



GSM

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EUROPEAN GRID SERVICE MARKETS symposium **2019**

Lucerne Switzerland

3 - 4 July

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Supported by Swiss State Secretariat for Education, Research and Innovation under contract number 17.00009,
and by the Fuel Cells and Hydrogen 2 Joint Undertaking under agreement No 735485.

Welcome

to the 3rd edition of the international **Grid Service Markets Symposium**, supported by

- the Swiss State Secretariat for Education, Research and Innovation under contract No 17.00009,
- the Fuel Cells and Hydrogen 2 Joint Undertaking under agreement No 735485,
- the Lucerne University of Applied Sciences and Arts,
- the international advisory board consisting of
 - Davor Bošnjak, HEP
 - Bruno Cova, CESI S.p.a.
 - Prof. K. Andreas Friedrich, Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)
 - Prof. Nikos Hatzigiorgiou, National Technical University of Athens (NTUA)
 - Prof. Christoph Imboden, Lucerne University (Chair)
 - Thomas Kudela, Ørsted A/S
 - Prof. Carlo Alberto Nucci, Uni Bologna
 - Dr. Bastian Schwark, Swissgrid AG
 - Andreas Svendstrup-Bjerre, Vestas Wind Systems A/S
 - Sebastian Ziegler, 50 Hertz
- and the organizer European Fuel Cell Forum EFCF, Obgardihalde 2, CH-6043 Luzern-Adligenswil (www.efcf.com).

Administrative information

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Program 3 July

12:45	Opening and welcome	
13:00	VPP-Panel: Business- potential and technology-challenges (joint with PACE project)	Andreas Svendstrup-Bjerre
15:20	Coffee break & poster visit	Foyer
15:50	Flexible units I & Developments in grid service markets I	Andreas Friedrich
18:00	End of sessions day one	
19:30	GSM network dinner (details will be announced at the end of the day)	Panorama Hall, Chateau Gütsch, Lucerne

Program 4 July

08:30	On-site registration	
08:45	Opening and welcome	
08:50	Developments in grid service markets II	Thomas Kudela
10:30	Coffee break & poster visit	Foyer
11:00	Flexible units II & Grid services operation	Nikos Hatziargyriou
12:40	Lunch break	Foyer
13:30	Poster session	Foyer
14:00	International collaboration	Bruno Cova
15:45	Summary and poster award	Christoph Imboden
16:15	End of official part the GSM symposium	
16:30	Grid Apéro (free attendance)	KKL
19:20 – 23:30	Dinner on the lake (if not yet booked: ask for tickets @ 120CHF at the registration desk)	Boarding on the lake side of the KKL

Posters in the foyer

GRASSHOPPER

25 MW PEM FC,
stationary, 100 kW
demonstrator

REMOTE

H2 based storage in
remote locations,
economic analysis

Operating results of PEMEL, AEL & SOEC

Reaction time, stack
stability, durability of
BoP, maintenance
effort

H2 off-grid H2 storage

H2 power generation
(PEMFC) for zero-
emission power
supply on islands

PowerAlliance

MV grid capacity
extension, market
based approach to
dynamic load
management

Economic analysis of ESS-based PP

PP providing
ancillary services,
hierarchical
clustering of offers
accepted

TSO preparation for CCRs

A pathway towards
building Capacity
Calculation Regions
according to the
CACM regulation

Session: VPP-Panel

VPP-PANEL: BUSINESS-POTENTIAL & TECHNOLOGY-CHALLENGES (joint with PACE project) Session-chair: Andreas Svendstrup-Bjerre		
Ameland: Frontrunner in the Energy Transition e.g. VPP Project with 45 Fuel Cells as part of an island wide Smart Grid, large H2 project	Jacob Dijkstra	Municipality of Ameland, The Netherlands
EnergieKoplopers (Energy Frontrunners): Lessons learned from a flexibility market for households with fuel cells	Stefan Nellen	Qirion Energy Consulting (Alliander), The Netherlands
NOVICE - Development and Demonstration of an Innovative Business Model for Energy Service Companies	Stephan Marty	KiWi Power Ltd London, UK
Demand side management and virtual power plants or Experience with virtual power plant operations in Switzerland and Germany	Aby Chacko	Tiko, Switzerland
Assessing the impact of virtual qualified units on the Italian ancillary services market	Marco Stabile	CESI S.p.A., Italy
VPP Panel Discussion: Business-Potentials & Technology-Challenges	Speakers & Audience Moderator: Andreas Svendstrup-Bjerre	Vestas Wind Systems A/S, Virtual Power Plant Architect, Denmark

Short coffee break

Next session starts **15:50**. Please be back 2 minutes before.

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Session: Flexible units I & Developments in grid service markets I

FLEXIBLE UNITS - DEVELOPMENTS IN GRID SERVICE MARKETS I		Session-chair: Andreas Friedrich
Modelling and optimization of a flexible PEMFC power plant for grid balancing purposes	Elena Crespi (1), Giulio Guandalini (1), Jorg Coolegem (2), Marianela M. Betancourt (3), Sönke Gößling (4), Peter Beckhaus (4), Stefano Campanari (1)	(1) Politecnico di Milano, Italy, (2) Nedstack Fuel Cell Technology B.V., The Netherlands, (3) Abengoa Innovación, Spain, (4) ZBT GmbH, Germany
Using electric water heaters to provide multiple energy services	Hanmin Cai, Shi You	Technical University of Denmark, Denmark
Integrating decentral renewable assets with a network of smart home storage devices	Matthias Dilthey	sonnen, Germany
Energy system decarbonisation: Informing reform of energy market and regulatory framework	Goran Strbac	Imperial College London, UK
Summary of the day, Details of the evening program	Christoph Imboden	Lucerne Uni of Applied Sciences & Arts, Switzerland

Summary of the day & evening program

Christoph Imboden, Symposium Chair

GSM network dinner

Place: Panorama Hall, Chateau Gütsch, Lucerne (www.chateau-guetsch.ch)

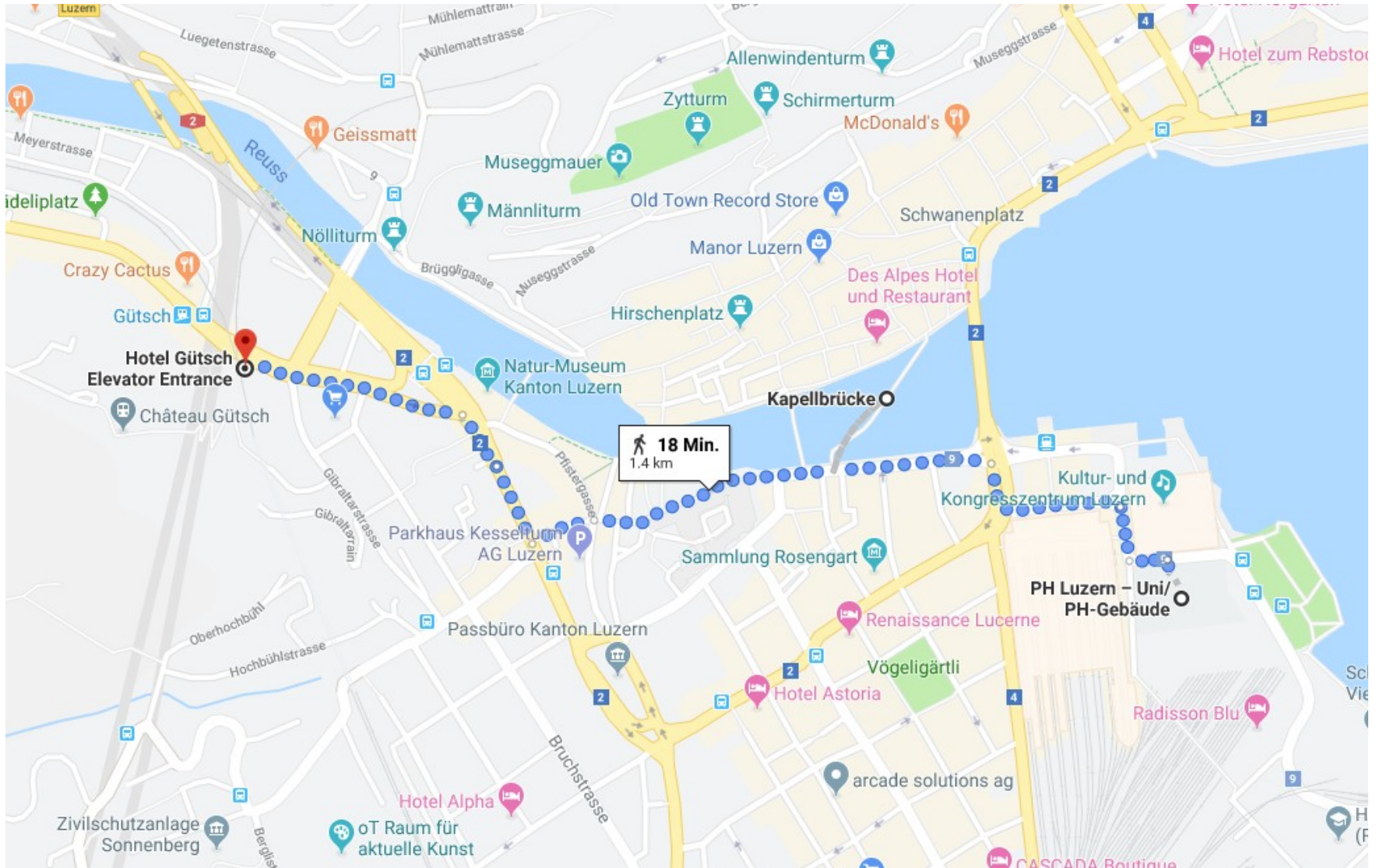
Time: 19:30, meeting at the terrace

How to get there: A 15-minute walk takes you to the entrance of the Gütsch elevator entrance at Baselstrasse 21A, which takes you to the hotel, from where you can enjoy a magnificent view of Lucerne, Lake Lucerne and the Swiss Alps.

On the way there you can admire the famous Kappeler bridge with its powder tower and many other magnificent buildings.



GSM network dinner





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Program 4 July

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Outlook to the EFCF @ 5 July

A special offer is available if you are interested to visit the European Fuel Cell Forum event at the KKL.

08:00	On-site registration	KKL entrance
09:00 – 16:15	EFCF conference, poster area & exhibition Sessions: <ul style="list-style-type: none">- Keynote: Industry perspective electrolyser- Electrolyser & FC for grid balancing- Electrolyser: OEM & tier 1 status report- FC applications- Photoelectrochemical water splitting- Pt-free catalysts- Diffuse media for FC & electrolyzers- Keynote by the Gold Medal Winner For details refer to the separate EFCF program.	KKL

Session: Developments in grid service markets II

DEVELOPMENTS IN GRID SERVICE MARKETS II		Session-chair: Thomas Kudela
Local market possibilities, experiences with and perspectives from the ENERA project	Philippe Vassilopoulos	EPEX SPOT, France
Impact of balancing and day-ahead market sequences on bidding behavior of market participants	Ksenia Poplavskaya (1,2), Fabian Ocker (3), Karl-Martin Ehrhart (4)	(1) Austrian Institute of Technology, Austria, (2) Delft University of Technology, Netherlands, (4) Karlsruhe Institute of Technology, Germany
Architectures for Optimized Interactions between TSOs and DSOs: Experiences and learnings from SmartNet	Ivana Kockar (1), Gianluigi Migliavacca (2), Andrei Morch (3), Siface Dario (2)	(1) University of Strathclyde, UK, (2) RSE SpA, Italy, (3) SINTEF Energy Research, Norway
Grid services as byproducts of a water electrolyzer	Valerian Klemenzenz, Tanaka Mandy Mbavarira, Christoph Imboden	Lucerne University, Switzerland
NODES – a new market design to trade decentralized flexibility	Benedikt Deuchert	NODES AS, Norway

Short coffee break

Next session starts **11:00**. Please be back 2 minutes before.

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Session: Flexible units II & Grid services operation

FLEXIBLE UNITS & GRID SERVICES OPERATION		Session-chair: Nikos Hatzargyriou
Five actions to improve your short term forecasting of electricity demand and RES production	Johan Nihleen, Alexander Nordling	Vitec Energy AB, Sweden
Qualifying Tests of Electrolysers for Grid Services System Behaviour and Scalability	Regine Reissner (1), Shi You (2), Cyril Bourasseau (3), Pablo Marcuello (4), Vincent Lacroix (3), Gilles Lavaille (3), Daniel A. Greenhalgh (5), Laura Abadia (6), Christoph Imboden (7), Marius Bornstein (8) et. al.	(1) DLR, Germany, (2) DTU, Denmark, (3) CEA, France, (4) IHT, Switzerland, (5) ITM Power, UK, (6) Foundation for the Development of New Hydrogen Technologies in Aragon, Spain, (7) HSLU, Switzerland, (8) NEL HYDROGEN AS, Norway
Overlook the Copernicus C3S-SIS-ENERGY service with a focus on seasonal forecast and additional climate indicators	Raphaël Legrand	Météo France, France
Dependence of operational processes in a power system on weather conditions	Davor Bosniak	HEP, Croatia

Lunch break at the foyer

Poster session starts **13:30** at the Foyer.

Next presentations session starts **14:00**. Please be back 2 minutes before.

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Poster session at the foyer

Next presentations session starts **14:00**. Please be back 2 minutes before.

POSTER SESSION - ALL TOPICS

Session-chair: **Christoph Imboden**

GRASSHOPPER project: Grid assisting modular hydrogen PEM power plant	Elena Crespi (1), Giulio Guandalini (1), Jorg Coolegem (2), Mariana Martín (3), Sönke Gößling (4), Peter Beckhaus (4), Jure Petkovšek (5), Silvain Buche (6), Stefano Campanari (1)	(1) Politecnico di Milano, Italy, (2) Nedstack Fuel Cell Technology B.V., The Netherlands, (3) Abengoa Innovación, Spain, (4) ZBT GmbH, Germany, (5) INEA d.o.o., Slovenija, (6) Johnson Matthey Fuel Cell, UK
REMOTE project: techno-economical sizing of H2-based energy storage systems in remote areas	Paolo Marocco (1), D. Ferrero (1), M. Gandiglio (1), A. Lanzini (1), M. Santarelli (1), K. Fløche Juelsgaard (2), K. Panopoulos (3), D. Consoli (4), M. Ciani Bassetti (4), I. Rosso (5), D. Thomas (6), S. Chatzigavriil (7), M. Lai (8), A. Veiga (9), K. Sundseth (10), B. Kvaal (11)	(1) DENERG, Politecnico di Torino, Italy, (2) BPSE, (3) CERTH, (4) EGP, (5) EPS, (6) HYG, (7) HOR, (8) IRIS, (9) POW, (10) SINTEF, (11) TREN
Operating results of PEMEL, AEL and SOEC systems	Michael Alkämper, Sebastian Stypka, Bernd Oberschachtsiek, Angelika Heinzl	Zentrum für Brennstoffzellentechnik GmbH (ZBT), Germany
Feasibility analysis of off-grid hydrogen energy storage system for energy independent island in south Korea	Xia Zhang, Byeong Soo Oh	School of Mechanical Engineering, Chonnam National University
PowerAlliance – Extending Grid Capacity on the Medium Voltage Level through Intelligent Sector Coupling	Joachim Bagemihl (4), Gwendolin Wilke (1), Ramón Christen (1), Vincent Layec (2), Holger Wache (2), Mirjam West (3), Silvia Ulli-Beer (3), Juliana Zapata (3), Yves Wymann (4), Thomas Stadler (5), Franz Stabauer (6), Daniel Laager (7), Jürgen Breit (8)	(1) Lucerne University of Applied Sciences and Arts, Switzerland, (2) University of Applied Sciences and Arts Northwestern Switzerland, (3) Zurich University of Applied Sciences, Switzerland, (4) Alpiq AG, Switzerland, (5) Xamax AG, Switzerland, (6) ASKI Industrie-Elektronik GmbH, Austria, (7) EBM, Switzerland, (8) Stadtwerke Crailsheim, Germany
A Market Data Clustering Aimed to the Economic Analysis of an ESS-based Power Plant providing Ancillary Services	Francesco Maria De Venezia, Simona Parrella, Vito Calderaro, Vincenzo Galdi, Antonio Piccolo	University of Salerno, Italy
Efficient preparation of TSOs for the integration of Capacity Calculation Regions (CCRs) in terms of security and welfare	Jadranko Kučica	Coratian Transmission System Operator Ltd., Croatia

Session: International collaboration

INTERNATIONAL COLLABORATION		Session-chair: Bruno Cova
Undersea cable between Italy and Montenegro: Project and forthcoming market and power flow consequences	Elia Ettore	Terna SpA, Italy
German-Austrian Market Split Implementation and Impact from a TSO perspective	Christoph Jachmann	APG, Austria
Market coupling mechanisms Transmission capacity allocation in zonal electricity markets	Anthony Papavasiliou	Université catholique de Louvain, Belgium
Network Codes, GLEB	Mathieu Fransen	ACM, The Netherlands
Summary & GSM award "Most Innovative Contribution" CLOSING	Christoph Imboden (1), Michael Spirig (2), Olivier Bucheli (2)	(1) Lucerne Uni of Applied Sciences & Arts, (2) European Fuel Cell Forum AG, Switzerland

Summary of the day & evening program

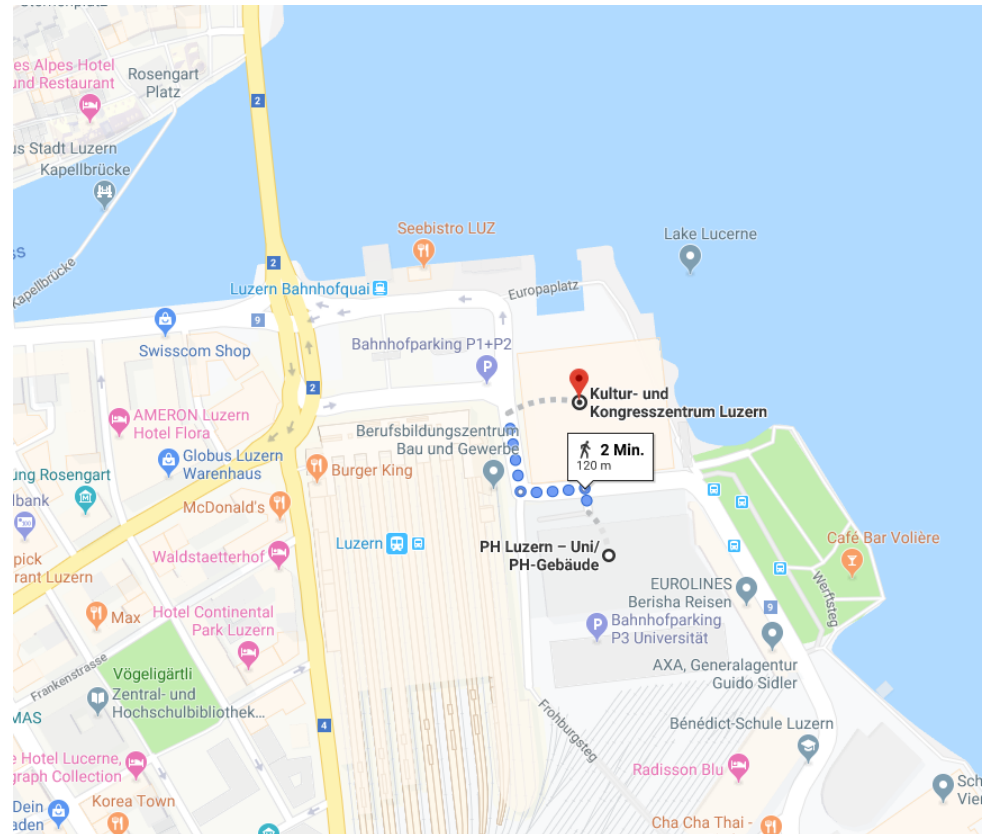
Christoph Imboden, Symposium Chair

Grid apéro and EFCF exhibition (free entrance)

Where: KKL entrance, EFCF exhibition area

Time: 16:30

How to get there: a 2 minutes walk – crossing the street at the university main entrance – takes you to the KKL and the EFCF exhibition.



Dinner on the lake (extra)

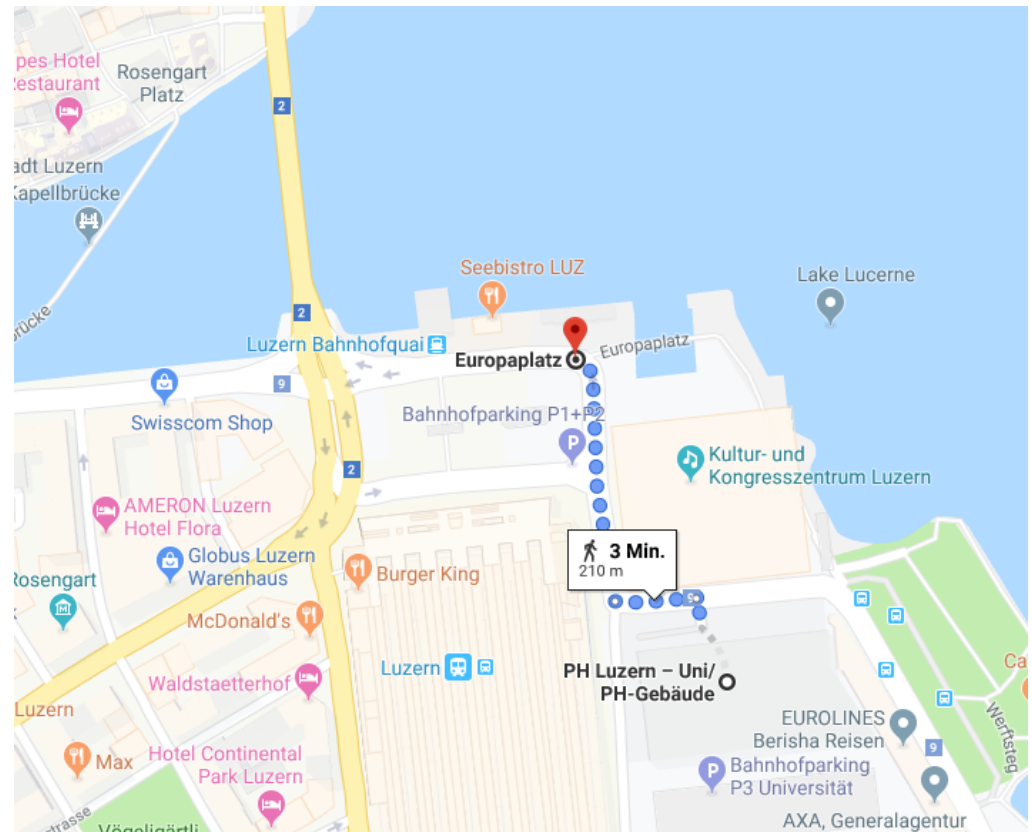
Boarding on the lake side of the KKL (don't forget your ticket!)

If not yet booked: ask for tickets @ 120CHF at the registration desk

Time: Boarding at 19:20 (be there in time!); return to Lucerne: 23:30

How to get there: a three minutes walk takes you to the lake side of the KKL, where the ship is waiting.

The ship will take you for a tour de Lake Lucerne, with a rich buffet and music offering the chance for a dance.



Thank you!

Thank you for your active participation at the GSM19 and all the deep exchange we had the last two days. I look forward to meet you again in a year at the GSM20. Have a safe trip back home!

Christoph Imboden, Symposium Chair

Lucerne University of Applied Sciences and Arts

Innovation and Technology Management, CC Power Economy

Prof. Dr. Christoph Imboden

Head of Research

T direct +41 41 349 3752, M +41 79 744 2669

christoph.imboden@hslu.ch

Technikumstrasse 21, CH 6048 Horw

T +41 41 349 33 11

www.hslu.ch/PowerEconomy