



PART OF **nocn** GROUP

# QUALIFICATION SPECIFICATION

## **NOCN Level 5 Certificate for Certified Energy Efficiency Practitioner (Buildings & Industrial)**

Qualification No: **603/7171/7**

### **Operational Start Date**

1<sup>st</sup> March 2021

### **Version**

1.1 – August 2022

### **To know more about NOCN:**

- Visit the NOCN website: [www.nocn.org.uk](http://www.nocn.org.uk)
- Call the Customer Service Team: **0300 999 1177**

## Introduction

**NOCN** is a market-leading awarding organisation that has been providing qualifications for a wide range of centres, including FE colleges and training providers, for 30 years both in the UK and internationally.

We work with centres to deliver a high quality and flexible service for learners to underpin our passionate belief in the power of education and its impact on communities and individuals.

We offer all the advantages of being with a national awarding organisation with a diverse portfolio of qualifications, alongside providing a personalised, bespoke, service to our centres and learners.

As an accredited Leader in Diversity, we are proud of our reputation as a provider of fully accessible, trusted and flexible qualifications.

## About NOCN Group

NOCN is part of NOCN Group, a progressive educational charity whose core aims are to help learners reach their potential and organisations thrive. The group includes business units specialising in regulated UK and international qualifications, end point assessment, endorsed programmes and assured short courses, Smart job cards, assessment services, consultancy, and research.

NOCN Group shares a joint purpose to offer learners, training providers, employers, and FE colleges a fully integrated range of learning and skills development products and services.

Information about all our courses and qualifications is available from our website:

<https://www.nocn.org.uk/>

## Qualifications at a Glance

Title	Size
NOCN Level 5 Certificate in Certified Energy Efficiency Practitioner (Buildings & Industry)	Certificate = Minimum 16 Credits = Minimum 80 GLH = Minimum 160 TQT
Purpose	Target Audience
The purpose of this qualification is to provide learners with the basic knowledge in energy efficiency and the energy auditing field using Building Rating System (BRS), to ultimately enable achievement of local energy efficiency initiatives.	This Level 5 qualification is aimed at graduates with a background in chemical, mechanical, civil, electrical, or architectural engineering, or those in their last year of study in related fields.
Content Overview	Entry Requirements
This qualification provides learners with an understanding of the requirements of energy audits and the considerations involved in improving energy efficiency.	Learners must hold, or be in the last year of study, of a degree in a relevant area.
Assessment	Additional Resources
There are a variety of assessment methods used in this qualification. Please see each unit for information on how it must be assessed.	

Introduction .....	2
About NOCN Group .....	2
Qualifications at a Glance .....	3
1. Overview of Qualifications .....	5
1.1. Entry Requirements.....	5
1.2. Progression Routes .....	5
2. Qualifications Details.....	6
2.1. Qualification Structures .....	6
2.2. Total Qualification Time (TQT) .....	7
2.3. Assessment and Evidence .....	7
2.4. Fair and Equitable Assessment.....	8
2.5. Learners with Particular Requirements.....	8
2.6. Recognised Prior Learning.....	8
2.7. Assessment and Evidence for the Components .....	9
3. Centre Information .....	10
3.1. Required Resources for Delivering the Qualifications .....	10
3.1.1. Tutor Requirements .....	10
3.1.2. Assessor Requirements .....	10
3.1.3. Internal Quality Assurer Requirements.....	10
3.1.4. Continuing Professional Development (CPD) .....	11
3.1.5. External Quality Assurance .....	11
3.2. Offering the Qualification.....	11
4. Component Information.....	12
4.1 Mandatory Components.....	14
4.2 Pathway Components.....	21

# 1. Overview of Qualifications

These qualifications are vocationally based and as such, offer the opportunity for learners to demonstrate an achievement of practical skills, understanding and knowledge in and will provide learners with a comprehensive background into the development of solar photovoltaic systems and the supporting information to enable them to progress to employment.

These qualifications also support progression to further learning at Level 6 and beyond.

## 1.1. Entry Requirements

The learners should be graduates with a background in chemical, mechanical, civil, electrical, or architectural engineering, or those in their last year of study in a related field. Learners must be in a position to demonstrate the requirements of the qualification and have access to required assessment opportunities and relevant resources. Please refer to specific assessment requirements on individual components for more information.

Centres should undertake initial assessment activities with learners to ensure this is an appropriate qualification and they are capable of achieving the level they will be studying before enrolling them onto a programme of learning.

This qualification is available to learners aged 19+ years or over.

The prerequisites to qualify for the training and certification have been defined to consider the possible diversity of education and practical experience individuals may have. However, each candidate must meet one of the following criteria.

Education
A degree from a university or college in chemical, mechanical, civil, electrical, or architectural engineering
In the last year of a degree from a university or college in chemical, mechanical, civil, electrical, or architectural engineering

## 1.2. Progression Routes

Achievement of one of these qualifications confirms the learner has gained the knowledge and skills required to:

- Progress directly into employment.
- Progress into further learning at a higher level.

## 2. Qualifications Details

### 2.1. Qualification Structures

The NOCN Level 5 Certificate for Certified Energy Efficiency Practitioner is a minimum 16-credit qualification with a minimum Total Qualification Time (TQT) of 160, including a minimum 80 Guided Learning Hours (GLH). The learner must achieve a minimum of 16 credits from the Mandatory Components, including one of the pathways chosen.

#### Mandatory Group

Component Title	Level	Credit Value	M/O	Ofqual Unit Ref	Assessment
Energy efficiency: measures and controls, concepts, background, systems, frameworks and tools	5	6	M	H/618/6421	Assignment / Portfolio
Development of an Energy Audit or Simulation Report and Financial Analysis	5	8	M	K/618/6422	Project Report

#### Buildings Pathway

Component Title	Level	Credit Value	M/O	Ofqual Unit Ref	Assessment
Energy Efficiency in Buildings: Measures and Controls, Concepts, Background, Systems, Frameworks and Tools	5	2	M	M/618/6423	Assignment / Portfolio

#### Industrial Pathway

Component Title	Level	Credit Value	M/O	Ofqual Unit Ref	Assessment
Energy Efficiency in Industry: measures and controls, concepts, background, systems, frameworks and tools	5	4	M	T/618/6424	Assignment / Portfolio

## 2.2. Total Qualification Time (TQT)

Through consultation with users, TQT has been agreed by considering the total number of learning hours required for the average learner to achieve the qualifications.

TQT is split into two areas:

Area	Example of activities
<p><b>1. Guided Learning Hours (GLH):</b></p> <ul style="list-style-type: none"> <li>• learning activity under the immediate guidance or supervision of a lecturer, supervisor, tutor or other appropriate provider of education or training</li> <li>• includes the activity of being assessed if the assessment takes place under the immediate guidance or supervision of a lecturer, supervisor, tutor or other appropriate provider of education or training</li> </ul>	<ul style="list-style-type: none"> <li>• Classroom-based learning supervised by a teacher</li> <li>• Work-based learning supervised by a teacher</li> <li>• Live webinar or telephone tutorial with a teach in real time</li> <li>• E-learning supervised by a teacher in real time</li> <li>• All forms of assessment which take place under the immediate guidance or supervision of an appropriate provider of training</li> <li>• Exam time</li> </ul>
<p><b>2. Other Learning Hours (OLH):</b></p> <ul style="list-style-type: none"> <li>• an estimate of the number of hours a learner will spend, as directed by (but not under the immediate guidance or supervision of) a lecturer, supervisor, tutor or other appropriate provider of education or training, including:                             <ul style="list-style-type: none"> <li>○ preparatory work</li> <li>○ self-study</li> <li>○ any other form of education or training, including assessment</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Independent and unsupervised research/learning</li> <li>• Unsupervised compilation of a portfolio of work experience</li> <li>• Unsupervised e-learning</li> <li>• Unsupervised e-assessment</li> <li>• Unsupervised coursework</li> <li>• Watching a pre-recorded podcast or webinar</li> <li>• Unsupervised work-based learning</li> </ul>

## 2.3. Assessment and Evidence

This qualification is assessed through internally set and assessed and externally quality assured assessment.

### Internal assessment

Internal assessment activity must ensure evidence of achievement against the learning outcome requirements as specified within each component.

Centres must ensure that knowledge-based learning is at the correct level for the qualifications.

Assessment activities must be robust in that they are:



<b>Valid</b>	Fit for purpose in that they are suitable for the identified assessment criteria and offer the learner the opportunity to demonstrate achievement at the required level.
<b>Sufficient</b>	Provide the opportunity for the learner to provide adequate evidence, showing full coverage of the requirements of the assessment criteria.
<b>Reliable</b>	Generate clear and consistent outcomes recognising that the activities may be applied to differing scenarios and in different contexts, with different learners. The evidence sought by the activity must be able to be assessed and result in assessment decisions that are consistent across all assessors and centres offering the qualifications. Assessment activities should not deliberately offer an unfair advantage to or disadvantage specific groups of learners.
<b>Authentic</b>	Evidence presented must be the learner's own work.

## 2.4. Fair and Equitable Assessment

Assessment must be designed to be accessible and inclusive, and the assessment methodology must be appropriate for individual assessment, giving due consideration to any assessment requirements attached to individual components.

## 2.5. Learners with Particular Requirements

If you are a NOCN Recognised Centre and have learners with particular requirements, please see the **NOCN Reasonable Adjustments and Special Considerations Policy and Procedure** found on the NOCN website at [www.nocn.org.uk](http://www.nocn.org.uk)

This policy gives clear guidance on the reasonable adjustments and arrangements that can be made to take account of disability or learning difficulty without compromising the assessment criteria.

The NOCN Centre Approval process requires the centre to hold policy statements on Equal Opportunities, Diversity and Disability Discrimination, which will be reviewed by NOCN.

Please refer to the **NOCN Quality Assurance Manual** for further details.

## 2.6. Recognised Prior Learning

Recognising Prior Learning is an assessment process that recognises learning that has its origins in a learner's experience and/or previous formal and informal learning contexts. This includes knowledge and skills gained within school, college, university, and outside formal learning situations such as through life, employment, apprenticeships, and other work experiences.



NOCN is committed to the Recognition of Prior Learning (RPL) and has developed a policy and procedures to inform and support centres. This is available on the NOCN website at [www.nocn.org.uk](http://www.nocn.org.uk)

### **2.7. Assessment and Evidence for the Components**

Forms and guidance for gathering learner evidence against the individual assessment criteria are available for download in Word format on the NOCN website:

<https://www.nocn.org.uk/support/nocn-support/quality-assurance/>

## 3. Centre Information

### 3.1. Required Resources for Delivering the Qualifications

As part of the requirement to deliver the qualifications there is an expectation that staff undertaking roles as part of the delivery and assessment of the qualifications have a demonstrable level of expertise.

NOCN expects that Tutors and Assessors can demonstrate the following competencies:

#### 3.1.1. Tutor Requirements

- Be subject matter experts, hold or be registered as working towards, a recognised education and training qualification, have experience of delivering training within this subject area. The minimum expectation is that the level of competence of the Tutor should be at the same level as the training that is to be delivered.

#### 3.1.2. Assessor Requirements

- Be technically competent, have experience of carrying out assessment activities and hold, or be registered as working towards, a recognised assessing qualification. The minimum expectation is that the level of competence of the Assessor should be at the same level as the qualification being assessed.

#### 3.1.3. Internal Quality Assurer Requirements

Each centre must have internal quality assurance policies and procedures in place to ensure that decisions made by Assessors are appropriate, consistent, fair, and transparent, and that they do not discriminate against any learner. The policies and procedures must be sufficient to secure the quality of the award, ensuring validity, reliability, and consistency.

NOCN expects that an Internal Quality Assurer is able to demonstrate the following competencies, they should:

- Have an understanding of the subject area, have experience in carrying out internal quality assurance activities and hold, or be registered as working towards, a recognised Internal Quality Assurance qualification. The minimum expectation is that the level of competence should be at the same level as the qualification being quality assured.

NOCN supports and recognises Centres' internal quality assurance systems which support the above; any system should include standardisation and sharing of good practice.

Centre staff may undertake more than one role, e.g., tutor, assessor, or internal quality assurer, but they **cannot** carry out any quality assurance on work that they have previously assessed.

### 3.1.4. Continuing Professional Development (CPD)

Centres are expected to support their staff, ensuring that their subject knowledge remains current and that their members of staff are up to date with regards to best practice in delivery, assessment, and quality assurance.

### 3.1.5. External Quality Assurance

Once recognised as a Centre, NOCN will allocate an External Quality Assurer. The External Quality Assurer will have ongoing responsibility for monitoring the Centre's compliance with the requirements of recognised Centre approval status.

The External Quality Assurer will make regular visits to all centres. During these visits they will:

Monitor the Centre's compliance with the Centre approval criteria by reviewing course documentation, meeting managers, tutors, internal quality assurers, learners, and administrative staff.

Review the standard of the Centre's assessment and internal quality assurance practices and decisions to determine whether all assessment requirements are met to support safe and valid claims for certification.

Refer to the **NOCN Quality Assurance Manual** for further information on the External Quality Assurance process.

## 3.2. Offering the Qualification

### Existing Centres

If you are already recognised to offer NOCN qualifications and would like more information about offering this qualification, please contact: [business-enquiries@nocn.org.uk](mailto:business-enquiries@nocn.org.uk).

Use Horizon to add the qualification to your Centre.

### New Centres

If you are interested in offering these qualifications, but are not yet a NOCN Approved Centre and would like more information about becoming a NOCN centre and offering the qualifications please see **Become a Registered Centre** on our website <https://www.nocn.org.uk/customers/nocn-centres/> and click Become a Centre.

## 4. Component Information

The NOCN Level 5 Certificate for Certified Energy Efficiency Practitioner (Buildings & Industry) consists of 2 mandatory components. There are additional pathways related to Buildings and Industry, depending on the learners' background. The qualification structure in Section 2 sets out the rules for achieving this qualification.

To achieve this qualification, a learner must provide evidence of learning and achievement as detailed on each of the components.

A copy of the Mandatory components and both of the pathways is included in this Qualification Specification.

Abbreviations are used through these units for efficiency and are listed below for reference.

BAT	Best Available Technology
BMS	Building Management System
BREEAM	Building Research Establishment Environmental Assessment Method
CHP	Combined Heat and Power
COP	Coefficient of Performance
CPD	Continuing Professional Development
EER	Energy Efficiency Ratio
EN	European Standards
EnMCT	Energy Monitoring and Control Tools
EnMS	Energy Management System
EnPI	Energy Performance Indicators
EPC	Energy Performance Contracting
ESCO	Energy Services Company
HVAC	Heating, Ventilation and Air Conditioning
IFC	International Finance Corporation
ISO	International Organization of Standardization
KPI	Key Performance Indicators
LEED	Leadership in Energy and Environmental Design
MEPS	Minimum Energy Performance Standard
OTTV	Overall Thermal Transfer Value
PV	Photovoltaics
ROI	Return on Investment
SEER	Seasonal Energy Efficiency Ratio
SHGC	Solar Heat Gain Coefficient
VSD	Variable Speed Drives

### 4.1 Mandatory Components

<b>Title:</b>	Energy Efficiency: Measures and Controls, Concepts, Background, Systems, Frameworks and Tools
<b>Level:</b>	5
<b>Credit Value:</b>	6
<b>GLH</b>	24
<b>Unique Reference Number:</b>	<b>H/618/6421</b>
<b>Aim:</b>	The aim of this unit is to provide learners with a background in energy efficiency, including methods for identifying opportunities for energy performance improvement.
<b>Assessment</b>	This unit will be assessed through an internally set multiple choice and written or verbal short answer questions.
<b>Learning outcomes</b> <i>The learner will:</i>	
1. <b>Understand energy efficiency and local energy trends</b>	
<p><b>Delivery Content:</b> The aim of this learning outcome is to provide learners with an overview of energy efficiency and local energy consumption trends.</p> <ul style="list-style-type: none"> <li>• Learners must be able to:</li> <li>• Understand energy efficiency measures</li> <li>• Discern the types, and importance, of mathematical formulas and equations in relation to identifying energy trends and calculating efficiencies.</li> <li>• Analyse the relationship between the source of energy, its usage and resulting emissions</li> <li>• Define how to report energy consumption and greenhouse gas emissions</li> <li>• Understand international and regional building rating schemes such as IFC, LEED, OTTV, Pearl Rating System, BREEAM etc.</li> <li>• Identify and utilise energy use trends, local building regulations and national drivers of energy efficiency and EnMS (energy management system)</li> <li>• Identify how energy subsidies affect energy conservation efforts</li> <li>• Source and understand local electricity and water tariff trends</li> </ul>	

<ul style="list-style-type: none"> <li>• Detail energy management systems</li> </ul>
<p><b>2. Understand the use and function of a Heating, Ventilation and Air Conditioning (HVAC) and the cooling system</b></p>
<p><b>Delivery Content:</b> The aim of this learning outcome is to provide the learner with an overview of HVAC system and cooling system.</p> <p>Learners must be able to:</p> <ul style="list-style-type: none"> <li>• Understand cooling load and heating demand</li> <li>• Understand cooling system measures and types as per the air-conditioning MEPS</li> <li>• Understand HVAC measures (temperature, humidity, air quality for filter and fresh air)</li> <li>• Understand the main source of energy loss in HVAC and cooling systems</li> <li>• Know about performance calculations and units (kW/ton ratio for efficiency)</li> <li>• Know about EER, COP, SEER, and the Performance factors in HVAC system</li> <li>• Understand operation modes</li> <li>• Understand refrigerant system/cycle with its components</li> <li>• Calculate the heat ratio</li> <li>• Determine the main optimisation approaches and energy performance improvements</li> </ul>
<p><b>3. Understand electric power systems and motors and how to optimize their energy use</b></p>
<p><b>Delivery Content:</b> The aim of this learning module is to provide learners with an overview of electric power systems and methods for improving energy efficiency.</p> <p>Learners must be able to:</p> <ul style="list-style-type: none"> <li>• Understand electricity consumption factors and load management systems</li> <li>• Understand the effect of electricity consumption on energy efficiency</li> <li>• Identify different types of motors and efficiency classes</li> <li>• Understand Variable Frequency Drives</li> <li>• Characterise the effect of electricity consumption on energy efficiency and methods of improving energy efficiency in ventilation</li> </ul>



#### 4. Interpret the importance of lighting systems and how to optimise for energy efficiency

**Delivery Content:** The aim of this learning outcome is to provide learners with an understanding of lighting systems, the various terminology and energy efficiency measures.

Learners must be able to:

- Understand lighting requirements, factors and standardized minimum levels
- Understand and distinguish between lighting terminology
- Compare between different types of lamp and fixtures, and their energy efficiency
- Explain the steps of a lighting survey
- Identify opportunities for performance improvements and control measures in a lighting system

#### 5. Identify areas of improvement in energy efficiency

**Delivery Content:** The aim of this learning outcome is to provide learners with an understanding of small-scale consumer requirements and building systems, and to gain an understanding of energy efficiency project problems and methods for solving.

Learners must be able to:

- Understand the objectives of monitoring and reporting energy consumption
- Define ecolabels and distinguish between different types of ecolabels
- Know examples and tactics of optimising energy use
- Analyse the energy performance of different case studies
- Understand Best Available Technology (BAT)
- Characterise the problems with energy efficiency projects including lack of standardization, disaggregation.
- Understand the importance of Building Management Systems (BMS) and Energy Monitoring and Control Tools (EnMCT) for energy audits
- Understand the importance of measuring Key Performance Indicators (KPI) and Energy Performance Indicators (EnPI)
- Distinguish between different kinds of monitoring systems

#### 6. Understand the concept of Energy Services Company (ESCO) & Energy Performance Contracting (EPC)

**Delivery Content:** The aim of this learning outcome is to provide learners with an overview of ESCO and EPC concepts.

Learners must:

- Know the concept of ESCO and EPC
- Understand the steps of an EPC model
- Understand the types of
  - EPC
  - Guaranteed Savings
  - Shared Savings
  - Guaranteed Rebate.
- Give an example of use for each type

<b>Title:</b>	<b>Development of an Energy Audit or Simulation Report and Financial Analysis</b>
<b>Level:</b>	5
<b>Credit Value:</b>	8
<b>GLH</b>	40
<b>Unique Reference Number:</b>	<b>K/618/6422</b>
<b>Aim:</b>	The aim of this unit is to provide learners with the opportunity to demonstrate their skills and knowledge in performing an energy audit and developing an audit report using performance rating from BRS tool.
<b>Assessment</b>	This unit will be assessed through the production of an energy audit report or simulation with accompanying information, including financial.
<b>Learning outcomes</b>	
<i>The learner will:</i>	
1. <b>Understand energy audits</b>	
<b>Delivery Content:</b> The aim of this learning outcome is to understand the concept of energy audit and its standards step by step.	
Learners must be able to:	
<ul style="list-style-type: none"> <li>• Understand energy audit standards ISO 50001 and 50002</li> <li>• Compare internal and external energy audits</li> <li>• Identify energy auditor</li> <li>• Understand the different energy audit types</li> <li>• Understand the purpose of energy audit</li> <li>• Understand ISO 50002 levels with details</li> <li>• Understand energy audit requirements</li> <li>• Understand energy audit areas</li> <li>• Identify related definitions, terms, energy performance units and equipment used in the field</li> <li>• Understand safety and hazards</li> <li>• Understand the planning protocol to perform energy audits</li> </ul>	

- Identify potential improvement areas in building energy performance

## 2. Understand energy audit report development.

**Delivery Content:** The aim of this learning outcome is to understand the process of developing an energy audit report.

Learners must be able to:

- Establish the report objective
- Assess the type of audience
- Define components of the report
- Provide report development best practices
- Review and analyse a sample report
- Prepare an energy audit report

## 3. Gain familiarity with financial analysis techniques

**Delivery Content:** The aim of this learning outcome is to provide learners with an understanding of financial analysis tools and techniques.

Learners must be able to:

- Analyse the simple payback indicator
- Understand the cost benefit analysis
- Understand the Return on investment (ROI) concept
- Understand other relevant financial indicators
- Perform financial calculations

## Scope of Training

The Scope of Training identifies areas that must be covered during the delivery of this unit. This is the minimum that is expected but tutors are expected to include other areas, knowledge of which will benefit their learners, based on location, types of work available and from the tutors own professional experience.

	Requirements
<b>Content</b>	<p>The contents covered must include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Energy audit concept and standard</li> <li>• Establish the report</li> <li>• Understand the financial indicators</li> <li>• Perform calculations</li> </ul>
<b>Formats</b>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Paper-based</li> <li>• Electronic (disc, pen drive etc.)</li> <li>•</li> </ul>
<b>Method</b>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Site visit</li> <li>• Energy consumption calculations</li> <li>• Financial calculations</li> </ul>

## 4.2. Pathway Components

### 4.2.1 Buildings Pathway

<b>Title:</b>	Energy Efficiency in Buildings: Measures and Controls, Concepts, Background, Systems, Frameworks and Tools
<b>Level:</b>	5
<b>Credit Value:</b>	2
<b>GLH:</b>	16
<b>Unique Reference Number:</b>	<b>M/618/6423</b>
<b>Aim:</b>	The aim of this unit is to provide learners with architectural, civil, mechanical and electrical background an understanding detailing energy efficiency, water and material measures in buildings with a focus on using building rating tool.
<b>Assessment:</b>	This unit will be assessed through internally set multiple choice and written or verbal short answer questions.
<b>Learning Outcomes</b>	
<i>The learner will:</i>	
<b>1. Understand building envelope</b>	
<p><b>Delivery Content:</b> The aim of this learning outcome is to provide learners with an understanding of building envelope.</p> <p>Learners must be able to:</p> <ul style="list-style-type: none"> <li>• Understand the building envelope energy performance</li> <li>• Know about window to wall ratio and wall &amp; roof assemblies</li> <li>• Understand the concept of solar reflectivity</li> <li>• Know about windows and skylight thermal transmission</li> </ul>	

- Be familiar with the concept of Solar Heat Gain Coefficient (SHGC)

## 2. Understand water consumption measures

**Delivery Content:** The aim of this learning outcome is to provide the learner with an overview of water consumption measures.

Learners must be able to:

- Understand the water consumption requirements
- Understand water consumption measures using grey water treatment and recycling system, low flow faucets etc.

## 3. Understand water heating systems

**Delivery Content:** The aim of this learning outcome is to provide the learner with an introduction to concepts related to water heating.

Learners must be able to:

- Understand water heating requirements
- Identify how to improve energy efficiency of domestic water heating
- Detail the concept of solar hot water collectors

## 4. Understand renewable electricity integration

**Delivery Content:** The aim of this learning outcome is to provide learners with an overview of renewable electricity sources and their effects on building energy efficiency.

Learners must be able to:

- Understand on-site solar PV panels as source of renewable energy
- Evidence an understanding of renewable electricity measures (on-site solar PV)
- Understand on-site wind electricity as source of renewable energy



- Understand the concept of net-zero building
- Understand the effect of on-site renewable energy on building energy efficiency

**5. Become familiar with Building Energy Performance Rating tool and other software**

**Delivery Content:** The aim of this learning outcome is to familiarise learners with Building Energy Performance Rating tool and other software.

Learners must be able to:

- Define the building rating tool objectives, scope and archetype
- Understand the overall methodology of the tool
- Follow general demonstration of building rating tool
- Understand the basic inputs and baseline assumptions for the tool
- Understand the categories and sub-categories of the rating tool
- Understand how to input data into tool for all rating criteria
- Demonstrate energy efficiency software and tools
- Understand key considerations to take when using software tools
- Understand the RETScreen Expert software and methodologies for clean energy project analysis
- Perform overview of a feasibility analysis using RETScreen
- Understand the uses, methodology and of IFC-Edge
- Know the features and capabilities of IFC-Edge
- Know the features, capabilities and different applications of an hourly simulation software
- Identify the considerations while choosing hourly simulation software and understand the required level of data and detail

#### 4.2.2. Industrial Pathway

<b>Title:</b>	Energy Efficiency in Industry: Measures and Controls, Concepts, Background, Systems, Frameworks and Tools
<b>Level:</b>	5
<b>Credit Value:</b>	4
<b>GLH:</b>	30
<b>Unique Reference Number:</b>	<b>T/618/6424</b>
<b>Aim:</b>	The aim of this unit is to provide learners with relevant engineering background with more details on energy efficiency with a focus on electrical and thermal utilities in industry.
<b>Assessment:</b>	This unit will be assessed through internally set multiple choice and written or verbal short answer questions.
<b>Learning Outcomes</b>	
<i>The learner will:</i>	
<b>1. Understand basics of fuels and combustion technologies</b>	
<p><b>Delivery content:</b> The aim of this learning outcome is to provide the learner with an understanding of fuel properties, methods for selecting the right fuel for right purpose and efficient use of fuel with combustion technology.</p> <p>Learners must be able to:</p> <ul style="list-style-type: none"> <li>• Understand the importance of fuel properties</li> <li>• Know the basics of combustion</li> <li>• Distinguish between characteristics of oil, coal, gas and biomass combustion</li> <li>• Identify the types of drafts</li> </ul>	

## 2. Understand basics of boilers and relevant opportunities for efficiency improvement

**Delivery content:** The aim of this learning outcome is to provide learners with an understanding of the basics of boilers, their construction, and best practices to optimise their availability & efficiency.

Learners must:

- Understand heat transfer mode in boilers
- Know boiler system components, type and classification
- Conduct a performance evaluation on boiler
- Understand boiler water treatment and importance
- Understand boiler blow down concept
- Identify energy efficiency opportunities in boilers

## 3. Understand steam system and relevant opportunities for efficiency improvement

**Delivery content:** The aim of this learning outcome is to provide the learner with an understanding of the basics of steam system, its applications and initiatives for energy conservation.

Learners must:

- Understand properties of steam
- Know about steam distribution system
- Distinguish between types of steam traps and their characteristics
- Understand condensate and flash steam recovery
- Know about steam pipe insulation
- Define efficiency utilisation of steam
- Identify energy efficiency opportunity in steam system

## 4. Understand different types of furnaces and their performance evaluation

**Delivery content:** The objective of this topic is to provide learners with an understanding of typical furnaces, their types and general fuel economy measures.

Learners must:

- Distinguish between types and classification of furnaces
- Understand methods of evaluation performance
- Know various losses in the furnace
- Identify energy saving opportunities

#### 5. Understand waste heat recovery and heat exchangers

**Delivery content:** The aim of this learning module is to provide learners with an understanding of the importance of low grade energy and understanding the feasibility of recovery through various type of heat exchanger.

Learners must:

- Understand waste heat sources and grades
- Differentiate between high medium and low temperature heat recovery
- Know evolving waste heat recovery scheme
- Identify types of waste heat recovery devices and applications
- Understand heat exchanger concept and distinguish between types of heat exchangers

#### 6. Gain an overview of energy efficiency considerations in electrical distribution systems

**Delivery Content:** The purpose of this learning outcome is to provide the learner with a basic understanding of electrical distribution system and the opportunity & methodology to optimise the distribution losses.

Learners must:

- Understand electricity billing analysis
- Know power factor importance and its benefit
- Know transmission losses and optimization
- Be familiar with Load Management Strategies
- Know about transformers and losses optimisation

### 7. Gain an overview of energy efficiency considerations in electric motors for industry application

**Delivery Content:** The aim of this learning module is to provide the learner with an understanding of electric motors and their types, as well as factors affecting motor performance and opportunities for energy conservation.

Learners must:

- Know about motor types, their characteristics and criteria for motor selection
- Be familiar with energy efficient motors and understand factors affecting motor efficiency
- Know about speed controls
- Understand soft starters with energy saver
- Understand variable speed drives
- Identify energy saving opportunities

### 8. Gain an overview of energy efficiency considerations in compressed air systems

**Delivery Content:** The purpose of this learning outcome is to provide the learner with a basic understanding working principle of compressors, their classification, and their performance evaluation.

Learners must:

- Understand type of compressors and compressed air system components
- Understand capacity and leakage assessment
- Identify the factors affecting the performance and efficiency
- Identify energy saving opportunities

### 9. Understand pumps and pumping systems

**Delivery Content:** The purpose of this learning outcome is to provide the learner with an overview of types of pumps, application, pump-curves and importance of flow control.

Learners must:

- Know the types of pump and factors affecting pump performance
- Understand efficient pumping system operation
- Analyse various flow control strategies
- Identify energy conservation opportunities in pumping system

#### 10. Understand heat rejection in cooling towers

**Delivery Content:** The purpose of this learning outcome is to provide the learner with an understanding of working principle of heat rejection and methodologies to optimise cooling tower performance.

Learners must:

- Understand cooling tower system
- Know the performance parameters of a cooling tower system
- Identify cooling tower losses
- Understand factors affecting performance
- Understand cooling water treatment
- Identify energy saving opportunities in cooling tower system

## Scope of Training

	Requirements
Documentation and sources of information	<ul style="list-style-type: none"> <li>• National energy authorities</li> <li>• National/local building codes</li> </ul>
Operating Principles	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Energy efficiency control measures</li> <li>• HVAC system</li> <li>• Tech BMS, EnMCT, Electricity &amp; motors</li> <li>• ESCO and EPC</li> </ul>
Technical terminologies and definitions	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• EER, COP, SEER</li> <li>• VRF system</li> <li>• CHP working principle</li> </ul>
Application types	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• HVAC system</li> <li>• BMS</li> <li>• Electric power system and motors</li> <li>• Lightning system</li> <li>• Building envelope</li> <li>• Water consumption/heating</li> </ul>
Energy accessibility	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Electricity</li> <li>• Motors</li> <li>• Heat exchanger</li> <li>• Lighting</li> <li>• Renewable energy</li> </ul>
System requirements	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Compression operation</li> <li>• Steam system</li> </ul>



	<ul style="list-style-type: none"> <li>• Expansion, heat exchanger &amp; condenser</li> <li>• Power system management</li> </ul>
<p><b>Applicable standards</b></p>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• MEPS</li> <li>• Energy Audit Standard</li> <li>• International Electro technical Commission</li> </ul>
<p><b>Stakeholders</b></p>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Client/owner</li> <li>• Regulatory authorities</li> <li>• Co-operating Companies</li> <li>• External engineers, designers, manufacturing facilities, etc.)</li> <li>• Commercial and marketing</li> <li>• Installation contractor</li> <li>• Enabling works contractors</li> </ul>
<p><b>Products</b></p>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Compressors</li> <li>• Pumps</li> <li>• Pumping systems</li> <li>• Heat exchanger</li> <li>• Cooling towers</li> <li>• Boilers</li> <li>• Lighting</li> <li>• HVAC</li> <li>• Building Insulation System</li> </ul>
<p><b>Calculations</b></p>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Heat ratio</li> <li>• Energy savings</li> <li>• Electric load</li> <li>• Energy cost</li> <li>• Return on Investment</li> </ul>

<p><b>Environmental parameters</b></p>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Ozone depletion potential</li> <li>• Global warming potential</li> <li>• Water scarcity</li> <li>• Renewable Energy</li> </ul>
<p><b>Safe and efficient operation equipment</b></p>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Electrical equipment</li> <li>• Mechanical equipment</li> </ul>
<p><b>Monitoring performance</b></p>	<p>To include but not limited to:</p> <ul style="list-style-type: none"> <li>• Power and equipment optimisation</li> <li>• ISO 50002</li> <li>• EN 16247</li> <li>• Building codes</li> </ul>

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