

EC 5/444: ECONOMICS OF GREEN ENERGY

Syllabus

In this course we will take the term “green” energy to mean energy that is: a) renewable (or “sustainable”, in the sense that the source is literally non-exhaustible); and b) “clean” in the sense that it does not have significant negative side-effects such as pollution or climate-warming.

Week 1

Therefore, we will start by looking at the current global situation, which is “non-green”: i.e. the evolution of the uses and sources of energy, including the technologies to make better use of it, from earliest times up to the present day, which can be characterized as an era of “fossil-fuel” dependency. This source, at least as it has been activated, is clearly exhaustible and has major negative effects.

Weeks 2,3

Following this overview, we will continue to focus on the fossil-fuel industry (specifically coal, oil and natural gas), beginning with a closer look at the existing technologies and then the economics of the industry: i.e., supply (derived from the technological specifications) and demand. However, at this point we need to introduce and/or review three elements in addition to the basic (“perfectly-competitive”) model: 1) imperfectly competitive market structures, particularly in the global oil market; 2) markets for exhaustible resources; and 3) the theory of externalities.

Week 4

After completing what is in effect our “case-study” of the fossil-fuel industry, the next step is to consider alternative energy sources. However, this will require one further analytical component: the so-called “Cost-Benefit” approach to investment decisions, which will encompass all of the previous elements together with an initial start-up cost and the problem of selecting appropriate discount rates.

Week 5: break to organize research/presentations

Once this has been done we should have all the analytical tools necessary to comparatively evaluate these alternatives, which could include solar, wind, wave, biomass/biofuel, geothermal, hydrogen (fuel cells), plus reconsiderations of hydro, nuclear and even fossil fuels. These individual topics will be the basis of presentations by members of the class, organized into “working groups” – or working individually as may be preferred – in the second half of the term. The format of each presentation should include a description of the technology (and data on the extent of its uses); per unit cost (current and projected), including externalities; pricing structure (including taxes and subsidies); and a guess as to the optimal level of investment, all evaluated in terms of present (or net present) value.

Weeks 6-10

Presentations and class discussion: selected topics

The three books required for this course are:

- F. Krupp and M. Horn, *Earth: the sequel*, Norton 2009
R. L. Evans, *Fueling Our Future: an introduction to sustainable energy*, CUP 2008
and J.M. Deutch and R.K. Lester, *Making Technology Work*, CUP 2008

These are listed in ascending order of their technical content, and are all very readable. At some points it may be necessary to introduce additional material, which I will hope to do by providing copies of relevant sources. In addition, a number of standard microeconomic texts will be placed on 3-day library reserve.

Grading will be based on an in-class midterm at the end of week 4, a final exam scheduled for week 11, and a term paper chosen by each student out of a list of alternative energy topics, also due in week 11. These will count 35-40-25 (%), respectively.

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(NB: this syllabus and all exams will be available on the departmental website)