



# **The 3rd International Conference on Energy and AI**

## **Conference Program**

July 11-12, 2022

University of Technology of Belfort-Montbéliard

Sevenans Campus, France

Blended online/onsite conference

<http://www.energy-ai.org/>

## Conference General Chair



**Prof. Fei Gao**

*University of Technology of Belfort-Montbéliard, France*

## Conference Co-chairs



**Prof. Kui Jiao**

*Tianjin University, China*



**Prof. Jin Xuan**

*Loughborough University, UK*

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Kui Jiao, Tianjin University, China

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中汽中心 | 数据

Automotive Data of China, China



UKRI Interdisciplinary  
Centre for Circular  
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Interdisciplinary Centre for Circular Chemical Economy, UK

## Conference Venue

### UNIVERSIT  DE TECHNOLOGIE DE BELFORT-MONTB LIARD



#### PONT

##### Niveau 0

- Atelier de m canique

##### Niveau 1

- Amphith tre P108
- Fontaine num rique P101
- Salles et espace de coworking

##### Niveau 2

- Infirmierie
- Bureaux des associations  tudiantes (AE, BDS)
- Espace de solidarit 
- Amphith tre P228
- Direction aux formations et   la p dagogie
  - P le planning et examens
  - P le admissions et  tudes
- Direction   la transition num rique
  - P le audiovisuel
- Biblioth que
- Service des affaires juridiques
- Qualit  / indicateurs

##### Niveau 3

- Accueil 
- Formations d'ing nieur en m canique
- Service   la communication
- Bureau de la vie  tudiante

- Direction aux relations internationales et   l'internationalisation
  - Mobilit s  tudiantes
- Direction aux relations avec les entreprises
  - Service des stages : Masters, Tronc commun, M canique, syst mes industriels
  - Formation continue
  - Service des ressources humaines

##### Niveau 4

- Formation d'ing nieur en Syst mes Industriels et en Logistique Industrielle
- Equipe de recherche CNRS / LMC
- Service patrimoine
- Service financier et contr le de gestion
- Service comptable et facturier
- Direction
- Direction g n rale des services
- SAIC

##### Niveau 5 (zigourat)

- Salle du conseil

#### CH TEAU

- Maison des Humanit s
  - Equipe langues
  - Equipe culture g n rale
- Equipe de recherche FEMTO-ST / RECITS

#### PLATEFORME TITAN

- Atelier de m canique
- Equipe de recherche ICB / LERMPS
- BV-PROTO

#### TOUR

- Tronc commun
- Amphith tre T306

#### ROTONDE

- Equipe de recherche ICB / CO2M

#### PAVILLON S

- Equipe de recherche ICB / LERMPS

#### RU / MDE

- Restaurant Universitaire
- Seven Go : restauration rapide
- Maison de l' tudiant
- K'fet

#### VENIR A L'UTBM



Autoroute A36, sortie n 11, Suivre Gare TGV puis Universit  de Technologie.



Depuis la gare de Belfort ligne 3 arr t « Œufs Frais » ou « Sevenans UTBM ».  
Infos et horaires : [www.optymo.fr](http://www.optymo.fr)



Depuis Belfort : passage de l'itin raire FrancoVeloSuisse   proximit .  
Depuis Montb liard : passage de la coul e verte.  
Le plan des pistes cyclables est disponible sur : [www.territoiredebelfort.fr](http://www.territoiredebelfort.fr), rubrique > transports > pistes cyclables.

#### ADRESSE

UTBM - Campus de Sevenans  
Rue de Leupe  
90400 SEVENANS  
T l. 03 84 58 30 00  
[www.utbm.fr](http://www.utbm.fr)



## Campus de Sevenans

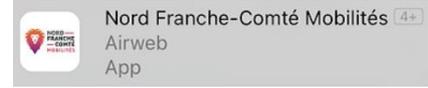
## Coming to the conference by bus from Belfort to Sevenans:

### Tickets

**Important:** You cannot buy bus ticket inside the bus!

You have to buy them beforehand. Here are the 3 options to buy tickets:

- SMS tickets: send « BUS » to the phone number 84 100
- Or download the application [Nord Franche Comt  Mobilit s](#)
- Or tickets can be bought at the train station: kiosk **RELAY** at Gare SNCF (open every day 7AM to 7PM) - 1 /ticket valid 1 hour (or 3,60  for a 24h ticket)



### Itinerary



### Bus Schedules

Two buses will take you to UTBM Sevenans from Belfort train station on Monday and Tuesday morning  
 Departure **7:50 AM** (Belfort station) -> Arrive 8:08 (UTBM)

or  
 Departure **8:10 AM** (Belfort station) -> Arrive 8:28 (UTBM)

(see details to the right) →

**7:48 AM (Monday) - 8:08 AM (20 min)**

7:50 AM from Gare de Belfort  
   2 min

[Add to Calendar](#)

7:48 AM	Gare	90000 Belfort
	Walk	� About 2 min, 100 m
7:50 AM	Gare de Belfort	
	3 Gare TGV	� 18 min (12 stops)
7:50 AM	Sernam	
7:51 AM	Colbert	
7:53 AM	Multiplexe	
7:55 AM	Varonne	
7:57 AM	Bosmont	
7:58 AM	Jacquot	
7:59 AM	Eluard	
8:01 AM	Grottes	
8:02 AM	Andelnans Pr�s	
8:04 AM	Port de Botans	
8:07 AM	Oeufs Frais	
	Service run by <b>OPTYMO urbain</b>	
8:08 AM	S�venans UTBM	

**8:08 AM (Monday) - 8:28 AM (20 min)**

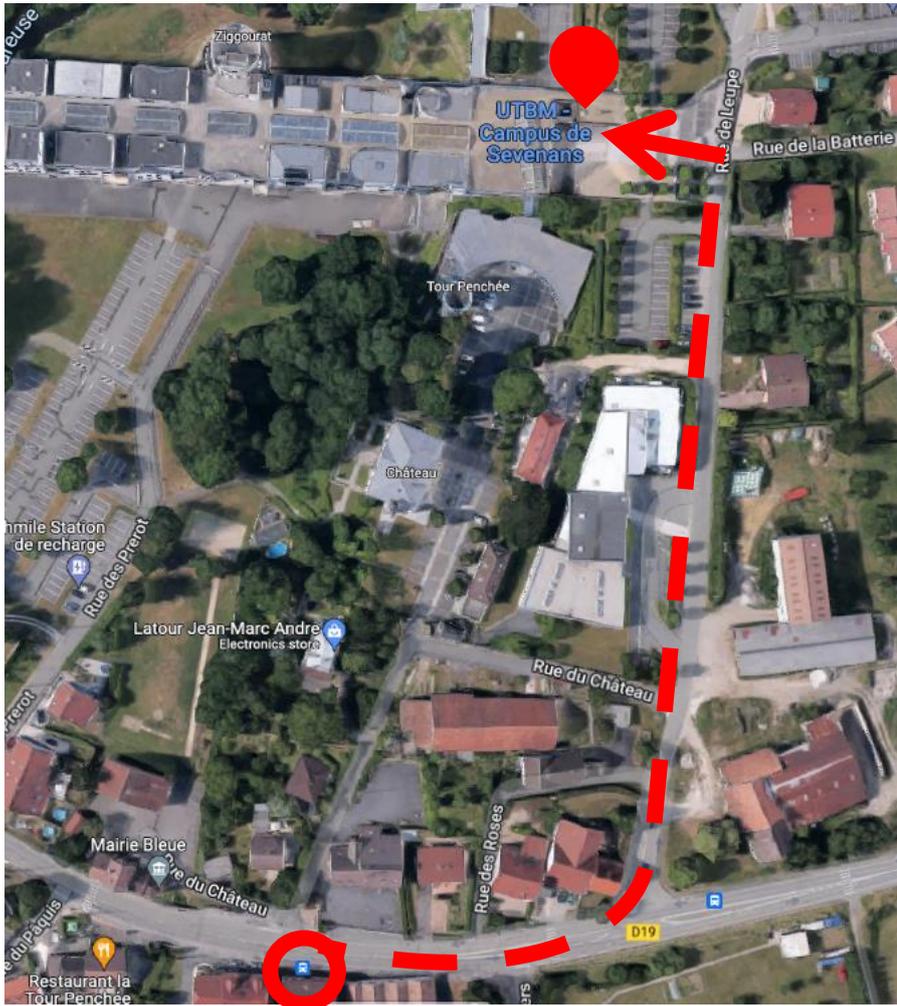
8:10 AM from Gare de Belfort  
   2 min

[Add to Calendar](#)

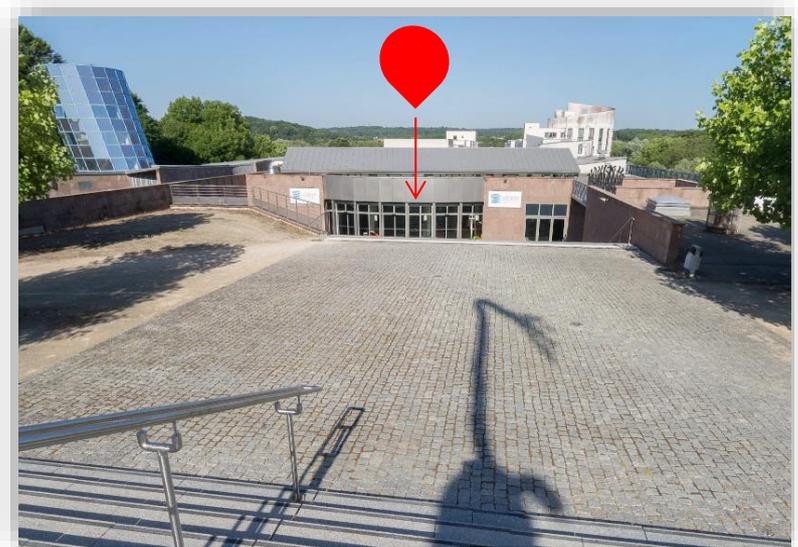
8:08 AM	Gare	90000 Belfort
	Walk	� About 2 min, 100 m
8:10 AM	Gare de Belfort	
	3 Gare TGV	� 18 min (12 stops)
8:10 AM	Sernam	
8:11 AM	Colbert	
8:13 AM	Multiplexe	
8:15 AM	Varonne	
8:17 AM	Bosmont	
8:18 AM	Jacquot	
8:19 AM	Eluard	
8:21 AM	Grottes	
8:22 AM	Andelnans Pr�s	
8:24 AM	Port de Botans	
8:27 AM	Oeufs Frais	
	Service run by <b>OPTYMO urbain</b>	
8:28 AM	S�venans UTBM	

## To go from “UTBM Sevenans” bus stop to Conference room

5 min walk – 400 m



Welcome to UTBM!



## ICEAI 2022 Program - Day 1

### Keynote session

Monday Morning, July 11<sup>th</sup>, 2022 (Paris Time: GMT+2)

**Room 1** in Campus of Sevenans, UTBM, Belfort, France

Zoom ID: **99736518001** (<https://zoom.us/j/99736518001?pwd=d1JYcm5lExoakxjZnVhcEFqSHNDZz09>)

Passcode: 824654

Time	Program	Speaker
8:00-9:00	<b>Registration</b>	
9:00-9:50	<b>Plenary 1: Navigating the journal publishing process</b>	Dr. Deborah Logan, Elsevier
9:50-10:40	<b>Plenary 2: Digital Twins as a key enabling technology for AI Powered Cyber-physical Power/Energy Systems</b>	Dr. Nikola Fischer Celanovic, Typhoon HIL
10:40-11:00	<b>Coffee/tea break</b>	
11:00-11:50	<b>Plenary 3: AI techniques integrated in the design and development of electrical machines for circularity and low use of critical raw materials</b>	Prof. Claudia Martis, Cluj-Napoca Technical University
11:50-13:00	<b>Lunch (buffet)</b> (served by Cotetoque: <a href="http://cotetoque.fr/">http://cotetoque.fr/</a> )	

### Technical session (10 min presentation + 2 min Q/A)

Monday Afternoon, July 11<sup>th</sup>, 2022 (Paris Time: GMT+2)

**Room 2** in Campus of Sevenans, UTBM, Belfort, France

Zoom ID: **99736518001** (<https://zoom.us/j/99736518001?pwd=d1JYcm5lExoakxjZnVhcEFqSHNDZz09>)

Passcode: 824654

Time	Presentation Title	Speaker
13:30-13:42	Accelerating battery material discovery through ab initio random structure searching <b>(online)</b>	Ziheng Lu, Microsoft Research
13:42-13:54	Screening adsorbent-working solution pairs for adsorption-driven osmotic heat engines based on experimental water adsorption isotherm database and machine learning <b>(online)</b>	Yanan Zhao, etc., Huazhong University of Science and Technology
13:54-14:06	On the application of an improved XGboost-Boruta algorithm for feature susceptibility of a PEMFC control system <b>(online)</b>	Xinjie Yuan, etc., Shanghai Hydrogen Propulsion Technology Co., Ltd.
14:06-14:18	Adaptive Matching Strategy for Automotive Polymer Electrolyte Membrane Fuel Cell System Using Genetic Algorithm <b>(online)</b>	Zhichao Gong, etc., Tianjin University
14:18-14:30	Graded designs of functional components within the catalyst layer of PEM fuel cell: Multi-objective optimisation with hybrid machine learning strategy <b>(in-person)</b>	Xin Yee Tai, etc., Loughborough University
14:30-14:45	<b>Coffee/tea break</b>	
14:45-14:57	Performance prediction of proton exchange membrane fuel cell systems based on LSTM <b>(online)</b>	Yupeng Wang, First Automobile Works
14:57-15:09	Health-Constrained Energy Management for Fuel Cell Hybrid Electric Vehicle Based on Machine Learning Algorithm <b>(online)</b>	Zhongbao Wei, etc., Beijing Institute of Technology
15:09-15:21	Optimisation of a silicate weathering-based carbon-capture reactor using a machine-learning surrogate model <b>(online)</b>	Jinyuan Zhang, etc., University of Oxford

15:21-15:33	Optimization of micro bent channel heat sinks based on multi-objective genetic algorithm <b>(online)</b>	Yuguo Fu, etc., Tianjin University
15:33-15:45	Fuzzy REINFORCE: A Fuzzy Policy Gradient Reinforcement Learning based Energy Management Strategy for Fuel Cell Hybrid Electric Vehicles <b>(in-person)</b>	Liang Guo, etc., Aix-Marseille University
15:45-16:00	<b>Break</b>	
16:00-16:12	A Fault Diagnosis Method for Proton Exchange Membrane Fuel Cell Based on Support Vector Data Description <b>(online)</b>	Yan Gao, etc., University of Electronic Science and Technology of China
16:12-16:24	Tracking Dynamic Deterioration Evolution of Proton Exchange Membrane Fuel Cell based on Genetic Algorithm aided Optimal Smoothing <b>(online)</b>	Zheyang Mo, etc., Shanghai Hydrogen Propulsion Technology Co., Ltd.
16:24-16:36	Cross-Domain Fault Diagnosis of diesel engine based on domain adversarial transfer learning <b>(online)</b>	Guobin Pei, etc., Tianjin University
16:36-16:48	Remaining Useful Life and State of Health Prediction for Lithium Batteries Based on Differential Thermal Voltammetry and a Long and Short Memory Neural Network <b>(online)</b>	Wentao Wang, etc., Beihang University
16:48-17:00	Application of data-driven surrogate model on optimisation of structural parameters of gas diffusion layers of PEM fuel cells <b>(in-person)</b>	Lei Xing, etc., Loughborough University
17:30-18:00	Departure by bus for Gala Dinner at Peugeot Museum	<b>Night at Peugeot Museum</b>
18:00-19:00	Visit Peugeot Museum	
19:00-21:00	Gala dinner at Peugeot Museum	
21:00-21:30	Back to Belfort city	

## ICEAI 2022 Program - Day 2

### Keynote session

Tuesday Morning, July 12<sup>th</sup>, 2022 (Paris Time: GMT+2)

Room 1 in Campus of Sevenans, UTBM, Belfort, France

Zoom ID: **99736518001** (<https://zoom.us/j/99736518001?pwd=d1JYcm5lcExoakxjZnVhcEFqSHNDZz09>)

Passcode: 824654

Time	Program	Speaker
9:00-9:50	Plenary 4: <b>Crystal ball gazing - predicting the future</b>	Prof. Sara Walker, Newcastle University
9:50-10:40	Plenary 5: <b>Key Techniques of Transmission System for Offshore Wind Power</b>	Prof. Bin Li, Tianjin University
10:40-11:00	<b>Coffee/tea break</b>	
11:00-12:00	Panel <b>"Women in science"</b>	
12:00-13:00	<b>Lunch (menu)</b> (served by Cotetoque: <a href="http://cotetoque.fr/">http://cotetoque.fr/</a> )	

### Technical session (10 min presentation + 2 min Q/A)

Tuesday Afternoon, July 12<sup>th</sup>, 2022 (Paris Time: GMT+2)

Room 2 in Campus of Sevenans, UTBM, Belfort, France

Zoom ID: **99736518001** (<https://zoom.us/j/99736518001?pwd=d1JYcm5lcExoakxjZnVhcEFqSHNDZz09>)

Passcode: 824654

Time	Presentation Title	Speaker
13:30-13:42	Study of catalyst loading and GDL porosity gradient variation effect to PEMFCs performance through recurrent neural network (RNN) data-driven assisted modelling <b>(online)</b>	Hanhui Lei, Northumbria University
13:42-13:54	Revealing Li deposition mechanism with multi-factors induced competition mechanisms <b>(online)</b>	Lisheng Zhang, Beihang University
13:54-14:06	Outlier removal and feature extraction hybrid framework for ORC system <b>(online)</b>	Xu Ping, Beijing University of Technology
14:06-14:18	S2SAME: A multi-modal deep learning system model for automated renewable energy trading <b>(online)</b>	Mehdi Mounsif, Modis
14:18-14:33	<b>Coffee/tea break</b>	
14:33-14:45	Boosting the performance and durability of SOCs using a data-driven Powder-to-Power framework <b>(online)</b>	Yang Wang, Tianjin University/The Hong Kong Polytechnic University
14:45-14:57	Multi-timescale Prediction of Lifetime and Operating Temperatures of PEMFC System by Hierarchical Echo State Network <b>(online)</b>	Zhiguang Hua, University of Technology of Belfort-Montbéliard
14:57-15:09	A Data-Driven Hybrid Battery Core Temperature Distribution Estimation Approach for Lithium-ion Battery <b>(online)</b>	Pengfei Li, etc., Beijing Institute of Technology
15:09-15:21	Integrating physics and neural networks for lithium-ion battery modelling <b>(in-person)</b>	Yicun Huang, Chalmers University of Technology
15:21-15:30	<b>Announcement of prizes (Please go to Room 1)</b>	
15:45-17:00	Departure by bus for Riquewihr village in Alsace Region	<b>Tour to Riquewihr village</b>
17:00-18:30	Tour in Riquewihr village	
18:30-19:30	Back to Belfort city	

## Plenary speaker



*Deborah Logan*

**Affiliation:** Elsevier

**Position:** Publishing director

## Navigating the journal publishing process

Researchers today need to secure funding, collaborate, share data, publish results, commercialise research, and demonstrate impact. Early career researchers in particular are faced with multiple pressures around these challenges. In this talk aimed primarily at ECRs, I will cover how the process works in general, what editors and reviewers are looking for, and techniques for effective reviewing. Sharing examples from Elsevier's Energy Journals' portfolio, I will also highlight particular points around the three gold standards of quality, integrity, and equity.

## Biography

Deborah Logan is Publishing Director for Elsevier's Energy & Earth journals' programme, which is the largest global publishing programme in the energy and earth sciences, and which includes many flagship titles publishing world-class content. Over the past few years, Deborah has looked to develop extensive publishing collaborations with researchers and policy makers, with a strong focus on recruiting journal editors with high standards of excellence and in launching new journals that will shape and serve the future energy needs of our global society. Deborah is based in Paris and has been working with Elsevier since 2006. Before then, she worked at Oxford University Press in UK; at a non-governmental agency in Kenya; with the Japanese Ministry of Education; and at Sony in Japan. Deborah's passions lie in raising standards, championing excellence, and promoting greater diversity in science.

## Plenary speaker



*Nikola Fischer Celanovic*

**Affiliation:** Typhoon-HIL

**Position:** CEO and co-founder

## Digital Twins as a key enabling technology for AI Powered Cyber-physical Power/Energy Systems

AI powered cyber-physical power/energy systems hold a great promise for the future. Who would not love to have intelligent, learning, adaptive system capable to exchange data and learn from its environment? Moreover, who would not love to have such systems at all levels of control hierarchy: from the levels that are the closest to the “metal” to the levels that are farthest away from the “metal”?

From the point of view of AI application in Cyber-physical Power/Energy systems a completely safe and data rich environment for AI to learn-by-doing is a challenge that can only be solved by judicious application of high-performance Digital Twin technology. For the purpose of this keynote we will treat the control levels that are very close to the “metal” as mature and part of the digital twin that is ready to support the development of higher level AI functions like the already demonstrated examples Deepmind’s AlphaStar and OpenAI Five that excel in most complex, real time, strategy games like Star Craft 2 and Dota 2.

Clearly, to unleash the power of machine learning on Power/Energy Systems a good “sandbox” is a must. So, what defines a good sandbox? A good “sandbox” has excellent physical models, that execute in real time which enables them to interface directly to the control layers that are closest to the “metal”. Such a system can then easily be interfaced to the AI algorithm and “left” to learn how to operate it until “perfection”. Finally, an AI controller verified on a digital twin can be “readily” deployed in the real e.g. grid when there are no more exceptional cases to be verified.

### Biography

Nikola is the CEO and co-founder of Typhoon-HIL, and was the leader of the team that developed both the theoretical algorithms and experimental validation of the world’s first 1 $\mu$ s ultra-low latency Hardware-in-the Loop (HIL) real-time emulator platform for power electronics.

Prior to founding Typhoon HIL he was with the ABB Drives Development Department, Turgi, Switzerland. Previously he was with the ABB Research Center, Baden-Dättwil, Switzerland.

He holds a Ph.D. degree from Virginia Polytechnic Institute and State University, Blacksburg in 1995, an M.S. degree in mechanical engineering from the Vanderbilt University, Nashville, TN, and a B.S. degree in electrical engineering from the University of Novi Sad, Serbia.

## Plenary speaker



*Claudia Martis*

**Affiliation:** Technical University of Cluj-Napoca

**Position:** Professor, Head of the Electromechanical  
Systems Group

## AI techniques integrated in the design and development of electrical machines for circularity and low use of critical raw materials

Electrical machines and drives are the heart of the modern energy conversion applications and the technology in this field continues to naturally grow and evolve. The driven forces behind this trend are as follows: (i) fast time to market and high-quality technical specifications (ii) critical raw materials (CRM) strategies; (iii) sustainable and circular economy; (iv) progress in active material engineering; (iv) high level of system integration; (v) new standards of energy efficiency, maintainability and reliability; (v) safety and environmental issues. **Artificial Intelligence** brings methods and techniques that can support the integration of CRM-less strategies and sustainability & circular economy (CE) principles, along the EMD value chain, from early design, to production, operation and end-of-life resulting in increasingly sustainable products that stand the test of circularity, reducing the impact on the environment and climate change.

### Biography

Claudia Steluta Martis is full professor at Technical University of Cluj-Napoca, Romania. She received the PhD in Electrical Engineering from the same university in 2001. Her research is focused on electrical machines and drives and she has a large experience with European and national projects management since 2012. She is co-author of more than 120 scientific articles and currently she is coordinating 9 PhD students.

## Plenary speaker



*Sara Walker*

**Affiliation:** Newcastle University

**Position:** Professor, Director of The Centre for Energy, Director of the EPSRC National Centre for Energy Systems Integration, Deputy Director of the EPSRC Supergen Energy Networks Hub, and Deputy Research Director of the Active Building Centre

## Crystal ball gazing – predicting the future

Buildings can be regarded as complex thermodynamic objects that account for a large proportion of energy consumption worldwide. Energy system management at a district level can play a crucial role in improving building energy efficiency as well as exploiting larger portfolios of demand and supply to offer balancing services. More advanced prediction of building performance, when combined with data-rich and distributed energy system controls, can add greater resilience to and targeted decarbonisation of building stock, particularly in light of the more extreme climatic patterns anticipated for this century. In this presentation, I will explain some approaches being used at the National Centre for Energy Systems Integration, to predict energy use for commercial and residential buildings.

## Biography

Professor Sara Walker is Director of **The Centre for Energy** at Newcastle University. She has been working in the energy sector since 1996, with a career spanning industry and academia. Her research focus is on renewable energy and energy efficiency in buildings, energy policy, energy resilience, and whole energy systems. She is Director of the National Centre for Energy Systems Integration, Deputy Research Director for the Active Building Centre, and Deputy Director for the Supergen Energy Networks Hub. Most recently, she has been awarded the role of Co-ordinator of a new Centre on Hydrogen Integration for an Accelerated Energy Transition (HI-ACT). She is an Advisory Committee Member for the UK Energy Research Centre and the UK CCS Research Centre.

## Plenary speaker



*Bin Li*

**Affiliation:** Tianjin University

**Position:** Professor, IEEE Senior Member, FIET

## Key Techniques of Transmission System for Offshore Wind Power

The development and utilization of offshore wind energy resources is the critical path for energy structure reformation. With saturation development of the near offshore wind energy resources, large-scale deep-sea offshore wind farms have been becoming significant trends in recent years. The voltage source converter based high-voltage DC transmission system has unique technical advantages such as long transmission distance, small transmission losses, and better performance in power control compared with the conventional AC transmission methods. Therefore, it is confirmed as one of the best feasible solutions to explore offshore wind power in deep-sea areas. However, the converter topologies, primary equipment composition, and fault ride-through requirements are extremely different in comparison with the onshore transmission network. To address the issues above, this presentation investigates the precise characteristics of the whole fault process in power transmission system. Moreover, the influence of control strategies on fault characteristics is analyzed quantitatively. Typical protection principles for the transmission lines are analyzed in detail. Furthermore, the risks and challenges of protections in the offshore transmission system are discussed. Then, the single-ended distance protection principles respectively based on the traveling-wave natural frequency and time-domain line-model iteration, which are not dependent on the line boundary elements, are introduced.

### Biography

Bin Li, Professor, IEEE Senior Member, FIET. His main research field is involved in the protection and control of smart grid. Currently he is an investigator of some on-going research projects in this area supported by National Natural Science Foundation of China and the industry. He has been authorized 50 invention patents. He has published 3 monographs and more than 180 papers, of which 75 are indexed by SCI and more than 100 are indexed by EI. Currently, he is the Director of the Tianjin Key Laboratory of Power System Simulation and Control, and the Deputy Director of Key Laboratory of Smart Grid of Ministry of Education of China.

## Peugeot Museum

### *A museum that tells more than 210 years of history*



The Musée de l'Aventure Peugeot (Museum of the Peugeot Adventure) is a historical museum devoted to the Peugeot automobile business. The museum was founded by members of the Peugeot family, opening in 1988 across the road from the company's huge industrial site at Sochaux.

The first Peugeot automobiles emerged in 1891. The museum presents a global view of the evolution of the Automotive industry virtually from its beginning. Peugeot products with longer pedigrees including bicycles are also represented along with the company's long history as a manufacturer of domestic articles and tools.



- 450 vehicles of which approximately 130 are on display at any one time
- 300 cycles and motorcycles of which approximately 130 are on display at any one time
- 45 000 m<sup>2</sup> of exhibition space of which 10 000 m<sup>2</sup> are open to the public
- 5 km of archives

## Riquewihr Village

*"wine village" originated in 16th century*

Riquewihr is a commune in the Haut-Rhin department in Grand Est in north-eastern France.

A popular tourist attraction for its historical architecture, Riquewihr is also known for the Riesling and other wines produced in



the village. Riquewihr looks today more or less as it did in the 16th century. It is located on the Route des Vins (The Wines Road), close to Colmar.



Winegrowing community on the Wine Route (altitude 300 m), Riquewihr currently has 1228 inhabitants and is a member of the Association of the Most Beautiful Villages in France. It stands 4 km from Ribeauvillé. Many

shops and boutiques, as well as hotels, restaurants and Winstubs, an intermunicipal campsite, bed-and-breakfast rooms and furnished flats. Many winegrowers offer guided tours of their cellars with tastings.