

ENGT 2803 - Introduction to Renewable Energy Entrepreneurship

I. Purpose

Currently, leadership in the United States has made energy independence a strategic initiative. The United States depends on foreign countries for two-thirds of its needs. President Obama believes our excessive reliance upon traditional hydrocarbons is unsustainable (Obama, 2009). Thus, he has made a commitment to renewable energy. Technology changes, coupled with strong interest in using green energy technology, have made solar energy, a priority area for renewable energy development.

Entrepreneurial processes in Renewable Energy and Sustainability are essentially driven by the desire to start a new venture, or re-invent and radically transform an existing company. Entrepreneurs and entrepreneurial managers seek to shape the future of their businesses by visualizing and implementing new imaginative ventures and models. The desired outcomes are organizational genesis, growth and rejuvenation that are underpinned by new competitive advantages leading to new profitable opportunities. Research on Renewable Energy and Entrepreneurial Processes has met with the greatest success at the dawn of the new millennium, stretching its frontiers from a peripheral sub-field of management studies into one of the most relevant spheres of strategic marketing, business and management.

II. Course Description

This course examines the strategic challenges of entrepreneurial companies. By 'strategic' we mean all the major managerial issues that entrepreneurs need to face in the process of starting a company. These include not only strategies for introducing new products into the market, but also strategies for creating a viable organization, and strategies for acquiring resources, most importantly, obtaining financing.

The course is designed for a variety of student interests. It directly addresses the concerns of students wanting to become entrepreneurs in the near or more distant future. It is also useful to anyone who expects to be interacting with entrepreneurs in their business careers, be it as private investors, venture capitalists, strategic partners, consultants, and/or customers. Finally, this course is useful for anybody with a curious mind and a willingness to combine serious analysis with creative thinking.

The course is primarily based on case studies and business planning. We will also have some classes with management, marketing, economics and financial exercises. There are two broad

sections to the class. In the first part we focus on the process of creating entrepreneurial companies. We will examine business issues of identifying opportunities in energy and environment, implementing strategies, and formulating and implementing the business plans. In the second part, we focus more specifically on the challenges of raising funds, dealing with investors and exploring issues in renewable (solar) energy and environment. We will occasionally change our perspective then, looking at the process from an investor's perspective.

The class will weigh up the prospects for disruptive innovations driven by entrepreneurs challenging the established giants of the energy, technology and automobile industries. The course will also help debunk a number of popular myths that have confused the public debate on energy, technology and environment matters. Among the notions we will consider for a reality check:

- Five Technologies that could change everything – Space-Based Solar Energy, Advanced Car Batteries, Renewable Energy Storage, Carbon Capture and Storage and Next Generation Biofuels
- The world is starting to run out of oil – Big oil looks to Biofuels
- Windmills and hybrid cars can save the planet
- The energy answer is Blowing in ... Iowa
- Hydrogen and fuel cells are a hoax
- Stop That (Solar) Thief!
- Corporate Social Responsibility is the key to tackling global warming
- Ethanol can end America's need for oil – Chemical Solution
- The energy industry is extremely innovative: How well do you know ... Innovation?
- Greener, Cheaper – Companies and Energy Requirements
- How well do you know ... Green IT?
- Energy and Technology – Don't be Dumb About Smart Phones
- Something Borrowed ... Chinese Baidu Inc. Versus Google
- Latest on alternative energy deals from Dow Jones Clean Technology Insight

The course will emphasize class participation and active debates on the above topics. By the end of the term, students will have a good grasp of the background behind current debates in energy and environment, as well as a sense of the potential business opportunities in this fast-evolving area.

III. Course Contents

Week 1– COBA Building

Entrepreneurship, Business, Management of Renewable Energy, Introduction to Business Plans, Feasibility Analyses and Project Management in Entrepreneurial Ventures of Renewable Energy
Assignment # 1 – Elaborate innovative business ideas in the field of renewable energy as a group of two students and apply all business, marketing and management tools taught during weeks 1 to 3 (150 points)

Week 2– COBA Building

Business Planning - Marketing, Advertising and Operations Management of Renewable Energy Companies with an Entrepreneurial Venture Focus

Week 3– COBA Building

Introduction to Financial Business Planning in Entrepreneurship and Innovation of Renewable Energy Companies, Introduction to Financial Ratios, Balance Sheets, Profit-Loss Statements, Cash Flows, and Pricing in Entrepreneurial Ventures of Renewable Energy (Presentations and Reports for Assignment # 1)

Week 4– Introduction to Electricity – COST Building

Learning Activities and Strategies

Getting the most out of our photovoltaic training program requires that students have a fundamental understanding of electricity. The classroom presentations will be punctuated with laboratory exercises. The following is a tentative plan for covering the instructional materials for achieving unit objectives:

- Fundamental of electricity as applied to the photovoltaic training
- Systems (Properties and terminology)
- Components (Installation and use)
- Common tools
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Week 5 – COST Building: Introduction to Renewable Energy

Learning Activities and Strategies Knowledge of renewable energy sources is essential for understanding the renewable energy systems. Renewable energy sources, forms of energy, and non-solar renewable sources are discussed in this unit of instruction. The classroom presentations will be punctuated with laboratory exercises. The following is a tentative plan for covering the instructional materials for achieving unit objectives:

- Force, energy and power
- Energy conservation: The First Law of Thermodynamics
- World Energy supplies
- Renewable energy sources
- Renewable energy in sustainable future

Week 6 – COBA Building

Entrepreneurial Strategy with respect to Renewable Energy – Strategic tools and techniques in Business Planning

Week 7– COBA Building

Mid Term of 300 points – 2 Components – Assignment #1 detailing Innovative Renewable Energy Business Ideas of 150 points and Individual Written exam on Feb 1 of 150 points (See Course Grading section)

Week 8– COST Building: Energy sources

Learning Activities and Strategies This unit consists of classroom and laboratory activities. The classroom presentations will be punctuated with laboratory exercises. The following is a tentative plan for covering the instructional materials for achieving unit objectives:

- Solar Energy
- Fuel Cells
- Wind Energy
- Hybrid Power Systems

Weeks 9 – COST Building: Solar Thermal and Photovoltaic Systems

Solar thermal signifies the thermal use of solar energy in general. In this unit students will explore technical applications of solar thermal systems. In this unit students will also learn about the Photovoltaic which is the direct conversion of sunlight into electricity. Classroom presentations will be supported by laboratory exercises. Following is a tentative plan for covering the instructional materials for achieving unit objectives:

- Solar thermal systems for water heating
- Solar Collectors
- Thermal Storage
- Heat Demand and Solar Fraction
- Solar generator with load
- Electricity storage
- Inverters

Weeks 10 & 11 (Mar 15 to Mar 26) – COBA Building

IT Tools and Decision Making – Renewable Energy Problems and Solutions
Hands-on MS Project Training

Weeks 12 & 13 – COST Building: Energy Efficient Building

Energy consumption is growing very fast and there is dire need to foster the energy resource development and environmental balance. In this unit the students explore energy consumption, environment and energy efficiency in buildings. Classroom presentation will be supported by simulation laboratory exercises. Following is a tentative plan for covering the instructional materials for achieving unit objectives:

- Energy Efficient Building (EEB) basic principles
- Technologies for EEB (passive cooling and sun control, lighting and day lighting, air-conditioning systems, active solar and photovoltaic)
- Energy Policy and Building Energy standards
- Case studies of building projects

Weeks 14 &15 (Apr 12 to Apr 23) – COBA Building

EN game and Final Business Plan along with Tangible Product Assembly

Week 16 (Apr 26 to Apr 30) – COBA Building

Final Exam

****** Formal weekly feedback on every Friday (to all three instructors of the course) by each group about Business Plan and EN Game**

IV. Course Requirements

Attendance is recommended, not least because you will be judged on your class participation. You are highly recommended to read *The Financial Times*, *Wall Street Journal* and *Economist* regularly. This will not only keep you current, but will also prepare you to participate in in-class discussions.

We will start every class with a topical discussion of recent news events relevant to entrepreneurial ventures in renewable energy and environment. The instructors will from time to time email newsworthy articles or reports to enrich your entrepreneurial-energy course material.

V. Course Grading

The course grade will be divided as follows:

Mid Term Exam - two parts - Energy and Business	300 points = 30%
Class Participation	100 points = 10%
EN Game: class presentation	150 points = 15%
EN Game: written report	150 points = 15%
Final Business Plan - written and report with a <u>tangible product assembly</u> @ Final Exam	300 points = 30%
Total	1000 points = 100%

VI. Renewable Energy Projects – Tangible Product Assembly

The course gives an overview of renewable energy technology, business plans related to energy, and outline the basic principles of solar electricity, solar water heating, wind power, micro-hydro, biomass and heat pumps and their application in urban and rural environments.

The emphasis is on how things work and what it is practicable to do, and the students have the opportunity to discuss their own projects. At the end of the course, participants should be able to do initial designs for renewable energy systems. No previous knowledge of energy technologies is required.

Overview of Hands-on Projects

Solar Car

Solar Bicycle

Fuel cell car

Wind Power powered Light Bulbs, Motors

An energy efficient house model

An energy efficient radio

Smart product development – prototype of smart technologies

VII. The Entrepreneurship (EN) Game

Starting a company seems like a daunting task. Entrepreneurs need to deal with a great variety of issues. We believe that there are a few basic skills that can be learned before engaging in an entrepreneurial venture.

In our class discussions and readings, we will sharpen our understanding of the entrepreneurial process by discussing and analyzing business problems that entrepreneurs face.

The Entrepreneurship Game has one simple objective: *to experience the challenges of starting and financing a new company.*

The fundamental idea of the game is to simulate the process of starting and financing a new company related to the renewable energy project undertaken (as outlined in Section VI). You will go through this process as an entrepreneur and as an investor. As an entrepreneur you will have to find your own business opportunity in renewable energy sector, communicate your idea to other people and negotiate funding with investors. Some of you will be successful in obtaining (fictional) funds to start your company, while others will get to ponder why nobody financed their business idea. As an investor you will learn to recognize good business opportunities, to mentor and critique entrepreneurs, to make hard choices about which companies to finance, and to negotiate terms with entrepreneurs.

Entrepreneurs rely on the resources and cooperation of other people and businesses. Throughout the Entrepreneurship Game you will focus on how to communicate your business ideas and even your personality. This is fundamental to the entrepreneurial process. It will give you an opportunity to learn from your peers, and hopefully to see how they are learning from you.

Maybe the most important aspect of the game is to play it with a positive and 'entrepreneurial' spirit. The game is meant to be an opportunity to explore new dimensions, to be creative, and also to have fun.

Overview of the Game

We will work in teams. Teams will have dual roles, both as entrepreneurs and investors. As entrepreneurs, teams will develop a business opportunity in renewable energy sector. They will write a 'business plan'. The focus of the game will be on the business plan, its execution or implementation, budgeting and financing, and finally, communicating the contents of the business proposal to various parties. As investors, teams will evaluate the business plans of other teams, and provide constructive feedback.

Entrepreneurs will try to obtain "fictional" financing from the investors. Naturally, not everyone will get financed. To create a competitive market place, we will use the following simple rules. To be funded as entrepreneurs, a team needs to find at least one or more teams that want to provide funding. As entrepreneurs, each team either obtains funding from one or more teams, or no funding at all. As investors, each team either funds one entrepreneurial team, or no team at all. The former is preferred, i.e., it is encouraged that each investor finances an entrepreneurial team. There are two obvious rules about conflicts of interest. First, no team can finance itself. Second, a team cannot both invest in another team and also receive funding from that same team.

The objective for the entrepreneurs is to obtain financing at a good valuation. As you can see, in this game it is not good enough to have a good idea. You really need to convince investors that your idea is the best.

The process of starting a company often takes several years, but we will have less than 6 months. The experience will be intense and it will be important to stay on schedule. The art of entrepreneurship is not to do things perfectly, but to do the best given the circumstances. The same principle will apply to the Entrepreneurship Game.

Class Presentations

As mentioned above, communication (both verbal and written) is very important in the game. In order for all of us to learn from each other, and in order to learn to present, each team will have the opportunity to present to the class. We will set aside several classes for class presentations. We also expect a high standard for these presentations.

Team meetings

During the game, we want to stay in touch with you and be aware of the progress you make and the challenges you face. We also want to have the opportunity to provide you with some feedback or to ask you more questions about your business idea. In addition to our informal contacts, we will need a formal weekly feedback on every Friday (to all three instructors of the course) from each group, discussing their progress and identifying appropriate business opportunities in renewable energy.

Protection of Intellectual Property

Some of you may consider pursuing your opportunity for real after the game. Each person is responsible for protecting his or her intellectual property. We suggest that you avoid disclosing any information that you consider confidential. Some of the assignments are meant to be distributed to other people in the class or the outside panel members. If you are worried about intellectual property issues, you may elect not to have parts or all of an assignment distributed to other people in the class or the outside panel members. You will have to let us know about this, but exercising that option would not result in a lower evaluation of your work. If you are uncertain about what to do with any particular assignment, you are welcome to ask for clarification anytime.

Business and Project Management Plans – The End Objective

We will cover the business plans and feasibility analyses in detail in the class. In addition to these, examples and templates will be provided. We will also incorporate Project Management standards from Project Management Institute (PMI) perspective. The Project Management Institute (PMI®) stands as a global leader in the field of project management. PMI is the world's leading not-for-profit membership association for the project management profession, with more than half a million members and credential holders in 185 countries. The worldwide advocacy for project management is supported by the globally-recognized standards and credentials, extensive research program, and professional development opportunities.

We will develop Project Scope Statement and Project Management Plan, as a part of the Business Plan.

*“So many questions haunting us...
Dangerous thoughts of what could go wrong
Against the odds, we must carry on
We must be strong and fearless”*

Neville Brothers
