EE2045 – Coursework on renewable energy systems, analysis and review

The last few decades have seen the introduction of highly efficient energy conversion techniques with the adoption and improvement of renewable energy (RE) technology and improved manufacturing capabilities. With these advancements and greater understanding, there is an acknowledgement and acceptance to push forward with widespread electrification of historically fossil-fuel based industries. Noticeably transport and energy generation are undergoing a significant transformation right now and this brings a sustainable energy future within reach.

We are living a global energy transformation and to limit climate change and achieve future sustainable growth renewable energies are playing a key role. The increasing global trend of low carbon energy generation can be seen in Figure 1 while some countries are represented in Figure 2.

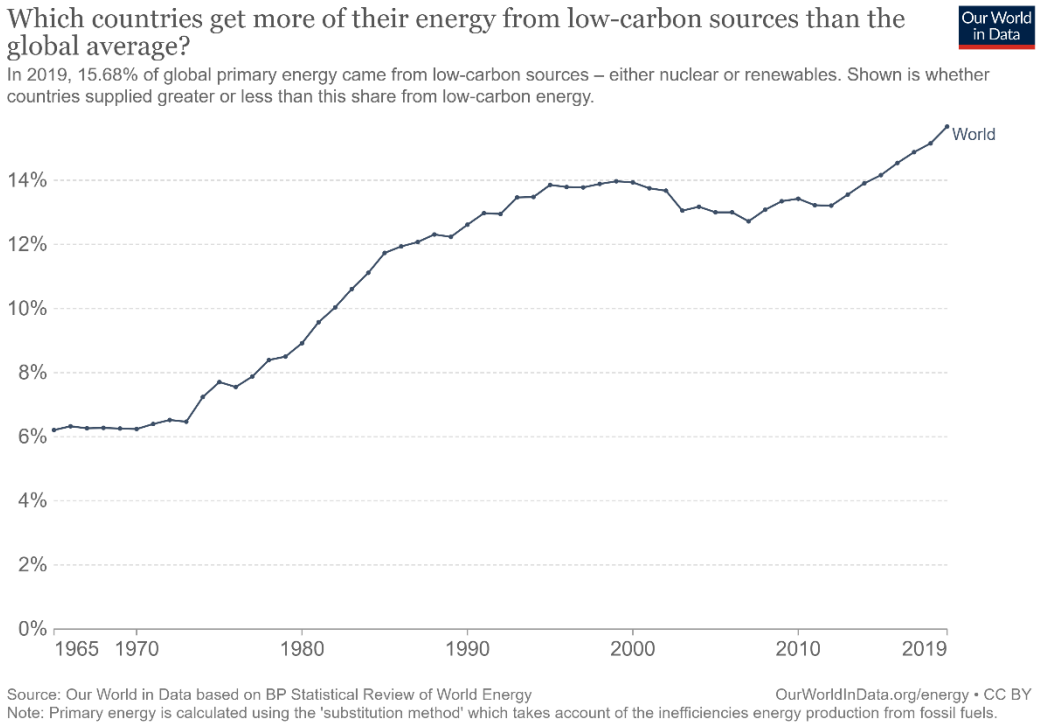


Figure 1. Global primary energy from low carbon sources [1]

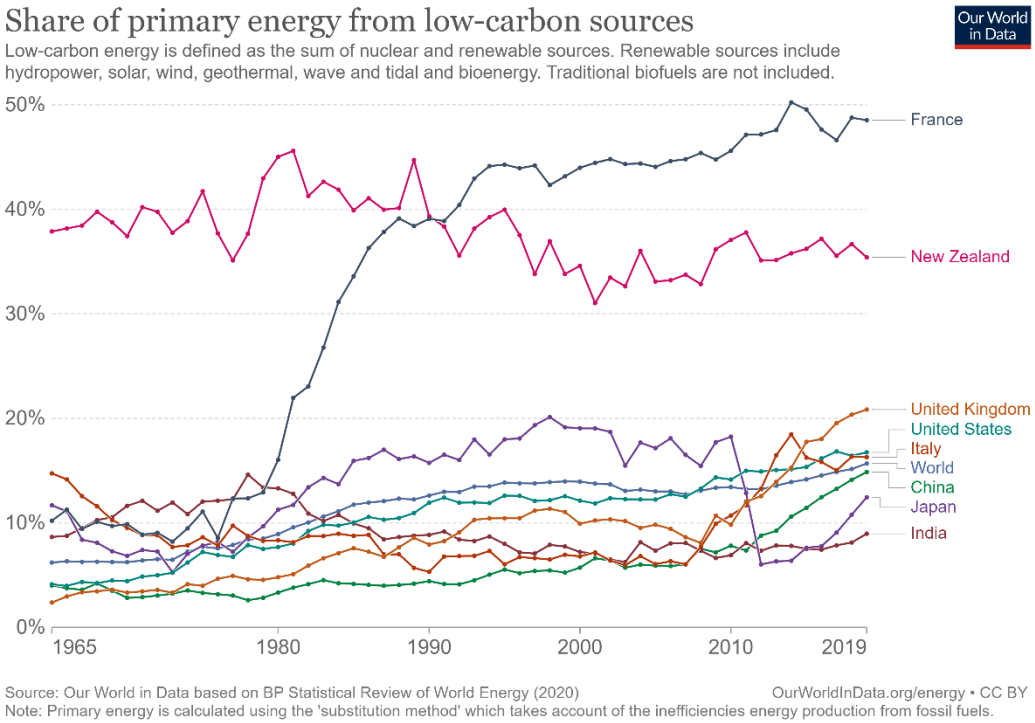
This coursework is an opportunity for you to study, analyse and review in detail how RE can provide the energy required for a country to operate while also identifying the drivers and limitations of the technology. In this coursework you will look at one or more RE technologies and systems for a specific country, among the ones that are using renewable sources to produce more than 40% of the required energy for that country to operate.

Coursework outline

This coursework requires you to create an original poster that discusses the current RE portfolio of the allocated country, what energy sources are used and why. Identify how this has changed and if available specify the potential growth of the RE sources. In this study/review work you will also need to specify technical details of one or more of the RE technologies used and define the key parameters that enable this technology to exist in the country (i.e., solar irradiance, wind characteristics, hydro capability etc.). You will also need to explain the enabling systems and technologies such as grid characteristics, power electronics, motors and drives, as well as give a description of the RE technology. This is an outline study considering the operational requirements as well as the limitations of the available RE technology, both today and in the future. It requires concise explanation of the capabilities and efforts of the country as well as technical descriptions of the technologies and conversion types.

Country assignment

You will be allocated a country or territory that is using RE technology to produce energy. The complete assignment list is on Moodle, where each student has a country from those generating more than 40% to operate from renewable sources to study. If for any reason, you wish to study a different country than the one assigned that is fine and will not affect your mark. You will need to justify it (a brief sentence) in an email to richard.davies@nottingham.ac.uk with subject "EEEE2045 RE coursework country change". This will be checked against last year's work - do not change to the same country.



Share of primary energy for low carbon sources from a range of countries [1]

Coursework aims

The main objective of this coursework is for you to get familiar with RE systems and to gain knowledge about their drivers, how they can be used for energy generation and the technology that enables it. The ability to source and select relevant information, condense the most critical parts, and present it in a logical yet appealing manner are common engineering skills that will be required.

Required effort: about 16 hours of independent research, review work and report writing (poster).

Assessment format

The coursework will consist of the production of one visually appealing A0 poster to be submitted in pdf format using filename structure of *EE2045_RE1_[your student number].pdf*. The poster should include the following contents:

- Overview of the RE technology portfolio for the specified country studied and identification of key parameters as well as driving forces.
- Analysis of the technical requirements to enable the RE systems to be used for energy production (e.g., voltage, power and energy levels of the power system). This must include a description of the conversion system and enabling technology to make this energy available (i.e., power electronics, drives, motors etc.).
- Description of the RE system supported by clear figures and/or schematics.
- A summary of the technology with potential expansion or change of technology in the future.
- Bibliography – max 5 representative references.

Assessment criteria

The weighting of the coursework is as follows:

- Renewable energy technology review in the assigned territory (15%)
- Technical review, requirements and key technologies of the RE conversion system (25%)
- Description of the RE electrical system and justification of technology used (25%)
- Technology Roadmaps and potential growth/expansion (15%)
- Quality, impact and structure of the poster (10%)
- Formatting, language, and references (10%)

[1] Graphs represent 2019 data taken from Hannah Ritchie and Max Roser (2020) - "Energy". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/energy' [Online Resource]