DRAFT

RESOURCE CENTER FOR ENERGY ECONOMICS AND REGULATION (RCEER)

SYLLABUS FOR AN ELECTIVE COURSE IN THE MASTERS IN DEVELOPMENT STUDIES PROGRAMMES
AT THE
INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH
UNIVERSITY OF GHANA

NAME OF COURSE: ENERGY VALUE CHAIN ECONOMICS AND REGULATION

Introduction

Energy is a key input for economic development of countries. Typically, energy industries require large, integrated infrastructures that are capital intensive to build and require professional skill to manage efficiently. As a result of the importance of energy for development and the scale economies involved in delivering energy to consumers, a vertically integrated and monopolistic structure became the norm around the world, especially for the electricity sector. In most places, a government-owned monopoly generated, transmitted and distributed electricity. Many countries maintain integrated oil and gas monopolies as well. Under this structure, countries were successful in building basic infrastructure. But, these entities have been reaching their limits because they developed inefficiencies partly as a result of lack of competition; and they fail to invest in new infrastructure to meet growing demand because governments tend to use these companies’ revenues for general government expenditures. Restructuring of the energy sectors attracted some private investment but, in many places, establishing and sustaining competitive structures remains a very challenging task, partly because human resources with professional skills and understanding of energy value chain economics are scarce.

Ghana is certainly not an exception. Volta River Authority is the dominant state electricity company, generating and transmitting electric power. Another state company, Electricity Company of Ghana is responsible for distribution of electricity. Although there are currently no significant production of oil or natural gas in Ghana, Ghana National Petroleum Corporation has been the integrated state company. With restructuring efforts in the sector, two regulatory agencies, the Energy Commission and the Public Utilities Regulatory Commission, started playing important roles in creating an environment for commercial energy investments and in development of energy policy for the country. With the completion of West Africa Gas Pipeline, Ghana will have access to natural gas, primarily for power generation and industrial uses. Clearly, the Ghanaian energy sector is becoming more sophisticated and integrated with its neighbors; as such, there is a greater need for studying economic principles that govern the energy businesses.
This course is intended to provide fundamentals of energy value chain economics to future professionals of the energy industry in Ghana. A better informed workforce will help ministries, regulatory agencies and companies operating in the sector perform better.

Reading Material
There is no assigned textbook for the course. There will be handouts and reading assignments. There are numerous resources on the internet to obtain background information on most of the topics we will discuss. An important site, for which you should establish a bookmark, is www.bp.com, where you can find the Statistical Review of World Energy. At the end of the syllabus, a list of references is provided.

Course Requirements
The elective will be a one semester (12 weeks) course. It will be three (3) credit hours course in the Masters in Development Studies Programme at the Institute of Statistical, Social and Economic Research (ISSER) of the University of Ghana

There will be a mid-semester examination (30%) and a final examination (70%).
COURSE OUTLINE

Weeks 1 & 2
- Some Basic Concepts
  o Definition of Energy
  o Measuring Energy
  o Energy Conversion and Efficiency
- Energy, Economy and Environment
  o Energy Consumption & Economic Growth & Human Development
  o Energy Intensity
  o Impact on Environment
- State of the Energy World

Week 3
- Economics of Exhaustible Resources
  o Reserves (possible, probable, proved) versus Resources (conventional, unconventional)
  o Theory of Optimal Depletion
  o Shortcomings of the Theory
    ▪ Reserve Additions
    ▪ Common Pool Problem

Weeks 4 & 5
- Oil Value Chain Components
  o Key Segments and Activities
  o Key Policy and Regulatory Considerations
- Investment in the Oil Value Chain
- Natural Gas Value Chain Components
  o Key Segments and Activities
  o Key Policy and Regulatory Considerations
- Investment in the Natural Gas Value Chain

Week 6
- Upstream Economics
  o A Model of Upstream Investment
- Pipeline Economics
  o A Model of Pipeline Investment
- Natural Gas Processing
- Refining
- Marketing

Week 7
- Liquefied Natural Gas (LNG)
  o Role of LNG in Global Natural Gas Trade
  o New LNG Supplies
    ▪ Atlantic Basin
    ▪ Pacific Basin
  o LNG Value Chain
    ▪ Liquefaction
DRAFT

- Transport
  - Regasification
    - LNG Pricing Mechanisms

Weeks 8 & 9
- Electric Power Value Chain Components
  - Key Segments and Activities
  - Key Policy and Regulatory Considerations
- Electricity Industry Restructuring
  - Key Drivers
  - Key Characteristics
- Investment in the Electric Power Value Chain
- Power Plant Economics
  - Key Considerations
  - Costs for Different Technologies
  - A Model of Power Plant Investment

Week 10
- Regulated versus Competitive Pricing
  - Objectives
  - Cost Plus
  - Rate of Return
  - Competitor Indexing
  - Geographical
- The Economic Welfare Goal and Universal Service
- State Monopoly versus Private Competition
- History of Energy Regulation

Week 11 & 12
- Energy Markets
  - Types of Markets
    - Spot Markets
    - Futures Markets
    - Forward Markets
  - Risk Management
    - Types of Risk
    - Risk Management Tools
    - Hedging & Speculation
- Economics of Alternative Energy
  - Power Generation
    - Technology
    - Economics
  - Transportation
    - Technology
    - Economics
ENERGY ECONOMICS BOOKS


Pennwell Press has many other books on different segments of the energy industry in its “non-technical” language series ([www.pennwell.com](http://www.pennwell.com)).

ACADEMIC JOURNALS

Energy Economics
The Energy Journal
Energy Policy
International Journal of Regulation and Governance
The Journal of Energy and Development
The Journal of Energy Finance & Development
Resources, Energy and Development
Resource and Energy Economics

MISCELLANEOUS INFORMATION SOURCES

*Industry Trade Journals*
The Electricity Journal
Public Utilities Reports’s *Fortnightly*
Natural Gas Yearbook (annual)
Oil and Gas Investor
Oil and Gas Journal
OPEC Bulletin
Petroleum Economist
World Oil

*Industry Trade Newsletters*
Coal Week
Foster’s Reports (natural gas and electricity)
Gas Daily
International Petroleum Finance
Latin American Energy Alert
Natural Gas Week
Oil Daily
Petroleum Intelligence Weekly
Power Markets Week
Russian Oil Investor
World Gas Intelligence
Government Data Sources (look for Web sites)
Canada International Development Agency (CIDA)
European Commission (EC), Director General XVII, Energy
International Energy Agency (IEA)
NARUC – Global Regulatory Network
Organizacion Latinoamericana de Energia, Ecuador (OLADE)
U.S. Department of Energy (DOE), Energy Information Administration (EIA)
U.S. Federal Energy Regulatory Commission (FERC)
U.S. Agency for International Development (AID)
The World Bank
Other development banks (African Development Bank, InterAmerican Development Bank, Asia Development Bank, etc.)

Industry Trade and Research Associations (look for Web sites)
American Gas Association (AGA)
American Petroleum Institute (API)
Canadian Gas Association (CGA)
Canadian Association of Petroleum Producers (CAPP)
Edison Electric Institute (EEI)
Electric Power Research Institute (EPRI)
International Association for Energy Economics (IAEE)
National Petroleum Council (NPC)
Natural Gas Supply Association (NGSA)
Petroleum Technology Transfer Council (PTTC)
World Energy Council (WEC), proceedings of triennial congresses
World Petroleum Council (WPC), proceedings of triennial congresses

Other Energy Research Institutes (look for Web sites)
Center for Energy and Environmental Policy Research (CEEPR), MIT
East-West Center, Program on Resources, Hawaii
Harvard Electricity Policy Group
Institute for Public Utilities, Michigan State University
*Institut Français du Petrol
*Japan Energy Institute
*Korea Energy Institute
National Regulatory Research Institute (NRRI), Ohio State
*Norwegian Petroleum Institute
Oxford Institute for Energy Studies, U.K.
Public Utility Research Center, University of Florida
Stanford University Energy Modeling Forum
Tata Energy Research Institute, New Delhi (TERI; alternative and rural energy, environment)
University of California Energy Institute
University of Dundee Program on Petroleum Economics (U.K.)
Worldwatch Institute (all sectors and environment)
World Resources Institute (all sectors and environment)
* National (government-sponsored) institutes