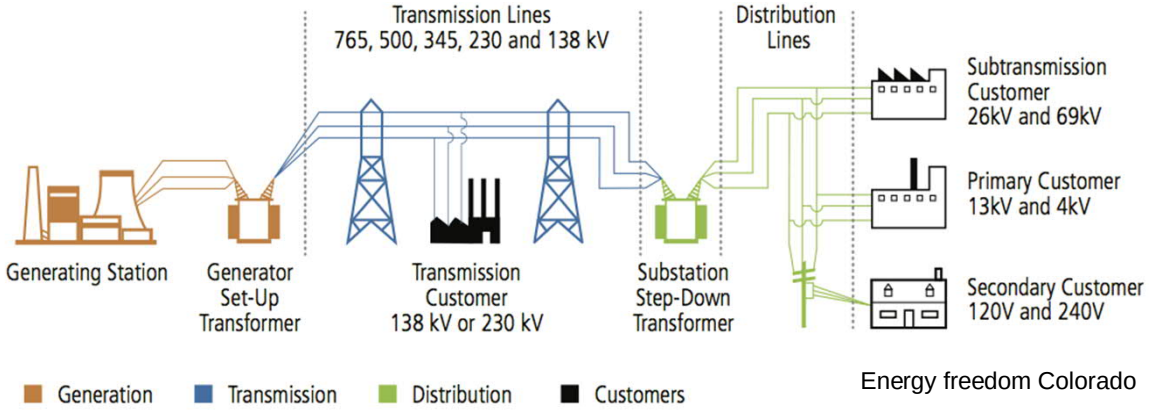
Aalto University

AAE-E3070
Electrical Energy Storage Systems

Course Intro video
2021

Electrical Energy Storage Systems (period III)

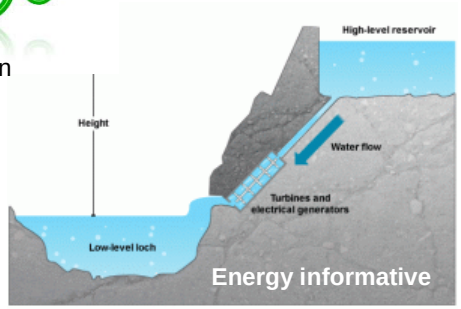


Energy freedom Colorado

Electricity grid
ELEC

New energy updates

European commission



Storages
ENG

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Indentent learning outcomes (ILO)

1. Describe operating principles of key energy storage technologies, including their benefits and fundamental limitations.

2. Select relevant technologies for energy storage, including storage and conversion components.

3. Design an energy storage interface for a power system or a power train, as a member working cooperatively in a small multidisciplinary team.

4. Share the expertise of ones field in a heterogeneous team

Teaching Staff

Annukka Santasalo-Aarnio
ENG

Floran Martin
ELEC

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ELEC

Hassan Rouhi
ENG

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Teaching methods

Active self-study

(Read / Reflect / Report)

Flip talk/industrial talk/video

Team work to apply concepts to your own case study

(formulated as a poster – 1 per week)

Online Poster workshop

Reflection from teachers + Discussion

Online Workshop timetable (example)

- 9.15 – 9.55 *Flash talk/Industrial talk*

  Break 5 min.

- 10.00 - 11.00 Poster presentations (in sub-teams)

  + Teacher Reflection

  Break 5 min.

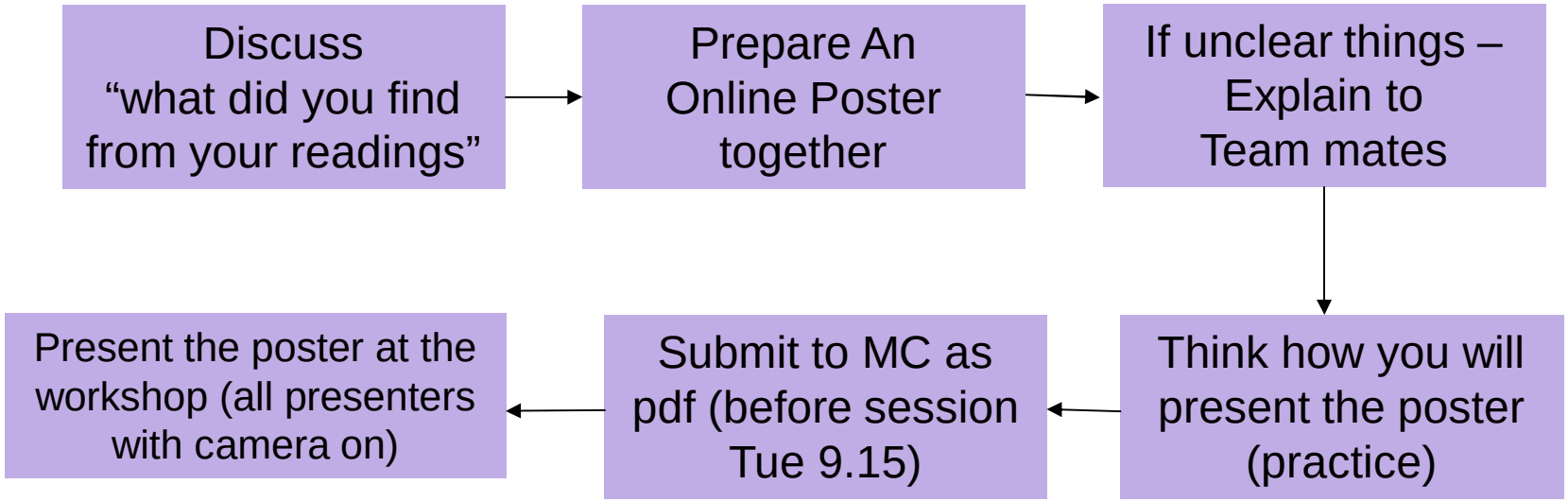
- 11.05 - 11.30 Introduction to new poster topic/Flash talk
- 11.30 - 11.45 Instructions to personal assingments

Teaching Schedule (Preliminary)

Week	Theme	Personal task	Team Project Flow
1 (12.1)	Background (ELEC/Storage)	Assigment 1 (basic concepts)	Team building + topic
2	Energy storage interfaces	Flip I	*Poster presentation 1 (10-11):* Introduce the system
3	Power conversion devices in EESS	Assigment 2 (storages)	*Poster presentation 2 (10-11):* Power conversion interphases
4	Finalizing Storage system	Flip II	*Poster presentation 3 (10-11):* Comparing 2 storage solutions
5	UPS (combining different purpose for storage)	Flip III	*Poster presentation 4 (Tue 10-11):* Economical issues
6	ESS Systems	Assignement 3 (industrial Que)	*Poster presentation 5 (Tue 10-11):* Sustainable final solution
8	Presenting the Final work		Complete solution

How to prepare the poster

- Before poster preparation – remember to do your own personal study before starting the poster
- If you need to find papers (for flip), coordinate in team
- When you meet (online/in person) for poster preparation



Poster max. 1- 4 p.
Presenting poster (2 p.) or prepare a video (2 p.)

Assessment

1. Personal tasks

Flip reports (3 x 4 p.)	12
Assignment 1	10
Assignment 2	10
Assignment 3 + Peer evaluation	10
Course feedback (Wepropol)	3
	45 p.

2. Group tasks

Final report	20
Posters (5 x 4 p.)	20
Presentation: poster (5 x 2 p.) and Final (5 p.)	15
	55 p.

100 p. total, 60 p. needed to pass the course
Grading table provided at the end of the course

Team tasks (55 % of grade)

https://joshsherin.wordpress.com/tag/group-work/

- There are no Exam on the course
- Online teams to peer teach (different bac
  - Online Poster preparation, where you apply the theory that you had study/learn for your case project
  - Oral presentation You will present your case every week to your peers and teachers with your poster. Final presentation of the group work you will present this to whole class
  - Written report: The team will prepare a written report on the case
- You will also prepare individual tasks as assignments, flip reports (reading reports) and feedback (45 % of grade)

Timetable at first contact session (12.1)

- 9.15 – 10.00 Introduction to Electrical Engineering

  Break 5 min.

- 10.05 - 10.55 Introduction to Storages
  - Practice to use Online poster tool

  Break 5 min.

- 11.00 - 11.15 Course Practicalities and Assignment 1
- 11.15 - 11.45 Team building and topics

Courses of Energy Conversion or Storage (Aalto)

- CHEM-E4255 **Electrochemical Energy Conversion**

  Introduces in more detail of electrochemical energy storage systems

- ELEC-E8412 **Power Electronics**

  Introduces electric power conversion devices that are commonly needed in energy storage systems.

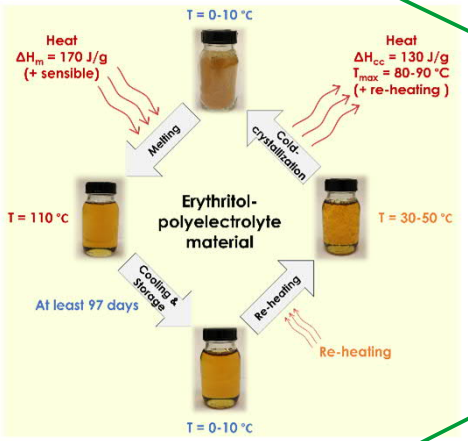
- ELEC-E8405 - **Electric Drives**

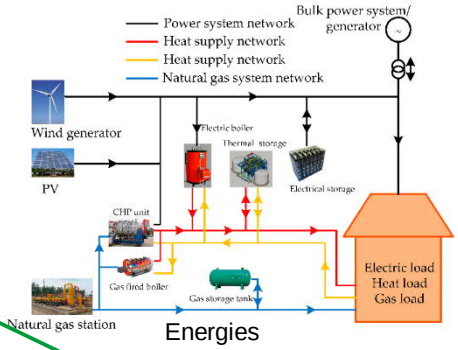
  Covers fundamentals of the electric-to-electric and electric-to-mechanical power conversions

- AAE-E3100 **Energy Carriers**

  How energy carriers are used in traffic (power to fuels/hydrogen) and EVs

AAE-E3080 Thermal Energy Storage Systems (period IV-V)



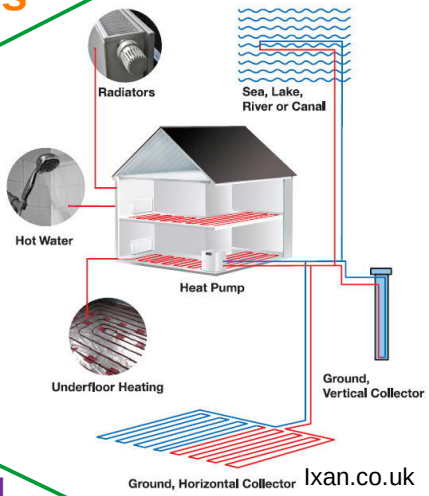


Energies

Thermal Energy Storage Systems

New Heat Storage materials

Heat pumps



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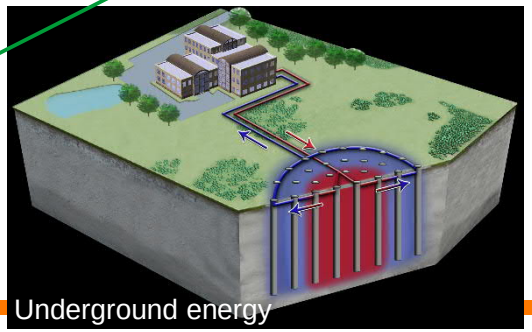

Underground energy

Using soil/buildings as Energy Storage

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Questions?

At first session (12.1) we will have also question session where the teachers are present.

If you have question before, contact course assistant (hassan.rouhi@aalto.fi)