

COURSE FEES

Fill this form and mail, fax, or e-mail a copy before **January 22nd, 2012** to:

Mrs. Andrée Moinat
Swiss Federal Institute of Technology (EPFL)
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The course fees include lectures, documentation, coffee breaks and lunches

Members of the EES-UETP: 367.5 EUR
University non members of the EES-UETP: 900 EUR
Industry non members of the EES-UETP: 1500 EUR

The Course Secretariat will send an invoice to each registered participant, after the reception of the filled Registration Form.

ACCOMMODATION

Special Prices have been arranged. Please contact directly the hotel:

Ibis Lausanne Centre

Rue du Maupas 20, CH-1004 Lausanne, Switzerland
Phone : +41- 21 340 07 07, Fax : +41- 21 340 07 17
h6772@accor.com; www.ibishotel.com

or,

Starling Hotel Lausanne

Route Cantonale 31, 1025 St-Sulpice, Switzerland
Phone : +41 21 694 85 85, Fax: + 41 21 694 85 86
contac@shlausanne.ch, www.shlausanne.ch

The price for a single-room with breakfast ranges from 100 to 200 CHF. Taxes are included.

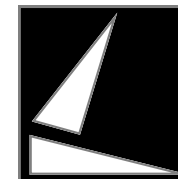
Room reservations must be made by **January 16th, 2012**. Please mention “**EES-UETP**”. Reservation requests after that date will be based on space and rate availability.

INFORMATION, REGISTRATION AND COURSE LOCATION

Swiss Federal Institute of Technology (EPFL)
CH-1015 Lausanne, Switzerland
www.epfl.ch

Secretariat : andree.moinat@epfl.ch
Phone: +41-21-693 26 61, Fax: +41-21-693 46 62

Course Coordinator : rachid.cherkaoui@epfl.ch
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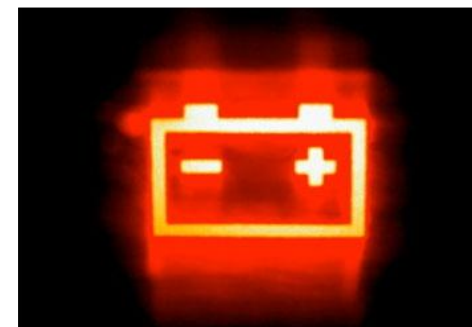


Electric Energy Systems
University Enterprise Training Partnership
<http://www.ees-uetsp.com/>

2012 Course Program

**Energy Storage in Power
Systems: Technologies,
Applications and Future
needs**

February 7th (2:00 pm) to 10th (1:00 pm), 2012



Organized by
Swiss Federal Institute of Technology
EPF-Lausanne and ETH-Zürich

Switzerland

Sponsored by
ENEL – EDF – IBERDROLA – RTE

Registration Form

Name: _____
Company: _____
Position: _____
Address: _____
Phone: _____ Fax: _____
E-mail: _____
Company main activity: _____

OBJECTIVES

The increase of the penetration of renewable energy resources (RERs) into electrical networks is certainly related to the availability of energy storage systems (ESSs). Indeed, the use of ESSs could, in principle, provide several ancillary services to electrical grids such as: balance of RERs energy production, balance local loads, reserves provision, islanded operation of distribution systems, integration into low voltage microgrids, etc.

The above-mentioned services are characterized by different energy and power requirements that involve the use of appropriate storage technologies. In this respect, the course aims at providing the state-of-the-art of ESSs technologies, their modeling as well as their applications into electrical grids both in large and small scales.

INTENDED AUDIENCE

This course is intended for professionals from transmission/distribution system operators, regulators, generation companies, customers (industrial facilities), consultants and post-graduate students.

COURSE DURATION

Three days, from Tuesday the 7th (2 pm) to Friday the 10th (1:00 pm) of February, 2012.

CONTENTS

1. **The need of balancing power with storage** (G. Andersson)
2. **Technologies:**
 - a. Modern Compound and Reversible Units for Pumped Storage Power Plants (F. Avellan)
 - b. Battery energy storage systems (C. A. Nucci)
 - c. Hydrogen: production, storage, applications and safety (A. Zuettel)

- d. Energy storage systems properties - case of Compressed Air Energy, Vanadium Redox flow Battery, Supercaps, etc. (A. Rufer)
- e. Thermo electric energy storage systems: (F. Marechal)

3. Applications

- a. *Large systems applications*
 - i. Large pumped storage hydro power plants (T. Aschwanden)
 - ii. Electricity storage: issues and opportunities from a TSO perspective (M. Geidl)
 - iii. Applications of BESS in electric power systems with renewable generation (A. Oudalov)
 - iv. Aggregated Demand Response using Thermal Loads, Integration in Virtual Power Plants, and Evaluation of Flexibility (S. Koch / A. Ulbig)
 - v. Requirements and possibilities for energy storage applications in railway power supply (M. Aeberhard / N. Cherix)
- b. *Distribution systems applications*
 - i. Distribution networks support (voltage control, islanding) (A. Borghetti)
 - ii. Controlling and managing V2G and V2H (J. Peças Lopes)
 - iii. Seal-healing operation of microgrids with BESS (M. Paolone)

INSTRUCTORS

Göran Andersson, ETH-Zurich, Switzerland.
François Avellan, EPF-Lausanne, Switzerland.
Carlo Alberto Nucci, University of Bologna, Italy.
Andreas Züttel, EMPA Materials Science and Technology, Switzerland.
Alfred Rufer, EPF-Lausanne, Switzerland.
François Marechal, EPF-Lausanne, Switzerland.
Thomas Aschwanden, Kraftwerke Oberhasli AG, Switzerland.
Martin Geidl, Swissgrid, Switzerland.
Alexandre Oudalov, ABB Corporate Research, Switzerland.
Stephan Koch, ETH-Zurich, Switzerland.
Andreas Ulbig, ETH-Zurich, Switzerland.
Martin Aeberhard, SBB-CFF, Switzerland.
Nicolas Cherix, EPF-Lausanne, Switzerland
Alberto Borghetti, University of Bologna, Italy.
Joao Peças Lopes, INESC, Portugal.
Mario Paolone, EPF-Lausanne, Switzerland

COURSE COORDINATORS

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Swiss federal Institute of Technology (EPF-Lausanne)
(course location)

**The number of attendees
is limited.**