University of Hawaii at Manoa  
Department of Economics

ECON 636 Fall 2016  
Renewable Energy Economics and Policy  
(Syllabus subject to revision)  
TR

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Office Hours: MW 10:30-11:30 AM

*This course is open to UHM graduate students. This course will satisfy a core-course requirement for the Renewable Energy and Island Sustainability (REIS) Graduate Certificate certificate. The course will not count as a field course for Economics PhD students. The course could count toward MA course requirement and PhD elective requirement upon the instructor’s approval.

Learning Objectives and Course Content:
This course reviews economic and policy aspects of renewable energy issues. In order to help students see renewable energy issues in perspective, the course will also review non-renewable, conventional energy sources including fossil fuel and nuclear power. Topics include the economics of major renewable energy options (e.g. bioenergy, wind, solar, and geothermal energy) as well as the energy mix between various fossil-fuel and renewable energy options. Students will learn about:

1. Basic economic concepts for analyzing renewable energy development;
2. Major criteria used in policy discussions (e.g. efficiency, energy security, sustainability);
3. Major positive and normative issues and analytical tools in renewable energy economics and policy.
4. The current market structures of nonrenewable and renewable energy options;
5. How to analyze the effects of alternative renewable-energy policies, with applications to renewable energy development in Hawaii.

Prerequisites:
College calculus and principles of economics, or consent.

Course Requirements:
Problem Sets  
Midterm  
Final exam  
Group project, presentation, and participation:

20%  
20%  
30%  
30%

There will be periodic problem sets to understand the theory of energy economics and policy and to apply the theory in the context of renewable energy. The problem sets consist of (i) analytical exercises that involve calculus in order to understand decision making by energy producers, consumers, and regulators as well as market allocations of energy; (ii) cost-benefit analysis...
exercises of renewable energy policies, and (iii) short-essay questions on renewable energy policies.

In class, you will be asked to present an overview of a selected renewable energy option from an economics point of view. The instructor will guide you in terms of the references and the content of your presentations.

You will also participate in a group project addressing the policy aspects of renewable energy options in Hawaii, where you apply cost-benefit analysis and/or other research tools.

**Textbooks**
The following is a required textbook.

The lectures will also draw on several references including the following optional textbooks:
Keohane, N.O. and Olmstead, S. M. Markets and the Environment [Paperback], Island Press (Listed Price: $22.5) (KO)

Most of the readings for the course are journal articles, and will be available at Laulima. Upon request, I will suggest additional technical readings for economics graduate students.

Classes will consist of lectures and student presentations. Occasionally we will have in-class exercise and group-project discussion sections.

**Topics to be covered**

0. Introduction: why economics and policy for energy?
   a. Energy use in historical perspective
   b. Why economics
   c. Measurements and key concepts of energy
   Readings:
   OECD/IEA *World Energy Outlook 2013*
   US Energy Information Agency (EIA) “Energy Explained”
   [http://www.eia.gov/energyexplained/index.cfm](http://www.eia.gov/energyexplained/index.cfm)
   KO: Chapters 1 & 2

1. Basics of energy economics and policy
   a. Supply, demand, market equilibrium, price elasticity
   b. Market power
   c. Externality
   d. Discounting and project finance
e. Gains from trade, energy-import dependence, energy security, opportunity cost
f. Sustainability

Readings:
VHV Ch 11, 12

2. Overview of major fossil-fuel energy options and nuclear power
   a. Coal: market structure, “clean coal,” carbon capture and sequestration
   b. Oil: world oil market, energy security, the price trend in the past and the future
      US EIA on oil [http://www.eia.gov/energyexplained/?page=oil_home](http://www.eia.gov/energyexplained/?page=oil_home)
      On global oil market structure:
      [http://nordhaus.econ.yale.edu/recent_stuff.htm](http://nordhaus.econ.yale.edu/recent_stuff.htm)
   c. Natural Gas: regulation, deregulation, shale gas development
      US EIA on natural gas
      MIT The Future of Natural Gas
   d. Nuclear power: energy security and waste management
      US EIA on nuclear energy

3. Economic and policy aspects of electricity generation
   a. Generation, transmission, distribution and retail
   b. Public utility regulation, rates-of-return regulation, and electricity pricing
   c. Smart grid and information security
   d. Energy efficiency and energy conservation

Readings:
VHV Ch. 11, Ch. 12
4. Overview of major renewable energy options
   a. Hydropower
   b. Solar power (thermal and photovoltaic, decentralized vs centralized)
   c. Wind power
   d. Biofuels
   e. Geothermal, ocean thermal energy conversion, energy storage technology, and
      other options

MPS Ch 4, 5.

5. Policies of renewable energy
   a. Price-based instruments including feed-in tariffs
   b. Quantity-based instruments including renewable portfolio standards
   c. Subsidies and tax credit for energy development

Readings:
MPS Ch 11.
Renewable and Low-Carbon Sources of Electricity. RFF Backgrounder, June 2010.
Fischer, Carolyn, Louis Preonas. Combining Policies for Renewable Energy: Is the
Whole Less than the Sum of Its Parts? RFF Discussion Paper 10-19, March 2010,
DSIRE: Database of State Incentives for Renewables & Efficiency.
[http://www.dsireusa.org](http://www.dsireusa.org).

6. Energy use and renewable energy potential in Hawaii
   a. Application: Hawaii Clean Energy Initiative (HCEI)
   b. Hawaii Act 234 (Greenhouse gas emission reduction)

7. Topics: US national aspects and global aspects of renewable energy
   a. Energy demand and supply in the long run
   b. Climate change and other environmental constraints


8. Topics: Renewable energy in the context of climate-change policies
   a. Economics of climate change: how much greenhouse gas emissions should be
      controlled, and how fast?
   b. Policies to reduce GHG emissions and their implications to renewable energy
centralization: emissions tax, emissions trading, voluntary approaches, carbon
credits and offsets
   c. International agreements on climate change mitigation
d. Renewable energy policies in the context: renewable energy certificates REC, climate registries

Readings:

Disability Access
If you feel you need reasonable accommodations because of the impact of a disability, please: (1) contact the KOKUA Program (V/T) at 956-7511 or 956-7612 in room 013 of the QLCSS (Queen Lili’uokalani Center for Student Services); (2) speak with me privately to discuss your specific needs. I will be happy to work with you and the KOKUA Program to meet access needs related to a documented disability.