Unit 5: Renewable Energy

Unit code F/615/1479
Unit level 4
Credit value 15

Introduction

With the increasing concerns regarding climate change arising from increasing carbon dioxide levels and other adverse environmental impacts of industrial processes, there are widespread economic, ethical, legislative and social pressures on engineers to develop technologies and processes that have reduced carbon and environmental impact.

The aim of this unit is to introduce students to renewable energy resources and technologies, including current storage and generation technologies, and explore their advantages and limitations.

On successful completion of this unit students will be able to determine the optimum combination of renewable energy technologies and evaluate their efficiencies, describe how to conduct a cost–benefit analysis to determine the most viable option between renewable and conventional energy sources, and consider the relevant political, socio-economic and legal factors that influence the selection of appropriate energy technologies.

Learning Outcomes

By the end of this unit students will be able to:

1. Explore potential renewable energy resources, including current storage and generation technologies.
2. Determine the optimum combination and efficiencies of renewable energy technologies for a particular location.
3. Conduct a cost–benefit analysis to determine the most viable option between renewable and conventional energy sources.
4. Explain socio-economic, legislative and environmental factors involved in the consideration and selection of other approaches to renewable energy resources and technologies.
Essential Content

LO1  Explore potential renewable energy resources, including current storage and generation technologies

*Alternative energy sources, their respective merits and drawbacks:*
Wind energy, ocean and tidal energy, biomass, geothermal energy, hydropower, solar and thermal energy
Waste as energy

LO2  Determine the optimum combination and efficiencies of renewable energy technologies for a particular location

*Energy demand and security of supply:*
Energy consumption changes, intensity and trends (domestic, industrial, transport, services sectors)
Factors affecting changes in energy consumption and demand
Future demand planning based on trends and needs analysis
Risk analysis for energy supplies for UK and local areas
Energy capacity margins analysis related to changes in demand
Alternatives for locally used energy sources

*Energy reduction and efficiency approaches:*
Energy systems available for a given location
Energy legislation and standards
Energy saving and reduction schemes, energy saving technologies available
Energy efficiency approaches for domestic energy use
Grants and government schemes, and the effects of such schemes on supply and demand

LO3  Conduct a cost–benefit analysis to determine the most viable option between renewable and conventional energy sources

Financial and environmental implications:
Cost–benefit analysis
Socio-economic factors
Financial implications of renewable and conventional energy
LO4  Explain socio-economic, legislative and environmental factors involved in the consideration and selection of other approaches to renewable energy resources and technologies

*Environmental factors of the set-up and operation of renewable technologies:*

Legislative and commercial considerations, including carbon taxes and national and international climate change legislation

Evaluation planning tools such as PESTLE analysis
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<th>Learning Outcomes and Assessment Criteria</th>
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<td><strong>Pass</strong></td>
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<tr>
<td><strong>LO1</strong> Explore potential renewable energy resources, including current storage and generation technologies</td>
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<td><strong>P1</strong> Create schematic diagrams showing the working principle of the most widely used renewable energy systems</td>
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<td><strong>LO2</strong> Determine the optimum combination and efficiencies of renewable energy technologies for a particular location</td>
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<td><strong>P2</strong> Describe how each renewable energy system could be connected with local energy systems</td>
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<td><strong>LO3</strong> Conduct a cost–benefit analysis to determine the most viable option between renewable and conventional energy sources</td>
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<td><strong>P3</strong> Calculate the installation and construction costs of one renewable energy system from a renewable energy standpoint</td>
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<td><strong>LO4</strong> Explain socio-economic, legislative and environmental factors involved in the consideration and selection of other approaches to renewable energy resources and technologies</td>
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<td><strong>P4</strong> Examine how socio-economic, legislative and environmental factors affect the selection, set-up and operation of renewable energy sources</td>
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Recommended Resources

Textbooks

Journals
Renewable Energy Focus Journal.
The Open Renewable Energy Journal.
Journal of Renewable and Sustainable Energy.

Websites
https://www.theguardian.com The Guardian
Renewable energy (Articles)
http://www.energysavingtrust.org.uk/ Energy Saving Trust
Renewable energy (General Reference)
http://www.gov.uk/ Gov.UK
Department of Energy & Climate Change (General Reference)

Links
This unit links to the following related units:
Unit 4: Managing a Professional Engineering Project
Unit 44: Industrial Power, Electronics and Storage
Unit 51: Sustainability