Clean Electrification: Renewables, Storage, EVs and Hydrogen

Module Descriptor

Module Code:	REN7CER
Version:	V1.00
Status:	Final
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Summary Module Details

Module Title: Clean Electrification: Renewables, Storage, EVs and Hydrogen

Module Leader: TBC

Module Mode: Supported online learning

Semester: Spring (UK)

Level: 7

Credits: 20

Learning Hours: 200

Contact & Study Hours

Directed Study Time: 60 hrs (30%)

Self-directed Study Time: 70 hrs (35%)

Assessment Study Time: 70 hrs (35%)

Assessment Type

Coursework: 100%

Module Summary

This module explores the technologies and strategies underpinning clean electrification as a cornerstone of the global energy transition. It examines how renewable generation, energy storage, electric vehicles, and hydrogen systems can be integrated to enable reliable, decarbonised power systems. Students will engage with technical design, operational challenges, and innovation opportunities while applying simulation platforms, digital labs, and real-world case studies based on industry datasets to understand the role of clean electrification in achieving net zero targets.

Taken on which Programmes

MSc Renewable Energy and AI (C)

Core (C) or Elective (E)

Module Aims

This module aims to:

- Provide a comprehensive understanding of clean electrification technologies and their interconnections.

- Equip students with the ability to design and evaluate integrated solutions involving renewables, storage, EVs, and hydrogen.

- Explore the operational and regulatory challenges associated with large-scale electrification.

- Develop students' ability to critically assess pathways for achieving reliable, low-carbon energy systems.

- Enable students to work with authentic datasets and modelling scenarios from industry to apply theoretical knowledge in practical contexts.

Module Learning Outcomes

LO1.   Critically evaluate the principles and roles of clean electrification technologies including renewables, storage, EVs, and hydrogen.

LO2.   Design and evaluate integrated energy solutions combining multiple clean electrification technologies.

LO3.   Critically analyse the challenges and opportunities associated with scaling up electrification in power and transport systems.

LO4.   Apply technical and modelling tools to assess the performance and resilience of clean electrification solutions.

Indicative Module Content

Module topics

- Foundations of Clean Electrification: Concepts, definitions, and role in net zero transition.

- Renewable Generation Systems: Solar PV, wind, and hybrid integration.

- Energy Storage Technologies: Batteries, thermal storage, pumped hydro, supercapacitors.

- Hydrogen Systems: Electrolysers, fuel cells, hydrogen storage and infrastructure.

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- Electrification of Transport: EV systems, charging networks, smart charging, vehicle-to-grid integration.

- System Integration: Technical and regulatory frameworks for combined operation.

- Challenges and Opportunities: Grid stability, scalability, cost, and environmental impacts.

- Practical Skills: Digital labs and scenario-based exercises using real-world industry datasets to design, simulate, and evaluate integrated clean electrification solutions.

This content will be reviewed and updated regularly to reflect the legal, moral and financial changes in professional standards and practice, and the evolving body of knowledge regarding social science research.

Overview of Summative Assessment

Module learning outcomes	Assessment	Word count or equivalent	Weighting
LO1, LO2, LO4	**Assessment 1** Coursework	2,500	50%
LO2, LO3, LO4	**Assessment 2** Coursework	2,500	50%

Module Pass Mark (as a weighted average of all assessments): 50%

Key Module Learning Resources

Core Sources and Texts

The core reading resources within each module will be provided via the specific Virtual Learning Environment (VLE) module pages and within the e-Library. Additional reference material and supplementary resources to support your studies are available through the University e-Library.

Module tools

Students will have access to study materials, dedicated academic support, student forums, and learning activities via an online learning platform (VLE).

The module page on the VLE is broken down into structured study weeks to help students plan their time, with each week containing a mixture of reading, case studies, videos/recordings and interactive activities to go through. Online webinars/seminars led by the Module Leader can be attended in real time and provide opportunities to consolidate knowledge, ask questions, discuss topics and work through learning activities together. These sessions are recorded to support students who cannot attend and to enable students to recap the session and work through it at their own pace. Module forums on the VLE provide further opportunities to discuss topics with other students, complete collaborative work and get extra help from the module team.

Professional online resources

The e-Library provides access to trusted, quality online resources, selected by subject specialists, to support students' study. This includes journals, industry publications, magazines, academic books and a dissertation/work-based library. For a list of the key industry specific and education resources available please visit the VLE e-Library.

Other relevant resources

Access is also provided to further information sources that include the British Library and Open University UK catalogues, as well as providing a monthly current awareness service entitled, **_Knowledge Foundations_** - a compendium of news, research and resources relating to the educational sector and the Built Environment.

The module resource list is available on the module VLE page and is updated regularly to ensure materials are relevant and current.