



# MOOC Energy Transition: Innovation Towards a Low-Carbon Future

---

The objective of this free online course, over five weeks (including the introduction week) and within the context of the energy transition and sustainable development, is to understand the technical concepts and innovation challenges of a decarbonized energy mix to mitigate climate change impacts associated with global warming.

## ***Learning Goals:***

Upon completion of the course, participants will be able to:

- State on the world energy context and its expected evolution considering the energy transition challenges to meet sustainability in development;
- Demonstrate the advantages of a sustainable energy mix based on the development of renewable sources of energy and natural gas, in order to achieve carbon neutrality by the end of the century;
- Analyze associated limitations and justify innovative mitigation solutions based on the development of underground storage capacities for emitted CO<sub>2</sub> and energy from renewables. Describe how these options can be deployed in time;
- Demonstrate the importance of energy efficiency in processes, the advantage of new generation of biofuels regarding induced CO<sub>2</sub> abatements and describe selected technical solutions.

***Note that for this third edition, a few videos relative to H<sub>2</sub> have been introduced in weeks 2 to 4.***

## *Week 0: MOOC Introduction: Energy Transition Challenges*

- World energy demand challenge
- Stresses on the energy demand: resources, environment, global warming
- A low carbon future: the 2°C scenario energy mix

## *Week 1: Energy mix part 1: Renewables for electricity generation in a carbon constrained world*

- Renewables and power generation in the global energy mix
- Renewable electricity: technical and economic trends
- Focus on offshore wind innovation challenges
- Renewables: Challenges for sustainability and solutions

## *Week 2: Energy mix part 2: Underground resources: geothermal power and natural gas*

- Geothermal power
- Gas rise: a mature chain from production to distribution and storage
- Greenhouse gas emissions reduction from production to end-use and gas decarbonization
- Native H<sub>2</sub>



*Week 3: Underground CO<sub>2</sub> storage and energy storage*

- Carbon capture and storage
- Underground energy storage scenarios: H<sub>2</sub> (power to gas), heating-cooling, advanced compressed air
- Focus on Advanced Compressed Air Energy Storage
- H<sub>2</sub> production: towards decarbonation

*Week 4: Energy efficiency in processes, biofuels, bio sourced chemicals and benefit regarding CO<sub>2</sub> emissions reduction*

- Heat network integration/optimization, stop/reduce steam trap leakages and recover waste heat from flue gas
- Biomass to biofuels
- Bio based chemicals
- E-fuels

***Who should attend?***

This MOOC is intended either for students and professionals interested in the energy transition challenges and innovative solutions to reduce CO<sub>2</sub> emissions. But more specifically it is intended for those willing to gain knowledge about developing a decarbonized energy mix based on both renewables and natural gas, underground CO<sub>2</sub> and energy storage, energy efficiency and CO<sub>2</sub> abatements in processes, biofuels. In general, for those who are convinced that climate change is really a challenge that can also be sustained through concrete solutions and societal awareness.

***When?***

The MOOC will start on **March 8<sup>th</sup> 2021**. The effective course duration is 5 weeks including the introduction week. Registration opens on February 8<sup>th</sup> 2021.

***Interested?***

The MOOC is free and can be achieved in English, French and Spanish.

All pedagogical materials are online and you can have a certification for free.

The effort estimated to complete the course is 2-3 hours per week.

You can sign up here: <https://mooc.innovation.ifp-school.com/Minisite/home/22186>

Contact information: [mooc@ifpen.fr](mailto:mooc@ifpen.fr)

***Supported by:***



*In association with:*

