



CERTIFICATE OF ADVANCED STUDIES (CAS) | DIPLOMA OF ADVANCED STUDIES (DAS)

# Sustainable Energy Systems Engineering: Industry Decarbonisation

## TARGET AUDIENCE

Industry and energy professionals seeking to acquire the skills and tools to build sustainable energy systems and accelerate the energy transition

A good technical background in engineering and/or mathematics is essential as advanced data analysis and modeling techniques are widely used in the programme.

## ORGANISATION

- Industrial Process and Energy Systems Engineering (IPESE), School of Engineering (STI), EPFL Valais Wallis, Switzerland
- Institute of Sustainable Energy, HES-SO Valais-Wallis, Switzerland
- Energy Center (CEN), EPFL, Switzerland

## INTRODUCTION

Reducing CO<sub>2</sub> emissions and optimising energy systems without compromising competitiveness is a major challenge for many industries. Given the long and heavy investment cycles involved, there is an urgent need for industrial companies to start transforming their operations by applying sustainable engineering practices today.

Energy efficiency, renewable energy integration, carbon capture and storage, hydrogen use, advanced conversion technologies, water-waste-energy nexus models, urban energy system optimisation are just a few of the options available. However, a holistic approach is essential to achieve symbiosis between production sites and the circular economy. How can your company develop a systemic approach to energy efficiency and decarbonisation of industrial processes?

## OBJECTIVES

- Be able to conduct energy audits that analyze and measure the energetics of a production process, considering thermodynamical, economical and environmental impacts
- Identify options for Decarbonisation and process efficiency improvement as, technological changes, CO<sub>2</sub> capture & sequestration, heat recovery & valorisation, optimisation of energy supply, renewable energy integration, waste-water-energy management
- Acquire tools and methods for implementing decarbonisation solutions in industrial processes
- Adopt a holistic approach integrating the company's industrial process with the main energy infrastructure and the surrounding industrial and urban system



**Certificate of Advanced Studies (CAS)** in Sustainable Energy Systems Engineering: Industry Decarbonisation, delivered by EPFL, 10 ECTS credits

- Programme spread over 6 months
- Blended learning combining face-to-face and asynchronous online courses

From February to July 2025

- Online
- Onsite: Energypolis, Sion, Switzerland

CHF 10 000.–

Visit our website to learn more on the CAS



### New programme leading to EPFL certification

The Certificate of Advanced Studies (CAS) in *Sustainable Energy Systems Engineering: Industry Decarbonisation* is a new continuing education programme.

Its cursus is designed to equip participants with the skills, tools and methods needed to conceive and implement decarbonisation solutions for industrial processes.

To meet the goal of limiting temperature rise to max. 2°C, the Intergovernmental Panel on Climate Change (IPCC) advises cutting human-caused CO<sub>2</sub> emissions by about 45% compared to 2010 levels by 2030. Ultimately, emissions need to reach “net zero” by 2050. The industry sector has an important role to play in creating a more efficient and low-carbon economy.

### An opportunity for your career

Completing the CAS is a real opportunity to advance your career, as there is a significant need for highly skilled professionals who can holistically implement sustainable energy systems and decarbonise industrial processes.

And for those aiming to pursue advanced specialisation, the CAS is also your first step into the following two advanced programmes:

- **Diploma of Advanced Studies (DAS)** in *Sustainable Energy Systems Engineering: Industry Decarbonisation*
- **Master of Advanced Studies (MAS)** in *Sustainable Energy Systems Engineering*

Upskill to lead the industrial energy transition now.

### CAS Programme

Day 1

#### WELCOME DAY

*Fri. February 14, 2025, Energypolis*

- Teaching staff and peers introduction
- Programme and teaching approach presentation
- Online platform starter kit

Asynchronous

#### ONLINE LEARNING

*Self-paced from February to June 2025, supplemented by coaching sessions with academic advisors*

- **Objectives:** Upgrade knowledge and acquire a solid theoretical foundation, necessary to develop a systemic thinking and approach to energy efficiency and decarbonisation of industrial processes
- **Topics:** Energy audits / Process integration / Industry decarbonisation / Fuel cells / Power to X systems / Compressors and heat pumps / Turbines and thermal cycles in industry / Industrial heat / Biomass conversion / Bio-refineries / CO<sub>2</sub> capture adsorption systems / Membrane based gas separation systems

### On-site activities

Week 1

#### ENERGY AUDITS

*Mon. March 17 to Fri. March 21, 2025, Energypolis*

- **Flipped class:** application of online learning (discussions, case studies, hands-on exercises, etc.)
- **Practical group project workshop:** Energy audit methodology / Process definition & efficiency improvement / Sustainability metrics (KPIs) / Process & energy system integration

Week 2

#### HEAT RECOVERY & ENERGY CONVERSION

*Mon. April 28 to Fri. May 2, 2025, Energypolis*

- **Flipped class:** application of online learning
- **Practical group project workshop:** Energy requirements of a process / Heat recovery (pinch analysis) & optimisation / Heat exchanger network / Industrial heat, combined heat & power technologies / Water minimisation & recovery

Week 3

#### INDUSTRIAL SYMBIOSIS & CO<sub>2</sub> CAPTURE

*Mon. June 2 to Fri. June 6, 2025, Energypolis*

- **Flipped class:** application of online learning
- **Practical group project workshop:** Renewable energy integration / Fuel cells & electrolysis / Biomass conversion / Waste minimisation & valorisation / CO<sub>2</sub> capture, use, sequestration & mineralisation / Industrial symbiosis / Energy infrastructure interaction & integration

### Practical group project & Evaluation

- **Objectives:** Collaborative work (group of 3) addressing a real-world energy challenge to gain practical experience in sustainable energy system modelling, research and proposal development
- **Project overview:** Research & documentation / Expert opinions / On-Site investigation / Solution proposal / Calculation and optimization / Holistic view
- **Evaluation:** Production of a group report and individual oral assessment

### CAS CURRICULUM

The *Certificate of Advanced Studies (CAS)* in **Sustainable Energy Systems Engineering: Industry Decarbonisation** consists of:

- Asynchronous online teaching (~80h)
- Flipped classroom instruction (27h)
- Practical group project workshops (~60h)
- Practical group project (~120h) with a group report production
- Individual oral assessment

This *Certificate of Advanced Studies* is one of the CASs recognized in the **Master of Advanced Studies (MAS)** in **Sustainable Energy Systems Engineering**.



**Diploma of Advanced Studies (DAS)** in Sustainable Energy Systems Engineering: Industry Decarbonisation, delivered by EPFL, 30 ECTS credits

CAS completion (6 months) + industrial project (600h)

From February 2025

CHF 20 000.– (CAS fees and industrial project supervision incl.)

Visit our website to learn more on the DAS



### A win-win project to rethink your industrial processes

As an organisation (from the public or private sector), are you ready to safeguard your competitiveness in the upcoming low-carbon economy?

The Diploma of Advanced Studies (DAS) in *Sustainable Energy Systems Engineering: Industrial Decarbonisation* is a unique opportunity to get ready for Net-Zero.

This innovative, hands-on program enables participants to actively engage in the transformation of an organisation's existing industrial processes, through the implementation of decarbonisation solutions and process efficiency improvements. Upon completion of the CAS programme, the participant carries out an industrial project, ideally within their employer's organisation, while benefiting from the expert advice of EPFL and HES-SO professors – a true win-win project for companies investing in upskilling their workforce.

Now is the time to get your business ready for Net-Zero.

### DAS Programme

Step 1

#### CAS PROGRAMME & PROJECT DEFINITION

*February to July 2025*

- **Completion of the CAS** in *Sustainable Energy Systems Engineering: Industrial Decarbonisation* (see above)
- **Industrial project topic definition**, e.g.: Decarbonizing options in the fine chemical industry / Decarbonisation roadmap for a dairy production site / A supermarket as a netzero renewable energy hub / Waste management plant in the perspective of the energy transition, etc.
- **Setting up the framework** for project implementation within the organisation

Step 2

#### INDUSTRIAL PROJECT

*The industrial project represents a minimum of 600 hours of personal work carried out within a company (estimated completion time of 6 to 8 months at 50% activity rate on the project).*

- **Completion of a personal industrial project**, ideally within the organisation of one's own employer<sup>1</sup>, that demonstrates the participant's ability to structure and manage an industrial energy transition project.
- **Supervision and advice** from academic experts in the field
- **Evaluation:** Report and oral assessment



### Industrial Projects Call for Proposals

If your organisation (public or private) is looking to implement an industrial energy transition project but lacks the necessary resources, you are in the right place. Sponsor and host a participant to lead an industrial project within your company!

Contact us for more information: [sustainable.energy@epfl.ch](mailto:sustainable.energy@epfl.ch)

<sup>1</sup> Candidates interested in completing the DAS but uncertain about where to undertake their industrial project at the time of enrolment, should register for the CAS programme. They have the flexibility to secure an internship position at a later stage. Whenever possible, the programme organisers will facilitate connections with companies seeking interns.

### DAS CURRICULUM

The *Diploma of Advanced Studies (DAS)* in **Sustainable Energy Systems Engineering: Industry Decarbonisation** consists of:

- Completion of the CAS
- Industrial project (min. of 600h)
  - Report production
  - Individual oral assessment

# Master of Advanced Studies (MAS)

## Become a leader of the energy transition

The key to a successful energy transition is to view the entire value chain as an integrated system. This requires highly skilled professionals with advanced scientific knowledge, strategic thinking skills, and the ability to take a comprehensive approach to sustainable energy systems.

## Ready to build an efficient, innovative energy future?

EPFL and HES-SO are jointly proposing a new Master of Advanced Studies (MAS) in Sustainable Energy Systems Engineering. The programme aims to prepare individuals for driving innovation, fostering renewable energy adoption, and implementing sustainable systems and practices across various industries through an interdisciplinary curriculum that integrates engineering, environmental science, and decision-making science.

EPFL and HES-SO are jointly proposing a new Master of Advanced Studies (MAS) in Sustainable Energy Systems Engineering. The programme aims to prepare individuals

## A MAS certification designed to acquire a holistic vision

Participants begin by completing four Certificate of Advanced Studies (CAS) programmes (in any order), each lasting six months and covering vital aspects of energy systems.

- CAS in Sustainable Energy Systems Engineering: **Industry Decarbonisation**
- CAS in Sustainable Energy Systems Engineering: **System Modelling**
- CAS in Sustainable Energy Systems Engineering: **Urban Systems**
- CAS in Sustainable Energy Systems Engineering: **Electric Power Systems**

Participants then complete an individual MAS research project. The goal is to apply sustainable energy systems engineering to a real-world industrial case using a holistic approach.



Master of Advanced Studies (MAS) in Sustainable Energy Systems Engineering, delivered by EPFL, 60 ECTS credits



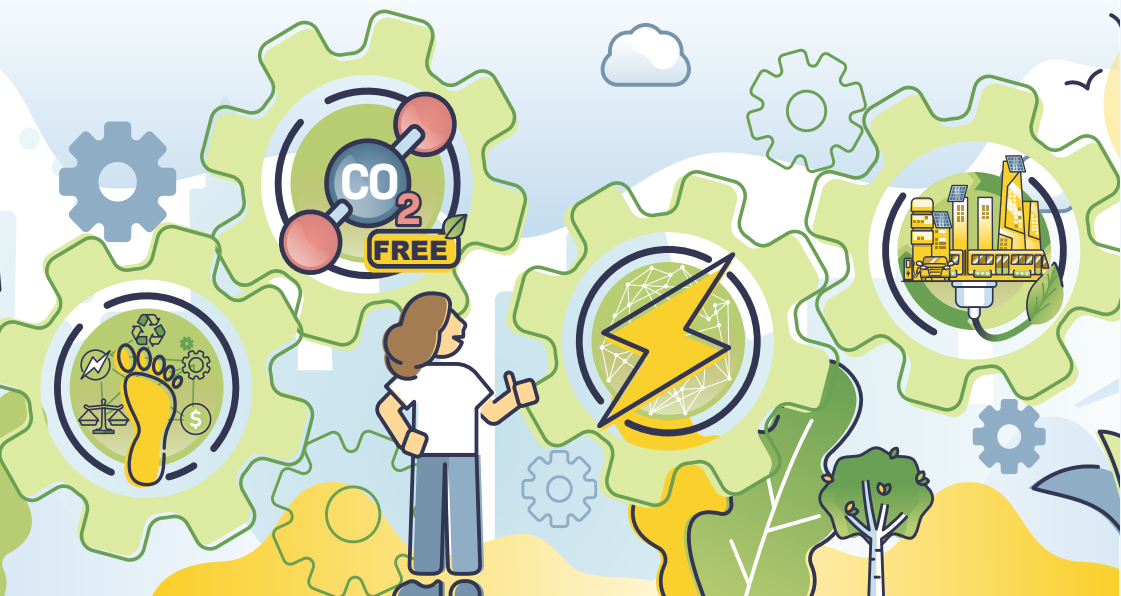
• Completion of 4 CAS + MAS research project



CHF 40 000.–



Visit our website to learn more on the MAS



# How to enrol



Admission on file to submit to  
Formation Continue UNIL-EPFL

Registration deadline: October 15, 2024

Number of participants is limited



Online registration  
for the CAS



Online registration  
for the DAS



Those interested in taking the MAS must register for the CAS (registration for the MAS is only possible once the 4 CAS have been completed).

## ADMISSION REQUIREMENTS

For MAS, DAS or CAS applicants:

- EPF or HES Master's degree, or another degree (in a field related to the programme) deemed equivalent by the Steering Committee<sup>1</sup>

<sup>1</sup> *Exceptionally, candidates who do not meet the above requirements may be considered for admission, provided they can demonstrate a sufficient level of qualification with another engineering degree in a relevant domain and at least 5 years' professional experience in the field.*

## PROGRAMME ACADEMIC DIRECTORS

- **Prof. François Maréchal**, *Head of Industrial Process and Energy Systems Engineering group, EPFL*
- **Prof. Manuele Margni**, *Institute of Sustainable Energy, HES-SO Valais-Wallis*

## STEERING COMMITTEE

- **Prof. François Maréchal**, *Head of Industrial Process and Energy Systems Engineering group, EPFL*
- **Prof. Manuele Margni**, *Institute of Sustainable Energy, HES-SO Valais-Wallis*
- **Prof. Gaëtan Cherix**, *Director of the School of Engineering (HEI), HES-SO Valais-Wallis*
- **Prof. Sophia Haussener**, *Head of the Laboratory of Renewable Energy Science and Engineering, EPFL*
- **Dr. Yasmine Calisesi**, *Executive Director of the EPFL Energy Center*
- **Rigas Hadzilacos**, *Deputy Executive Director of Formation Continue UNIL-EPFL*

## CAS ACADEMIC LEADERSHIP

- **CAS Sustainable Energy Systems Engineering: Industry Decarbonisation**  
Prof. François Maréchal (EPFL) & Prof. Jessen Page (HES-SO)
- **CAS Sustainable Energy Systems Engineering: System Modelling**  
Prof. Michaël Aklin (EPFL) & Prof. Manuele Margni (HES-SO)
- **CAS Sustainable Energy Systems Engineering: Urban Systems**  
Prof. Claudia Binder (EPFL) & Prof. Jakob Rager (HES-SO)
- **CAS Sustainable Energy Systems Engineering: Electric Power Systems**  
Prof. Mario Paolone (EPFL) & Prof. Fabrizio Sossan (HES-SO)

## CONTACT

For academic questions :

**Dr. Jean-Marie Fürbringer**,  
Programme Executive Director of  
MAS, DAS and CAS Sustainable Energy  
Systems Engineering

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