

## **Report on 5<sup>th</sup> World Congress on New Technologies (NewTech'19)**

August 18 - 20, 2019 | Lisbon, Portugal

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The conference started on 18<sup>th</sup> of August by registration, coffee and networking from 3:00 PM until 5:00 PM in Lisbon, Portugal, at the Hotel Real Palacio. After registration, we talked for a while and got to know some of the people were attending in the conference.

Next day official opening started at 9:00 AM by Dr. Devika Chithrani from University of Victoria, Canada who was Congress Co-Chair. The conference had two or three parallel sessions every day.

I attended a talk about “An Assessment of Operating Conditions for Supercritical Water Gasification and Safety Issues” by Cataldo De Blasio, Mauro Prestipino, Antonio Galvagno, Margareta Björklund-Sänkiaho. This paper describes experimental investigations of Black Liquor Supercritical Water Gasification in a continuous Plug Flow Reactor system. Operating conditions heavily affects the gasification yields within the process. Nevertheless, an important issue in SCWG is the possible deposition of tar, char and inorganic compounds with subsequent plugging of the reactor. Reactions of re-polymerization are taken into account in regards to the results obtained. Important considerations are given here concerning the design and operation of high-pressure reactor systems aimed at SCWG of biomass. Operational issues are seldom taken into account in this kind of investigations.

After that, there was a talk on “Producer's Best Response in Pay-as-clear Electricity Market with Uncertain Demand” by D. Aussel, M. Branda, R. Henrion, M. Pištěk. In this work, they particularly focused on several sources of uncertainty in (pay-as-clear) electricity markets. To deal with stochastic demand they employ the so-called chance constrained formulations of the problem of the ISO as well as the problem of each producer. In detail, the ISO minimizes the production cost using a value-at-risk (VaR) approach, thus hedging against discrepancies between estimated and real electricity demand. Similarly, in the day-ahead market, each producer is hedging against the uncertainty of his own prediction of the demand using VaR approach again. In such a setting they aim at determining the “best response” of a given producer, i.e. the bid maximizing its profit. In the second step, they substitute this solution into the formula determining the profit of a producer. Benefiting from the specific structure of this formula, they may reformulate the problem of a producer as a deterministic nonlinear programming equivalent. The resulting problem is then solved numerically to find the best response of a given producer. To illustrate their results, they provide a numerical evaluation

based on the historical distribution of both estimated and real electricity demand. They used the real market data from France observed between January 3 and February 28 of 2017. Based on these observations, they estimated the parameters of the respective lognormal distributions. The mean values correspond to the predicted quantities, whereas the variances represent the mean squared prediction errors. Based on these estimates they determined the optimal production of electricity given the probability prescribed to satisfy the aggregated demand. Then, they prepared a numerical simulation with five producers and found the best response of one of them using the sequential quadratic programming algorithm. Finally, they investigated the development of the best response of a given producer with respect to the changes of the probabilistic level.

In the afternoon, I attended a session on “Electric Vehicles”. There was a talk about “Support For Areas With Low Level Of Electromobility Through The Use Of Big Data” by Grzegorz Sierpiński. The article presents the method that enables to develop electromobility in cities which have a negligible number of charging station. The method is based on new technologies (in this case, multimodal trip planner developed in the framework of an international project Electric Travelling in ERA-NET CoFund Electric Mobility Europe) and acquisition of Big Data determining directly the needs of people travelling. Information gathered can provide a relevant decision-making support while determining the location of charging stations with the objective of promoting electric vehicles.

After that, there was a talk about “Spatial Information Systems as Sources of Data for Electromobility Planning” by Marcin Staniek. The article presents spatial information systems as sources of data describing the public space in cities and suburbs. The article focuses on a system used by the local government to manage road infrastructure, including areas designated for car parks. It presents the OSM, a commonly used open data system, which contains data extraction algorithm. The study covered by the article examines existing parking places in the town of Sosnowiec, Poland, as potentially suitable for electric vehicle charging stations. Determination of such convenient locations is one of goals of the international project of Electric Travelling under the ERA-NET CoFund Programme, a project which focuses on developing and implementing a platform supporting electromobility, both from the point of view of transport system users and administrators of transport infrastructure. Moreover, the article presents general objectives of the Electromobility Law and short description of the ETSys platform architecture.

Also, I attended a talk on “E-mobility Infrastructure in the Górnośląsko - Zagłębiowska Metropolis, Poland, and Potential for Development” by Elżbieta Macioszek. The article presents results of the survey on e-mobility infrastructure in the Górnośląsko-Zagłębiowska Metropolis, Poland, and potential for development.

Next day, I attended two keynote lectures. First talk was about “Ultra-Fast Graphene Electronic Devices” by Dr. Aimin Song from University of Manchester, UK. Most effort on graphene electronic devices has so far focused on transistors by, e.g., generating a suitable bandgap in order to achieve a reasonable on/off ratio while preserving the carrier mobility. In contrast to transistors, the functionality of some diodes does not necessarily require a large bandgap. In particular, a nano-rectifier known as the ballistic rectifier can greatly benefit from the extremely long carrier mean-free-path in graphene. Here, they fabricate ballistic rectifier structures by creating an asymmetric cross-junction in a single-layer graphene sandwiched between two boron nitride flakes. A mobility of around  $200,000 \text{ cm}^2/\text{Vs}$  is achieved, ensuring a mean-free-path well beyond that required for the device to operate in the ballistic regime. This enables a very high intrinsic responsivity at room temperature. Taking advantage of the four-terminal device architecture in which, the output channels are orthogonal to the input channels, they show that the device noise is hardly influenced by the input and is mainly limited by thermal noise, and this enables an exceptional noise-equivalent power in the order of  $\text{pW}/\text{Hz}^{1/2}$ . High-frequency characterisation and imaging experiments have also been carried out up to 640 GHz. Results of their other recent graphene THz nanodevices also discussed.

Another keynote lecture was about “Towards Net-Zero Energy Buildings - Integration of Renewable Energy Sources in Buildings” by Dr. Mohamed Hamed from McMaster University, Canada.