What will our world look like in 2050? Who will have political and economic power? How will we provide energy/electricity to the world? And how will our climate have changed the way we live? These are the questions that will explore by looking forward over the next 35 years and tracing the history of energy/climate over the past 100 years. We will also plunge into today’s complicated world of energy politics, technology, oil prices, and climate change.

Redesigned class into hybrid energy seminar:

Investing in Energy is a multidiscipline class that covers a great deal of content. Like many seminars, a more structured format focuses on student engagement, online reflection, interaction, and discussion, so that students experience the challenges of making decisions in an uncertain environment. Hybrid online courses are a build around explicit in-class and out-of-class “lesson plans.” Students will learn from each other and industry experts. They will also be exposed to material across many disciplines. The new course format will prepare students to operate a complex problem solving work environment, such as consulting or economic planning.

Investing in Energy is a seminar structured course that is part of the “Sustainable” specialization at Brandeis International Business School. This is a content focused class that looks at the factors affecting the supply, demand, and price of energy in global markets; and how various players/companies operate in volatile markets and how policy makers influence climate policy. The Investing in Energy class introduces students to many disciplines/perspectives: politics, economics, finance, technology, and project management. We will meet with a range of experts, read many of articles, and then, we will evaluate the feasibility of investing in specific energy projects as part of our final class.

Course Overview and Learning Goals

How do energy companies and investors around the world make investment decisions in our current economic/political environment? How do investors assess the risks and the long-term opportunities? What are the potential returns in an uncertain world? How do companies manage energy projects and implement new technologies in such a world? In a word, how do you decide to make a substantial investment in an energy project in today’s volatile and uncertain market?

To evaluate energy investments students need to acquire the background knowledge, the technical skills, and an appreciation of the politics of energy/climate policy across the world. The Investing in Energy course will establish a broad framework of analysis, and then, students will focus on assessing the economic viability/feasibility of a project.

- First, students need to understand the political and economic context in which energy companies operate. This means understanding the history of the industry: the anti-trust break-up of Standard Oil, the formation of the powerful OPEC oil cartel, and the role of influential new players, such as Russia, China and National Energy companies.
- Second, students need to be familiar with the details of energy supply/demand trends and future scenarios across global markets. This includes the transportation demand for oil; the electrical utility use of oil/gas, future demand for coal and/or nuclear; and the consumer demand for petroleum based products, such as gasoline, plastics, and pharmaceuticals.
• Third, it is critical that students appreciate the science of climate change, the potential impact and the policy options that are being implemented. Climate change policies will have a significant effect on the economics of the energy business. We will look at the impact of various policy options (IPCC and COP 21) under consideration in different countries / regions and the longer-term climate change forecasts / adaptation scenarios.

• Fourth, technology – old, new and emerging – is at the core of most energy investments. Students need to appreciate the challenges of technology investments and its implications on project timelines / costs. Students will learn about a broad set of technology initiatives such as: clean coal (CCS), shale gas, nuclear power, LNG, wind turbines, electric cars, long-lasting batteries, thin coat solar, and our more flexible power grids.

• Fifth, the class will conclude with student assessments of specific energy projects. This will include analysis of the market and the technology opportunities / risks. Project cost estimates, price assumptions, cash flow forecasts, risk/return analysis, and value will be a part of the project assessment. Should we make the investment?

By the end of the class, Investing in Energy students should be able to answer the fundamental energy investment questions: why invest, what are the risks, what are the expected returns, what don’t you know, what do you know, and what is the timeline?

Consistent hard work and class attendance is expected of all, particularly with guest speakers. READ, read… read; ask questions, listen, ask more questions, and learn. Please DO NOT cruise internet in class.

Class structure

The class will begin with a discussion or guest speaker talk who will introduce a topic and review some new material (70 - 75 minutes) followed by an active discussion. After the class break (around 8:15 p.m.) students will lead a topic discussion and bibliographic review that relates to the class lecture (for 100 slides no more than 10-15 minutes before active discussion).

The student topic discussion is NOT a presentation; it is a discussion of the questions, facts (information), and preliminary thoughts about an issue that concerns the group. Students leading the topic discussion are expected to engage the class (see description of Echo presentation below). For example, given the changes in the market students might choose to lead a discussion about the market structure / pricing in oil markets, or the changing role of Saudi Arabia and other players (Russia) in the energy markets. How might Saudi Arabia influence / affect pricing oil decisions in world markets?

The specific topics and class facilitation will be determined by the students and professor.

Grading and class requirements are as follows:

• Class participation and attendance 20%
• Quizzes and exercises (3/4) 20%
• Topic discussion and scenarios (presentation) 20%
• Energy investment project analysis / paper 40%
Presentations, papers and investment project assignments:

Energy students will work in groups of 4 to lead one discussion topic and write one energy project analysis paper

1. **Topic discussions**: The topic discussion / bibliography presentation (20 + minutes and 20 slides before class) is an important part of our seminar discussion. Suggested topics will be developed in our online and in-class discussions as we work through the assignments during the first three weeks of class. Specific topics will be reviewed with the professor before the topic presentations.

   Each student group will prepare an **Echo video** (by Monday morning) before class, so that the presentation can be reviewed / commented on by students before class so that we will have a class discussion, rather than presentation (with Q&A). In other words, student topic groups will have **TWO presentations**:
   - Longer Echo video prepared before class (20-25 minutes and 20 slides) uploaded by Monday
   - Shorter summary in class presentation (10 slides, 10 minutes; Tuesday) followed by an active class discussion that keys off of student questions recorded in LATTE forum.

2. The **final energy project** analysis (20 + pages with financial forecasts) is due at the end of the semester after each group has presented a preliminary project assessment to the class (note the Saturday class). We will have the same Echo video (upload) and shorter class discussion structure as our topics.

   Energy projects could include building a new nuclear plant in India, a clean coal plant in China, developing an electric car, a wind farm in Central Asia, shale gas development in Pennsylvania, or construction of a new pipeline from Russia to Europe/China. The feasibility analysis involves understanding the technology challenges, the project timeline, the estimated costs and longer-term revenues, and ultimately the potential returns / risks.

   Groups will work with the professor identifying and working on potential energy projects during the semester (preliminary topics, discussion of economics) so that the final presentations and paper will be completed in incremental steps and **Not all at once**.

In addition, there will be three (3) individual student exercises / quizzes and an active scenario forums / google docs that will help students think about our energy future frameworks.

**Reading and source material**

A sample reading list and source material is provided on Latte. This is hardly comprehensive (additional material and links will be posted on LATTE). I expect you to skim and summarize the readings in period journal entrees and quizzes. We will be skimming over 1000 pages of articles, reports, and excerpts during the semester, so your responsibility is to focus on particular articles of interest. I will also include journal entrees and other assignments to help you focus on the most relevant readings.

Students are also strongly encouraged to do their own research and searches (Brandeis University library, energy climate blogs, and United Nations Intergovernmental Panel on Climate Change (IPCC); [http://www.ipcc.ch/](http://www.ipcc.ch/). There is a great deal of information available about energy, technology and climate change. Our task is to sort our way through the scholarship and current research, so that we can arrive at a general assessment energy / climate by the end of the semester.

Ballantine 1/18/2016
I will also provide additional information on general Energy and Climate source material on LATTE.

The HBS link for Investing in Energy2014 and the required background readings on the oil industry, China and Saudi Arabia, and case discussions (Caspian pipeline, Kashagan Production Sharing) are available at

**HBS energy cases with link to HBS Energy class 2016**

You need to register on the site to create a user name if you do not already have one. Once you have registered, you can log in to see the course materials. You will have access to these materials for 6 months.

After you register, you can get to the course again by doing the following:

1. Visit hbsp.harvard.edu and log in.
2. Click My Courses, and then click this course name: Energy 2016

**Course Structure**

**Part I | Background: history of energy, climate change, and government policies**

What are the beginnings of the energy industry, how did it develop and where are we now? What is the structure of the industry and how might this impact supply and demand? We start with John D. Rockefeller and the growth of Standard Oil in the 1890s, and then, move to the development of oil in the Middle East, and the formation of OPEC in the 1950s. As we develop an understanding of the supply / demand for energy, we will examine the trends in various energy markets and forecasts of the future, particularly the role of coal, gas and renewables. We conclude the first part of the seminar with the challenges of climate change and the policy options currently under discussion.

- **Weeks 1 & 2 | History of Oil: Standard Oil (Rockefeller) and the evolution of OPEC**
  - Introduction: Discovery of oil and the development of industry with Rockefeller / Standard Oil, and the antitrust break-up; politics / muckrakers (Tarbell), and the new industry structure. Public attitudes towards oil and trusts (readings, film clips, etc). The focus will be on oil / energy companies, but we will also look at coal.
  - Middle East oil / OPEC: WWI, Turkish Petroleum Company and the formation OPEC and its emerging power: OPEC I and OPEC II. The people, companies and the political economy of cartels will be highlighted. Background readings on the changing structure of the energy industry and the new players will be discussed. The politics of oligopoly pricing will be emphasized. Film clips / background readings about the changing industry structure.

- **Weeks 3–5 | World Energy Supply and Demand by source and region.**
o Evolution supply/demand scenarios, and a review of various forecasts by IEA, Shell, UN and others. We will look at the evolution of US energy policy over the past 40 years looking at various reports (1970s, A Time to Choose) and the Obama plan.

- **Weeks 6 – 8 | Global Climate Change and Politics (IPCC and current reports)**
  o Energy policy, technology, politics and impact of climate change. Emphasis on impact of climate change forecasts and the different approaches of various companies, governments, NGOs throughout the world (US, Europe, Africa, China, Russia, etc.).
  o History of climate change and impact: Review and discuss the recent (2007, 2013) reports by Intergovernmental Panel of Climate Change (4 reports) and conferences (2010 to 2014). The science, recommendations, scenarios and impact; adaptation?
    – What are the climate / energy scenarios over the next 20-30 years across world?
    – Investing in Oil, Caspian oil development, case discussion.

  *Topics 1–3 presentations with Echo Videos and in-class discussion*

**Part II | The Future: technology, policy and investments**

How will government energy policies affect future demand / supply? What is the impact of new technologies and what is the timeline? And what will the price of energy be in the 2025, 2050? We will explore the economics of existing / emerging technologies through discussion of several possible technologies. We conclude with an energy project feasibility analysis.

- **Weeks 9 & 10 | Future and energy technologies: coal, nuclear, solar, wind, autos…**
  o Technology, costs and demand for new energy sources. What is involved in bringing new sources of energy to the market -- clean coal, solar, wind, biofuel, wave, geothermal, etc? What is the technology, how does it work, who is investing and exploring the technology, what is the timeline and what does it cost?
  o Outside speakers will discuss specific technologies and energy sources such as nuclear, coal, solar, wind. Other technology possibilities will also be considered.
  o Case discussion on Production sharing agreements in Kashagan.

  *Topic 4-5 Echo presentations and in-class discussion*

- **Week 11 | Scenarios / investment frameworks: What will happen in the future?** Energy demand, and possibility of non-linear changes in our world by 2030 and 2050.
  o Linear / non-linear changes in supply and demand of energy. These exercises will help us think about various energy / world scenarios over the next 20 to 40 years.
  o Review other frameworks and assumptions scenarios. Students will then outline their positive and negative scenarios and price/costs factors for energy in 2030, 2050.

- **Week 12 | Investing in energy** What are the long-term market values, returns and what are the risks? Investment needs? The role of companies, investors, and markets in both short and long term.
  o How do investors and market participants assess uncertain energy scenarios and investment opportunities?
  o Investment professionals will review their experience and lessons
Project feasibility, politics and investment returns. Raising money, making money and the economics of long term investments.

- **Week 13 & 14 | Student analysis / discussion of various energy investment projects**
  - Students will present a preliminary analysis of the feasibility of various energy investments in the final two class sessions (Tuesday and Saturday). Technology, governmental policy, price scenarios and cash flow forecasts will be discussed.
  - Final project analysis papers due at end of semester after feedback from the class discussion.

### Academic Honesty

You are expected to be honest in all your academic work. The University policy on academic honesty is distributed annually as section 5 of the Rights and Responsibilities handbook. Instances of alleged dishonesty will be forwarded to the Office of Campus Life for possible referral to the Student Judicial System.

The University has requested that course syllabi include the following passages:

> **ACADEMIC INTEGRITY IS CENTRAL TO THE MISSION OF EDUCATIONAL EXCELLENCE AT BRANDEIS UNIVERSITY. EACH STUDENT IS EXPECTED TO TURN IN WORK COMPLETED INDEPENDENTLY, EXCEPT WHEN ASSIGNMENTS SPECIFICALLY AUTHORIZE COLLABORATIVE EFFORT. IT IS NOT ACCEPTABLE TO USE THE WORDS OR IDEAS OF ANOTHER PERSON – BE IT A WORLD-CLASS PHILOSOPHER OR YOUR LAB PARTNER – WITHOUT PROPER ACKNOWLEDGEMENT OF THE SOURCE. THIS MEANS THAT YOU MUST USE FOOTNOTES AND QUOTATION MARKS TO INDICATE THE SOURCE OF ANY PHRASES, SENTENCES, PARAGRAPHS OR IDEAS FOUND IN PUBLISHED VOLUMES, ON THE INTERNET OR CREATED BY ANOTHER STUDENT.**

> **VIOLATIONS OF UNIVERSITY POLICIES ON ACADEMIC INTEGRITY, DESCRIBED IN SECTION THREE OF THE RIGHTS AND RESPONSIBILITIES, MAY RESULT IN FAILURE IN THE COURSE OR ON THE ASSIGNMENT, OR IN SUSPENSION FROM THE UNIVERSITY. IF YOU ARE IN DOUBT ABOUT THE INSTRUCTIONS FOR ANY ASSIGNMENT IN THIS COURSE, IT IS YOUR RESPONSIBILITY TO ASK FOR CLARIFICATION.**

> **IF YOU ARE WORKING IN GROUPS THAT I HAVE AUTHORIZED, I WILL EXPECT YOUR ANSWERS TO RESEMBLE THOSE OF YOUR PARTNERS; OTHERWISE I EXPECT YOU TO DO YOUR WORK SEPARATELY FROM YOUR FRIENDS, CLASSMATES, FAMILY MEMBERS, AND SO ON. YOU ARE NOT PERMITTED TO HAVE ANYONE OTHER THAN YOUR PROFESSORS HELP YOU ON WRITTEN ASSIGNMENTS OUTSIDE OF CLASS. IF YOU HAVE QUESTIONS ON THE TYPE OF HELP YOU MAY RECEIVE, PLEASE ASK ME BEFORE YOU SEEK HELP FROM SOMEONE.**

### Disabilities

If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me immediately. General course outline (see separate schedule syllabus).

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1 Shawn McGuirk, Kara Curcio, and Carrie Klugman, “Information for your Syllabi,” Memorandum to Faculty, Department of Student Development and Conduct, Brandeis University, August 1, 2004.