



# InnoEnergy Skills Institute

## Energy Systems Integration: Introduction

Last revised: 2023 March

Making the shift to more sustainable models, technologies, and solutions and staying ahead of the innovation game, it is imperative to see the bigger picture and understand how energy systems interact – and how your energy expertise fits within the wider framework of the global energy transition.

This certification has been designed as an introduction to the integration and regulation of different energy systems. You will learn how energy vectors – fuels, electricity, and heating – interact and how to find added value at the interfaces between them. You'll also build insights into the ways in which energy systems connect to other infrastructures, such as data networks, water, and transportation systems. And you will learn about how consumer psychology and society have a role in building a more sustainable, reliable, and cost-effective energy system.

### Learning outcomes

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

- Explain energy vector coupling in real-life scenarios
- Describe how energy systems interact with water, transportation, and data networks
- Describe the interplay between the energy consumer and energy systems

### 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 eight self-paced online lessons and is structured as follows:

Lesson 1: What is Energy Systems Integration?

Understand what Energy Systems Integration is, why it matters and where exactly in the energy system plays a valuable role.



### Lesson 2: Coupling Across Energy Vectors

Explore the coupling of energy vectors through several technical examples to provide insight into how ESI can bring benefits for the cost-effectiveness, reliability, and environmental sustainability of the integrated energy system.

### Lesson 3: Coupling Across Geographical Scales

Explore how energy networks allow coupling across geographical scales while looking into examples of large-scale and small-scale energy network coupling.

### Lesson 4: Coupling of Regulation and Control Mechanisms

Look into the coupling of regulation and control mechanisms.

### Lesson 5: Coupling of Other Infrastructures

Understand why energy systems do not exist in isolation and are coupled with other infrastructures.

### Lesson 6: The Integrated Energy System: Bringing it all Together

Understand how combining coupling across energy vectors, scales, institutional mechanisms, and other infrastructures results in a very complex system with many interactions.

### Lesson 7: Case Study 1: GE and Energy Systems Integration

Get introduced to how energy systems integration is being implemented at GE. The case study explains the role of software and its role in successful integration of renewables into the electricity grid.

### Lesson 8: Case Study 2: Renewables Integration and Support Services

Delve deeper into the technical enablers for the integration of renewable energy resources into the electricity grid, including advanced forecasting models and flexible thermal fleets.

## Instructors

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

#### **Mark O'Malley**

Research fellow at the National Renewable Energy Laboratory (NREL), chief scientist of energy systems integration (ESI), and director of the International Institute for Energy Systems Integration (iiESI).

#### **Beth Larose**



General Manager of Energy Consulting, General Electric, leading GE's global team of power system experts to deliver a full portfolio of techno-economic consulting services on electric power systems, thermal and renewable power generation, and power economic studies for various stakeholders in the electric power industry.

## How will you learn?

This is an online certification and can be taken at your usual study location. The certification has eight self-paced lessons.

**Duration: 4 Hours**

## Is it right for you?

The certification has been designed for a broad diversity of professionals – executives, change leaders, researchers, and individuals from any sector who understand the importance of the global energy transition, and who want to know how energy systems integration impacts your life, your business, or your research.

**Prerequisites:** There are no prerequisites.

## 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.**

### InnoEnergy Skills Institute Certificates

#### 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.