Sustainable Business Ventures: Business and Energy UC Davis Graduate School of Management MGP 290-3 Dates June 15 – July 20 Time: Monday /Wednesday 6pm to 9pm Office Hours by Appointment GSM Davis 3411 Gallagher Hall Professor: Amy Myers Jaffe abmjaffe@ucdavis.edu TA: Amin Afshar afshar@ucdavis.edu

The upheaval in the global oil market over the last half decade has been unprecedented. Rising fuel costs and volatility of the oil market can have negative impacts on venture profitability, if firms do not have strategies to deal with such risks. Global climate change and sustainability is another challenge that is increasingly impacting businesses. Energy sustainability as a business goal extends beyond "green" products but encompasses a set of complex values that can be expressed in a multitude of ways. Sustainable development broadly defined ensures that economic and social activity can meet the needs of the present without compromising the ability of future generations to meet their own needs. Governments, businesses, civil society and individuals all have a role in promoting sustainability.

This course will introduce students to the inner workings of the oil and gas industry and the geopolitical and economic influences that affect energy pricing and the associated environmental externalities of the oil and gas business. Students will learn about the various strategies, tools, and financial products that are available to help business managers reduce their business' exposure to fuel price risks and to address carbon emissions limitations. Topics will include case studies on corporate responses to the potential "carbon bubble"; sustainability metrics; gyrating jet fuel prices and integrating energy efficiency and renewable energy into fuel strategies.

In this class, students will:

- Broaden their understanding of the operations of energy markets and oil price forecasting;
- Learn about how energy markets and sustainability affect businesses
- Learn about basic risk management tools and financial products that are used to hedge the impact of commodity price volatility on cash flows and budgets
- Learn how management incorporates sustainability metrics into business operations
- Expand their leadership potential as a business manager by increasing their knowledge of how energy markets and sustainability issues affect business operations, profitability, and reputation

Prerequisites: There are no prerequisites for this class. Basic understanding of macro and micro economics will be helpful.

Grading Overview:

Attendance and Class Participation: 10%

Students are required to attend class and participate in class discussion. A high participation grade will reflect student's performance to participate in class activities with evidence that students have mastered readings and have come to class prepared with completed assignments.

Problem Sets: 20%

Students will be asked to prepare a global oil-demand balance forecast and to present that forecast as part of the OPEC game. The forecast assignment will be graded based on the student's ability to defend in writing the analysis / calculation process for his/her individual forecast (as opposed to its accuracy of whether its predictions are more or less correct). Assignment will include completion of a spread sheet without calculation errors and written exposition explaining and defending the forecast choices made.

Hedging problem set will be graded based on student's ability to complete the problem correctly and explain their work in writing.

OPEC War Game 15%

Each student will be assigned to participate in a negotiation exercise of a simulation of an OPEC meeting. Students will select a country and serve as the minister of that country. Each student will be graded based on the quality of and detailed information in their opening statement preparation, their success in negotiating for what is the best outcome of their country and their ability to influence group dynamics in their favor.

Final Presentation 15%

Each team of students will prepare and present a 10 minute power point presentation about a sustainable venture or company's sustainability strategy. Grading will be based on the visual quality of the presentation materials, effectiveness of verbal and visual presentation, and clarity of the presentors' knowledge of the subject being presented. Each team member will receive the same grade.

Final Paper: 40%

Each student will prepare an individual paper based on the team project.

The Papers will be evaluated based on the following criteria:

<u>*Theory/Application:*</u> satisfactory level of mastery of the sustainability concepts presented during class and in readings and then applied to case study/or new product concept.

Organization: How clearly written and organized is the paper.

<u>*Referencing:*</u> Papers must use proper citations when referring to published materials and data and should include references for background materials used.

<u>*Peer Evaluation:*</u> How do other members of your group evaluate your contribution to the group's performance? Evaluation form will be distributed in class and will be factored into the "Attendance and Class Participation" grade.

Problem Set Assignments:

Students will be asked to prepare and present a global oil-demand balance forecast Hedging Strategy Problem Set case

SCHEDULE:

Note: Readings listed are to be completed prior to the actual day of class.

Monday June 15, 2015 Fundamentals of the Petroleum Industry

Lecture: The Oil and Gas Industry 101

Readings:

Robert O. Anderson, <u>Fundamentals of the Petroleum Industry</u>, University of Oklahoma Press, 1984, P 270-289 (PDF)

Natural gas energy explained, US Energy Information Administration

http://www.eia.gov/energyexplained/index.cfm?page=natural_gas_home

Adam Brandt, et al, Methane Leaks from North American Natural Gas Systems, February 14, 2014, Vol 343, No. 6172, pp. 733-735

http://www.sciencemag.org/content/343/6172/733.full

Wednesday June 17, 2015 OPEC and Price Formation

Lecture: Forecasting Prices and Intro to OPEC War Game Hand Out Problem Set on Forecast Exercise and OPEC war game instructions

Readings:

Wall Street Forecasts, Citi Research, Energy Commodities, Quarterly Outlook (PDF posted on Class resources page and handed out in class)

Oil Market Intelligence, Energy Intelligence Group, Monthly Fundamentals: Forecast Spread Sheet (PDF posted on class resources page and handed out in class)

U.S. Energy Information Administration (EIA) <u>Short Term Energy Outlook</u> <u>http://www.eia.gov/forecasts/steo/</u>

Dermot Gately, "OPEC's Incentives for Faster Output Growth" *Energy Journal* Vol. 25, no. 2 (2004) P. 75-96 (PDF)

Michael J. Brennan, "The Supply of Storage" *The American Economic Review* Vol. 48, No. 1, March 1958, p 50-72 (PDF)

Amy Myers Jaffe and Ronald Soligo, "The Role of Inventories in Oil Market Stability" *The Quarterly Review of Economics and Finance*, 42 (2002) p. 401-415 (PDF)

Monday June 22, 2015 OPEC War Game

Wednesday June 24, 2015 Futures, Storage and Hedging

Lecture: Introduction to Futures Markets and Strategy and Case Studies on Corporate Strategy Problem set on Forecasting Due Hand Out Problem Set assignment on hedging

Readings:

Peter C. Fusaro, <u>Energy Risk Management</u>, <u>Hedging Strategies and Instruments for the</u> <u>International Energy Markets</u>, McGraw Hill, 1998 Chapters 1 and 2 (PDF)

"Shell Augur field Swap" The Complete Guide to Oil & Gas Derivatives, PIW Publications, Chapter 2 (PDF)

Dave Carter, Dan Rogers, Betty Simkins, <u>Fuel Hedging in the Airline Industry: The</u> <u>Case of Southwest Airlines</u> (PDF)

Franklin R. Edwards and Michael S. Canter, "The Collapse of Metallgesellschaft: Unhedged Risks, Poor Hedging or Just Bad Luck?" *The Journal of Futures Markets* Vo. 15. No 3, 1995 p 211-264 (PDF)

Monday June 29, 2015 Sustainability and Business

Lecture: Sustainability metrics vs CSR or green products Problem set on hedging and project topic due

Readings:

Robert W. Kates, Thomas M. Parris, and Anthony A. Leiserowitz, What is Sustainable Development? Goals, Indicators, Values and Practice, Environment: Science and Policy for Sustainable Development, Vol. 47, Number 3, p. 8-21

http://www.rpd-

mohesr.com/uploads/custompages/WHAT%20IS%20SUSTAINABLE%20DEVELOP MENT.pdf

Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswarni, "Why Sustainability Is Now the Key Driver of Innovation", Harvard Business Review, September 2009 (PDF)

James Phills and Lyn Denend, "Social Entrepreneurs: Correcting Market Failure", Stanford Graduate School of Business Case Study (PDF)

Wednesday July 1, 2015 Guest Lecture: Sustainable Venturing: Founder of Clean Tech Venture

Monday July 6, 2015

Carbon markets, policy and well to wheel carbon emissions from energy sources Lecture: *Pricing Carbon*

Readings:

William Nordhaus, "Estimates of the Social Cost of Carbon", NBER working paper, No 17540, October 2011 available at <u>http://www.nber.org/papers/w17540</u>

Andre F. Perold, Forest L. Reinhardt, and Mikell Hyman, "The Carbon Market", Background Note, HBS Case Collection (PDF posted on Classes*v2)

Forest Reinhardt et al, "The Political Economy of Carbon Trading", Harvard Business School Case Study (PDF posted on Classes*v2)

Danny Ellerman, "The EU Emission Trading scheme: A prototype global system?" Working paper available at http://belfercenter.ksg.harvard.edu/publication/18488/eu_emission_trading_scheme.html? breadcrumb=%2Fpublication%2F20859%2Fglobalization_of_carbon_trading

Wednesday July 8, 2015 Part 1 The Carbon Bubble and the Divesture Movement Lecture: How real is the carbon bubble?

Readings:

Al Gore and David Blood "The Coming Carbon Asset Bubble" *Wall Street Journal* October 29, 2013 (PDF posted on Classes*v2)

Carbon Tracker Report on What A Carbon Constrained Future Can Mean for Oil Company Creditworthiness http://www.carbontracker.org/report/bonds-2014/

Paul A. Griffin, David Lont, Amy Myers Jaffe, Rosa Dominquez-Faus, "Science and the Stock Market: Investor's Recognition of Unburnable Carbon" Energy Economics, forthcoming (PDF posted on Classes*v2)

Kelly Levin, Benjamin Cashore, Steven Bernstein, Graeme Aud, "Overcoming the Tragedy of Super Wicked Problems: Constraining to ameliorate climate change" *Policy Sciences* (PDF posted on Classes*v2)

ExxonMobil statement on "Energy and Carbon: managing the risk <u>http://corporate.exxonmobil.com/en/environment/climate-change/managing-climate-change-risks/carbon-asset-risk</u>

Part 2 Energy Companies and CO2 emissions strategies

Lecture: Corporate responses to lower carbon footprints

Readings:

Forrest Reinhardt, "Suncor in the Oil Sands Industry", Harvard Business School Case Study (PDF)

http://www.ethiquette.ca/en/strategies/engagement/suncor-petro-canada/

http://sustainability.suncor.com/2011/en/responsible/3523.aspx

GE Sustainability Highlights report 2013 http://www.gesustainability.com/downloads/

David Victor and Joshua C. House, "BP's Emissions Trading System" *Energy Policy*, Vol 34, (2006) (PDF posted on Classes*v2)

Monday July 13, 2015 Part 1 The Clean Tech Boom Lecture: The Clean Tech challenge

Readings:

Andrew Hargadon and Martin Kenney, "Misguided Policy" California Management Review, Vo. 54, No. 2, Winter 2012, p 118-139 (PDF posted on Classes*v2) Maureen McNichols, Anne Casscells and Jaclyn Foroughi, "Tesla Motors Evaluating a Growth Company", Stanford Business School Case Study (PDF posted on Classes*v2)

Eric Cahill, "Selling Plug In Vehicles: Lessons from the California Market" (working paper) http://phev.ucdavis.edu/project/dealer-study/

Wednesday July 15, 2015

Part 2 Energy and Poverty: A Business Opportunity *Lecture: The Business of clean energy in India and Africa*

Readings:

Biomass Cook stoves in India <u>http://iis-</u> db.stanford.edu/pubs/23358/Shrimali_Slaski_Thurber_Zerriffi,_Cookstove_sellers_in_ India,_Energy_Policy,_Aug_2011.pdf

Stephen Karekezi, "Poverty and Energy in Africa" *Energy Policy* Vol. 30 Issues 11-12 Special Issue (PDF)

Gevorg Sargsyan et al, "Unleashing the Potential of Renewable Energy in India" The World Bank E Library, June 2011 (PDF)

Monday July 20, 2015 and Wednesday July 22, 2015 Student Team Presentations of Final Assignment Final Assignment Due: July 24, 2015

Final Assignment – Team Project presentation and Individual Team Member Papers

1) Identify a problem of Sustainable Energy/Fuel

Evaluate the roots of the problem (technical, environmental, cultural/social, economic, gender, etc) and discuss a case study on a solution that has been implemented by a major corporation and whether this solution has been effective or propose a start- up business idea that would address the challenge. Discussion should include barriers to your solution, such as policy design, financial, technical or competition from an incumbent business and how to overcome said barriers. For existing businesses or corporate case study, include discussion of why effort was successful or not successful.

Recommended length: 3,000 to 7,000 words Outline: Discussion of Sustainability Problem Evaluation of Roots of Problem Discussion of Business solution/ Start up/Product