



POLITÉCNICA

SEMINARIOS (SEMINARS)

MÁSTER UNIVERSITARIO EN SISTEMAS DE INGENIERÍA CIVIL

-CURSO 2023/2024- PROPUESTA DE SEMINARIO (SEMINAR PROPOSAL)



UNIVERSIDAD POLITÉCNICA DE MADRID
ETSI CAMINOS, CANALES Y PUERTOS

Título (Title)

Green energy for railways: decarbonization and life-cycle assessment

Ponente (Lecturer) and UPM-Tutor (Tutor)

Ing. Jeanne-Marie Dalbavie (IKOS Consulting) and PhD. Benoît Volant (IKOS Consulting - CentraleSupélec)

Assist. Prof. Carlos Romero (Escuela de Ingenieros de Caminos, UPM)

Resumen (Abstract)

The seminar is designed to introduce the basic concepts of railway operations and tractions, in order to understand the opportunities and difficulties of railway decarbonation ("Greening of railway") and, above all, being able to assess them. Indeed, even with one of the best environmental performance for a transportation mode, many diesel locomotives are still in use preventing the European objective to reach carbon neutrality by 2050. Railway being a complex system with multiple interfaces, and uncertainty being high due to low and unequal maturities of upcoming decarbonation solutions, evaluating the best way to replace diesel locomotives prove difficult but nevertheless mandatory.

The global objectives for the seminar are:

- 1. To be able to assess the main technical consequences of various decarbonation solutions for a given railway line*
- 2. To be able to analyze the impacts (environmental, economical) of such in order to provide decision-making recommendations*

To achieve them, the students will acquire:

- 1. Technical knowledge of the traction architectures and functions of low-carbon rolling stock, as well as the associated infrastructures and their interfaces*
- 2. Notions of railway operations and costs*
- 3. Capacity to do a preliminary technico-economic feasibility of railway traction regarding on-board technologies, infrastructures and operations*
- 4. An understanding of LCA impact categories*



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To do so, after an introduction of all useful theoretical background, the students will first practice in groups on some railway line examples using a first tool developed by IKOS, then push further by developing their own decision-making tool, based on data provided, for the report.

Programa (Agenda)

The duration of the seminar will be 6 hours in total : 3h the morning and 3h the afternoon. The agenda is the following :

1. Session I (3h)
 - a. Introduction to railway electrical traction (1h30)
 - b. Introduction to railway decarbonation (45min)
 - c. Introduction to Life Cycle Assessment (45min)
2. Session II (3h) – case study “analyzing impacts of decarbonation on a given railway line with the purpose to find the best way”

Evaluación (Evaluation)

The student's evaluation will be based on two blocks:

- (i) Attendance to the seminar (40%),
- (ii) Report from students, which will be equivalent to 34 working hours (60%).

Reports must be submitted to the tutor Carlos Romero by email (carlos.romeromoraes@upm.es) until December 15th. Both the slides and the explanations will be in English.