SEMINAR PROJECTS FOR M.SC STUDENTS - ADVANCED ENERGY ECONOMICS POLICY AND TECHNOLOGY

Professor Graham Weale
Honorary Professor for Energy Economics and Politics,
Centre for environmental management, resources and energy (CURE) at the Ruhr University Bochum

Summer Semester from 17.04.2023 in GD 03/218

The seminar work enables students to undertake projects addressing important current issues in energy and the environment. A project occupies four weeks full-time work. Larger projects can be undertaken by two or three students working together and the reports can be written in English or German.

In preparing and supervising these projects I draw on my experience from the oil industry (ExxonMobil), in energy consultancy (covering all forms of energy across Europe), as Chief Economist of Germany's largest power generator - RWE AG, and as senior advisor to the Energy Transitions Commission.

An average grade of 2,5 especially in subjects relevant to energy economics is the recommended.

The following topics are available:

1. **Decarbonising buildings – heat pumps, biomass, and conventional heating**

   The German government has been considering a prohibition of gas or oil for heating in new or renovated buildings from 2024, implying that either heat-pumps or biofuels systems must be installed. The project will look at the costs and life-cycle emissions of different options, including improving the building insulation. The aim is to make an objective comparison of the possibilities and also consider constraints such as a shortage of skilled workers.

2. **Decarbonising transport – electric cars and e-fuels**

   This project will look at life-cycle costs and emissions of different drive-train systems for passenger cars – conventional internal combustion engines, electric cars, and cars with e-fuels. It will also consider the infrastructure necessary for refuelling/charging the cars, with the aim of determining a realistic position by 2030.

3. **Decarbonising industry and the risk of deindustrialisation**

   Decarbonisation of industry is very challenging and will depend in many sectors on hydrogen. The project will pick out between one and three sectors (steel, cement, chemicals) and determine how production can be decarbonised and what costs will be involved. The proposed Carbon Contracts for Difference (CCfD or Klimaschutzverträge) are an essential component and must be analysed as part of the project.

4. **Evaluation of hydrogen strategy in Europe or Germany**

   Very ambitious hydrogen strategies are being proposed. What conditions have to be satisfied for them to be realised, who are the different actors and what volumes might be realistically in use by 2030? This will cover production, transportation of the fuel by sea/pipeline, its use in industry and the major actors.

5. **Evaluation of the EU Green Deal and REpowerEU plans**

   The European Commission has set out very ambitious plans to reduce emissions radically. The project will determine what conditions are required (e.g. build-out rates of renewables, change of energy use in different sectors) to assess how realistic are the plans and what is likely to be a achieved by 2030.

6. **Energy storage costs and roles – technological and economic aspects**

   Energy storage has always been important for supply security and seasonal reasons. Now with an increasing share of energy coming from variable renewable sources it is becoming an even more critical aspect of the energy supply system. The project will review the various forms of storage (batteries, gas, and liquids) and examine their roles and the cost developments.

7. **Respective role of market and state in energy in selected countries inside and outside Europe**

   For over twenty years the European Union has been pressing for an increasing role for a market-based energy system, yet some of the key goals seem difficult to reach left to the market alone. Within Europe the role of the state varies considerably between countries and in external competitors it generally has a stronger role. What are the implications and observations of different levels of state intervention and what recommendations are there for the future energy supply in Europe?

8. **Electricity's price and role in different countries**

   The price of electricity both to households and industry varies enormously both within and outside Europe. Countries with low price electricity have considerable economic advantages: they can supply households and transport at lower costs and also produced electricity-intensive products more cheaply than other competitors. This project will look at selected countries, identify the reasons for large differences in electricity costs and analyse the consequences for the countries of cheap or expensive supplies.

9. **Role of long-term energy contracts – power, renewables, gas, hydrogen, and others**

   For over fifty years long-term contracts (initially for natural gas) have played a major role in securing energy supply. Around 2000 the European Commission started to resist such gas contracts seeing them as anti-competitive, yet now realises that they are needed to start the hydrogen market. Long-term contracts also play an essential part in developing renewable power. The project should draw conclusions on their future need.

Contact: graham.weale@ruhr-uni-bochum.de

Links: www.gw-energy.eu

https://www.linkedin.com/in/prof-graham-weale-29117942

https://www2.wiwi.rub.de/personen/prof-weale/