

MY RESEARCH STAY WITHIN THE TECHNISCHE HOCHSCHULE INGOLSTADT

This research stay occurred during an exceptional time of pandemics, from September 2020 to March 2021. One could think this would not be an optimal timing for a researcher abroad. Still there has been such a rich environment provided by the THI, from which I profited from for my professional and personal growth. Hopefully I could also contribute to the institute where I was allocated and my THI supervisor's own work and team.

My name is Kristie Kaminski Küster and I am a doctoral student in the pursuit for a Ph.D. in Electrical Engineering in Post-graduate Program in Electrical Engineering of the Federal University of Paraná. My background already included advanced studies in Germany. From 2011 to 2013, I attended to a regular two-year MSc program that teaches a broad fundament in renewable energy at the Carl-von-Ossietszky Universität Oldenburg.

This time around I have returned to Germany with a family – my husband and two kids (a 4-year old boy and a 1,5 year old girl) are here with me. This brought some extra challenges but in the long run, it has been an outstanding experience for us as a family. To begin with, I would like to report about the experience as a general. In the sequence, I will give the details of my research during this time.

1 My experience in general with the THI

1.1 The enrollment process

The enrollment took place all digitally through the platform PRIMUSS provided by the THI and the email and telephone contact from the responsible parties of the THI. The online platform itself is very self explainable and user-friendly. Every needed information is also available in English.

In order to get everything done, I had the help of many THI staff. Here I would like to acknowledge the special work of Mrs. Lisa Hermsen, from the InES Institute and Mrs. Astrid Moser (Schmidt) from the Graduiertenzentrum. They were not only friendly and helpful, they were warm and welcome, which made the distance from the phone/email conversation completely disappear. Not to mention the plentiful support from my THI Supervisor, Prof. Dr. Daniel Navarro Gevers, and my UFPR supervisor, Prof. Dr. Alexandre Aoki, who got me in with the right contact persons and followed up on the enrolment process. This has made all the difference in doing this all virtually, as I really felt safe to have support on enrolment issues and felt welcomed to the THI since the beginning.

1.2 First steps after the Immatrikulation

After I got enrolled, I got an access with login and password for all platforms used by the university: Moodle, Webmail, PRIMUSS among others. I was recommended to do the virtual Introduction to the University's IT Systems. I cannot stress enough how much this was extremely helpful. The course itself is awesome because it was my first experience in "gaming" a lecture – a format which takes boredom away and gets your attention to everything you must learn. The university has an awesome digitalized platform and everything can be solved effortlessly online. That is why this Introduction Course is very

necessary and it really set a great start to my relationship to the university, which during this time was exclusively virtual.

1.3 The Library

In the library I got to do some inter-library-loans to get some books for my research. I didn't have any problems with it and everything went online. But the most I got from the library was access via EZ-proxy to several scientific journal databases available. This is very important for a researcher to keep up with the latest developments and trends of their research topic. As a PhD student from abroad, make sure to know how to use this tool.

1.4 The InES Institute

On the November 20th 2020, a presentation was given by me via Zoom Meeting to the research staff and Professors from the InES Institute at THI. It was an opportunity for me to show my research topic and current advances in my work. The inputs and feedback from the participants were invaluable. It allowed me to get contact and exchange ideas with other researchers doing work on similar topics.

Also at InES, I had a chance to assist Prof. Dr. Navarro in a Research Seminar where the M.Sc. candidates are supposed to present from one of the predefined topics related to renewable energy systems. I developed some of the topics from which the students could choose and participated together with Prof. Navarro in the feedback sessions and evaluation from the students.

1.5 Experience with a german startup company

During the enGlobe scholarship at the THI, an opportunity has presented in offer from Prof. Dr. Navarro to contact the startup company OLI SharEnergy GmbH, located in Stuttgart, Germany for possible partnerships for this PhD study. OLI has responded with interest in our contact and suggested a partnership through a current research endeavor named FlexChain, a project in which they are currently participating. In this period, I could participate on meetings and do some activities to collaborate and better understand the project, which is groundbreaking and at the edge of the technology of smart energy systems and applications of blockchain. This opportunity really enriched the scholarship period.

2 Developed research - results

The expected outcome of my current Ph.D. research is a model for decentralized energy market at power system distribution level to study the impacts of market-based control to the electric grid. This model should take into account the optimality of the grid operation, scalability for mass integration of distributed energy resources, trade and supply functionality, protection of customer's devices, among others. The result of this work aims to contribute to the paradigm shifts needed for a transition to

sustainable energy through a deeper comprehension of the impacts of the massive decentralization of energy resources.

During this time I spent in the research stay at THI, my goal was to try to narrow down my research question a bit more and begin the process of setting up the simulation models by analyzing the existing simulation platforms and writing some scripts myself. The results of this endeavour are shown in the Table below. These steps have helped me along my pathway to the doctorate and I appreciate the time I had at THI to further develop my research.

Table 1 – Accomplished Workplan during the research stay

Task	Content	Deliverable	set-20	out-20	nov-20	dez-20	jan-21	fev-21	mar-21
Literature Research	Literature Update on Topic of research, containing a summary of a up to Sept. 2020 of the most relevant publications	Report							
Presentation Preparation	Slides for a presentation on the research topic for the students at INES-THI	Power Point Slides							
Presentation	Presentation at INES	Presentation							
Work with a german startup company	Activities within the Project "Flexchain" from OLI Energy Systems	Report							
Simulation modelling	Details on the initial developments of the simulations and models to be developed	Report							
Assistance for Master Students	Preparation of correlate topic of PhD study for Prof. Navarros Research Seminar at the M.Sc. Degree offered by InES. Providing assistance and feedback for the students who chose the topic.	Presence in the presentations							