (research):</u> 12 units	8 units (course work) 4 units (research) _____ 12 units	8 units (course work) 4 units (research) _____ 12 units

11) Sources of funding.

We expect the EGG program to be highly competitive and to attract academically outstanding students to UC Davis. Through the combination of existing campus financial commitments, fellowship and scholarship opportunities, and significant extramural fundraising, many Master's students are supported in part or in full by fellowships or funded research opportunities.

12) PELP, In Absentia and Filing Fee status.

Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide: <http://www.gradstudies.ucdavis.edu/publications/>

Ph.D. DEGREE REQUIREMENTS

1) Admissions Requirements:

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Applicants are strongly encouraged to communicate with potential research advisors (major professors) prior to admission to the program. It is essential that prospective doctoral students contact faculty in the Energy Graduate Group (<https://energy.ucdavis.edu/education/energy-graduate-group-faculty/>) who are conducting research in areas that the student wishes to pursue, in order to introduce themselves and inquire about faculty willingness to accept a new student in this degree program. This process of communicating with potential major professors should begin prior to relevant application deadlines. Applicants should take the initiative to inquire about future research directions, exchange ideas with potential major professors, and make every effort to identify viable possibilities.

In addition to completing the "UC Davis Graduate Application" online, the following criteria are required for admission to the Energy Graduate Group:

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Minimum GPA. A minimum GPA of 3.0 in the applicant's undergraduate program and in any prior graduate program is required.

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GRE Scores. Applicants will be required to submit official GRE General Test scores from within the last 5 years. This requirement is in addition to self-reporting GRE test scores on the online “UC Davis Graduate Application.” Competitive applicants will report strong overall GRE scores. For the Energy Science & Technology degree track, most successful applicants will have a very strong GRE Quantitative Reasoning score. For the Energy Policy & Management degree track, most successful applicants will have a very strong GRE Verbal Reasoning score.

Application and Fee. All applicants will be required to complete the Office of Graduate Studies online “UC Davis Graduate Application” application and to remit the accompanying application fee by the stated admission deadline.

Faculty Mentor. Applicants are required to list three potential faculty mentors identified by the applicant on the basis of his/her research interests. Applicants are strongly encouraged to communicate with potential research advisors (Major Professors) prior to admission to the Energy Graduate Group. Ideally, this process of communicating with potential Major Professors should begin no later than in the Fall prior to anticipated enrollment. Applicants should take the initiative to inquire about future research directions of specific faculty at UC Davis, exchange research ideas with potential Major Professors, and make an effort to identify viable possibilities. To assist applicants, the UC Davis Energy Institute will maintain a website that identifies faculty affiliated with the Energy Graduate Group and notes their area(s) of expertise.

TOEFL/IELTS Requirements. The program will follow the policies of the UC Davis Graduate Council for evaluation of international applicants. TOEFL or IELTS scores must be submitted to demonstrate English language proficiency for international applicants who have not studied at an institution where the language of instruction was in English. International applicants must meet the Office of Graduate Studies minimum score requirement.

a) **Prerequisites:**

In addition to the admission requirements stated above, applicants are expected to have passed the equivalent of the following UC Davis courses:

All EGG students, regardless of track, must have completed at least one of the following courses in upper division Statistics (or its equivalent) and must have completed the following two courses in Calculus (or their equivalent):

ARE 106	Econometric Theory and Applications	4 units
ECI 114	Probabilistic Systems Analysis for Civil Engineers	4 units
ECN 140	Econometrics	4 units
STA 100	Applied Statistics for Biological Sciences	4 units
STA 103	Applied Statistics for Business and Economics	4 units
STA 104	Applied Statistical Methods: Nonparametric Stats	4 units
STA 106	Applied Statistical Methods: Analysis of Variance	4 units
STA 108	Applied Statistical Methods: Regression Analysis	4 units
ECI 114	Probabilistic Systems Analysis for Civil Engineers	4 units
MAT 16A, 17A or 21A	Calculus	4 units
MAT 16B, 17B or 21B	Calculus	4 units

*For the **Energy Science & Technology** track, applicants are recommended to have an undergraduate or graduate degree in a Science, Technology, Engineering, or Mathematical field.*

Students will need to be prepared to take the required coursework which often includes prerequisites consistent with undergraduate degrees in engineering or the natural sciences.

*For the **Energy Policy & Management** track, applicants must have completed the following course (or its equivalent):*

ECN 100A or ARE 100A	Intermediate Micro Theory: Consumer and Producer Theory	4 units
ECN 100B or ARE 100B	Intermediate Micro Theory: Imperfect Competition and Market Failure	4 units

b) **Deficiencies:**

Pre-requisite coursework deficiencies must be taken for a letter-grade and are expected to be completed by the time the student files for advancement to candidacy.

2) Dissertation Plan:

The Energy Graduate Group will offer the Ph.D. Plan B. This plan is described in detail under Section 519(D)(2) of the Davis Division Academic Senate Regulations, and described in greater detail in Section 8 below.

Pursuant to those rules, and consistent with the bylaws of the Energy Graduate Group, the student will nominate to the Executive Committee of the EGG a Dissertation Committee consisting of at least three faculty members, with the candidate's Major Professor serving as Chair. The Executive Committee will formally recommend the Dissertation Committee to Graduate Council for final appointment.

Formal requirements for the degree of Ph.D. will include passing an oral Qualifying Examination (QE), and completion of an acceptable dissertation. These steps are described in greater detail in Section 8 below. In the QE, the student will be examined by a committee of faculty. The QE will be used to determine the adequacy of the student's preparation to undertake the dissertation research prior to advancement to candidacy for the degree.

The Energy Graduate Group will not offer the C.Phil. degree for students who are advanced to candidacy for the Ph.D. but have not yet received that degree.

3) Course Requirements – Core, Sub-Core, and Electives (minimum of 45 units)

Ph.D. students will be required to take at least 45 units, of which 30 units must be graduate level courses in the major, exclusive of seminars and research units, and an additional 15 units of upper division or graduate courses. All required courses must be completed before taking the qualifying examination, except the third seminar. At least 24 of these required units must be taken at UC Davis.

Ph.D. students will be required to complete four Core Courses, and will be required to enroll in EGG 290 *Energy Seminar* in the Fall Quarter of their first, second, and third years of the program. Ph.D. students will also be required to take at least one course in research design. Additionally, Ph.D. students will be required to take an additional two courses (minimum of 6 units) from among a list of pre-approved Sub-Core Courses designed to give the student a strong foundation in their chosen degree track (either Energy Science & Technology, or Energy Policy & Management).

The remaining units required for the student to achieve the minimum of 45 units required for the degree will be determined by a program of study developed by the student in coordination with their Major Professor that is designed to provide the student with a specialization within the energy field. Ph.D. students will also be expected to take EGG 299 research units each quarter as they work toward completing their dissertation.

a) **Core Courses (15 units)**

EGG 200	Introduction to Energy Science and Technology	4 units
EGG 201	Life-Cycle Analysis of Energy Systems	4 units
EGG 202	Energy and Climate Policy	4 units
EGG 290	Energy Seminar	1 unit (x3)

b) **Research Design Requirement (minimum of 3 units)**

In addition to the core courses outlined above, students in the Ph.D. program will also be required to take at least one course (minimum of 3 units) in research design. The courses that fulfill this requirement depend on whether the student is pursuing the Ph.D. in Energy Science & Technology, or in Energy Policy & Management.

The following courses, or their equivalents as approved by Research Advisor and EGG Graduate Advisor, satisfy this requirement for Ph.D. candidates on the Energy Science & Technology track:

STA 206	Statistical Methods for Research	4 units
EBS 265	Design and Analysis of Engineering Experiments	5 units
MAE 207	Engineering Experimentation and Uncertainty Analysis	4 units

The following courses, or their equivalents as approved by Research Advisor and EGG Graduate Advisor, satisfy this requirement for Ph.D. candidates on the Energy Policy & Management track:

STA 206	Statistical Methods for Research	4 units
PSC 207	Survey and Questionnaire Research Methods	4 units
ARE 256A	Applied Econometrics I	4 units
ECN 240A	Econometric Methods	4 units

c) **Sub-Core Foundation Courses (6 to 8 units)**

In addition to the "Core Requirements" above, all students will be required to take at least two courses (minimum 6 units) in a foundation area. At least one course (minimum 3 units) taken to fulfill the Sub-Core foundation requirement must be taken at the graduate level, while the other may be upper division. Students in the Energy Science & Technology track will be required to take courses in Science and Technology to fulfill this requirement. Students in the Energy Policy & Management track will be required to take courses in Policy & Management to fulfill this requirement.

Science and Technology

ABT 212	Path to Zero Net Energy	4 units
ATM 116	Climate Change	4 units
ATM 149	Air Pollution (same as ECI 149)	4 units
CHE 205	Symmetry, Spectroscopy, and Structure	3 units
CHE 226	Principles of Transition Metal Chemistry	3 units
CHE 228C	Solid-State Chemistry	3 units
CHE 228D	Homogenous Catalysis	3 units
CHE 241D	Electroanalytical Chemistry	3 units
DES 136A	Lighting Technology and Design	4 units
EBS 218	Solar Thermal Engineering	4 units
EBS 265	Design and Analysis of Engineering Experiments	5 units
EBS 267	Renewable Bioprocessing	3 units
EBS 270	Modeling and Analysis of Biological and Physical Systems	3 units

ECE 216	Low Power Digital Integrated Circuit Design	3 units
ECE 284	Design and Optimization of Embedded Computing Sys.	4 units
ECI 125	Building Energy Performance	4 units
ECI 241	Environmental Reactive Chemical Transport Modeling	4 units
ECI 246N	Understanding Climate Change: Causes and Conseq.	4 units
ECI 268	Infrastructure Economics	3 units
EME 106	Thermo-Fluid Dynamics	4 units
EME 163	Internal Combustion Engines and Future Alternatives	4 units
EME 164	Intro to Heating, Ventilation and Air Conditioning Systems	4 units
EMS 170	Sustainable Energy Technology: Batteries, Fuel Cell, PV	4 units
EMS 170L	Sustainable Energy Technologies Laboratory	3 units
ENG 160	Environmental Physics and Society	3 units
ETX 203	Environmental Toxicants	4 units
FST 205	Industrial Microbiology	3 units
FST 228	Sustainable Food Systems	3 units
MAE 216	Advanced Thermodynamics	4 units
MAE 217	Combustion	4 units
MAE 218	Advanced Energy Systems	4 units
MAE 258	Hybrid Electric Vehicle System Theory and Design	4 units
MAE 268	Wind Power Engineering	4 units
MAE 269	Fuel Cell Systems	4 units
MAE 271	Advanced Modeling and Simulation of Mechatronic Sys.	4 units
MAE 272	Theory and Design of Control Systems	4 units
MCB 263	Biotechnology Fundamentals and Application	2 units
PHY 200A	Theory of Mechanics and Electromagnetics	4 units
PHY 200B	Theory of Mechanics and Electromagnetics	4 units
PHY 200C	Theory of Mechanics and Electromagnetics	4 units
PHY 210	Computational Physics	3 units
PHY 241	Advanced Topics in Magnetism	3 units
PHY 242	Advanced Topics in Superconductivity	3 units
SSC 222	Global Carbon Cycle	3 units
TTP 289A	Applied Data Analysis	4 units

Policy and Management

ARE 147	Resource and Environmental Policy Analysis	3 units
ARE 175	Environmental Economics	4 units
CRD 245	Political Economy of Urban and Regional Development	4 units
ECI 268	Infrastructure Economics	3 units
ECN 125	Efficiency in Energy Markets	4 units
ECN 215D	Environment and Economic Development	4 units
ENV 200A	Analysis of Environmental Management & Policy	4 units
ENV 200B	Environmental Policy Evaluation	4 units
ENV 200C	Environmental Policy Process	4 units
ENV 201	Environmental Law	3 units
ESP 163	Energy and Environmental Aspects of Transportation	4 units

ESP 167	Energy Policy	3 units
ESP 212A	Environmental Policy Process	4 units
ESP 212B	Environmental Policy Evaluation	4 units
ESP/ARE 275	Economic Analysis of Resource & Environmental Policy	4 units
LDA 201	Theory and Philosophy of the Designed Environment	4 units
LDA 205	Urban Planning and Design	4 units
LDA 217	Ecologies of Infrastructure	4 units
MGT 206	Decision Making and Management Science	3 units
MGT 241	New Product Development	3 units
MGT 250	Technology, Competition, and Strategy	3 units
MGT 251	Management of Innovation	3 units
POL 171	The Politics of Energy	4 units
POL 208	Policy Analysis	4 units
TTP 289A	Energy and Transportation Modeling for Policy Analysis	4 units

d) **Elective Courses (minimum of 23 units)**

Ph.D. students will develop a coherent program of study with their Major Professor by the end of the student's first quarter of study. This program of study will be designed so that the student can develop a specialization within the energy field through electives. Students may enroll in any of the courses listed above as eligible for the foundation requirement as electives to fulfill their degree requirements, or the student may enroll in other electives subject to the approval of their Major Professor.

Allowing for this flexibility in the course of study will allow the student and their Major Professor to design tailored programs of study that will result in specializations most relevant to the particular student and his/her career objectives. The following are a few examples of the types of specializations within the field that may be expected from EGG students:

- Building energy efficiency; Biomass conversion; Fuel cell engineering; Sustainable transportation policy; Energy economics; Biofuels; Nanosolar manufacturing; Energy systems analysis; among others.

As a result of the diversity of specializations expected within the EGG program, EGG faculty members have chosen not to pre-identify a list of eligible or preferred electives. As the program matures, however, the Executive Committee of the EGG may consider requiring additional specific courses as certain specializations become more common.

e) **Research (total required # research units):**

EGG 299 research work does not count toward the total number of coursework units.

f) **English Language Requirement**

Students who have not obtained a previous degree at an approved English-medium institution or demonstrated English-language proficiency through an appropriate exam (e.g. TOEFL) are required to complete appropriate English-language courses, as described in the policy *Graduate Student Course Requirements – English as Second Language* ([GC2018-02](#)). Courses taken in satisfaction of this requirement do not count towards the units required for graduation.

g) **Summary:**

Ph.D. students will be required to complete a minimum of 45 units to graduate, at least 30 of which must be at the graduate level. Of those units, all Ph.D. students will be required to complete 15 units of core coursework, and will be required to complete a minimum of 6 units of additional sub-core coursework to develop a foundation within the student's chosen degree track (either Energy Science & Technology, or Energy Policy & Management). Ph.D. students will also be required to take at least one course in research design. Ph.D. students will then develop a coherent program of study with their Major Professor by the end of the student's first quarter of study. This program of study will be designed so that the student can develop a specialization within the energy field through electives.

Full-time students must enroll for 12 units per quarter including research, academic and seminar units. Courses that fulfill any of the program course requirements may not be taken S/U unless the course is normally graded S/U (such as EGG 290 *Energy Seminar*). Once course requirements are completed, students can take additional classes as needed.

Only courses in which A, B, C, or Satisfactory are earned may be counted in satisfaction of degree requirements. A grade-point average of at least 3.0 must be maintained for all upper division and graduate courses.

If the GPA falls below the 3.0 minimum, the student is placed on academic probation. If a student is on academic probation for more than two quarters, the student is subject to disqualification upon recommendation by the Graduate Advisor to the Dean of Graduate Studies.

4) Special Requirements: None.

5) Advising Structure and Mentoring:

The **Major Professor** is the faculty member who supervises the student's research and dissertation and helps the student to develop his/her detailed program of study designed to result in a specialization within the energy field; this person also serves as the Chair of the student's Dissertation Committee. The Major Professor is not, however, permitted to Chair the Qualifying Examination Committee. The Major Professor also advises the student on course selection each quarter. Students are required to submit a proposed program of study which lists the quarter's registration plan (must include at least 12 units per quarter, and may include research and seminar units). The approved program of study will be filed with the student's official record in the Graduate Program Staff's office. Any changes to the program of study must similarly be approved by the Major Professor and Graduate Advisor.

The **Graduate Advisor**, who is appointed by the Office of Graduate Studies, is a resource for information on academic requirements, policies and procedures, and registration information.

The **Graduate Program Coordinator** (staff) assists students with identifying a Major Professor, identifying appointments and fellowship opportunities, and assists with general university policies. The Mentoring Guidelines can be found in the graduate student handbook produced by Graduate Council and can be found online at the following address: <http://gradstudies.ucdavis.edu/sites/default/files/upload/files/grad-council/mentoring.pdf>

6) Committees:

a) **Executive Committee:**

The administration of the EGG program and its activities will be vested in an Executive Committee. The committee will coordinate with the Chair in administering the EGG program and oversee the modification of the EGG program's mentoring guidelines and

application within the program. The committee will consist of the Graduate Advisor, the Graduate Admissions Advisor, and a third member appointed by the Chair. The Graduate Advisor will serve as the Chair of the Executive Committee. The Graduate Staff Coordinator will be a non-voting member of the Executive Committee. Unless otherwise serving as an active member of the Executive Committee, the Director of the UC Davis Energy Institute will serve as an ex-officio member of the Executive Committee.

The principal responsibilities of the Executive Committee are to:

- (1) Administer the graduate program, including the approval of all individual programs of study (POS) and graduate course approval forms;
- (2) Nominate Qualifying Examination Committee (Ph.D.) membership (to include five faculty members and not to be chaired by the student's Major Professor) to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy;
- (3) Nominate Dissertation Reading Committee (Ph.D.) membership (to include three faculty members and typically Chaired by the student's Major Professor) to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy;
- (4) In consultation with the Chair of the EGG program, appoint such standing and ad hoc committees as deemed necessary to properly administer the activities of the Program

b) **Qualifying Examination Committee (Ph.D.)**

The student, in consultation with the Major Professor and the Graduate Adviser, recommends five faculty members to the Executive Committee to serve on their Qualifying Examination (QE) Committee. The QE Committee conducts the exam and submits the results to the Office of Graduate Studies. The Major Professor is not to serve as the Chair of the QE Committee. The Executive Committee nominates the QE Committee to the Office of Graduate Studies for formal appointment in accordance with Graduate Council Policy. Only members of the Academic Senate or the EGG program have automatic eligibility to serve as members of advanced degree committees.

Members of the Academic Senate who are *not* members of the EGG program can seek exception to serve as Chair of an advanced degree committee; the petition to do so can be obtained from the Office of Graduate Studies.

Individual who are not members of the Academic Senate or the EGG program can serve on advanced degree committees with written recommendation from the student and approval by the Graduate Adviser and the Office of Graduate Studies; the petition to do so can be obtained from the Office of Graduate Studies. Nomination of an individual who is neither a member of the Academic Senate nor a member of the EGG program to serve as the Chair of an advanced degree committee is approved by the Executive Committee only in the most exceptional circumstances.

c) **Dissertation Reading Committee (Ph.D.)**

The Dissertation Reading Committee is a three-member committee identified by the student, in consultation with the Major Professor. The majority of the committee should be from faculty members of the EGG program. The composition of the dissertation committee is entered on the Advancement to Candidacy Form and submitted by the group's Executive Committee to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy.

The role of the Dissertation Committee is to advise the doctoral student on the research topic and methods, and then to review the final completed dissertation for acceptance.

The Committee Chair (usually the Major Professor) should determine the desires of the individual members regarding assistance with the research and dissertation review at the time the dissertation committee is constituted. Students are expected to meet with the Chair of their dissertation committee regularly. Dissertation committee members are expected to read and comment on a dissertation within four weeks from its submission. This time limit policy does not apply to summer periods for faculty holding nine-month appointments. The student and faculty will coordinate a timeline for the student to present the thesis to the dissertation committee. This timeline must allow all dissertation committee members enough time to fulfill their responsibilities within the four-week deadline.

d) **Graduate Affairs Committee**

The Graduate Affairs Committee will be chaired by the Graduate Advisor. The committee will consist of four members, including one graduate student representative, and shall have the following responsibilities:

- (a) To prepare recommendations, as needed, regarding minimum requirements for graduate degrees and other programmatic proposals for consideration by the members of the EGG Program;
- (b) To review and recommend revision, as needed, of the Energy Graduate Group curriculum;
- (c) To review petitions from graduate students

Recommended revisions to the EGG Program curriculum must be approved by simple majority vote of the membership.

e) **Student Admissions and Membership Committee**

Once the completed application for admission, all supporting material (as described above), and the application fee have been received, the application will be submitted to the Student Admissions and Membership Committee. The Student Admissions and Membership Committee consists of four faculty members. Based on a review of the entire application, a recommendation is made to accept or decline an applicant's request for admission. That recommendation is forwarded to the Dean of Graduate Studies for final approval of admission. Notification of admissions decisions will be sent by the Office of Graduate Studies.

7) **Advancement to Candidacy:**

Before advancing to candidacy for a doctoral degree, a student must have satisfied all requirements set by the graduate program, must have maintained a minimum GPA of 3.0 in all course work undertaken (except those courses graded S or U), and must have passed a Qualifying Examination before a committee appointed to administer that examination in accordance with Graduate Council policy. Normally, students will have advanced by the end of the 9th quarter of study. The student must file the appropriate paperwork with the Office of Graduate Studies and pay the Candidacy Fee in order to be officially promoted to Ph.D. Candidacy. Refer to the Graduate Council website for additional details regarding the Doctoral Qualifying Examination at <http://gradstudies.ucdavis.edu/gradcouncil/policiesall.html>.

8) **Preliminary Examination, Qualifying Examination and Dissertation requirements:**

a) **Preliminary Examination**

The Ph.D. program does not have a preliminary examination.

b) Qualifying Examination

1. General Information

All students will complete all course requirements before taking their Qualifying Examination (QE). Passing the QE exam makes the student eligible for advancement to candidacy. The QE should be taken by no later than the end of the 9th quarter after admission to the Ph.D. program.

The primary purpose of the QE is to validate that the student is academically qualified to conceptualize a research topic, undertake scholarly research and successfully produce the dissertation required for a doctoral degree. The QE must evaluate the student's command of the field, ensuring that the student has both breadth and depth of knowledge, and must not focus solely on the proposed dissertation research. In addition, the QE provides an opportunity for the committee to provide important guidance to the student regarding his or her chosen research topic.

The QE will consist of both written and oral examinations.

2. Written Portion of the Qualifying Exam – Dissertation Prospectus

At a minimum the written portion of the QE consists of a research proposal called the Dissertation Prospectus. The Prospectus should be provided to members of the QE committee at least 10 days before the oral portion of the QE.

The Prospectus is an independently prepared proposal of 5-10 pages describing the student's dissertation-specific research aims, hypotheses, progress to date, and experimental approach. Concepts within the research proposal can be discussed with others (such as the student's Major Professor and peers), but the writing of the proposal should be solely the student's work (i.e., no editorial assistance is allowed) as the proposal will serve as evidence of the student's proficiency in scientific writing.

The QE committee will be responsible for assessing that the student's writing proficiency is satisfactory before advancement to candidacy. Furthermore, the Prospectus will provide information that may be discussed during the oral portion of the QE.

3. Oral Portion of the Qualifying Exam

The oral portion of the QE will be 2-3 hours in length and is intended to demonstrate the student's critical thinking ability, powers of imagination and synthesis, and broad knowledge of the field of study.

The QE committee will evaluate the student's general qualifications for a respected position as an educator or leader as well as the student's preparation in a special area of study based upon relevant portions of the student's previous academic record, performance on specific parts of the examination, and the student's potential for scholarly research as indicated during the examination.

4. Outcome of the Qualifying Exam

The QE committee will reach a decision on the student's performance immediately after the oral portion of the QE exam. The QE committee, having reached a unanimous decision, shall inform the student of its decision to:

- **“Pass”** (no conditions may be appended to this decision),
- **“Not Pass”** (the Chair's report should specify whether the student is required to retake all or part of the examination, list any additional

requirements, and state the exact timeline for completion of requirements to achieve a “Pass”), or

- **“Fail.”**

If a unanimous decision takes the form of “Not Pass” or “Fail”, the Chair of the QE committee must include in its report a specific statement, agreed to by all members of the committee, explaining its decision and must inform the student of its decision. Having received a “Not Pass,” the student may retake the QE one additional time; the QE report must identify and list the specific conditions and timing for the second exam. After a second examination, a vote of “Not Pass” is unacceptable; only “Pass” or “Fail” is recognized. Only one retake of the QE is allowed. Should the student receive a “Fail” on the first or second attempt at the exam, the student will be recommended for disqualification from the program to the Dean of Graduate Studies.

Note that to address any deficiencies identified during the oral portion of the QE exam, additional work, as determined by the QE committee, may be required of the student in order to pass the QE on second attempt.

c) **The Dissertation**

1. **Dissertation: General Requirements**

Filing of a Ph.D. dissertation with the Office of Graduate Studies is normally the last requirement satisfied by the candidate. The deadlines for completing this requirement are available from the Office of Graduate Studies. A candidate must be a registered student or in Filing Fee status at the time of filing a dissertation, with the exception of the summer period between the end of the Spring Quarter and the beginning of Fall Quarter. The PhD. Dissertation will be prepared, submitted, and filed according to regulations instituted by the Office of Graduate Studies <http://gradstudies.ucdavis.edu/students/filing.html> Satisfaction of this requirement must be verified by the Dissertation Committee Chair.

2. **Dissertation:**

The research conducted by the student must be of such character as to show ability to pursue independent research. The dissertation reports a scholarly piece of work of publishable quality that solves a significant scientific problem in the field and is carried out under the supervision of a member of program while the student is enrolled in the program. The chair of the Dissertation Committee must be a member of the EGG program and must be immediately involved with the planning and execution of the experimental work done to formulate the dissertation.

Students should meet regularly with their Dissertation Committee. The dissertation must be submitted to each member of the dissertation committee at least one month before the student expects to make requested revisions; committee members are expected to respond within 4 weeks, not including summer months for nine month faculty. Informing committee members of progress as writing proceeds helps the members to plan to read the dissertation and provide feedback within this time frame. The dissertation must be approved and signed by the dissertation committee before it is submitted to the Office of Graduate Studies for final approval.

9) **Normative Time to Degree**

Normative time is the elapsed time (calculated to the near academic quarter) that a student would need to complete all requirements for the degree, assuming that they are engaged in full-time study and making adequate progress. For the Ph.D. degree from the Energy Graduate

Group, the normative time to advancement to candidacy is 9 quarters (three years of full-time academic enrollment).

For Ph.D. students, measured from the time a student begins graduate study, the normative time in candidacy to complete the dissertation and earn the degree is approximately 5 years.

10) Typical Time Line and Sequence of Events

This section provides two timelines. The first table illustrates the expected timeline for full-time Ph.D. to meet broad objectives within the program. The second table presents an example of a study plan for a Ph.D. student focused on energy engineering.

Action Item	Expected Quarter of Completion After Enrollment
Select a Major Professor	1
Submit Graduate Student Study List	1 / 2 / 3
Select Program of Study Committee	1
Submit Graduate Student Annual Progress Report	3 / 6 / 9 / 12 / 15
Submit Preliminary Program of Study	1
Establish Dissertation Committee	3
Submit final Program of Study	6
Submit Application for Qualifying Exam	6
Take initial Qualifying Exam	6
Retake Qualifying Exam (if necessary)	9
Submit Application for Advancement to Candidacy	6 / 9
File Dissertation	15

The following table presents an example of a study plan for a Ph.D. student focused on energy engineering and economic modeling of energy systems. This student will have entered the EGG program with an undergraduate degree in Engineering and thus has fulfilled all pre-requisites.

Year One	Fall	Winter	Spring
	EGG 200: Fundamentals of Energy Science and Technology (4)	EGG 201: Life Cycle Analysis in Energy Systems (4)	EGG 202: Energy and Climate Policy (4)
	EGG 290: Energy Seminar (1)	ARE 275: Economic Analysis of Resource and Environmental Policies (4)	EBS 265: Design and Analysis of Engineering Experiments (5)
	ECI 143: Green Engineering Design and Sustainability (4)	EGG 299: Research (4)	EGG 299: Research (3)
	EGG 299: Research (3)		
Total Units:	8 units (course work) 1 unit (seminar) <u>3 units (research):</u> 12 units	8 units (course work) 4 units (research) _____ : 12 units	9 units (course work) 3 units (research) _____ : 12 units

Year Two	Fall	Winter	Spring
	EGG 290: Energy Seminar (1)	MAE 271: Advanced Modeling and Simulation of Mechatronic Systems (4)	ECI 268: Infrastructure Economics (4)
	MAE 216: Advanced Thermodynamics (4)	ECI 125: Building Energy Performance (4)	MAE 272: Theory and Design of Control Systems (4)
	MAE 218: Advanced Energy Systems (4)	EGG 299: Research (4)	EGG 299: Research (4)
	EGG 299: Research (3)		
Total Units:	8 units (course work) 1 unit (seminar) <u>3 units (research):</u> 12 units	8 units (course work) 4 units (research) _____ 12 units	8 units (course work) 4 units (research) _____ 12 units
Year Three	Fall	Winter	Spring
	EGG 290: Energy Seminar (1)	ARE 256B: Applied Econometrics II (4)	ECI 249: Probability Design and Optimization (4)
	ARE 256A: Applied Econometrics I (4)	EGG 299: Research (8)	EGG 299: Research (8)
	ECI 250: Civil Infrastructure System Optimization and Identification (4)		
	EGG 299: Research (3)		
Total Units:	8 units (course work) 1 unit (seminar) <u>3 units (research):</u> 12 units	4 units (course work) 8 units (research) _____ 12 units	4 units (course work) 8 units (research) _____ 12 units

The student will take predominantly EGG 299 research units in years four and five of study as the student completes the research needed for the dissertation. The student may take additional graduate or upper-division courses during this time as determined to be appropriate by the Major Professor.

11) Sources of funding.

We expect the EGG program to be highly competitive and to attract academically outstanding students to UC Davis. Through the combination of existing campus financial commitments and significant extramural fundraising, it is expected that all EGG PhD students will receive fellowship and research support.

12) PELP, In Absentia and Filing Fee status.

Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide: <http://www.gradstudies.ucdavis.edu/publications/>

13) Leaving the Program Prior to Completion of the Ph.D. Requirements.

Should a student leave the program prior to completing the requirements for the Ph.D., they may still be eligible to receive the M.S. degree if they have fulfilled all the requirements necessary for that degree (see M.S. degree requirements section). Students can use the Change of Degree Objective form available from the Registrar's Office to initiate this process: http://registrar.ucdavis.edu/local_resources/forms/D065-graduate-major-degree-change.pdf.