InnoEnergy Skills Institute

Battery Management, Connection, and Control

Last revised: 2023 March

Battery storage is the future. But that future hinges on maintaining full control over the operation of batteries and building a robust system that enables connection to the electric grid, the consumer or the electric vehicle.

This certification will allow you to dive deep into power conversion systems that connect storage systems to smart grids and consumers, learning how to choose the right type of converter while assessing overall system performance with respect to energy efficiency. It will also be your introduction to battery management systems (BMS): the masterminds behind battery packs. In this certification, you will thoroughly explore the BMS and the critical parameters that we can control. And you will discover the use of battery testing and operation simulation in order to predict real-world in-service behaviour.

Learning outcomes

Upon completion of the certification, learners will be able to:

- Expertly discuss the role of power conversion systems
- Distinguish and assess the type of power converters for battery applications
- Understand and explain the importance and function of battery management systems in the control and operation of batteries
- Describe different battery testing procedures and the relevant characteristics that can be determined
- Understand how we can simulate battery operation in order to predict in-service behaviour

Certification structure

The certification is delivered fully online and is self-paced, making it easy for participants to learn without having to take time off work.

The certification consists of six courses and is structured as follows:

Course 1: Introduction to Power Electronic Converters

- Dive into the world of power conversion starting with an introduction, to the basic principles of power conversion and the relation to the energy efficiency of the energy system

Course 2: Power Conversion and Efficiency in Battery Systems

- Discover why power converters are needed for battery applications and how we can choose the right type for a specific application

Course 3: Power Electronics and Grid Connection

- Dive deeper into the typical topologies and main functionalities of power conversion systems (PCSs) for connecting batteries to diverse electrical systems

Course 4: Battery Management Systems

- Discover battery management systems and explain their components and functions

Course 5: Battery Testing

- Explore the different types of battery testing and related standards and regulations

Course 6: Modelling, Simulation, and Control

- Explore the modelling, control, and simulation of batteries

Instructors

The certification is led by experts from the EIT InnoEnergy ecosystem. Instructors on this certification are:

Francisco Díaz-González

Professor at Universitat Politècnica de Catalunya in subjects linked with the grid integration of renewable energies. His current research interests include the fields of power electronics for electrochemical energy storages and renewable energies.

Dr. Jeroen Büscher

Product Manager Electrical Storage of Vito / Energy Ville. Since 2016 Jeroen is leading the VITO team working on electrical storage technologies and is responsible for the development and execution of the related activity roadmap. Since 2011, Jeroen has been coordinating several projects within Europe on electrical storage, smart grids and e-mobility.

Jolien Despeghel
PhD student in Electrical Engineering at KU Leuven/Energyville. She is a researcher on the project Energy Storage as a Disruptive Technology in the Energy System of the Future.

How will you learn?

This is an online certification and can be taken at your usual study location. The certification consists of six courses and is self-paced.

Is it right for you?

The course in this certification is beneficial for professionals interested in understanding all elements related to the management and testing of batteries and in getting involved in the power conversion systems for batteries' design, efficiency, and operation.
Duration: 22 Hours

Prerequisites: In order to be able to follow and benefit from the Battery Management, Connection and Control certification learners would need to have a basic understanding of battery cells, system components and their working principles. Also, a basic understanding of electrical systems.

Certificates of Achievement

We offer two pathways for issuing of certificates, **InnoEnergy Skills Institute Certificate** and **EDC (European Digital Credentials),** each with its own unique set of benefits, allowing your organization to choose the one that best suits the objectives. **The Achievement recognition will be awarded at a >75% course assessment pass rate.**

What is it?
The InnoEnergy Skills Institute serves as the certificate issuer, verifying learners' progress and achievements with the course material.

What are the benefits?
InnoEnergy Skills Institute certificates are highly adaptable for recognizing various learning levels and achievements. We offer Participation, Completion, and Achievement certificates for learners who complete online courses through the Skills Institute platform.

What that means for you?
You will receive a digital credential that you can store in your personal digital credential wallet.

You can also add and share these credentials on your social media platforms. The authenticity of the credentials can be verified online by anyone seeking credential verification.

European Digital Credentials (europass)

What is it?

European Digital Credentials provide an online record of an individual's personal achievements and qualifications. Recognized by employers across the continent, InnoEnergy Skills Institute can issue European Digital Credentials, which learners can add to their European Digital Credentials wallet. For this type of credentials, we only offer Achievement certificates, awarded at a >75% course assessment pass rate.

What are the benefits?

It allows learners to signal their skills and qualifications using the European Learning Model — a semantic standard that helps the recognition of qualifications and digital credentials across Europe. It also combats fraud, and greatly reduces administrative costs.

What that means for you?

You can be confident in the authenticity of your credentials and showcase your skills in a way that is understood in the context of the European Learning Model. You'll also be able to access everything quickly and easily via your online European Digital Credentials wallet.

Versioning

#	Version	Summary of Changes	Date
1	v1.1	Updated the formatting as per InnoEnergy Colour and Font styles	09-Dec-24