

**FINA 7397/GENB 7397**

**Competitive Strategy and Real Options  
in Energy Finance**

**Spring 2007**

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## I. Course Objective

This course focuses on the sources **value creation** (i.e., the process of generating superior *economic* performance for the firm over the long run) in the energy industries. It studies the special challenges associated with energy projects and the methods, conventional and advanced, for evaluating these opportunities. But while the focus is on the energy industry, the concepts are cutting-edge and should be in the tool-kit of all students interested in working for major corporations or as stock analysts.

Three types of problems will be examined in the course.

- Limitations inherent in the prevailing Net Present Value or WACC (weighted average cost of capital) methodology.
- Characteristics of energy industry projects, shared with some other industries, e.g. long-life assets, commodity business risks, capital intensity with long project development periods, that magnify and compound the conceptual limitations of NPV/WACC.
- Special, less widely appreciated characteristics of the energy industry. These include having to commit large funds in advance of obtaining reliable information to assess discovery/depletion risks; the impact of grassroots investments on commodity price structures, the organizational challenges of developing integrated projects across different business units and the tendency for successful projects to amplify political risk in emerging market countries.

The Advanced Methods to be evaluated will be:

- Competitive Advantage Theory;
- Real Options Theory.

The course will also provide some material on Decision Analysis, a technique used by consulting firms to help project sponsors organize and evaluate key issues before defining key planning bases for capital projects.

The course aims to demonstrate how each of these can address specific limitations of NPV/WACC. Ultimately the course aims to show how the Advanced Methods can refine and supplement NPV/WACC rather than entirely replace it.

In some respects, this course is also a research project. Students will join faculty in testing the application of advanced methods to case studies of recent energy industry projects. The case studies have been chosen for the way in which they illustrate the advanced problems that strain current evaluation practices

## II. Course Organization

The course will be divided into two modules.

- Module 1, encompassing eight weeks, introduces students to the Advanced Problems and especially the limitations of NPV/WACC. It then introduces and examines the basic concepts of the Advanced Methods.
- Module 2 is concerned with applications. Six new case studies of recent energy industry projects provide students with an opportunity to consider the limitations of NPV/IRR when evaluating upstream, refining and petrochemical investments. The students will then have an opportunity to consider if and how the Advanced Methods might produce a sounder, more complete evaluation.

## III. Course Materials

The course material will consist of:

- Lecture notes (in the form of PowerPoint slides);
- Portions from textbooks;
- Case studies; most of the case studies have been authored by the course instructors and will be placed on WebCT Vista. A few must be purchased by students from an online course set up on the Harvard Business School Publishing website (further details will be provided in advance).

The slides will be e-mailed to students and placed on WebCT Vista.

## IV. Class Content and Attendance

Class time will be divided between lectures on the analytic material and discussion of cases that highlight the practical management issues raised by the theoretical frameworks. The cases are carefully chosen, and do much more than simply illustrating the concepts covered in the lectures. The cases will often point to ambiguities in the concepts or invite attention to subtle issues in real-world management that do not usually come through in the study of text-books. **Class attendance is very important and strongly encouraged (see the description of the class participation grade below).**

## V. Course Requirements

Students will be required to present both written work and oral presentations and analysis. The written work will involve:

- A homework problem set;
- An in-class mid-term exam;
- 2 case reports (one of which will serve the purposes of a final exam).

In additions, students will make at least one team presentation of cases and participation in class discussion of cases.

## VI. Grading

The grading weights of the course-work are as under:

1. Homework 1	15 percent.
2. Midterm Exam	20 percent.
3. Case Report 1	20 percent
4. Final Case Report	25 percent
5. Case Presentation	10 percent
6. Class Participation	10 percent

At the conclusion of the course, students should have a sharpened awareness of the weaknesses associated with conventional presentations of energy project economics. They should then be able to use the Advanced Methods to determine whether the investments in question are likely to turn out better or worse than portrayed via conventional NPV/IRR. As a result, students will be better equipped to contribute unique perspectives on the investment choices facing their own companies; in particular they should be able to identify whether projects up for approval are more or less likely to lead to follow-on opportunities and a gain in competitiveness versus other projects with which they are competing internally for scarce capital.

*Enjoy the Course and Good Luck!*

# Detailed Reading and Class Schedule

## Class

## I

### Topics

Why a course on Energy Project Evaluation?  
Review of the WACC/NPV/IRR Methodology  
Introducing the Advanced Methods  
The course as a Research effort

### Assignments

*Class Notes introducing Problems with Traditional Methodology, Introduction of Advanced Methods*  
*Class Notes on Value-Creation Drivers*  
*Class Notes on WACC Calculation and embedded assumptions*

## Class

## II

### Topics

Investigating Problems with NPV/WACC  
Problems with NPV/IRR & Cost of Capital  
- Technical Problems  
- Static vs. Dynamic Planning  
- Special problems of Residual Value and Political Risk  
- Organizational Problems  
Why NPV/WACC has endured  
Special distortions using NPV/WACC on  
Energy Projects

### Assignments

*Class Notes on NPV/IRR Embedded Assumptions*  
*Class Notes on NPV vs. Real Options*

## Class

## III & IV

### Topics

#### Basic Concepts of Competitive Advantage (CA)

##### Industry Value Chain

- Company Value Chain
- Types of Competitive Strategy
- Porter's 5 Factors
- Supply Curves
- Experience Curves

Using Competitive Advantage to identify  
Tactical and Strategic options

#### Construction and Use of Industry Competitive Scenarios (ICS)

##### Methodology

Using Competitive Advantage Theory and Industry Scenarios  
to refine commodity pricing, operating  
costs, & sales projections

Using Competitive Advantage/ICS to develop Strategic Content  
Analysis (SCA) and refine Residual value assumptions

Scenario Techniques to Address Political Risk

Restating the Project's 'Business Proposition' beyond NPV

### Assignments

#### Industry Analysis (HBS)

*Building Strategy on the Experience Curve (HBS)*

*Class Notes on Industry Structure*

*Class Notes on Creating & Sustaining CA*

*Class Notes on ICS Methodology*

**Class**

**V , VI, & VII**

**Topics**

Using Real Options Theory to upgrade  
NPV/WACC  
Basics of Real Options Theory  
Applying Real Options Theory to Long  
Term capital projects  
- Identifying options that can  
Shape a projects long term  
Ability to compete

**Assignments**

*Capital Projects as Real Options: An Introduction*  
*Strategies and Real Options*  
*Investment Strategy as Real Options: Getting Started with Numbers*  
*Class Notes on Real Options*  
*Case: Arundel Partners (HBS)*

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**Class**

**VIII**  
**Cases to Prepare**

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**MW Petroleum (A)**

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**Case Questions**

1. What do you think motivated the sale of MW properties? Are the properties likely to be worth more to Apache than to Amoco?
2. Consider the cash flow projections. Who made the projections? Are they true expected cash flows? How does the nature of the cash flow forecasts affect the discount rate that you use?
3. Estimate the value of MW using the APV method.

4. Do you think the 13% discount rate is excessive? How would the value change if the discount rate was say 9%? How does the discount rate relate to what you might expect to estimate from the forward curve?
5. Which MW assets should be regarded as options? Provide a strategy for valuing these options and make some rough estimates.

**Class**

**IX**

Midterm Exam

**Class**

**X - XIII**

**Topics**

Using Real Options to value Embedded Investment opportunities  
 - Using Real Options to assess Long term competitiveness, margins And growth  
 Using Real Options to coordinate investment  
 Creating Real Options as a Pro-active strategy  
 Integrating Competitive Advantage, ICS and Real Options into An Advanced Methods Synthesis  
 M&A, Strategic Content Analysis and Residual Value  
 Dynamic Scenarios and High Political Risk

**Assignments: Case Studies**

Case Study 2 Upstream  
Investing with Exploration risk

Read: *Bidding under Uncertainty for GOM Leases*

*Case Preparation questions to be assigned*

Case Study 3: Refining  
Grassroots Manufacturing Investments

Read: *Valuing Flexibility for the Samara Refinery Expansion*

Case Study 4: Petrochemicals  
Investing/Divesting on the Experience Curve

Read: *NCC Microporous Film*



Case Study 5: Petrochemicals  
Investing across Functional Boundaries

Read: *Structuring  
Terrasia Aromatics*

Case Study 6: Integrated Upstream/Downstream  
M&A with Strategic Residual Value issues

Read: *Negotiating a  
Tar Sand/Refinery JV*

Case Study 7: Emerging Markets  
Investing Under Acute Political Risk  
(if time permits)

Read: *Comparing US  
tight gas vs. W. Africa  
under capital  
constraints*

Using Scenarios to Decompose and  
Value Political Risk