IGA-525M: Energy Innovation Policy

Syllabus

Term: Spring 2013
Credits: 0.5 credits
Class meets: M/W 10:10 a.m. - 11:30 a.m.
Room: Littauer 130

Instructor: Prof. Laura Diaz Anadon
Office: Littauer 333B
Telephone: 617-384-3725
E-mail: laura_diaz_anadon@harvard.edu
Office hours: M 1:45 p.m. - 2:45 p.m.; W 12:30-1:30 p.m.; Th 4:00 p.m. - 5:00 p.m.

Faculty assistant: Karin Vander Schaaf
Office: Littauer-333A
Telephone: 617-496-5584
E-mail: karin_vander_schaaf@harvard.edu

To make an appointment to see the instructor during office hours, please put your name on the sign-up sheet on her office door (L333B).

1. Course Description
Innovation in energy technologies is necessary to confront profound challenges facing countries all over the world. Concerns regarding resource availability, the environment, health, national security, competitiveness, and access are driving government efforts to accelerate innovation in energy supply, end-use, and storage technologies. This course will cover the basic frameworks for analyzing technology innovation systems (focusing on technology development stages, actors and institutions, and innovation functions), and the range of available policy tools (including research and development funding, tax incentives and prizes, and performance standards). Students will become familiar with the complexity of measuring the returns of innovation programs, identifying the factors that shape technological change, and integrating water and land-use considerations in energy policy decisions, among other topics. This course combines theoretical, quantitative, and comparative approaches. The latter is accomplished through cases, which will focus on the path from invention to commercialization of various energy technologies, as well as the recent energy innovation efforts of various governments.

2. Prerequisites
This course is open to graduate students from any school or department, and to qualified undergraduates with the permission of the instructor; the diversity of backgrounds enriches the course. Training in natural or engineering sciences is not a requirement.

3. Class participation
Students will be encouraged to participate in in-class discussions, and to hone their analytical, research, and writing skills through the assignments.
4. Expectations

The Kennedy School is a professional school, training professionals. As such, students are expected to:

▪ attend all classes;
▪ be on time;
▪ submit assignments on time;
▪ be respectful of each other and of the instructor;
▪ be prepared to be cold-called; and
▪ do their best to prepare professional products for their assignments.

Students are expected to have read the required readings before class – many of the classes will be discussions of issues raised in the readings. Recommended readings represent additional resources that may be useful for students especially interested in a particular topic, but reading them is not required for class.

5. Assignments & Grading

There are three assignments for this course in addition to the readings and class participation.

The first assignment is a problem set designed to exercise some of the material covered in the first couple of lectures and to familiarize students with the magnitude and dynamics of the energy system. The problem set needs to be completed individually; this means that students can give hints to each other or can discuss the problem set in groups, but cannot share their answers.

The second assignment is a policy memo advising a senior level official—in national or a regional government, in an international organization, etc.—to: (a) take one action or one of several actions to address a question in an energy innovation context (e.g., about a technology, a sector, or a set of actors); or (b) modify an existing policy that has an impact on innovation in energy. Students are encouraged to set up a time to meet with the instructor to discuss their selected topic and approach. Students will be provided an example of the basic format of a policy memo.

The final assignment will be a research paper analyzing a policy challenge related to energy innovation policy using the concepts, case studies, and/or simple models covered in the classes. Suggestions for possible topics will be made available in class, and final choices need to be approved by the professor.

Assignments must be posted to the class page by 5:00 p.m. on the day they are due. Late assignments will be marked down one grade for each day they are late, unless the professor grants an exception due to special circumstances. The assignments will be due on the following dates:

Problem Set: 2/11 (Wed)
Policy Memo: 2/27 (Mon)
Final Research Paper: 3/28 (Wed)

Grading for this course is as follows:

Class Participation: 15%
Problem Set: 15%
Policy Memo: 20%
Final Research Paper: 50%
Requests for reconsideration of grades on the final paper will be accepted only in writing and must be received within one week of receiving your graded paper, with a clear statement of what you feel has been incorrectly graded. Your entire paper will be reconsidered and regraded if need be.

For their class participation grade, students will be evaluated on their level of participation in and engagement with the class as a whole. Effective class participation requires that students read and review the assigned readings before coming to class. The class participation and engagement grade will depend on the quality of verbal participation in class discussions. The following types of class participation are particularly appreciated, and can help you increase your participation grade: (a) bringing in evidence/ideas from the readings; (b) building on comments from others; and (c) linking professional experience to the material being discussed.

The participation grade will also take non-verbal participation in the class into account. Although the use of laptops and table PCs is permitted for referring to the readings and lecture outlines and for taking notes, use of these devices for non-class purposes (work for other classes, and all internet related activities) has negative impacts on the overall class environment and is not permitted. Even permitted use of laptops and tablets can have the negative effect of reducing the level of attention devoted to the class. As a result, failure to be engaged in the class, due to excessive focus on laptop or table can result in a lower participation grade. In addition, the use of cell phones and smartphones in class is not permitted.

Throughout the course, the quality of both verbal and non-verbal participation will be monitored by the instructor and the faculty assistant.

6. Citation Practices

Students must be familiar with and must observe Kennedy School and Harvard University rules regarding the citation of sources. Any sentences or paragraphs taken verbatim from the writing of (or interviews with) any other person or persons, or from your own writing that has been published elsewhere, must be placed in quotation marks and their source must be identified with a footnote or endnote that includes the usual bibliographic information: author’s name, title of article or chapter, venue (book, journal, magazine, website, report, thesis, term paper, private letter), date, and page numbers if applicable. (Note: A URL with no title, author, or date is not a complete reference; if in doubt, check The Chicago Manual of Style or similar style guides.) Changing the wording of a sentence or passage slightly does not evade the requirement for citation (nor reduce the chance of detection). Indeed, whenever you are drawing an important argument or insight from someone else, even if you reword it into your own words, a reference to the source is required. All of these requirements also apply to material taken from websites.

Including material from others in the assignments without appropriate quotation marks and citations is regarded, as a matter of School and University policy, as a serious violation of academic and professional standards and can lead to a failing grade in the course, failure to graduate, and even expulsion from the University.
### 7. Class Schedule

<table>
<thead>
<tr>
<th>Class</th>
<th>Date</th>
<th>Topic</th>
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<tr>
<td></td>
<td></td>
<td><strong>Part I: Concepts and Simple Models – The Energy System and Technical Change</strong></td>
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<tr>
<td>1</td>
<td>January 28 (Mon)</td>
<td>The need for energy innovation and energy sector dynamics</td>
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<tr>
<td>2</td>
<td>January 30 (Wed)</td>
<td>Opening up the black box of technical change</td>
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<td><strong>Part II: Theory – Understanding Innovation Systems</strong></td>
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<td>3</td>
<td>February 4 (Mon)</td>
<td>National innovation systems</td>
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<td>4</td>
<td>February 6 (Wed)</td>
<td>Barriers to energy innovation and innovation functions</td>
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<td><strong>Part III: Applications – The Energy Innovation Policy Toolkit</strong></td>
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<td>5</td>
<td>February 11 (Mon)</td>
<td>Technology push policies I</td>
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<td>6</td>
<td>February 13 (Wed)</td>
<td>Technology push policies II</td>
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<td>February 18 (Mon)</td>
<td>President’s Day (no class)</td>
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<td>7</td>
<td>February 20 (Wed)</td>
<td>Market push I</td>
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<tr>
<td>8</td>
<td>February 25 (Mon)</td>
<td>Market push II</td>
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<td><strong>Part IV: Integrated Assessment Considerations</strong></td>
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<td>9</td>
<td>February 27 (Wed)</td>
<td>Innovation clusters</td>
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<td>February 27 (Wed)</td>
<td>Guest: Dr. Susan Hockfield, MIT President Emerita, Marie Curie Visiting Professor at HKS</td>
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<td>10</td>
<td>March 4 (Mon)</td>
<td>Measuring the outcomes of RD&amp;D</td>
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<td>11</td>
<td>March 6 (Wed)</td>
<td>International initiatives</td>
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<td>12</td>
<td>March 11 (Mon)</td>
<td>Management of multiple resources and dealing with uncertainty</td>
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<td>13</td>
<td>March 13 (Wed)</td>
<td>Wrap-up: Lessons from history and from other sectors</td>
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<td>Final</td>
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<td>March 28 (Thu)</td>
<td>Final paper due</td>
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8. Readings & Assignments

**Part I – Concepts and Simple Models: the Energy System and Technical Change**

**Class #1 1/28 The need for energy innovation and energy sector dynamics**


*Optional:*


**Class #2 1/30 Opening up the black box of technical change**


*Check:*

Santa Fe Institute. Performance Curve Database. Available at: [http://pcdb.santafe.edu/](http://pcdb.santafe.edu/)

*Optional:*


**Part II – Theory: Understanding Innovation Systems**

**Class #3 2/4 National innovation systems**

Problem Set handed out


And *skim* at least one of these chapters in the Nelson & Rosenberg (1993) book; each covers a different country (note that they have a lot of references and are not as long as they seem):

- United States pp. 29-75
- Germany pp. 115-157
- Japan pp. 76-114
- South Korea pp. 357-383

Optional:

**Class #4 2/6 Barriers to energy innovation and innovation functions**


Optional:
Part III – Applications: The Energy Innovation Policy Toolkit

Class #5 2/11 Technology push policies I
Mini-cases: Wind development in Denmark and the United States
The U.S. Synfuels Corporation

Problem Set due


Optional:

Class #6 2/13 Technology push policies II
Mini-cases: R&D tax credits, prizes, procurement, and patents
Innovation institutions in selected countries

Policy Memo assignment out


Optional:


updated: December 14, 2012
Class #7  2/20  Market pull policies I
Mini-cases: Standards and information programs in the United States
Biofuels in Brazil


Optional:


Class #8  2/25  Market pull policies II
Mini-cases: Coal-bed methane in the United States
PV in Japan and Spain


Optional:

Class #9 2/27 Innovation clusters
Guest: Dr. Susan Hockfield, President Emerita of MIT, Marie Curie Visiting Professor at HKS

Policy Memo due


Part IV – Integrated Assessment Considerations

Class #10 3/4 Measuring the benefits of RD&D


Optional (but highly recommended):


Class #11 3/6 Management of multiple resources and dealing with uncertainty


Optional:


Check:
The Economic Input-Output Life Cycle Assessment tool: http://www.eiolca.net/

Class #12  3/11  International initiatives and trends
Case: The Montreal Protocol
Climate Innovation Centres


Optional:


Class #13  3/13  Pulling lessons from history and other sectors

Read at least one of the following chapters of the Henderson & Newell (2011) book:

Final 3/28 Final Research Paper due

9. Some Relevant Journals


10. Some Relevant Websites with Information

BP Statistical Review of the World: http://www.bp.com/sectiongenericarticle800.do?categoryId=9037130&contentId=7068669
Intergovernmental Panel on Climate Change: http://www.ipcc.ch/
Santa Fe Institute Performance Curve Database: http://pcdb.santafe.edu/
World Bank Indicators: http://data.worldbank.org/indicator