Duke University
ENERGY 620: Energy Finance
Professors Rasiel, Buley and Francis

Instructors and Contact Information
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Class meetings
The class meets on Tuesdays from 5:30-8:00/8:30 approximately. The first class is August 25, 2014.
All classes will be held in the Sauer Classroom in the Fuqua School of Business.

Course Objectives
This course exposes students to key topics in energy finance including: discount rates and discounted cash flows, valuation approaches, option pricing, real options, energy derivatives, project finance, energy specific taxation, and risk management. The goal of the course is to increase your understanding of financing and investment decisions as they relate to energy companies and energy-related projects.

Organizational Matters
Course Web Page and Discussion Boards:
The Sakai site contains links to the course materials. We have also set up an electronic discussion board. You should monitor this board for general announcements related to the course (e.g., updates on assignments, clarifications).

Course Packet:
The course packet contains the syllabus materials (readings, lecture notes and cases). The materials were chosen to stimulate, rather than solidify, your thinking. We view all materials and their associated discussions as an integral part of the learning experience of the course. We expect that you will prepare the materials for each session and that you will be actively involved in all class discussions, including asking questions and sharing your knowledge and experiences with the rest of the class. In some situations, the materials will represent your first exposure to a particular issue or problem; in such instances, you are expected to read and work through them to the best of your ability or your team’s ability. It is likely that you will not understand or be familiar with all terms that are used in the materials. The responsibility for increasing your understanding of these terms lies jointly with you (to look up these terms and phrases prior to class) and us (to lay out the fundamental issues in class as part of the lecture and discussion).
Class Meetings and Attendance:
We will provide a break roughly half way through each class (the exact time of the break will be determined by the instructor based on what seems to be the best stopping point). We expect you to attend class regularly and on time, having prepared beforehand all assignments and readings. On time means that you are in a seat and prepared to begin class at the start of the scheduled class time. If you are unable to attend class on a given day (and this should not be a regular occurrence), you will not be permitted to make-up that participation in some other way. During class, all electronic communications devices should be turned off.

Assignments and grading:
Your course grade will be based on a final exam, a midterm exam, team assignments, and class participation. The following weights will be used in calculating your final grade:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Final Exam</td>
<td>40%</td>
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<tr>
<td>Midterm Exam</td>
<td>30%</td>
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<tr>
<td>Team Assignments (2)</td>
<td>20%</td>
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<tr>
<td>Class Participation</td>
<td>10%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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The final exam reflects your individual effort, is cumulative and is open-book, open-notes. The midterm exam also reflects your individual effort and is cumulative; it is closed-book, closed-notes.

Team assignments require a case write-up from each team (4 members, or your choosing). The format of each case write-up will, be defined by the instructor. All case write-ups should be typed with no smaller than 11-point font and 1” margins on all sides. The write-up should respond to the questions posed for each case. Please submit a single write-up with the names of all team members at the top of the first page.

Class participation is an individual effort. Because every class will be based on a collective analysis of one or more cases or reading(s), it is critical that you attend class and come prepared to participate actively in the discussion. The questions we provide for cases and readings will help you prepare for class. Learning for everyone in this class is enhanced through debate, different perspectives, and new insights. Keep in mind that your goal should be to contribute high quality comments, not high quantity. You detract from class discussion if you talk a lot and do not make a clear point. To contribute high quality comments, you must also listen carefully to the comments of your classmates. You should try to extend or qualify their comments while avoiding repeating them. To keep class conversations interesting and widely distributed across students, we will give priority to those who have spoken less, and sometimes we will solicit participation from specific students. We will also cold call to make sure that everyone contributes his or her knowledge and insights.

Duke University Honor Code:
The Duke University Honor Code applies to all aspects of this course. We will not tolerate any infraction of the Honor Code. The nature of each assignment indicates the type of communication and consultation that is permitted. Work that is described as an individual effort is to be your work alone, without consultation or assistance from any other person. Work that is described as a team effort is to be your team’s effort alone, again without consultation or assistance from anyone else. If you are uncertain about the nature of collaboration for any assignment, please ask us.
Course Schedule

Session 1: (August 25th)
Topics: Course introduction; discounting of cash flows; discount rates; estimating cash flows.
Readings:

Session 2: (September 1st)
Topics: More on the cost of capital; role of leverage and taxes; adjusted present value method (compared to WACC method)
Readings:
- Luehrman, T. Business valuation and the cost of capital. (9-210-037, November 20, 2009)
- Luehrman, T. Note on adjusted present value (9-293-092, October 28, 1994).
- Luehrman, T. The adjusted present value method for capital assets (9-294-047, July 12, 1994).
Assignment:
- Also, Midland Energy Resources Spreadsheet (4140-XLS-ENG). We will discuss in class (not for submission). Questions: For purposes of your calculations, assume that Midland’s debt beta is zero and its tax rate is 40%. (1) How did Midland arrive at the debt and equity values shown in Exhibit 5? (2) Calculate Midland’s prevailing WACC and its targeted WACC. (3) Calculate separate target WACCs for Midland’s three divisions: Exploration & Production, Marketing and Refining, and Petrochemical. (4) Should Midland use a single WACC for evaluating investment opportunities across divisions? Why or why not?

Session 3: (September 8th)
Topics: Multiples valuation
Readings:
Assignment:
- Cequel Energy Spreadsheet is available on the course website. We will discuss in class (not for submission). Questions: Determine a value for Cequel Energy based on a multiples approach.

Session 4: (September 15th)
Topics: Accounting issues relevant to the energy industry: reserves, depletion, asset retirement obligations, contingencies (including Superfund), and leases.

Session 5: (September 17th, Thursday)
Guest Speaker: Joseph Saad, JP Morgan, Managing Director in North American Credit Trading. He is a member of the Investment Committee for OEP, Co-Chair of the NA Analyst and Associate Development Committee and Captain of the Duke recruiting team. From 2000-2002 he worked in the Restructuring Group and from 1998-2000 he worked in Global Syndicate Finance. Prior to JPMorgan, Joe worked at First Chicago in their leveraged finance group and at Price Waterhouse before business school. He has a MBA from Duke University's Fuqua School of Business and a B.S. in Accounting from the University of Maryland, a CFA Charterholder and a CPA Inactive.

Note: To get to the equity value you must adjust for 396.5 thousand exercisable stock options, with a strike price of $34.12.
Session 6: (September 22nd)
Guest Speaker: Nils Magnussen, Chevron Corporation

Session 7: Midterm Exam (September 29th)

Session 8: (October 6th)
Topics: Introduction to project finance; structuring and financing transactions
Readings:
• “Project Finance Primer for Renewable Energy and Clean Tech Projects”, Wilson Sonsini Goodrich & Rosati (Groobey, Pierce, Faber and Broome) (April 2010).
• JP Morgan Cazenove, Analyst Report on BP.
Assignment:
• BP Amoco (A)—Policy Statement on the Use of Project Finance. Esty, B. (HBS 9-201-054, May 4, 2010). We will discuss in class (not for submission). Questions: (1) What are the key differences between corporate finance and project finance? (2) Which projects are the best candidates for project finance? (3) How does a financial manager consider the costs and benefits of project finance versus corporate finance and what factors should be considered? (4) What are the key differences between BP’s and Amoco’s policies prior to the merger?
• BP Amoco (B) – Financing Development in the Caspian Oil Fields. Esty, B. (HBS 9-201-067, May 4, 2010). We will discuss in class (not for submission). Questions: (1) How does the merged BP Amoco implement their new policy in the existing project in the Caspian Sea? (2) Since BP and Amoco have already taken different approaches to the financing of the project it is wise to change or modify the strategy? (3) What additional risks do you see from the combined Firm’s approach to its partners and the sponsor? (4) Consider at least three of the project Risks and how you would mitigate them.
• The Chad Cameroon Petroleum Development and Pipeline Project (A). Esty, B. (HBS 9-202-010, March 17, 2006). We will discuss in class (not for submission). Questions: (1) What are the different approaches to finance an oil extraction business versus an oil transportation business? (2) What unique factors in “frontier markets” must be considered? (3) How does “risk sharing” work between the host country, the Development Finance Institution, the Energy Firms and the NGO’s (4) What the differences between the “A Loans” and the “B Loans”

Session 9: (October 20th)
Topics: Structuring transactions; dealing with externalities
Assignment:
• Hong Kong Disneyland: Chase’s Syndication of Project Loan (A) and (B). Esty, B. (9-201-072, April 14, 2003, Esty, B. (HBS 9-201-086, March 17, 2003). This case should be turned in for submission. (Team Assignment #1) Questions: (1) Consider market conditions at the time of the development of the transaction and consider a few ways in which the debt capital markets have changed since the time of the case. (2) What are the key challenges to the project and how does Chase seek to mitigate those challenges through its structuring of the deal? (3) What choice of financing strategy would you have used if you were Disney? (4) Was the transaction successful from the standpoint of: (a) Disney; and (b) Chase?
• Nghe An Tate & Lyle Sugar Co (Vietnam). Esty, B. (HBS 9-202-054, May 27, 2003). The Equator Principles. We will discuss in class (not for submission). Question: (1) Consider at least three negative societal externalities in financing large projects. (2) What is the role of the Equator Principles in mitigating these externalities? (3) What are three of the private and public returns to
the Sugar factory? (4) Will this project be financially viable as currently structured? (5) How will social progress be measured and does such social measure conflict with financial success?

- U.S. Department of Energy & Recovery Act Funding: Bridging the “Valley of Death”, Michael Roberts, Joseph Lassiter, Ramana Nanda (HBS 810144, June 16, 2011). We will discuss in class (not for submission). Questions: (1) What is the “Valley in Death” in energy venture capital and how does a sponsor exit the Valley of Death? (2) What is the goal of the Department of Energy in stimulating energy development? (3) Could the private sector provide the same type of funding in the same scale? (4) What were the results of the Department of Energy financial intervention? (5) Would you have invested in the same projects as the Department of Energy?

Session 10: (October 27th)

Topics: Risk management

Readings:
- Fitch Ratings: Global Infrastructure and Project Finance (2012)

Assignment:
- Petrolera Zuata, Petrozuata C.A. Esty, B. (HBS 9-299-012, March 7, 202). We will discuss in class (not for submission). Questions: (1) Why use Project Financing tools to complete this project? (2) What are the pre-completion, operating, technological, sovereign and financial risks to the project identified at inception? (3) What factors will rating agencies use in evaluating the Project (Consider “Fitch Ratings: Global Infrastructure and Project Finance”)? (4) What elements of the structure lead to greater chance of loss to the parties in the event of financial distress? What elements reduce that chance of loss given financial distress? (5) Why did the sponsors choose not to attempt to mitigate market risk?
- Calpine Corporation: The Evolution from Project Finance to Corporate Finance. Esty, B. (HBS 9-201-098, January 21, 2003). We will discuss in class (not for submission). Questions: (1) Consider the opportunity presented to the CEO of Calpine. Why was this a “once in a lifetime opportunity”; what role does deregulation play in power and energy markets? (2) What competitive factors drove the CEO to embark on the financing strategy? (3) How did the CFO craft his strategy and why did the banking syndicate finance the “once in a lifetime opportunity” (4) What risks at the time of the financing would you anticipate as a lender? (5) The unique “hybrid structure” was eagerly accepted by the financial markets. Would you have participated in the financing? If so, why. If not, why not.

Session 11: (November 3rd)

Topics: Forwards and futures; spot vs futures markets; hedging vs speculation; futures pricing using no-arbitrage; exceptions in the commodities futures markets; contango and backwardation

Session 12: (November 10th)

Topics: Option pricing: Binomial model; relationship between options and futures; options for hedging and speculation

Session 13: (November 17th)

Topics: Real options; from NPV to option-adjusted PV; expansion, timing and learning options; extracting the value of the real option through dynamic hedging

Assignment: Real Options Valuation of Oil Concession in the North Sea (Emma Rasiel, 2002). This case should be turned in for submission. (Team Assignment #2)

Final Exam (December 2nd)