DAAD

Deutscher Akademischer Austauschdienst
German Academic Exchange Service

German-Brazilian Research Cooperation in the Energy Sector

NoPa 2.0/ Cooperation in the area of Green Hydrogen/PtX, Direct Electrification and Energy Storage

DAAD MATCHMAKING | 23-26 OCTOBER 2022 | RIO DE JANEIRO, BRAZIL

Federal Ministry
for Economic Cooperation
and Development

cooperação
alemã
DEUTSCHE ZUSAMMENARBEIT

Por meio da

giz

CONFERENCE OFFICE:

Ms Isabelle von Uslar-Gleichen
On site
M: +49 179 750 05 82

Ms Rebecka Michel
Backoffice
M: +49 163 260 92 60

MICHEL International Relations & Services (MIRS)
daad-nopa-bra@michel-irs.com | www.michel-irs.com

German-Brazilian Research Cooperation in the Energy Sector

NoPa 2.0/ Cooperation in the area of Green Hydrogen/PtX, Direct Electrification and Energy Storage

DAAD MATCHMAKING | 23-26 OCTOBER 2022 | RIO DE JANEIRO, BRAZIL

Representatives from BMZ, GIZ, DAAD, the private and scientific sector will take part at the Matchmaking Event. The event addresses members of German and Brazilian universities, co-operations and research institutes as well as political decision-makers. The Matchmaking event has the aim to inform on the upcoming call for applications for a German-Brazilian Research Co-operation in the Energy Sector. To promote the call and to give interested participants the chance to meet and get to know each other, this Matchmaking event will be held.

GERMAN-BRAZILIAN RESEARCH COOPERATION IN THE ENERGY SECTOR

NoPa 2.0/ Cooperation in the area of Green Hydrogen/PtX, Direct Electrification and Energy Storage

DAAD MATCHMAKING | 23-26 OCTOBER 2022 | RIO DE JANEIRO, BRAZIL

Objective:
The event addresses members of German and Brazilian universities, co-operations and research institutes as well as political decision-makers. The Matchmaking event has the aim to inform on the upcoming call for applications for a German-Brazilian Research Co-operation in the Energy Sector. To promote the call and to give interested participants the chance to meet and get to know each other, this Matchmaking event will be held.

Sunday, 23 October 2022

	Individual arrivals at the hotel in Rio de Janeiro and check-in
10.00	For early arriving participants Cultural excursion to Cristo Redentor and Sugarloaf Mountain
18:50	Meeting in the lobby and joint walk to the restaurant
19.00	Joint informal dinner at a restaurant

Day 1 | Monday, 24 October 2022

8.30	Registration at Windsor Excelsior Copacabana Hotel in Rio de Janeiro
9.30	Welcome words Ilona Daun Programme Manager German Academic Exchange Service (DAAD) Petra Schmidt Head of German Cooperation for Sustainable Development German Embassy Brazil Fabiola Gerbase Deputy Director German Academic Exchange Service (DAAD) in Brazil
9.50	Agenda and expected results of the matchmaking and introduction of the participants
10.00	Presentation of the project DKTI (E2, H2) and sector coupling Dr Johannes Kissel Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

10.10	“Cooperation Projects and NoPa: What are the Key Elements for Success? • Clarifying GIZ Projects and their overall goals (GIZ) and Locating NoPa in the context of the projects (GIZ) Marcus Regis Consultant Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) • The Roles and Responsibilities of DAAD Ilona Daun & Anja Munzig Programme Manager & Programme Administrator German Academic Exchange Service (DAAD) • Identifying Research Topics (MR) Marcus Regis Consultant Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Further discussion on research topics and a recap on the selection process.
11.10	Short coffee/tea break
11.30	Poster presentation of project ideas • 10 Minutes presentation and Q&A All participants (60 min)
12.30	Lunch
13.30	Poster presentation of project ideas • 10 Minutes presentation and Q&A All participants (120 min)
15.30	Short coffee/tea break
16.00	Poster presentation of project ideas • 10 Minutes presentation and Q& A All participants (30 Min)
16.30	End of day one
19.00	Joint dinner at a restaurant

Day 2 | Tuesday, 25 October 2022

9.00	Get together at the hotel in Rio de Janeiro
9.30	Q&A regarding the call Time will be made available on day 3 for specific one-on-one interactions Ilona Daun & Anja Munzig German Academic Exchange Service (DAAD)

10.30	Short coffee/tea break
11.00	First round of matchmaking opportunities
12.30	Lunch
13.30	Second round of matchmaking opportunities
15.00	Short coffee/tea break
15.30	Third round of matchmaking opportunities
17.00	Wrap-up and look out to last matchmaking day
17.15	End of day two
19.00	Joint dinner at a restaurant

Day 3 | Wednesday, 26 October 2022

9.00	Get together at the hotel in Rio de Janeiro
9.30	Q&A regarding the call and opportunity to discuss potential joint funding proposals Ilona Daun & Anja Munzig German Academic Exchange Service (DAAD)
10.30	Short coffee/tea break
11.00	Opportunity provided for individual, detailed discussions with DAAD and/or GIZ
12.30	Lunch
13.30	Exchange with representatives from industry/business (tbc)
17.15	End of matchmaking and individual departures
19.00	Joint dinner for participants leaving later that night or on the following day

FOLLOW UP REPORT

Report by Facilitator

GERMAN-BRAZILIAN RESEARCH COOPERATION IN THE ENERGY SECTOR

NoPa 2.0/ Cooperation on Green Hydrogen/PtX, Direct Electrification and Energy Storage

DAAD MATCHMAKING | 23-26 OCTOBER 2022 | RIO DE JANEIRO, BRAZIL

Abbreviations & Acronyms

ANEEL	Brazilian Electricity Regulatory Agency
BMZ	German Federal Ministry for Economic Cooperation and Development
DAAD	German Academic Exchange Service (*Deutscher Akademischer Austauschdienst*)
DKTI (E2, H2)	German Climate Technology Initiative (Electricity, Hydrogen)
FUNDEP	Research Development Foundation (*Fundação de Desenvolvimento da Pesquisa*)
GIZ	German Cooperation Agency (*Deutsche Gesellschaft für Internationale Zusammenarbeit*)
NoPa	New Partnerships Programme (*Novas Parcerias*)
PtX	Power-to-X (concept)

MATCHMAKING EVENT

Day 1: Monday, 24 October

REGISTRATION
INTRODUCTIONS
PRESENTATIONS OF GIZ & DAAD
PRESENTATION OF PROJECT IDEA
POSTERS

Welcome addresses were given by:

Ilona Daun
Programme Manager
German Academic Exchange Service (DAAD)

Petra Schmidt
Head of German Cooperation for Sustainable Development
German Embassy, Brazil

Fabiola Gerbase
Deputy Director
German Academic Exchange Service (DAAD) in Brazil

The participants introduced themselves by name and the institution they represent; many had met on the excursion the day before.

After the review of the agenda and expected results of the workshop, a presentation of the GIZ project DKTI (E2, H2) and key elements for cooperation projects and sector coupling was given by:

Dr Johannes Kissel
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Marcus Regis
Consultant
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Pedro Rodrigues
Technical Advisor
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Gianna-Maria Pedot
Advisor
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Aschkan Davoodi
Technical Advisor
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

The roles and responsibilities of the DAAD were clarified, along with ways to identify research topics in the scope of GIZ projects. There was also time for Q&A.

The rest of the day was dedicated to presentations of all the German-Brazilian research projects and answering related questions. (See Annex 2)

Day 2: Tuesday, 24 October

Q&A REGARDING THE CALL
MATCHMAKING

After having three questions answered about the call, the participants were ready to start with the matchmaking.

Each of the nine German university representatives stayed at a roundtable and the Brazilian partners rotated every 20 minutes. The idea was to explore every possible bilateral combination and allow for sufficient time to discuss potential cooperation opportunities.

The dynamic became a bit more static after the participants started finding matches and more things in common to explore. As conversations continued gaining momentum, the group essentially organised itself and was interrupted only for short reminders and important announcements that brought the second day to a close.

Day 3: Wednesday, 25 October

Q&A REGARDING THE CALL AND ONE-ON-ONE INTERACTIONS
DISCUSSION OF POTENTIAL JOINT FUNDING PROPOSALS
AHK MATCHMAKING

As the project proposals took shape, the participants had more questions and uncertainties that ultimately required all the time allotted for Q&A.

ANEEL's representative delivered a presentation about state-of-the-art E2 and H2 projects and how to get funding for Brazilian research and implementation projects (presentation in Annex 2).

FUNDEP's representative, who stated that they have been increasingly providing funding for projects in these topic areas, was available throughout the event to clarify questions from the Brazilian researchers.

The participants pointed out that up to seven cooperation projects were designed during the matchmaking and proposals were ready (or almost ready) to be submitted. They took the opportunity to clarify all the possible questions – for example, about the possibility of double funding occurring and invalidating a proposal, as the same person could be involved in more than one project or two German universities with a similar research topic could join the same proposal. Brazilian partners wanted to understand why funding could not go directly to their institutions and what could actually be funded (and how).

The DAAD explained in detail what was and was not allowed by the German regulations, described all the administrative procedures involved, and provided a realistic overview of what was needed.

The DAAD portal was introduced and explained, as some applicants were ready to send in their proposals.

The timeline of the project was presented to provide the participants with the necessary information about the selection process: the application deadline, when the DAAD would respond, the official kick-off date, etc.

The participants continued to engage in in-depth conversations throughout the day, taking the chance to have one-on-one interactions with the DAAD and GIZ representatives. ANEEL and FUNDEP also sent representatives, who offered possibilities for funding from the Brazilian side with an eye towards continuing projects after the DAAD funding comes to an end. The delegates explored as many possibilities as they could during their time together. They had meetings even during the breaks and including other peers via video conference to discuss further formalities and responsibilities.

In the afternoon, AHK conducted a matchmaking round with non-academic organisations. The intention was to foster exchanges with institutions from the corporate and industry sectors to find cooperation opportunities. This part seemed to be more relevant for the Brazilian than the German researchers. No resulting potential partnerships were reported.

GENERAL REMARKS AND RECOMMENDATIONS

“The matchmaking has had an impact simply because it happened.”

This affirmation came from a Brazilian delegate who pointed out the enormous benefits of connecting with researchers at a level that only in-person interaction allows. As an example, he cited a relationship he had built with a German professor who is developing H2 transport solutions. Although they had not found a match, as the Brazilian research is at an early stage, he knows that the question of transport will arise in the near future. They agreed to get back together and discuss a partnership when the right time comes, even in the absence of funding. While both parties are engaged in other projects that are more suitable at the moment, their research is complementary and they have already established a basis of trust.

“Bridges have been built and a type of cross-pollination has happened.”

Among the various cases in which participants found areas where their projects overlapped and complemented one another, two German universities with the same topic decided to simply combine them. Instead of writing two competing proposals, they ended up collaborating and merging their research topics into one. Although the funding seemed rather meagre for their individual endeavours, they could see the advantages in optimising their joint efforts and increasing their performance. Some partnerships appeared to have the potential to happen even without funding.

One participant pointed out that it would be a loss if any of the seven applications were not approved, as all were at a very high level. He therefore challenged the sponsors to increase their funding and support all the proposals. After suggesting that the funding would not be enough to complete the projects, another delegate said they would write their application to elaborate their concept and figure out how to implement it in a subsequent stage considering the overall costs.

During the event, some participants were multitasking, but because they were interacting with one another for almost the entire time, this did not compromise their level of engagement and connection. It is important to remember that researchers and professors at this level have their work running in parallel. For instance, one professor recorded his lectures so that he could attend the entire event. Another Brazilian professor was

not allowed to do so and, as he was the only representative from his institution able to deliver an international programme in English, he gave lectures early in the morning and arrived later to the event. The same was true of a German professor who gave lectures at 6:00 am. This demonstrates the participants' level of commitment to their duties both at the event and elsewhere.

The short-term deadline presented a challenge for universities that depend on their dean to sign off on and approve engagements like these, which may involve a rather lengthy bureaucratic process. Despite this and other obstacles, the participants were enthusiastic about the positive outcome of the event. They praised the organisers for the great opportunity to get together with international partners and for creating a unique sense of cooperation.

"The matchmaking worked very well. Everybody seems so familiar now on the third day. And there wasn't a single person who didn't get involved in at least one proposal."

A total of 21 experts from Germany and Brazil participated in the event. Considering the representatives of contributing institutions, the organisers, and the support staff, the total number of participants was 35. The German Chamber of Industry and Commerce (AHK) was invited to hold a matchmaking session between non-academic institutions and the delegates, so the number of participants increased to 40 after lunch on the third day.

ANNEX 2: LINK TO ALL PRESENTATIONS GIVEN DURING THE EVENT

Download here:
https://e1.pcloud.link/publink/show?code=kZdJBQZ2N1NaUQJCkzCtEu7LJTzx8NNCBoX

ANNEX 3: VISUAL IMPRESSIONS

- Photos: https://drive.google.com/drive/folders/15nleZvi7PYGvdOFdEAKFFfl7J7R5LJGI?usp=sharing
- Raw video and drone capture: https://drive.google.com/drive/folders/1u-QVmNuFKLB6MC_-d_OOhtSm9x-InOGZg?usp=sharing

PROJECT BRIEFS

WHICH PUBLIC POLICIES CAN INFLUENCE THE DEVELOPMENT AND INTEGRATION OF GREEN HYDROGEN AND ELECTRIC MOBILITY IN A FRAGMENTED AND DIVERSIFIED CONTEXT, AND IN WHICH WAYS? THE CASE OF BRAZIL.

GENERAL INFORMATION

University of Campinas, Institute of Geosciences, Department of Science and Technology Policy (DPCT), Laboratory of Electric Vehicles Studies (LEVE)
Coordinator: Professor Dr Flávia L Consoni
Researchers: Dr Altair Oliveira Filho
Dr Ediliane Camillo
Dr. Tatiana Bermúdez Rodríguez
PhD Student. Anna Carolina Navarro

▶ THE CHALLENGE

The aim of our proposal is to discuss the role of, and relationships between, government policy and regulation, and their articulation within innovative business models. The specific focus is on urban transport and logistics integrating two technological routes: green hydrogen and electric mobility. The question to understand is: what are the most appropriate technological routes and business model options in the Brazilian context?

Which scientific questions do you focus on?

What are the policies and regulations that the countries of global North and global South have been implementing to stimulate electric mobility and its integration with green hydrogen?

Are there any differences between the policies implemented by the countries of the global North and the global South?

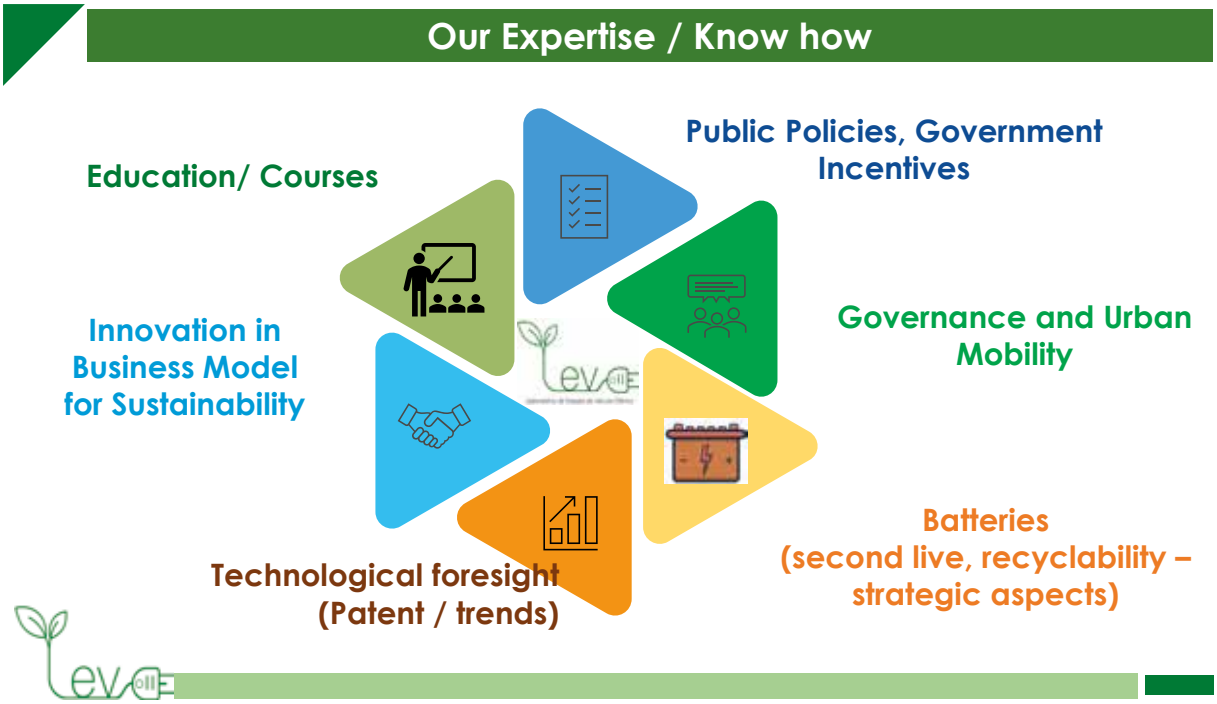
What kind of policies have been implemented by Latin American countries to stimulate electric mobility and green hydrogen?

What kind of business models have been implemented in Latin American countries that integrate electric mobility and green hydrogen in logistics and public transport?

What are the main policies and initiatives implemented in Brazil to stimulate the integration of electric mobility and green hydrogen?
What is the public policy coherence to promote the integration of, and synergies between and within, green hydrogen and electric mobility in Brazil?

Describe the background and relevance.

Our proposal will focus on the analysis of the policies and initiatives that are being implemented by the countries of Latin America for the stimulation of electric mobility and



Areas of expertise LEVE/ UNICAMP

green hydrogen. In fact, several Latin American countries such as Chile, Colombia, and Uruguay already have specific strategies and policies to stimulate both the development of green hydrogen and of electric mobility. These policies and roadmaps have defined short-, medium- and long-term goals for the implementation of battery electric vehicles and fuel cell electric vehicles powered by hydrogen. What can Brazil learn from Latin American experiences?

Describe the significance and innovation of your project idea.

We noticed that many Brazilian cities are planning the transition to low emission mobility despite the lack of policy coherence with federal policies and regulations. Our project intends to provide a framework that can guide the policy maker to promote the integration of green hydrogen and the electric mobility considering local specificities (diversities).

▶ THE APPROACH

In order to achieve our aim, we will carry out a mapping of international policies and initiatives that address the integration of two technological routes: green hydrogen and electric mobility. Moreover, we will analyse the strategies and initiatives that are being developed in Latin America regarding green hydrogen and electric mobility. Our proposal also includes the mapping out of the initiatives and policies in Brazil regarding the integration of these two technological routes. Finally, we intend to carry out interviews with the main stakeholders in Latin America and Brazil, as well as technical missions to learn about the main initiatives in the region with a focus on innovative business models.

▶ THE INTENDED IMPACT

Policies and regulations to encourage electric mobility and green hydrogen are critical to achieving carbon neutrality and meeting international climate commitments. In addition, the Latin American countries have the potential to develop a value chain in these technological routes with export possibilities. The mapping and analysis of policies, regulations and initiatives that are being implemented in the region (cities) will generate insights for the formulation of public policies in Brazil that integrate electric mobility and green hydrogen.

CONTACT

Flávia Consoni | University of Campinas | fconsoni@unicamp.br | +55 11 997834316
University of Campinas |Institute of Geosciences
Department of Science and Technology Policy (DPCT)
Laboratory of Electric Vehicles Studies (LEVE)
Rua Carlos Gomes, n. 50
Zip code: 13083-855
Campinas – São Paulo – Brazil.

ASSESSMENT OF PATHWAYS FOR A BILATERAL ENERGY PARTNERSHIP BETWEEN BRAZIL AND GERMANY.

GENERAL INFORMATION

Technology
Arts Sciences
TH Köln

Thorsten Schneiders, Ingo Stadler, Peter Stenzel
TH Köln

▶ THE CHALLENGE

Energy system transformations towards sustainable, renewable energy generation and efficient energy usage in the end-use sectors is a major challenge in the context of climate change and the global energy and economic crisis due to the conflict in the Ukraine. In this regard, bilateral cooperation between energy- exporting and energy-importing countries becomes of increasing relevance. Due to the shift from fossil fuels to renewable energy carriers, new partnerships need to be established. In this context several questions arise: How do supply and demand of renewable energy carriers fit together? Which energy carriers are most suitable for bilateral energy cooperation between Brazil and Germany? When will they be available, at what price, and in which quantities?

▶ THE APPROACH

In the proposed project, a bilateral energy system model between Brazil and Germany is developed with the focus on import and export of hydrogen and related power-to-x products. The model will be implemented in Python on the basis of open access energy system frameworks. The model will be jointly developed between TH Köln and partner Universities from Brazil.

▶ THE INTENDED IMPACT

Outputs and Results include the following:

- Scenarios for energy system transformation in Brazil and Germany
- Development of a techno-economic supply chain database for different renewable energy carriers
- Comparative assessment of renewable energy carrier supply chains
- Identification of the most suitable pathways for an energy partnership between Germany and Brazil
- Development of a roadmap for the implementation of selected energy cooperation pathways

The results will be published at international conferences and in high-level scientific journals as well as in the form of reports including summaries for policymakers. All results will be published with open access.

Engineering building TH Köln

Metabolon circular economy site

biomass and hydrogen laboratory at metabolon site

Fuel cell bus of Cologne public transport company RVK

Smart grid simulation lab at TH Köln

CONTACT

Prof. Dr. Thorsten Schneiders
Cologne Institute for Renewable Energy
TH Köln
Betzdorfer Str. 2
50679 Cologne, Germany
thorsten.schneiders@th-koeln.de

Photo & graphic credits (image rights):
Schneiders, TH Köln

GREEN H2, DIRECT ELECTRIFICATION AND STORAGE WITH 100% SOLAR ELECTRICITY

GENERAL INFORMATION

Prof. Ricardo Rüther
Universidade Federal de Santa Catarina
Solar Energy Research Laboratory

▶ THE CHALLENGE

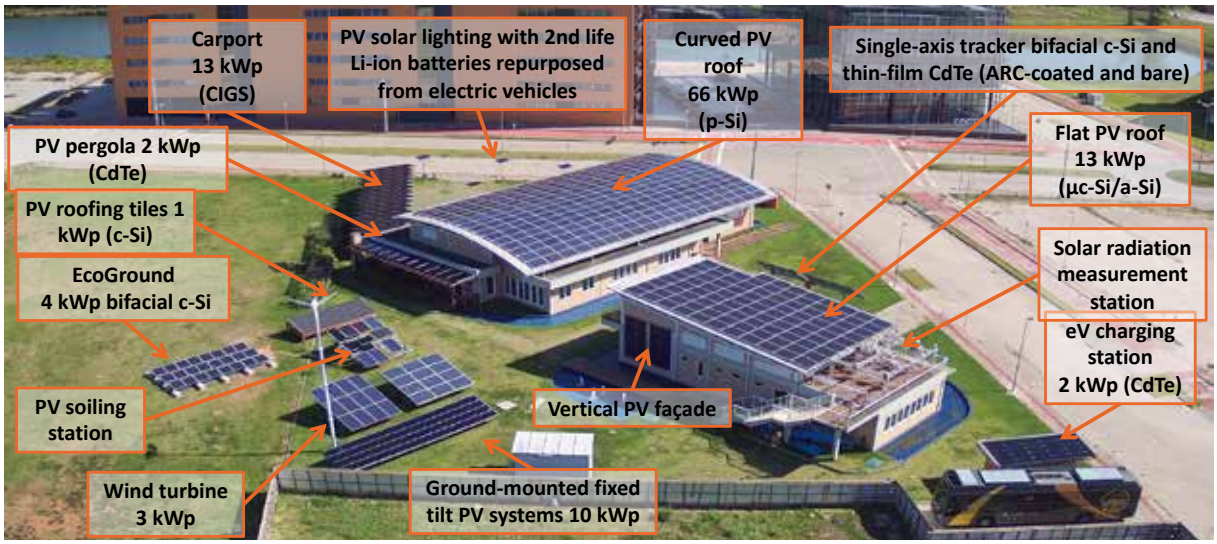
The project focus is the scientific and practical demonstration of the potential for a fully electrified, 100% solar-powered world, showcasing the Solar Energy Laboratory at Universidade Federal de Santa Catarina (www.fotovotaica.ufsc.br), in which solar photovoltaic energy conversion is used to produce green hydrogen and green ammonia, together with electrochemical electrical energy storage, electric mobility, and full electrification of all energy supply and loads. The declining costs of solar photovoltaics, together with the need to decarbonise the energy mix including transport, puts solar generation plus direct electrification among the most promising and effective means to abate climate change. All these technologies are put into practice at the Solar Energy Research Laboratory in Florianópolis, in which human resources training, technology showcasing, and innovative research and development efforts are carried out simultaneously.

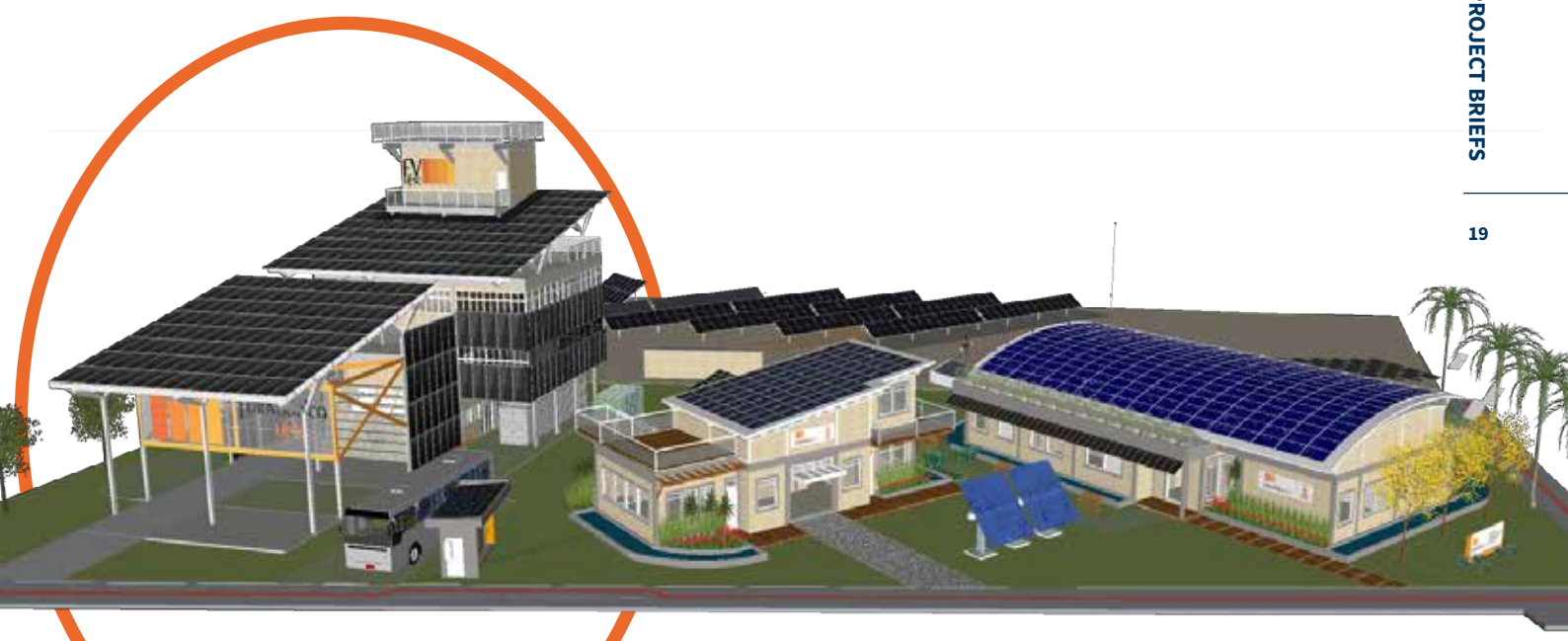
▶ THE APPROACH

With financial support from the Brazilian Ministry of Science and Technology (MCTI), and the German Agency for Technical Cooperation (GIZ and PtX Hub Berlin), the Solar Energy Research Laboratory at the Universidade Federal de Santa Catarina was established, with the objective of preparing well-trained human resources, showcasing technologies, and developing innovative R&D on solar photovoltaics, green hydrogen products, direct electrification, energy storage and electrical mobility. This living laboratory is now completing a whole set of infrastructure that will be used to further advance applied R&D in Brazil on all these topics. Training trainers, hosting researchers and visitors, demonstrating established and emerging technologies, and partnering with the energy industry to promote development and a more widespread and faster adoption of all these technologies are the core activities carried out.

▶ THE INTENDED IMPACT

The living laboratory resulted from the project idea, with training, technology showcasing and R&D activities in solar photovoltaics, green hydrogen and green ammonia, electromobility and energy storage as the core activities. Open days and capacity building to a varied demography are the means used for information transfer and public outreach.





The new energy storage (green H2 and Li-batteries)
Laboratory at Fotovoltaica/UFSC
Under construction in November/2022

CONTACT

Prof. Ricardo Rüther
Laboratório de Energia Solar Fotovoltaica
Universidade Federal de Santa Catarina, Sapiens Parque – Florianópolis-SC, Brasil
www.fotovoltaica.ufsc.br

Photo & graphic credits (image rights):
Prof. Ricardo Rüther
Universidade Federal de Santa Catarina

A SEAMLESS MOBILITY APPROACH TO PROMOTE ELECTRIFIED PUBLIC TRANSPORTATION.

GENERAL INFORMATION

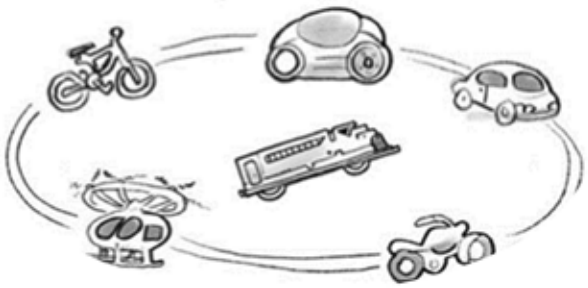
UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Lisa Kraus (Research Associate), Chair of General Business Administration and International Automotive Management, Chair holder Prof. Dr Heike Proff

▶ THE CHALLENGE

- To increase the acceptance of battery-electric public transport by the integration of further shared (electric) mobility offerings. To achieve this, the necessary partners need to interact in an ecosystem (e.g. Adner 2017) and align their roles with the overarching value proposition of "seamless mobility" to promote the mobility as a service (MaaS) concept (Fig. 1) and increase resilience.
- To determine the most promising way to promote the modal shift from the car to environmentally friendly solutions and public transport as the backbone of MaaS.
- To create a special focus on the different national institutional settings and governance rules.
- To innovate regarding MaaS promotion in the Global South.



Integrated mobility tp promote MaaS and to decarbonize transportation [1]

▶ THE APPROACH

- Create a blueprint of a minimum viable MaaS ecosystem with a focus on ecosystem governance: (1) value proposition, (2) the exchange platform definition, (3) operating model composition with individual value elements in the form of value streams (4) governance determination with rules, roles and regulations and (5) estimation of joint value created by all partners (Fig. 2).
- Investigations of the political and economic framework conditions of (for example) municipalities and employers.
- Take into account the high dependence on governance of integrated mobility in particular on local, national, and international regulations → condsideration on a case-by-case basis necessary.
- Comparative case study between Germany and Brazil.
- Examination of potential joint value creation via willingness to pay surveys (Fig. 3), market simulations, and expert interviews to determine existing regulations and future scenarios of best-case regulations and their financial impact, also regarding externalities.
- Partners: municipalities, sharing companies, Chair of urban planning.
- Methods: conjoint analysis to determine relative importance (Fig. 4) of different transportation attributes with a focus on electrified mobility; focus group discussions and scenario analyses as case studies comparing a Brazilian with a German city (Fig. 5).

▶ THE INTENDED IMPACT

- Outline for policy consultancy on value-enforcing regulations.
- Presentation at international conferences such as GERPISA and ICoMaaS.
- Publications of scientific papers in transportation journals.

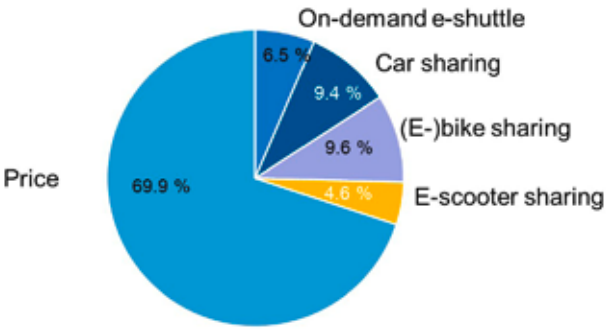
3 Which monthly offer is the best for you? (2 of 8)

	Option 1	Option 2	Option 3
On-demand e-shuttle	Up to 10 trips at one university	PAYG*	Up to 10 trips at one university
Car sharing	PAYG*	Up to 6 h or 200 km	Up to 6 h or 200 km
(E-)bike sharing	PAYG*	Up to 30 min pedelec, any number of times	PAYG*
E-scooter sharing	Up to 10 trips or 50 min	PAYG*	PAYG*
Price [€]	60	60	70

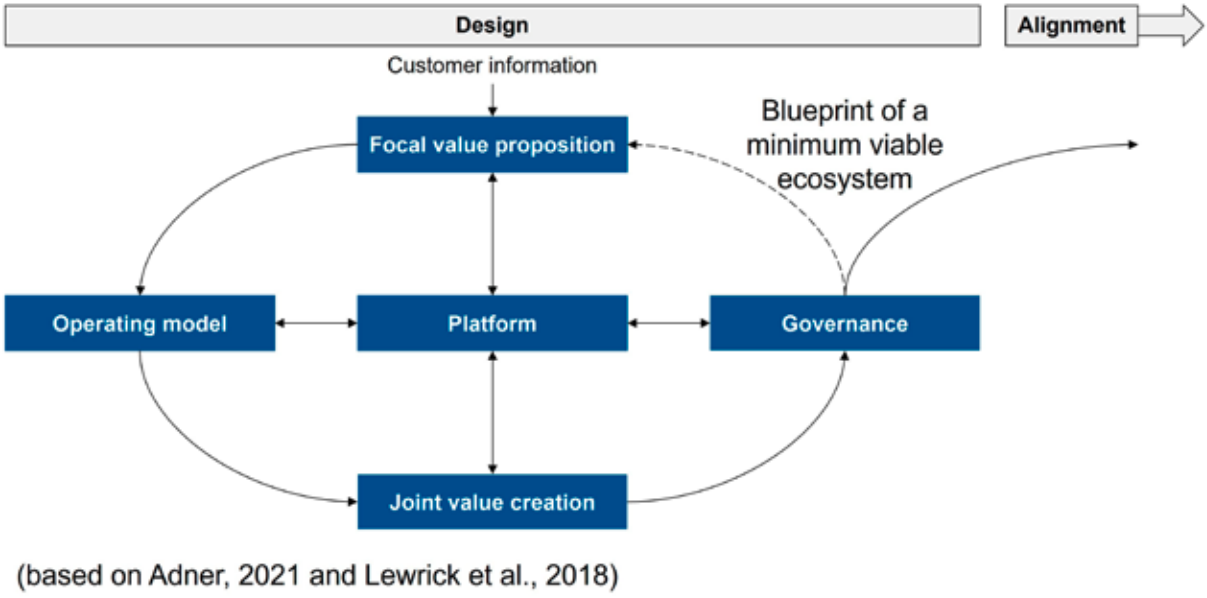
* PAYG = pay-as-you-go

Real price willing to pay: €___

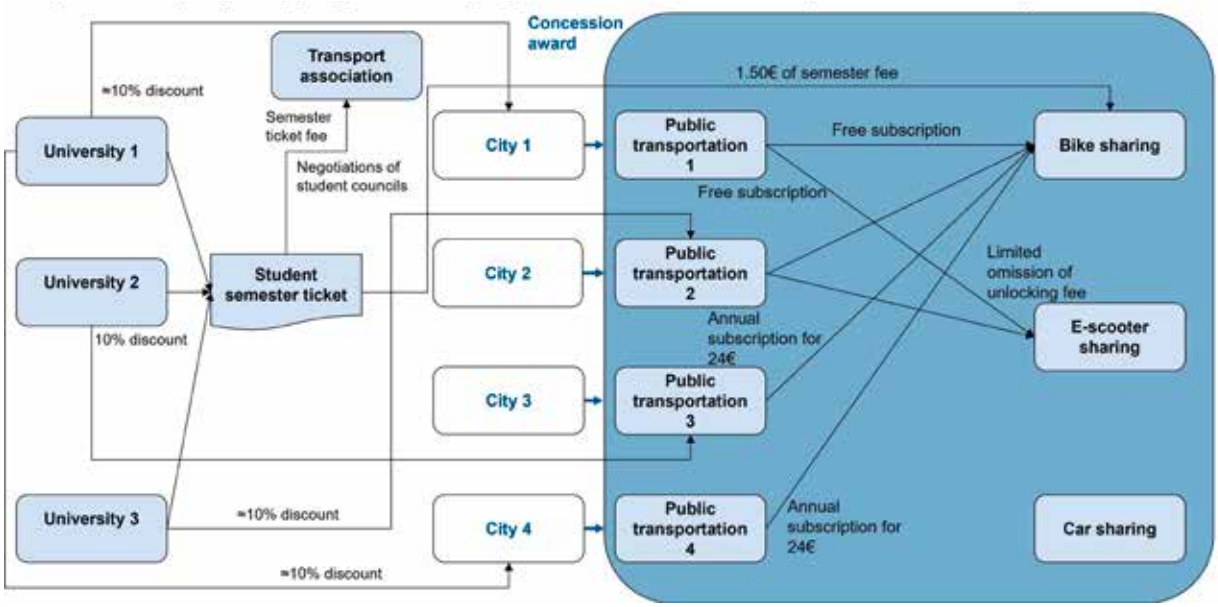
Survey page example of a conjoint analysis regarding MaaS offers for university students [3]



Relative MaaS attribute importance resulting from conjoint analysis regarding MaaS offers for university students [4]



Building blocks of a minimum viable ecosystem [2]



Exemplary mapping of existing agreements between transportation service providers [5]

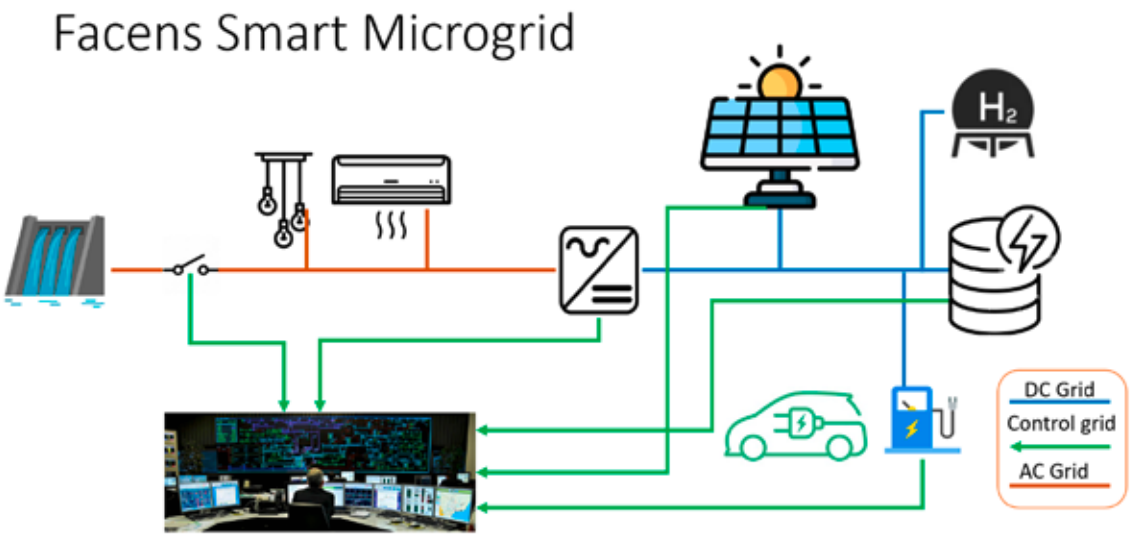
CONTACT

Lisa Kraus,
Chair of General Business Administration and International Automotive Management,
lisa.kraus@uni-due.de,
Lotharstr.1, 47057 Duisburg

A 5G SMART MICROGRID AS LIVING LAB FOR V2G

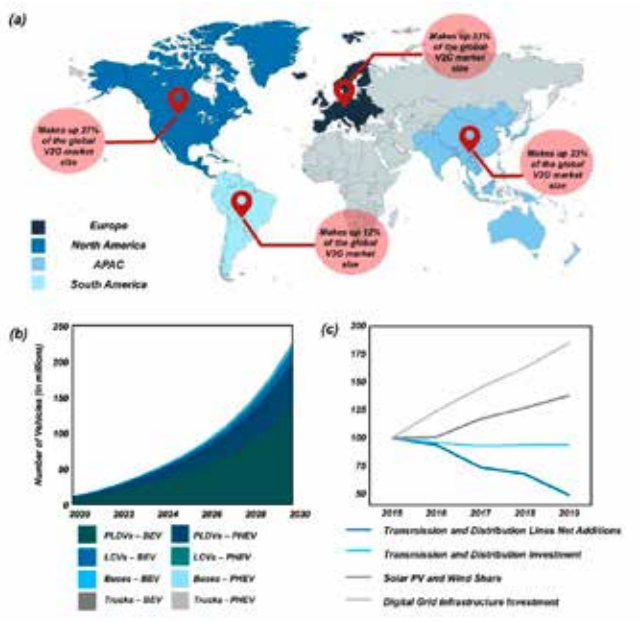
GENERAL INFORMATION

Roberto Silva Netto
Institution: Facens
Partners: UNIFEI (confirmed), others to be confirmed



▶ THE CHALLENGE

The aim is to understand the technological and regulatory challenges that may delay V2G from being implemented in Brazil. For this, we need to understand the level of maturity of the current technology and its use in practice globally. How can creating an integrated simulation platform involving the electrical system, the communication system, and the management and control system reduce the challenges of inserting electric chargers into the distribution system? This innovative framework has opened up new possibilities for testing and simulating real use cases, in order to evaluate most important aspects of the supply of energy within a microgrid.



(a) V2G market size across various countries globally, (b) projection of the number of EVs across different vehicle types till 2030, and (c) power grid investments in Europe.(t.ly/ZKqM)

V2G Stellantis Project (t.ly/_5MQ)

Ioniq 5 EVs with V2G to create world-first "bi-directional" energy system (t.ly/KD64)

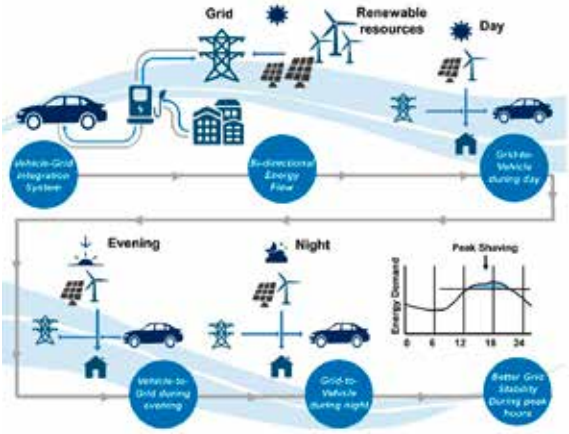
▶ THE APPROACH

First, it will be necessary to analyse the results of V2G use cases that already exist in the world (Germany and Italy). When the charging system was designed, not all protocols supported communication to enable V2G. What other approaches to solving this challenge have been studied, and what are the results? National regulatory aspects must also be understood in order to propose changes to the public sector so that research results can be implemented without impacting the quality and stability of the electricity system.

In 2015, a process of digital transformation was initiated in Facens, and it now has 5000 citizens served by an integrated system including energy meters, an electric vehicle charging station, 5G communication that covers the entire campus, and a substation without energy as a laboratory for training and qualification. Partnerships with companies like Stellantis, with its V2G project in Italy, provide mutual assistance, both with the vehicle and with understanding challenges that the project faces. CPFL, the energy utility that serves Facens, could assist with defining the requirements to prevent V2G's impact on the distribution system. Bosch, the partner in another ADAS project, could help with integrating the vehicle into the Facens electrical system. Discussions are underway with Huawei's Digital Power division regarding how their inverters could be used to create a virtual power plant which could be integrated into CPFL's electrical system. All this, combined with the simulation in real-time digital simulators (RTDS), allows Facens to test devices and algorithms accurately without connecting to the active power system.

▶ THE INTENDED IMPACT

Which solutions are currently being developed and studied that can be implemented so that V2G can be used? What are the regulatory aspects that can prevent V2G from being used as a solution to improve the quality of energy concessionaires? What is the main obstacle for energy utilities in adopting V2G as a solution for the development of their smart grid? Can the vehicle be considered as a power supply platform for one's home, neighbourhood or business? What is needed in order to implement the technology that already exists for energy transport and communication between systems? A roadmap which suggests the best way forward could reduce the time between studies and the actual use of technology.



An illustration of the V2G concept during different times of the day (t.ly/ZKqM)

5G Smart Campus Facens

CONTACT

Roberto Silva Netto
Insitution: Facens
Address: Rodovia Senador José Ermírio de Moraes, 1425
Castelinho km 1,5 – Alto da Boa Vista
Sorocaba/SP – CEP 18087-125
Email: roberto.netto@facens.br

COST-EFFICIENT METHANOL SYNTHESIS FOR THE STORAGE OF GREEN HYDROGEN

GENERAL INFORMATION

Prof. Dr. rer. nat. Johannes Gulden
Head of the Directorate of the Institute for Renewable Energy Systems
Stralsund University of Applied Sciences

The Institute of Renewable EnergySystems founded by over 30 scientists from the University of Stralsund on the 14th January 2009 structures the joint commitment in applied research and practical oriented teaching in the fields of renewable energy sources and hydrogen technology at the University of Stralsund.

The goal of the scientific institute is the interdisciplinary research, teaching and training and the technology transfer in the area of modern energy systems with focus on:

- Use of renewable and alternative energy
- Energy conversion, storage and use
- Modelling and automation of related processes
- Economic and environmental aspects of such energy systems

▶ THE CHALLENGE

The competitiveness of green methanol compared to fossil alternatives will depend on the efficiency of the methanol production plants, the cost of renewable energy resources, the availability of biogenic CO2, and the different utilisation pathways. The present methanol synthesis processes are not economically profitable on a small and medium scale, and are only cost-efficient under certain conditions in large-scale applications. However, profitability could be viable through process optimisation in the methanol synthesis process. Our research project focuses on the integration of water separation into a methanol synthesis plant to eliminate the current need for downstream distillation of the methanol-water mixture to obtain pure methanol. In this way, the methanol production can be more cost-efficient and the methanol synthesis technology will be brought closer to market maturity.

the Lab of Alternative Energies at the Institute of Renewable Energy Systems © University of Applied Sciences Stralsund

▶ THE APPROACH

The planned research project has several objectives:

1) To develop and demonstrate a concept for water separation during methanol synthesis to increase efficiency and economic feasibility.
2) To work out the economic, feedstock and energy synergies with the processes that can provide biogenic CO2 and green hydrogen in Brazil, the desired country of production.
3) To calculate the change of the carbon footprint in different sectors (transport, industry, agriculture) depending on the CO2 source, the hydrogen production potentials, and the synergies through process integration at the sources of biogenic CO2.
4) To survey the status quo in Brazil and assess impact, investigating the importance of fossil fuels and their substitutes for the Brazilian economy as well as interdependencies between sectors.
5) To identify important changes to be expected from the expansion and scaling up of methanol synthesis.
6) To estimate the changes in the economic structure of the producing country Brazil through the uptake of the production and use of green methanol in different sectors.

▶ THE INTENDED IMPACT

The outputs and results of the project will be

- the installation of a jointly developed methanol synthesis plant with water separation at a pilot site in Brazil
- test results: proof of concept of the integrated water separation
- optimised methanol synthesis for production of green methanol that can be applied in smaller scale, for example at farms, to diversify and extend the agriculture business
- measurement campaigns with different sources of biogenic CO2 (ethanol, paper, biogas)
- impact assessment through the expansion of a methanol economy: identifying the potential for substituting fossil fuels in different sectors of the Brazilian economy through the production and use of green methanol
- knowledge transfer of hydrogen and methanol production technology to Brazilian researchers and economies

the Lab of Alternative Energies at the Institute of Renewable Energy Systems © University of Applied Sciences Stralsund

Mini-methanol synthesis plant at the University of Applied Sciences Stralsund ©

CONTACT

Prof. Dr. rer. nat. Johannes Gulden
Head of the Directorate of the Institute for Renewable Energy Systems
Stralsund University of Applied Sciences
Zur Schwedenschanze 15
D-18435 Stralsund

Phone: +49 3831 45 6742
E-Mail: Johannes.Gulden@hochschule-stralsund.de

DEVELOPMENT OF A TOOL TO SUPPORT THE LICENSING OF GREEN HYDROGEN PLANTS USING THE LIFE CYCLE ANALYSIS CONCEPT

GENERAL INFORMATION

José Tavares Araruna Júnior
Department of Civil and Environmental Engineering
Pontifical Catholic University of Rio de Janeiro

▶ THE CHALLENGE

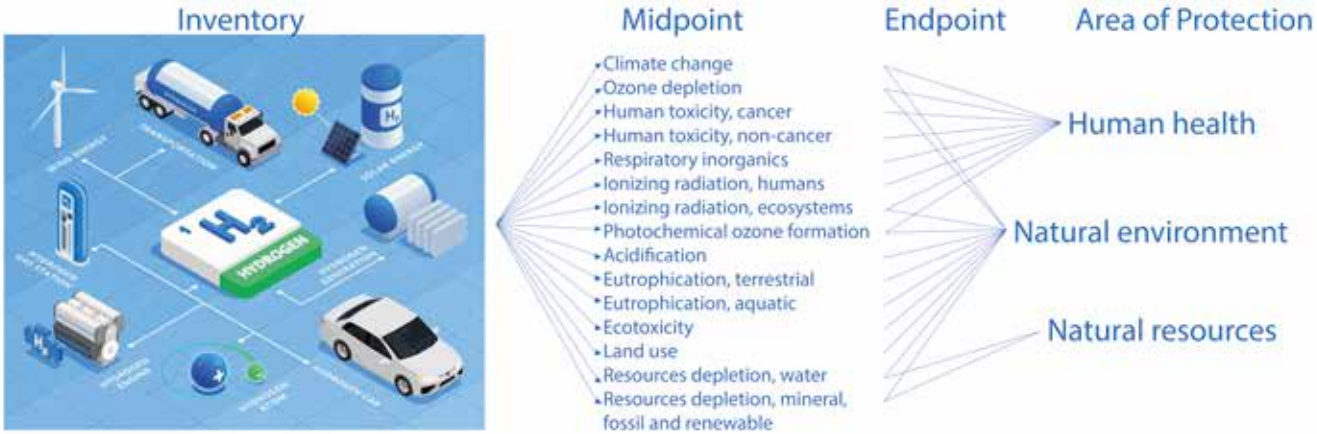
The proposal aims to improve environmental licensing practices and the evaluation of the environmental impacts of green hydrogen plants. The discussion about these themes and where they interface with the environment is relatively new in the national context. Therefore, this proposal, if implemented, will consist in a critically important instrument for improving environmental licensing, which will foster further discussion in the country.

▶ THE APPROACH

The proposal aims to apply the concepts of life cycle management to ensure efficient environmental management of green hydrogen production in Brazil. In this context, the application of the concept of the life cycle is presented as a tool for addressing new paradigms of innovation, integrated management, knowledge dissemination, and the promotion of technologies and methods for the management of environmental risks in order to promote sustainable use of natural resources and facilitate regulators in their decision-making processes. The methodology will be based on an analysis of the cause and effect chains produced in the waste and effluent management process and also factor in atmospheric emissions from green hydrogen plants, taking into account the interrelations between phase/activity/aspect/environmental impact/programmes, plans, projects and mitigating procedures/measures for this typology. A qualitative paradigm will be adopted based on a literature review; interviews with professionals in the sector; field research; data collection for the characterisation of solid waste, volumes, logistics, and types of appropriate treatments; and mapping of the current scenario.

▶ THE INTENDED IMPACT

The aim is to compile a database that gathers inputs and outputs for the different processes involved in the a) licensing, b) construction and assembly, c) manufacturing and distribution, and d) decommissioning phases of green hydrogen production. It is expected that the implementation of life cycle analysis as a methodology will aid in compiling existing information to facilitate reflection, comparative analysis, and/or decision-making on the environmental impacts of different options for managing waste, effluents, and emissions. The expectation is that it will be possible to identify the challenges and benefits in the use of databases and computational packages for the improvement of environmental programmes that are required by the Brazilian Environmental Federal Agency and implemented by operators in the management of green hydrogen production activities.



CONTACT

José Tavares Araruna Júnior
Department of Civil and Environmental Engineering
Pontifical Catholic University of Rio de Janeiro
Rua Marquês de são Vicente, 225 – Gávea – Rio de Janeiro

A METHODOLOGY FOR MINIMISING THE IMPACT OF VEHICULAR CHARGING ON THE ENERGY DISTRIBUTION GRID, THROUGH NETWORK RECONFIGURATION, PV GENERATION AND INSERTION OF ENERGY STORAGE

GENERAL INFORMATION

Marcos Malveira is a senior researcher at ITEMM (Edson Mororó Moura Institute of Technology)

▶ THE CHALLENGE

The increasing number of electric vehicles could impact negatively on the electrical protection grid levels, generating failures and imbalances in the networks. There is a need to evaluate how to allocate new charging points, and how to minimise their impact on the energy distribution network. The objective of the research is to evaluate impact minimisation strategies through the optimisation of lines and the insertion of photovoltaic microgeneration with energy storage.

▶ THE APPROACH

This study would be aimed at analysing the estimated load increase in a distribution network with the addition of charging stations, and evaluating the reconfiguration of the feeders using optimisation and load transfer techniques. Such algorithms are commonly used in so-called smart grids, but are usually applied in FLISR (Fault Location, Isolation and Service Restoration) solutions. In this case, the application will be directed to load relief, which would already significantly reduce investments in generation and storage. Once the power grid readjustment is applied, the association of energy storage systems with photovoltaic panels is proposed, with the objective of smoothing the energy demand on the grid. This study should generate a methodology proposal for the sizing and economic feasibility of the application including environmental aspects, recycling and disposal, both for panels and batteries.

As a result of this research, it is expected that a pilot test will be carried out in partnership with an energy concessionary to validate the reconfiguration of the feeders, where possible, and to monitor the impacts suffered by the feeders with and without the associated generation system to charging stations.

▶ THE INTENDED IMPACT

The intended outcomes of this research are the creation of a new network evaluation procedure for the installation of electric stations, and a feasibility study that will allow the evaluation of pairings of energy generation and storage, which minimise negative impact on energy distributors. Such a model can be applied both in the Brazilian electrical system and in electrical systems in other countries, requiring only adjustments in costs and generation potential.

CONTACT

Marcos Roberto Rodrigues Malveira, ITEMM – Instituto de Tecnologia Edson Mororó Moura
Address: Padre Carapuceiro Street, 733 room-1301 Recife-PE, Brazil

INNOVATIVE HYDROGEN EVAPORATOR TECHNOLOGY

GENERAL INFORMATION

THU
Technische Hochschule Ulm
University of Applied Sciences

Prof. Dr.-Ing. Ralf Voß, Ulm University of Applied Sciences

Partner:
Prof. Dr.-Ing. Peter Renze, Ulm University of Applied Sciences

▶ THE CHALLENGE

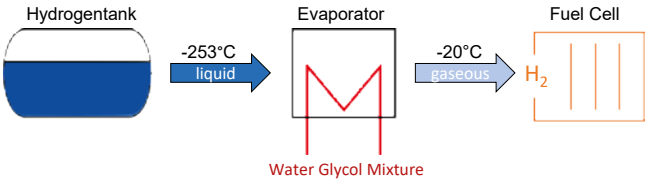
The use of green hydrogen is undisputedly of great importance for the decarbonisation of central areas of the world's mobility sector. For mobile applications, the low energy density of hydrogen is a challenge for storage technology, and the liquefaction of hydrogen offers the best solution. This requires an extreme thermodynamic condition (-253°C). Fuel cells, however, require hydrogen in gaseous form at moderate temperatures (above -20°C). For many applications, reliable and established technological solutions for controlling these state changes do not yet exist.

▶ THE APPROACH

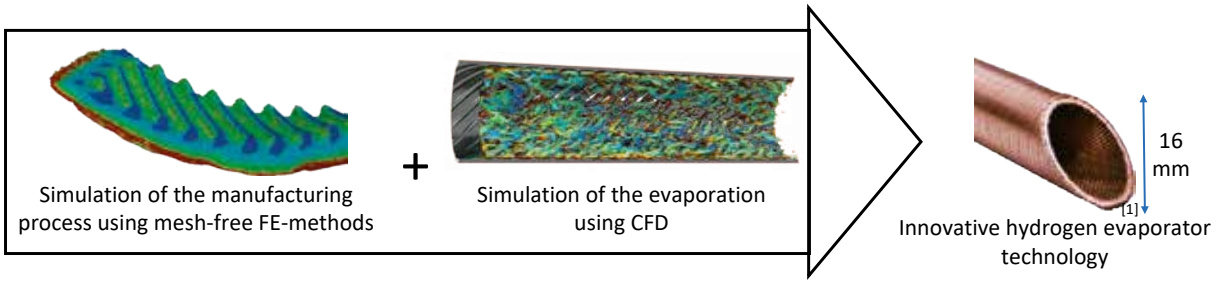
The subject of the proposed research project is the investigation of technological concepts for the evaporation and superheating of liquid hydrogen in a heat exchanger. The project will investigate the use of heat transfer intensification through micro-structured surfaces of evaporator tubes. The main challenges lie in avoiding icing in the warmer fluid and Leidenfrost effects in the evaporating hydrogen.
The production of such micro-structured geometries is also challenging in terms of manufacturing technology. For this reason, modern simulation methods are to be used to investigate the structuring while simultaneously considering the manufacturing process and the final product's properties in a multi-domain simulation model.
The proposed project structure is as follows: THU will be responsible for the simulation of the manufacturing process and the creation of the necessary material models. The Brazilian partner will handle the CFD simulation by developing a solver (e.g. in OpenFoam) that simulates the evaporation of hydrogen in micro-structured heat exchanger tubes. A third potential partner may be responsible for manufacturing tests and thermal experiments.

▶ THE INTENDED IMPACT

By providing a suitable multi-domain simulation model that includes both the manufacturing process and the heat transfer calculation, it will be possible to efficiently develop small, compact, and cheaper evaporators, especially for mobile applications (such as trucks, which play a central role in Brazilian logistics). The potential market is huge: In 2021, for example, around four million heavy trucks (>6 tons) were produced worldwide.



Process of mobile use of liquid hydrogen [1]



Approach of the research project [2]

CONTACT

Prof. Dr.-Ing. Ralf Voß
Institut für Konstruktion und CA-Techniken
Technische Hochschule Ulm
Prittwitzstraße 10
89075 Ulm
Phone: +49 (0) 731 50-28249
E-mail: ralf.voss@thu.de

A BRAZILIAN INDUSTRIAL FRAMEWORK TO SUPPORT THE ENERGY TRANSITION TO MORE SUSTAINABLE PRODUCTION.

GENERAL INFORMATION

Sérgio Roberto Knorr Velho, University of Brasília (UnB)
Prof. Dr Sanderson Cezar Macêdo Barbalho (UnB)
Prof. Dr Paula Meyer Sorares (UnB)
Jorge Boeira (Cognitio Consultoria)

▶ THE CHALLENGE

Which industrial sectors in Brazil are best suited for direct electrification, indirect electrification, and energy storage? More than 30% of Brazil's total energy usage and approximately 40% of its electricity consumption are accounted for by industry. According to the Energy Efficiency Atlas (2021) published by the Energy Research Company (EPE), 33.8% of the nation's energy usage in 2020 came from the industrial sector. Motors, pumps, and compressors are examples of equipment used in these industrial facilities on a daily basis that has an impact on energy demand as well as the needs of the electrical system.

▶ THE APPROACH

The general strategy for the task would be the following:
1. Data analysis of industrial sector and utility electrification (base scenario).
2. Analysis of policies created by industry for the optimisation and efficiency of processes.
3. Evaluation of technologies for alternative electrical processes according to different electrification scenarios in different industrial sectors (state of the art).
4. Modelling and analysis of electrification scenarios based on suggested solutions.
5. Scenario comparison and evaluation.

▶ THE INTENDED IMPACT

Due to the fact that industrial sectors have thus far mainly been ignored in climate policy, new research and policy assessment methodologies are required to promote and evaluate progress. Through direct, indirect, and energy storage electrification of industrial sectors, it is believed that this study will directly contribute to efforts to achieve the global objective of zero emissions.

CONTACT

Sérgio Roberto Knorr Velho
University of Brasília (UnB)
Prédio da Faculdade de Tecnologia, Bloco E
Campus Darcy Ribeiro
70910-900 Brasília-DF
knorrtec@gmail.com
sergio.velho@mcti.gov.br

Photo & graphic credits (image rights):
Source: siderurgiabrasil.com.br 19-05-2022

BIOMASS TO HYDROGEN AND DIMETHYL ETHER IN INTEGRATED BIOREFINERY CONCEPT USING PROCESS INTENSIFICATION (HIDESPI)

GENERAL INFORMATION

Prof. Dr Karen Valverde Pontes
Federal University of Bahia
Partners: BTU Cottbus-Senftenberg / TU-Berlin

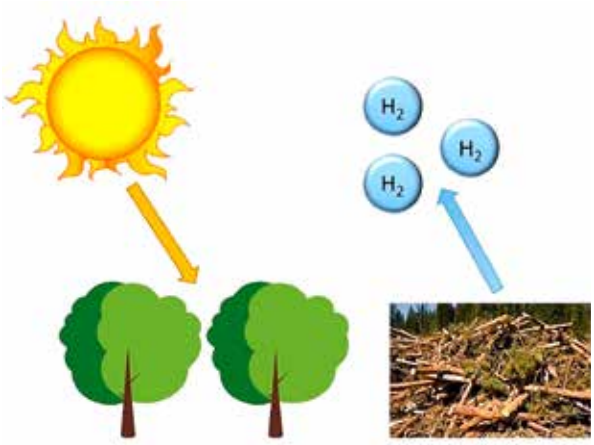
▶ THE CHALLENGE

Residual biomass plays a key role in the current energy transition. The gasification of residual biomass offers a new business model for the H2 value chain: a decentralised solution for the production of sustainable fuels aimed at supplying both the national and international markets. Innovative technologies for pre-treatment of biomass and the intensification of the conversion step will be the cornerstone for scaling up and commercialising the process.

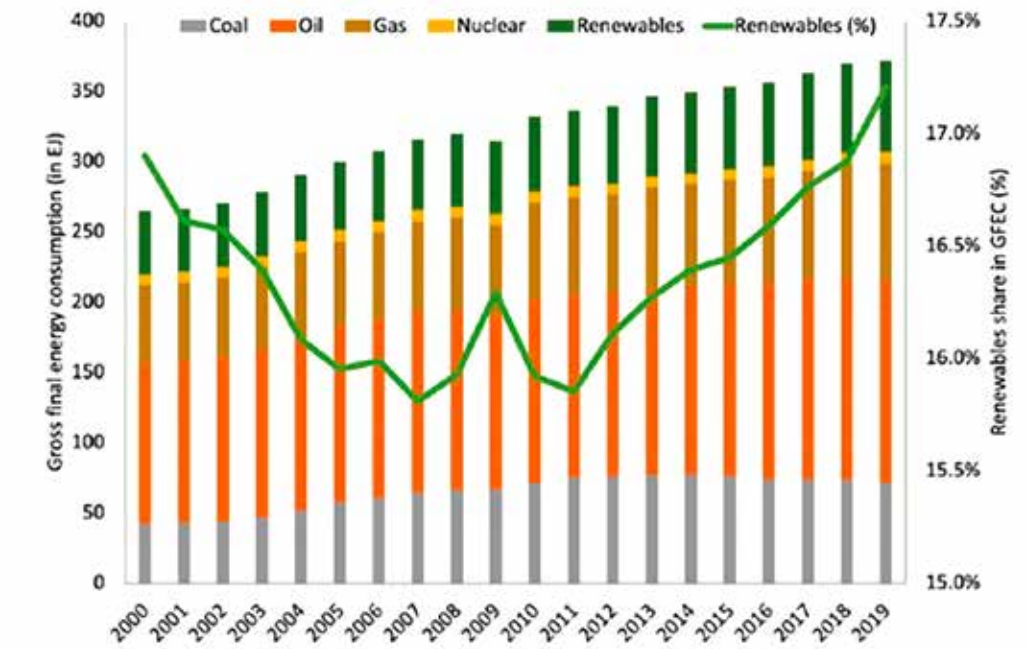
▶ THE APPROACH

The main goal is to produce H2 from residual biomass gasification and convert it into chemicals and renewable fuels in the context of an integrated biorefinery as an alternative for the expansion of renewable energy sources in the global energy matrix. Some technological and economic barriers will be investigated, such as the presence of tar in the synthesis gas, which reduces the efficiency of the process; the cost of logistics and the pre-treatment of biomass as a result of its decentralisation and low energy density; and the conversion of CO2-rich syngas into sustainable fuels such as dimethyl ether (DME).

This is a joint project with BTU-Cottbus Senftenberg and TU-Berlin. The former will assist with the intensification of a DME synthesis reactor, and the latter with carbon capture and product purification using cost-effective technologies. UFBA will be responsible for the biomass pre-treatment, gasification, and catalytic synthesis.



Biomass to hydrogen concept. [1]

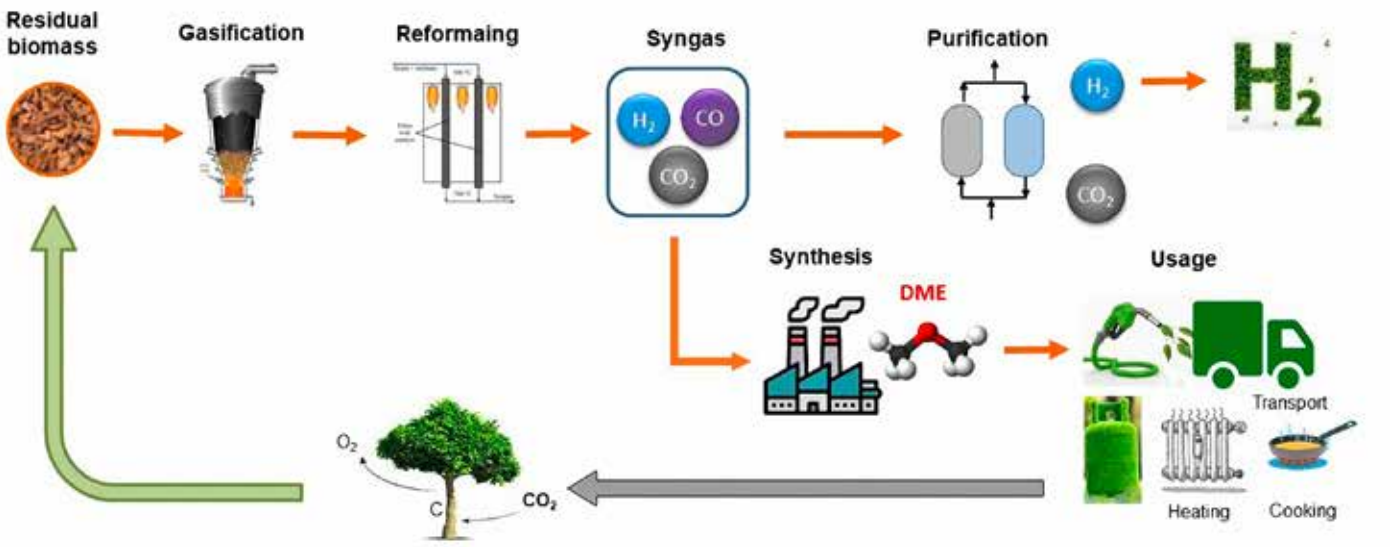


Total energy share. Source: Tezer et al. Biomass gasification for sustainable energy [2]

Gasification pilot plant at UFBA [3]

▶ THE INTENDED IMPACT

The project will provide a cost-effective and sustainable pathway for decentralised production of H2 and sustainable fuels, especially DME within the context of a biorefinery. The conversion of H2 into DME offers a safer alternative to hydrogen storage and transportation while taking advantage of existing energy infrastructure. Gasification of residual biomass is a carbon neutral process that contributes to the circular economy and reduces dependence on fossil fuels. The use of residual biomass not only solves the problem of disposal, but also adds value to agro-industrial residue. The solutions addressed here could be promising in the synthesis of other sustainable fuels in the hydrogen value chain. Therefore, the outcomes of this project might interest a broader spectrum of players in the energy transition.



Integrated biorefinery for hydrogen and sustainable fuel production [4]

CONTACT

Prof. Dr. Karen Valverde Pontes
Federal University of Bahia
Rua Aristides Novis n.2 – Escola Politécnica, Federação Salvador Bahia – Brazil
karenpontes@ufba.br

ROBUST BATTERY DESIGN FOR ISOLATED SYSTEMS

GENERAL INFORMATION

Technische Hochschule Ingolstadt

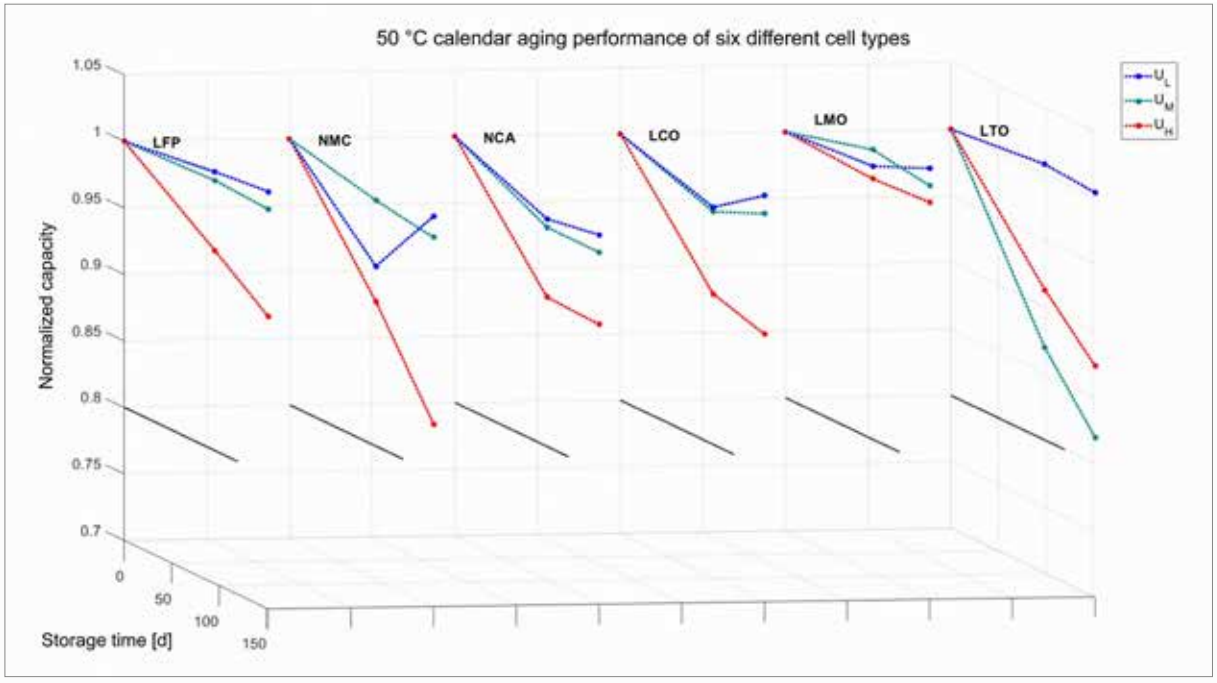
Prof. Dr.-Ing. Sergej Diel
Prof. Dr.-Ing. Hans-Georg Schweiger
(Technische Hochschule Ingolstadt)

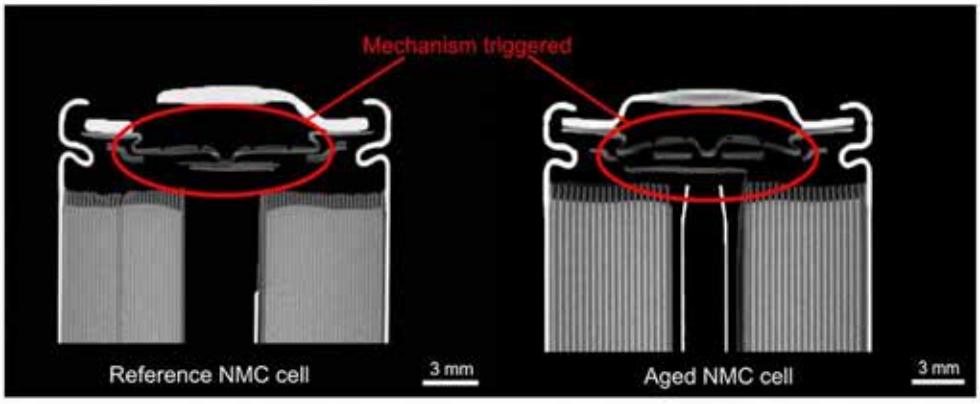
▶ THE CHALLENGE

Lithium-ion batteries (LiB) exhibit high efficiency, long service life, and a high energy density. For this reason, they are well suited for use in isolated systems. In order to ensure robust functioning and long service life, key factors such as usage behaviour and environmental conditions must be considered when designing LiB batteries. This project focuses on the development of robust batteries for isolated systems while factoring in usage behaviour, environmental conditions, and mechanical aspects.

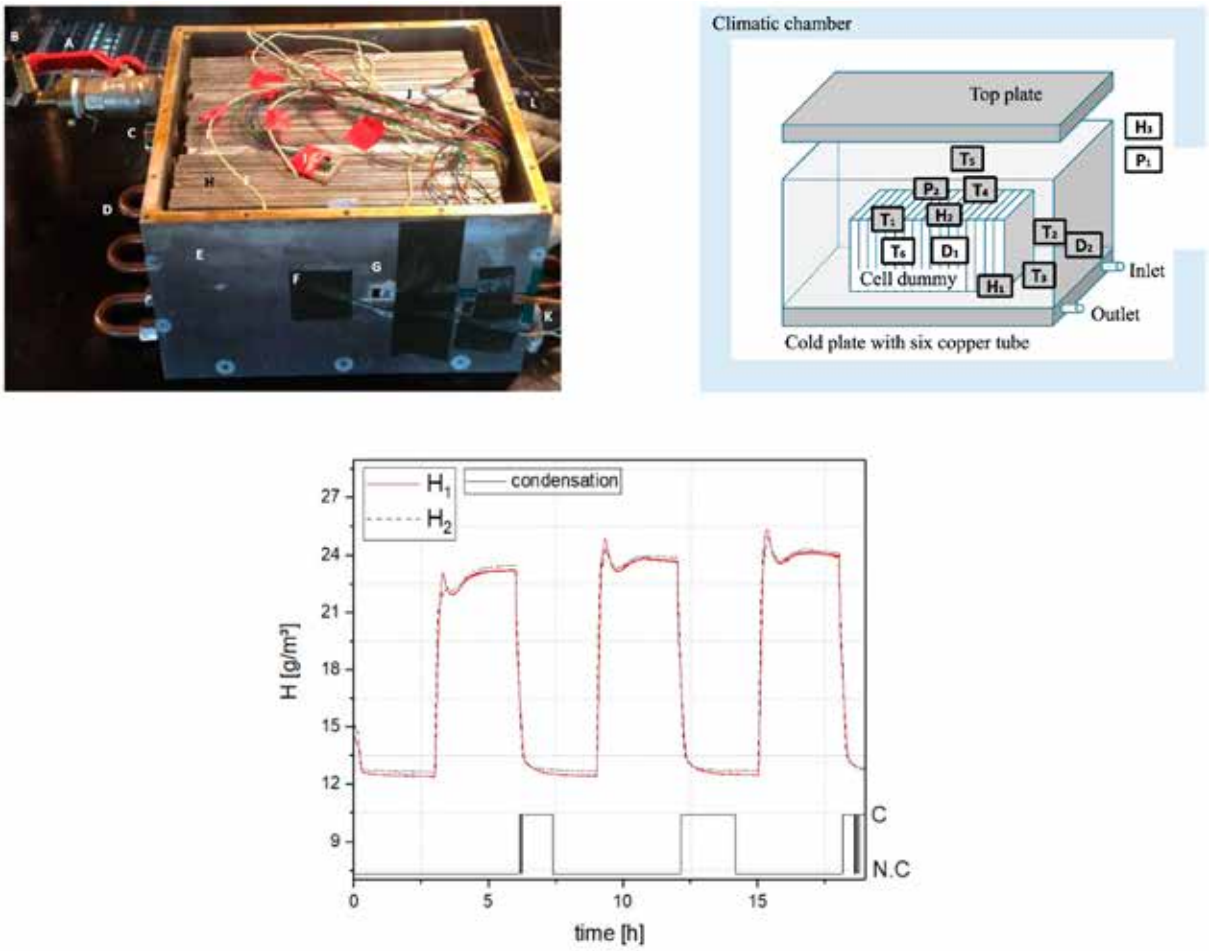
▶ THE APPROACH

The fundamental behaviour of cells available for the Brazilian market will be investigated first. On the basis of experimental investigations on different cell types for cyclic and calendar aging, the cells are to be examined at different temperatures and air humidities. For this purpose, relevant parameters such as state of health or internal resistance will be measured and evaluated. Based on these results, mathematical models for predicting service life in the climatic conditions of Brazil will be developed. This





Calendar aging performance of different cell types and CT scans of a new and an aged cell [1]



Physical simulation of water condensation in battery systems [2]

will make it possible to select the most suitable battery cells. In order to minimise the influence of moisture on the corrosion of fasteners in batteries, design proposals for an optimised design will also be developed. Another relevant point relates to the expansion of battery cells as a function of service life and charging cycles ("swelling"). Depending on how battery cells are mounted in a housing, swelling can lead to a reduction in service life. For this purpose, the force-response curves of battery cells will be measured. Using this information, FEM simulations are to be used to elaborate design proposals for battery housings that facilitate optimal operation in terms of service life.

▶ THE INTENDED IMPACT

Since the anticipated research results apply to energy storage systems in general, usability and scalability throughout the Brazilian market is to be expected. Depending on the results obtained, recommendations on the use of certain types of storage systems can be developed.

Apparatus for measuring force-response curves of cells due to swelling during operation [3]

CONTACT

Prof. Dr.-Ing. Sergej Diel, Faculty of Mechanical Engineering, Technische Universität Ingolstadt

SPATIAL OPTIMISATION OF OFFSHORE POWER PLANTS FOR COST-COMPETITIVE HYDROGEN PRODUCTION

GENERAL INFORMATION

Technische Hochschule Ulm
University of Applied Sciences

Federal University of ABC (UFABC)
Laboratory of Computational Intelligence Applied to Electrical Systems (LICSE)

▶ THE CHALLENGE

Offshore energy sources such as offshore wind and solar photovoltaic installations can be a sustainable complement to each country's electricity matrix. Additionally, energy surpluses can be used to produce green hydrogen for other energy demands. In countries with a high dispersion of energy demands and several environmental conservation zones, spatial techniques are thus becoming essential to meet the goals of all the stakeholders involved in installing offshore plants. In this project, the LICSE laboratory and future German partners will develop spatial optimisation methodologies to reduce the cost of implementing offshore plants.

▶ THE APPROACH

This project aims to develop an open-source computational tool to assist decision-makers in installing offshore plants. The LICSE laboratory will characterise spatial constraints and process public spatial databases to achieve this objective. The methodology developed by LICSE is based on three steps:

The first involves selecting the areas of most significant interest for the study through geoprocessing techniques while factoring in environmental, technical, and social restrictions. At this stage, the project is looking for partners in Germany who are interested in contributing. After that, there will be virtual meetings to build a spatial database that will be used as input information to better characterise the potential in Brazil and Germany.

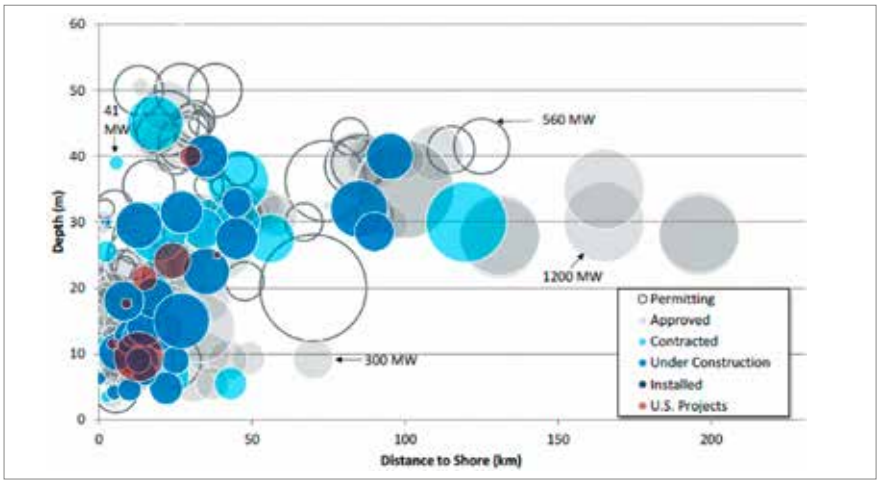
In the second stage, LICSE will use computational intelligence techniques to quantify investment within the selected areas and the corresponding electrical energy production, taking into account the available connection capacity of the nearest electrical substation. In this step, the LICSE laboratory and future partners from Germany will work together to develop optimisation tools and discuss findings related to their improvement.

Finally, LICSE and its partners from Germany will calculate the surplus energy available for hydrogen production in order to size the appropriate hydrogen production system to meet the energy demand in each zone.

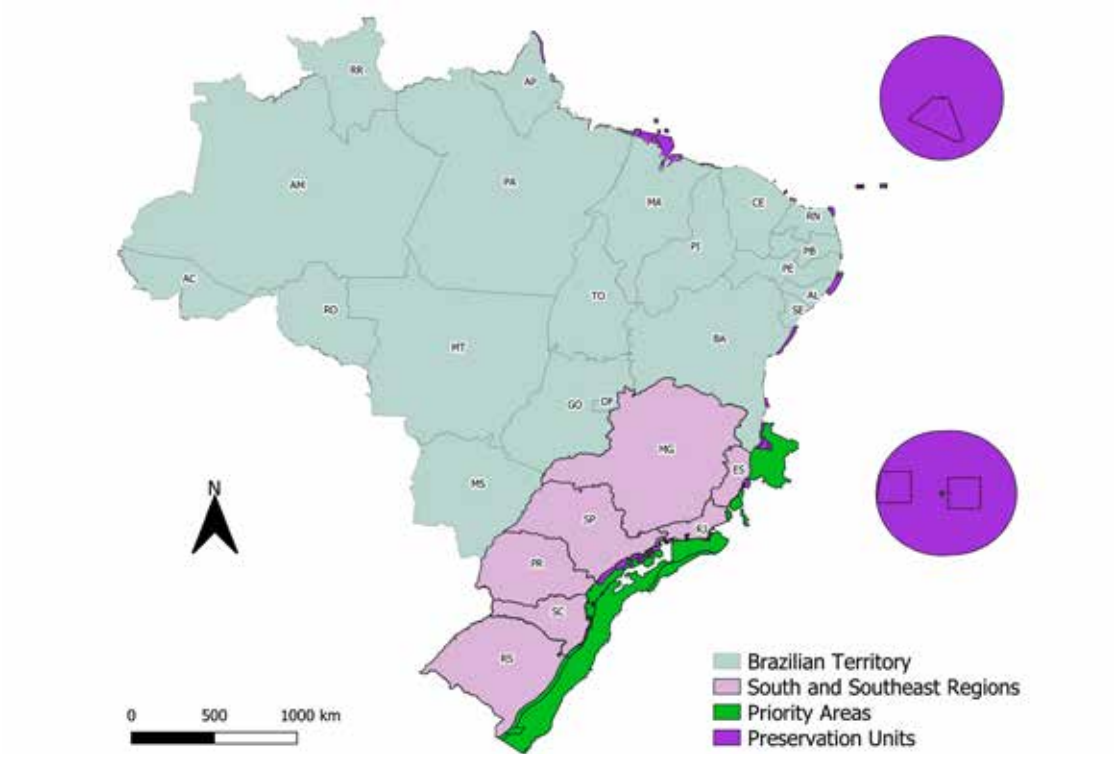
▶ THE INTENDED IMPACT

The project is meant to produce an open-source computational tool for evaluating favourable sites for installing offshore plants to produce green hydrogen and generate electricity. The expected results will thus show the market's spatial potential and make it possible to identify the plant locations that could significantly contribute to the electrical system and hydrogen production. Finally, the computational tool the project plans to develop will be usable in different countries to identify the best sites for offshore power plants.

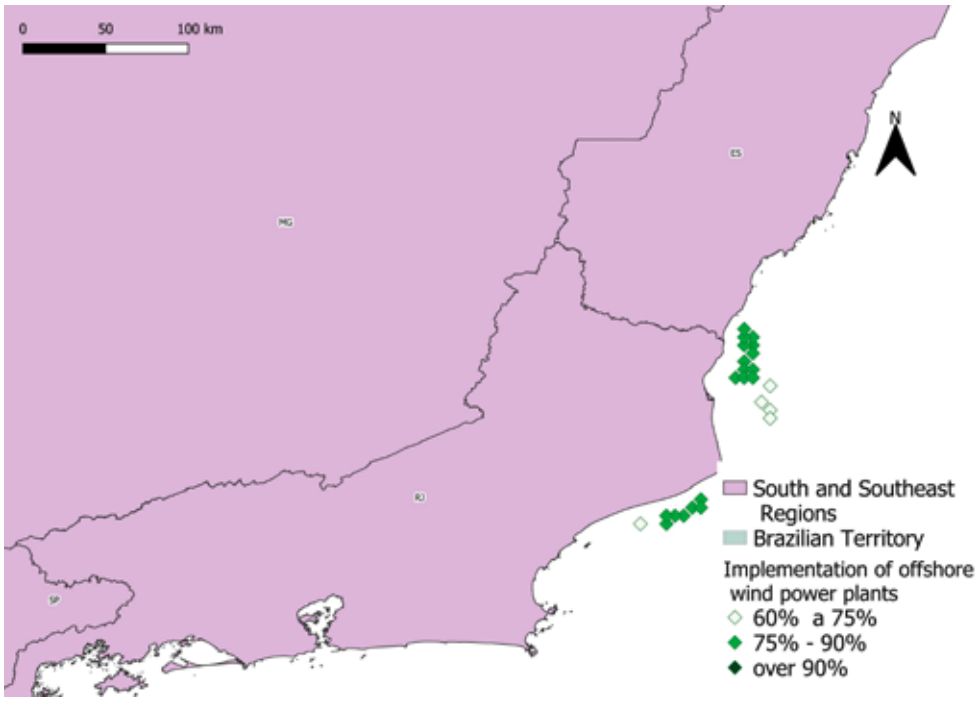
LCOE of offshore wind, 2010–2020 [2]



Distribution of offshore wind projects by size, installation depth, and distance from shore for 2017 [1]



Environmental conservation zones and regions with high electricity consumption [3]



Favourable locations for offshore wind power plants in Rio de Janeiro and Espírito Santo [4]

CONTACT

Karen Fernanda de Paula, UFABC, karen.paula@aluno.ufabc.edu.br
Julio Giovanni Del Mar La Torre, UFABC, julio.giovanni@ufabc.edu.br
Joel David Melo Trujillo, UFABC, joel.melo@ufabc.edu.br

UFABC - Avenida dos Estados, 5001 - Bangú, Santo André - SP

Photo & graphic credits (image rights):

[1] Roadmap Offshore Wind in Brazil, April 2020
[2] Offshore Renewables: An Action Agenda for Deployment, July 2021
[3] Lógica Fuzzy e Geoprocessamento para Instalação de Usinas Eólicas Offshore nas Regiões Sul e Sudeste do Brasil
Karen F. Paula, Renata Sander, André T. S. Melo, Djalma M. Falcão, Patricia T. L. Asano, Joel D. Melo
Simpósio Brasileiro de Sistemas Elétricos-SBSE 2022.
[4] Lógica Fuzzy e Geoprocessamento para Instalação de Usinas Eólicas Offshore nas Regiões Sul e Sudeste do Brasil
Karen F. Paula, Renata Sander, André T. S. Melo, Djalma M. Falcão, Patricia T. L. Asano, Joel D. Melo
Simpósio Brasileiro de Sistemas Elétricos-SBSE 2022.

THE LOGISTICS OF GREEN HYDROGEN AND ITS DERIVATIVES AS THE FUTURE PRIMARY ENERGY SOURCE FOR BRAZIL WHILE CONSIDERING THE ASPECTS OF ECOLOGY AND SUSTAINABILITY

GENERAL INFORMATION

HOCHSCHULE ANHALT University of Applied Sciences

Prof. Dr Markus Holz, Anhalt University of Applied Sciences

▶ THE CHALLENGE

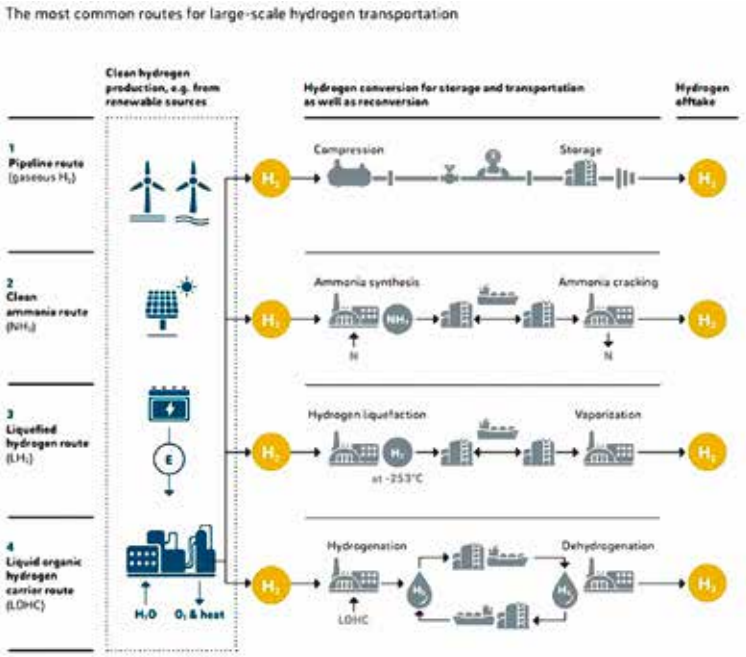
Research questions:

1) Quantify the needs, locations, and mix of green H2 and its derivatives in Brazil to calculate a techno-economic optimum and the optimal logistical chain
2) Modelling the export of green hydrogen to Europe/Germany by optimising long-haul transport by vessel
3) Considering the environmental compatibility of a hydrogen economy in Brazil and the minimisation of negative effects in the biosphere

▶ THE APPROACH

Brazil already covers a large part of its current consumption of electrical energy based on regenerative generation. However, 53% of the country's primary energy requirements are met with fossil fuels. Due to climate change and the need to avoid further CO2 emissions, the "green" production of hydrogen as a universal CO2-neutral energy source will play a significant role in the substitution process. Furthermore, the export of H2 to Europe/Germany is a strong future business opportunity for Brazil. A field that has to date received too little attention in the overall value chain is the logistical transport and storage process chain of H2/H2 derivatives. H2 can be transported, for example, in liquefied or highly compressed form, in the form of basic chemicals such as NH3 or MeOH, or in a carrier medium (LOHC). The logistical process, which involves aspects such as production/shipment, interim storage, regional and national/international transport, collective storage and (fine) distribution, is to be examined further.

"Brazil Potential H2 Production" (Brazilian Hydrogen Association (ABH2), Hydrogen Energy in Brazil, 2020)



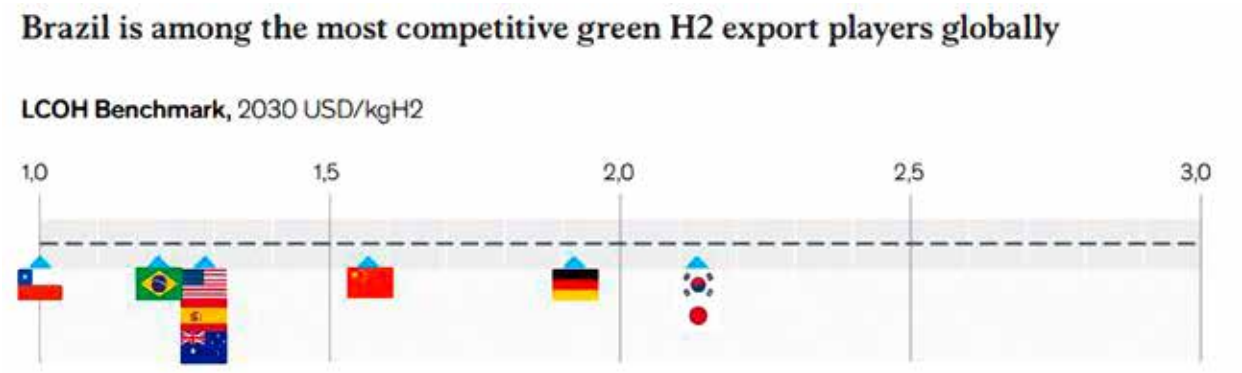
"Typical H2 Logistics" (Roland Berger, Hydrogen Transportation 2021)

To deepen this research, we are looking for a Brazilian partner university that is active in this field of techno-economic research, primarily with a focus on logistics management and process management.

We propose a two-year intensive bi-national research project based on a literature review, our own calculations/modelling, and a presence in selected Brazilian locations that are relevant to the research topic. We plan to apply for the necessary funding jointly from the beginning.

▶ THE INTENDED IMPACT

The aim is to develop a techno-economic model to optimise certain H2 mix scenarios and identify optimal locations and logistical pathways to support future investment decisions and regulatory frameworks in Brazil. The results of the research is intended for governmental institutions, other research centres, and the public.



"Brazil most competitive" (https://www.niras.com/projects/building-a-green-hydrogen-economy-in-brazil/)

Anhalt University Campus Building at Bernburg

CONTACT

Prof. Dr Markus Holz
Anhalt University of Applied Sciences
Strenzfelder Allee 28
D-06406 Bernburg/Germany
markus.holz@hs-anhalt.de
Phone/WhatsApp: +49 171 234 2556

PILOT-SCALE REACTOR SYSTEM FOR SUSTAINABLE HYDROGEN PRODUCTION VIA SUPERCRITICAL WATER TECHNOLOGY

GENERAL INFORMATION

Federal University of Goiás, Research Laboratory in Renewable Processes and Catalysis

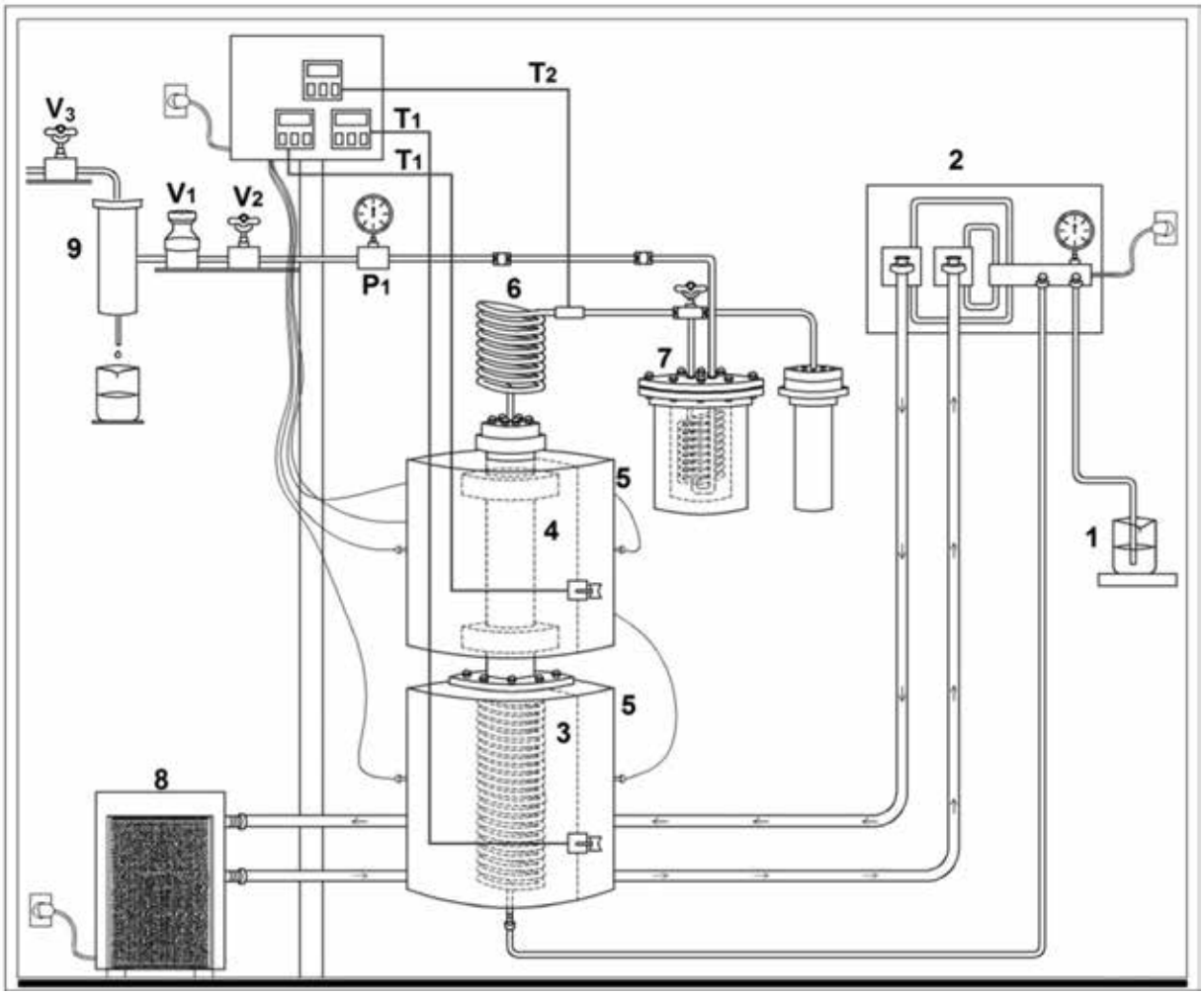
Partners: Prof. Dr Christian Gonçalves Alonso
Dr Isabela Milhomem Dias
Lucas Clementino Mourão (M.Sc)

▶ THE CHALLENGE

This proposal contemplates the conceptualisation and construction of a pilot-scale reactor system based on supercritical water (ScW) technology. The primary goal of the proposed system is the decentralised production of hydrogen from residual liquid biomass and primary renewable energy sources. The versatility of supercritical water technology allows for the use of a wide variety of residual liquid biomasses, agro-industrial wastewaters, and even urban residential sewage as low-cost and highly available raw materials for the generation of hydrogen.

▶ THE APPROACH

The modular-reactor system will be developed as an independent unit and built within a structure that facilitates its transportation and allows for on-site, decentralised operation in the vicinity of raw material sources, such as industrial locations, sewage treatment plants, or even rural properties. In this sense, sources of residual liquid biomass will be evaluated while considering the effects of operational parameters (such as temperature, volumetric flow, and the presence of catalysts) on the hydrogen production efficiency of the scaled-up system. Also, it is important to highlight that the

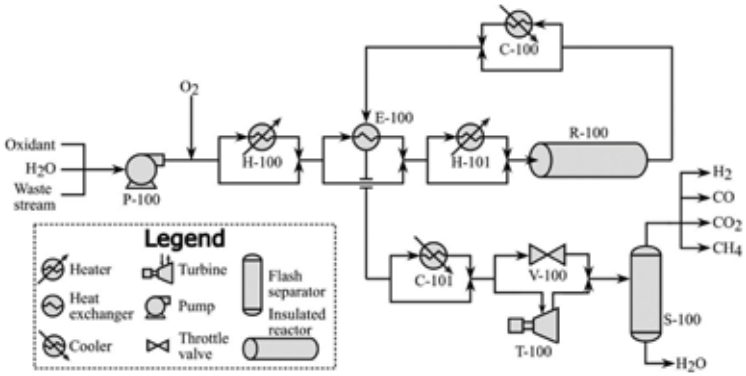


Schematic representation of the continuous ScW system

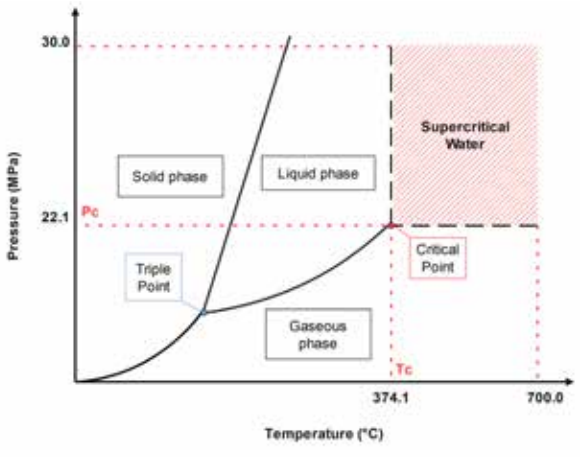
quality of the water obtained after processing in a supercritical medium will be assessed regarding the possibility of its reuse as fit-for-purpose water. In addition, with the aid of specific engineering software, the reactor system can be integrated with solar energy generation technology, making it possible to carry out feasibility studies. The supercritical water technology equipment, which has been developed by the proposing laboratory, has an installed hydrogen production capacity of approximately 0.2 Nm^3/h. Based on results from previous bench-scale studies, the proposal aims to evolve and scale up the system by a factor of 10 to 30.

▶ THE INTENDED IMPACT

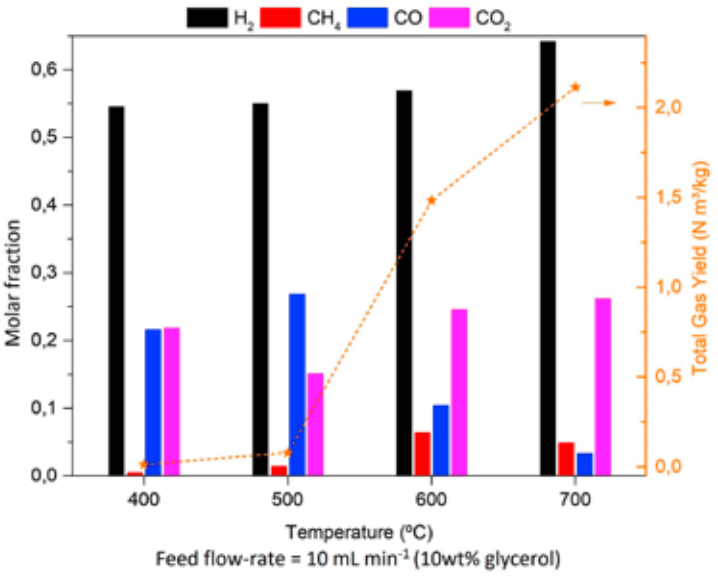
The proposal is aligned with the aims of economic decarbonisation, climate neutrality, and sustainable water management due to the use of residual biomass with high organic load and complex treatability as its main source of raw material. The achievement of the proposal's objectives thus has the potential to result in a technological product that is capable of offering an alternative route to traditional technologies in the decentralised production of renewable hydrogen.



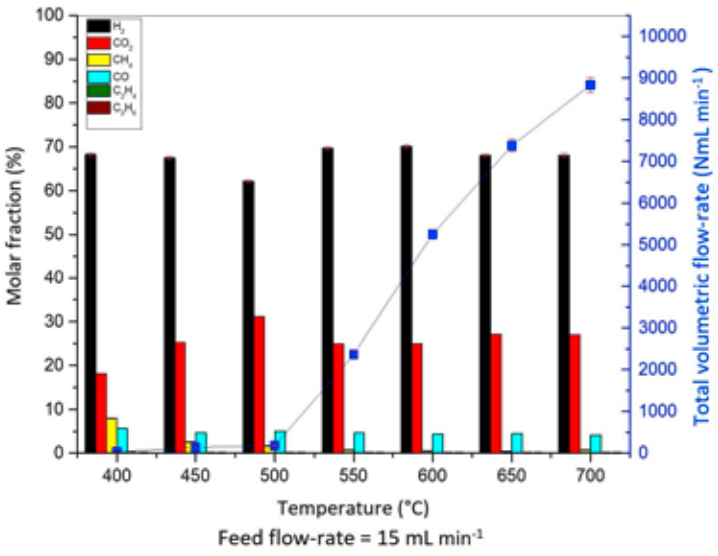
Supercritical water process flowsheet diagram superstructure



Generic phase diagram for pure water



Hydrogen production via ScW gasification of synthetic glycerol solution



Hydrogen production via ScWG of real biodiesel industry wastewater

CONTACT

Guilherme Botelho Meireles de Souza
Federal University of Goiás
Avenida Esperança, s/n, Instituto de Química – IQ II, Goiânia, Goiás – Brasil.
email: botelhg@gmail.com

ECONOMIC POTENTIAL OF ECOLOGICALLY ATTRACTIVE MULTI-LIFE PRODUCTS – THE EXAMPLE OF LITHIUM-ION BATTERIES

GENERAL INFORMATION

UNIVERSITÄT DUISBURG ESSEN
Open-Minded

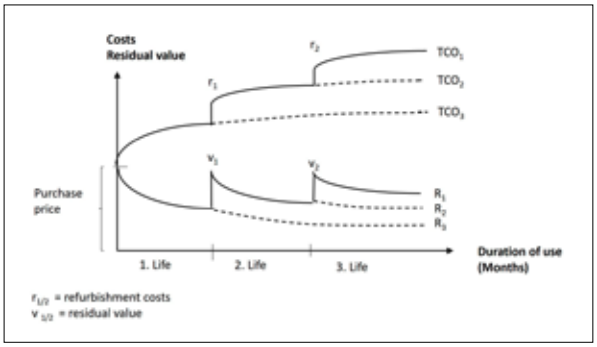
Arne Jeppe, Chair of General Business Administration and International Automotive Management, University of Duisburg-Essen

▶ THE CHALLENGE

The aim is to develop a practical and scalable concept for the development of multi-life products and associated business models and to validate it in potential industrial applications (mobility, electronics, and energy technology). In particular, the international cooperation of the partners in development, production, and use will be analysed. To meet the challenges of increased complexity due to the increasing number of first- and second-life application requirements in product development and to increase the potential of repurposing, the project will focus on sustainable thinking in modules. Therefore, the aim is to develop modular and changeable business models based on product modules in order to enable their individual end-of-life strategies. In the process, the blueprint for a minimum viable ecosystem (MVE) should also emerge as a network of participating partners.

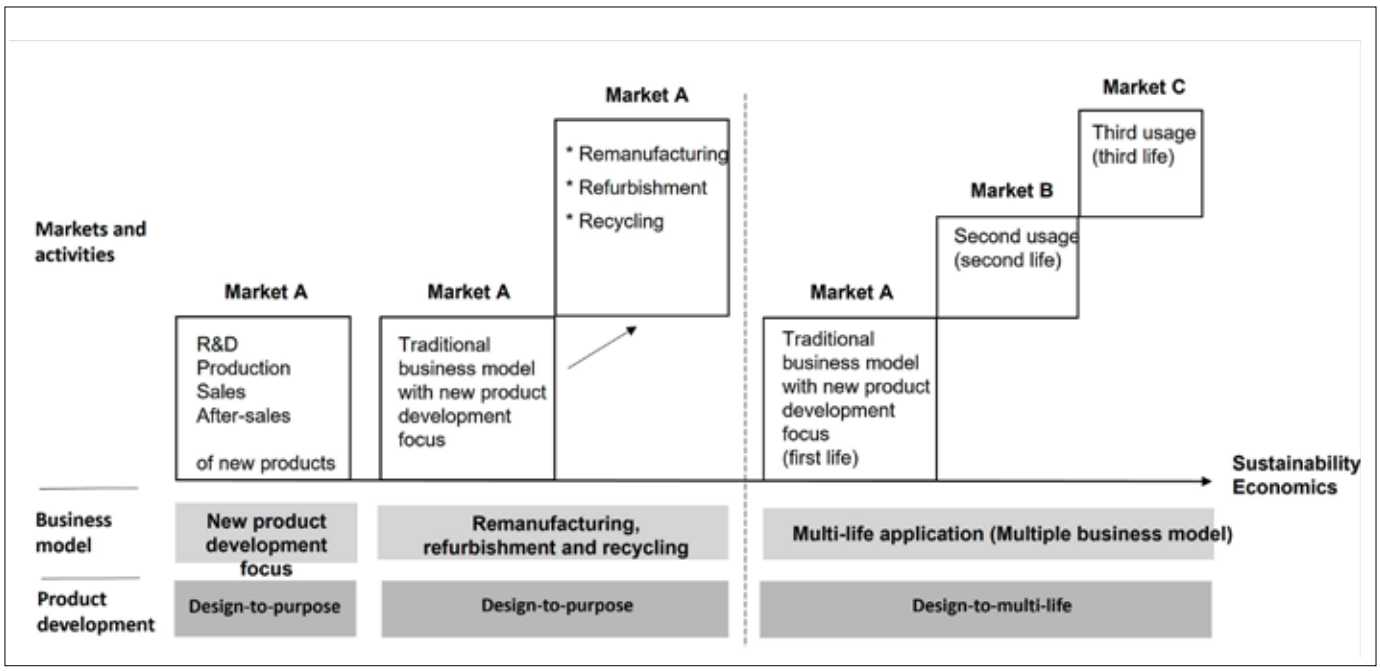
▶ THE APPROACH

In this international and interdisciplinary project, the development of modular and adaptive products and multiple business models will be aligned with assumptions about future applications. This requires close collaboration across countries and disciplines. To successfully scale the effects of environmental relief through lifetime extension, a high applicability of multi-life products is required. Therefore, the project will derive reliable criteria, procedures, and guidelines for the development of multi-life scenarios, product concepts, and business models that are oriented towards high durability, adaptability, and value retention.



▶ THE INTENDED IMPACT

This will result in blueprints for multi-life business models and ecosystems and design guidelines for the development of multi-life products that will be constantly compared with products from the industrial environment over the course of the project. This comparison will offer insights into suitability and necessary extensions or adaptations in procedures, which will aid in improving these products incrementally and adapting them to practical contexts.



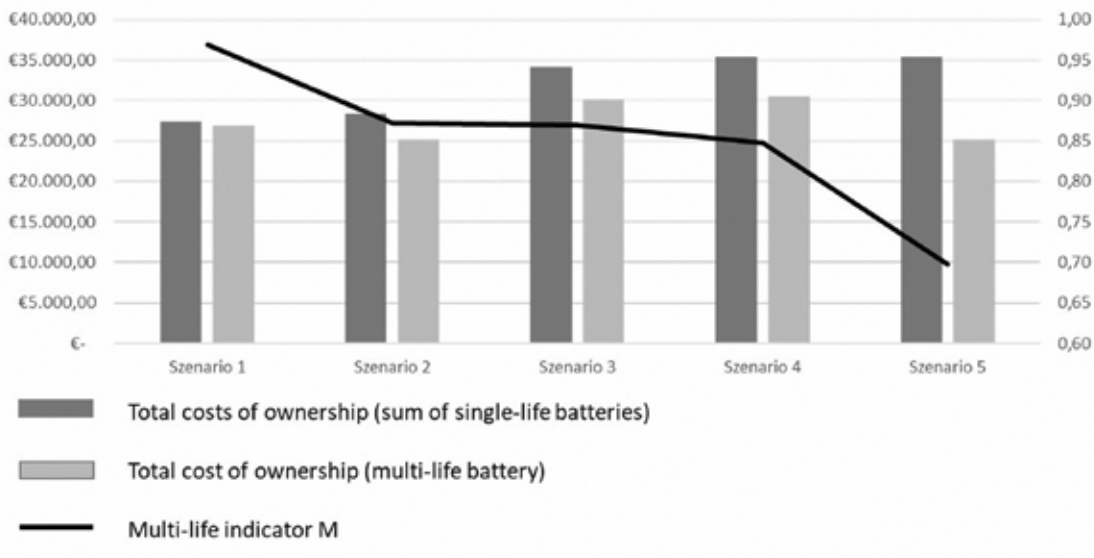
The conceptual design of various multi-life products and associated business models for potential applications in the fields of mobility, electronics, and energy technology is intended to underpin the applicability, economic viability, and scalability of the approach and create long-term economic incentives (governance) for circular products. This approach is to be developed on a multi-life battery system. To this end, the cooperation (in development and production) between South American countries (especially Brazil) and Europe (especially Germany) is to be analysed.

a) Input for an assessment of a single-life battery (with an isolated use)

Battery 1 use in cars		
	Capacity	60 kWh
	Invest	EUR 6,000
	Lifecycle	8 years
	Running costs	EUR 600
	Residual value	EUR 2,480
Battery 2 use as electricity storage devices in the home		
	Capacity	48 kWh
	Invest	EUR 9,600
	Lifecycle	10 years
	Running costs	EUR 960
	Residual value	EUR 3,970
Battery use in a fork lifter		
	Capacity	30 kWh
	Invest	EUR 3,600
	Lifecycle	2 years
	Running costs	EUR 360
	Residual value	EUR 1,488

b) Input for an assessment of a multi-life battery (with adaptations for multiple use over the duration of use)

Capacity	60 kWh
Invest	EUR 7,800
1st lifecycle	8 years
Running costs p.a.	EUR 780
Refurbishment cost	EUR 1,920
Capacity	48 kWh
Invest	
2nd lifecycle	10 years
Running costs p.a.	EUR 780
Refurbishment costs	EUR 1,920
Capacity	30 kWh
Invest	
3rd lifecycle	2 years
Running costs p.a.	EUR 780
Resale/Recycling value	EUR 390



CONTACT

Arne Jeppe
Chair of General Business Administration and International Automotive Management University of Duisburg-Essen
E-mail: arne.jeppe@uni-due.de
Tel.: +49 203 379 1133

ALLOCATION AND HEALTH MANAGEMENT OF SECOND-LIFE BATTERIES FROM ELECTRIC VEHICLES IN RENEWABLE ENERGY SYSTEMSA

GENERAL INFORMATION

Iury Bessa, e-Controls Research Group,
Federal University of Amazonas (UFAM)

▶ THE CHALLENGE

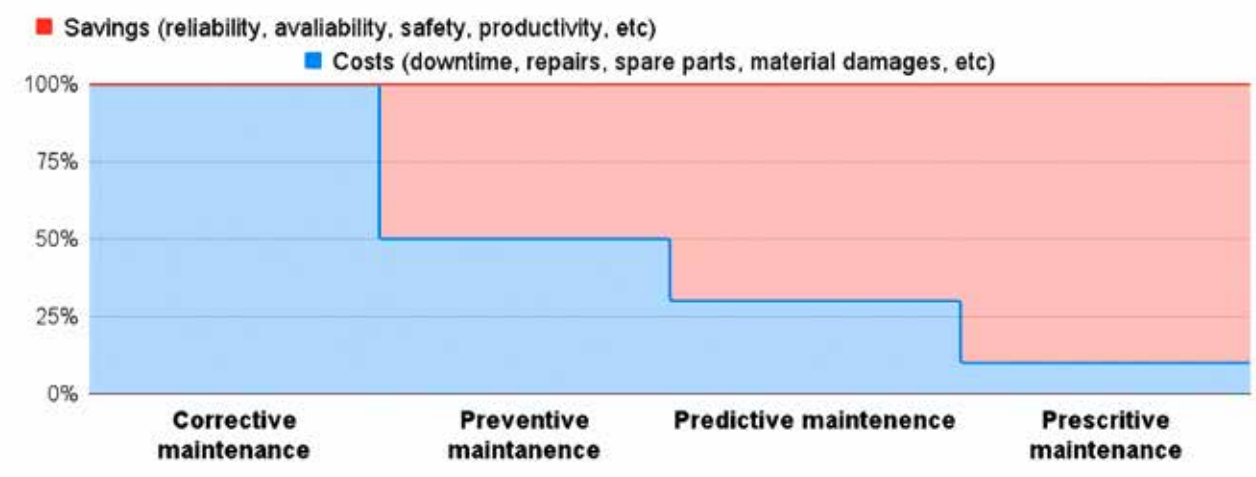
The goal of this proposal is to investigate the optimal allocation of second-life batteries extracted from electric vehicles in renewable energy systems and manage the health of these batteries to increase their remaining useful life and avoid failures. The use of second-life batteries (SLBs) is attracting attention since it makes it possible to reduce the environmental impact of disposing batteries from electric vehicles. In particular, several studies already indicate that renewable energy systems are suitable applications for these batteries. However, there is still a need for significant studies related to the prognostics and health management of second-life batteries and the optimal application of these batteries depending on their condition. This proposal intends to fill that gap by using data-driven and artificial intelligence methods to estimate second-life batteries' state of health (SoH), predict their remaining useful life (RUL), and properly manage their health.

▶ THE APPROACH

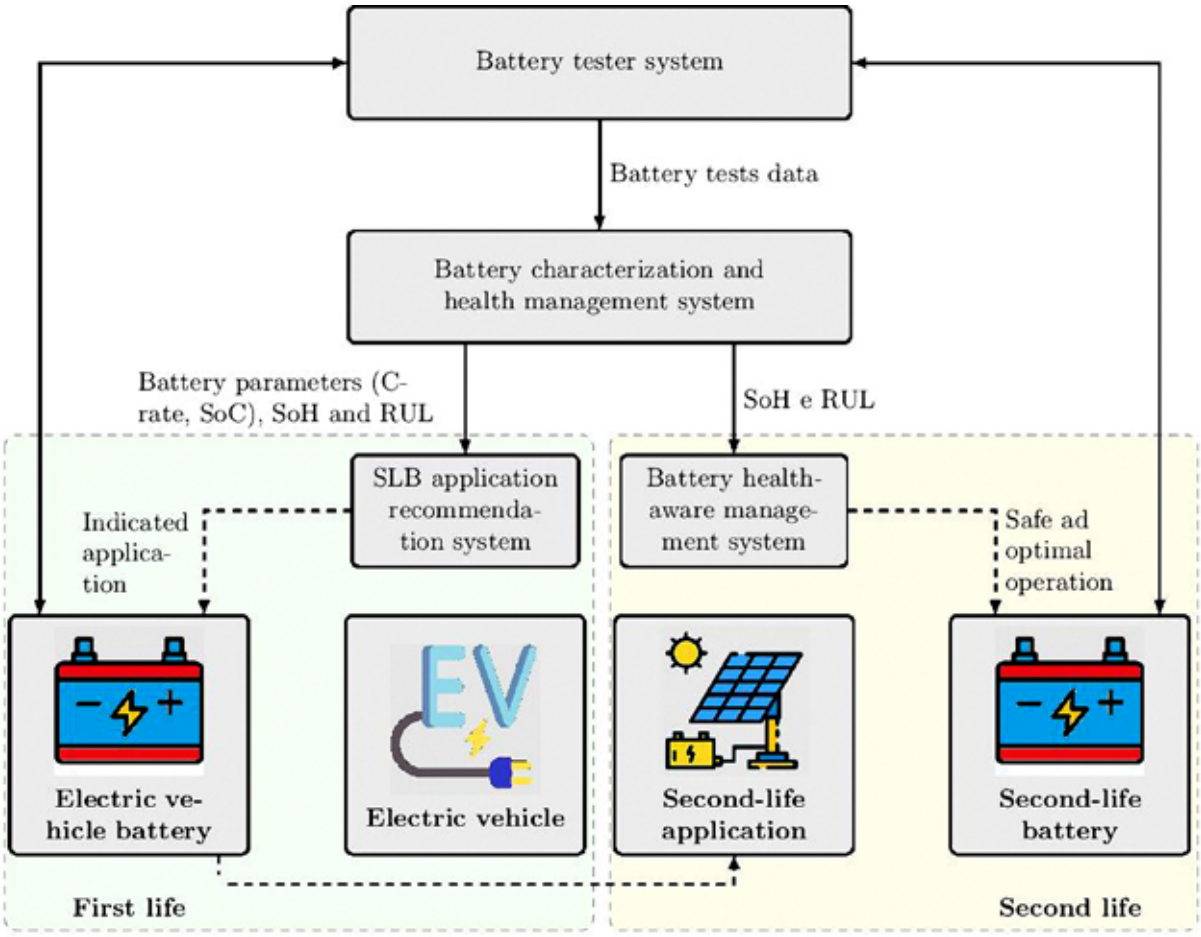
This project idea has two main objectives. First, we intend to develop algorithms that allow for optimal allocation of second-life batteries (SLBs) from electric vehicles to renewable energy applications under consideration of corresponding health indicators. In addition, this project aims to implement policies for the reuse and health management of second-life batteries in order to extend their useful life. Both objectives must consider technical standards that specify minimum safety conditions for the application of second-life batteries in the stationary applications investigated. Additionally, the costs and savings associated with battery reuse and the implementation of a maintenance policy will also be considered in the automatic and optimal obtaining of recommendations and guidelines related to these policies, as well as in the choice of second-life battery applications. For this purpose, our methodology will contain four modules:

- Establishment and operation of a laboratory that facilitates tests for collecting degradation and parameter data from batteries during charge and discharge cycles
- Investigation of prognostic and health management methods for second-life batteries that will enable the development of a battery characterisation and monitoring system for corresponding health parameters (e.g. C-rate), state of charge (SoC) and SoH estimation, and RUL prediction
- Investigation of a decision-making algorithm to support an application recommendation system for second-life batteries that takes into account the characteristics and specifications of each potential application
- Investigation of health-aware control methodologies and development of a second-life battery health management system that provides guidelines for battery operation in order to extend battery life and ensure compliance with safety restrictions.

The overview of the project idea is shown in Figure 2.



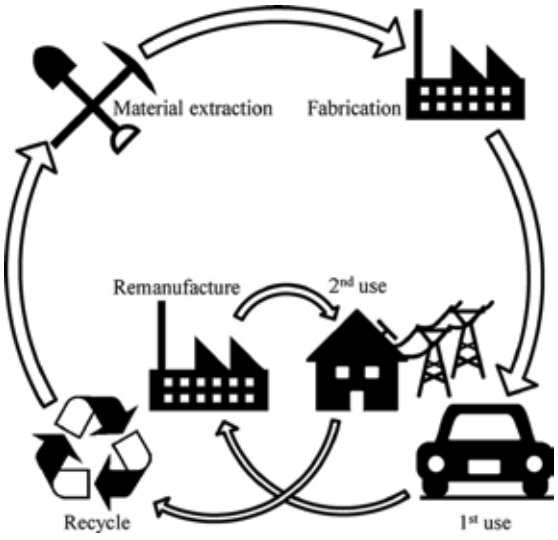
Costs and savings related to each kind of maintenance policy [1]



Overview of the project idea [2]

▶ THE INTENDED IMPACT

Adopting the recommended second-life applications for batteries from electrical vehicles increases the battery reuse rate and reduces the environmental impact of the electric vehicle market, which is in line with environmental, social, and corporate governance practices. At the same time, consumers of second-life batteries, in particular those linked to the renewable energy sector, will be able to purchase reliable inputs (batteries) at a reduced price, which will reduce capital expenditures and the levelised cost of energy. The innovation of this idea lies in its application of prognostics and health management techniques – in particular, health-aware control to improve the SLB market. With these techniques, prescriptive and predictive maintenance policies can adopted to extend the useful life of SLBs and improve the advantages of their application. Figure 1 depicts the advantages related to costs and savings through the application of predictive and prescriptive maintenance policies.



Second life batteries lifespan: Rest of useful life and environmental analysis. (3)

CONTACT

Professor Dr Iury Bessa
Department of Electricity and e-Controls Research Group
Federal University of Amazonas

TECHNICAL-ECONOMIC ANALYSIS OF GREEN HYDROGEN AND GREEN AMMONIA PRODUCTION IN SOUTHEAST BRAZIL AND SOLUTIONS FOR STORAGE AND TRANSPORT TO GERMANY

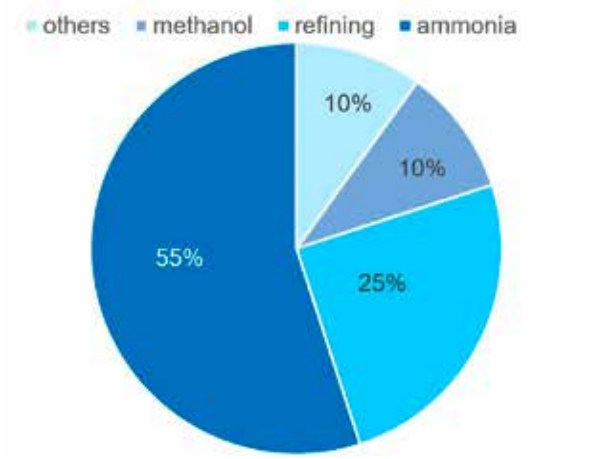
GENERAL INFORMATION

HOCHSCHULE RUHR WEST
UNIVERSITY OF APPLIED SCIENCES

Karla Ohler-Martins, Institute of Business Administration, Ruhr West University (Germany); Amanda Lemette Teixeira Brãndao, Chemical Engineering and Materials Science Department, Pontifical Catholic University of Rio de Janeiro (Brazil)

▶ THE CHALLENGE

To gather real information for green hydrogen production, including on the needed infrastructure, plant locations, operating costs, port costs, and handling costs. The best technical-economic and environmental strategy for green hydrogen has to be found. Green hydrogen production has a huge economic relevance because it is the energy of the future. The desired structure of producers, distributors, and consumers of green hydrogen is new and innovative.



Global use of hydrogen

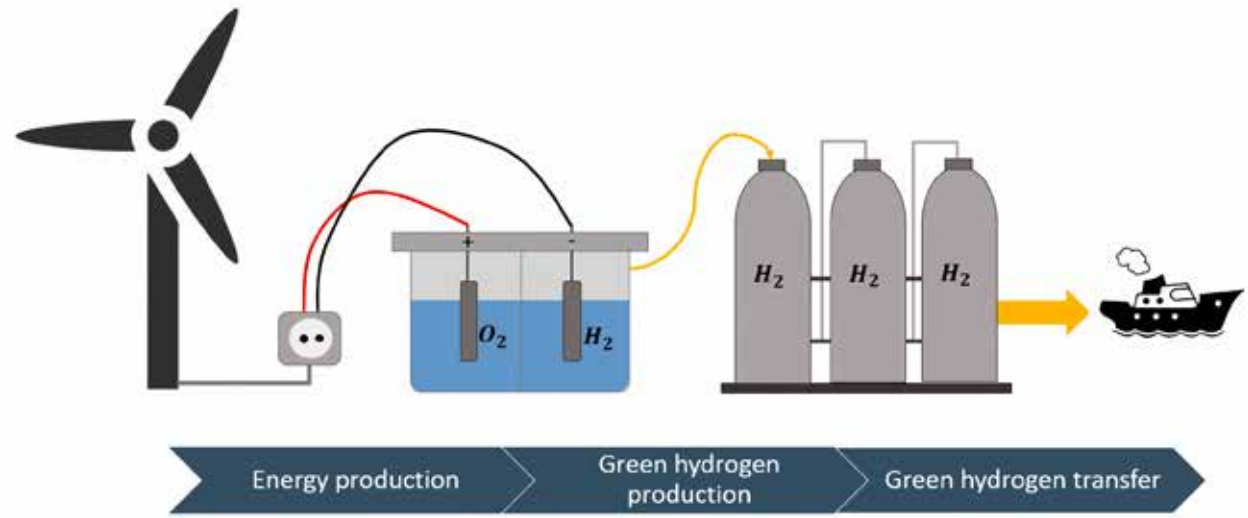
▶ THE APPROACH

The proposal is based on the modelling, simulation, and optimisation of a hydrogen distribution network in the northeastern region of Brazil.

Industrial consumers and ideal locations for green hydrogen production plants have to be defined.

A green hydrogen plant will be simulated by Prof. Lemette from PUC-Rio in Brazil using a commercial process simulator. Industrial and pilot plant data for the simulation will be collected by Prof. Ohler-Martins from the Ruhr West University of Applied Sciences in Germany. In order to obtain real industrial process data, a partnership with industrial suppliers, producers, distributors, and service providers of hydrogen will have to be developed. Workshops on process simulation and economic evaluation will be offered to more than 10 multipliers in areas of the northeastern region of Brazil. Partners and government research institutes specialised in hydrogen, such as IPEA and Brazilian regulatory agencies such as ANEEL and ANP, could be engaged in this research. The company Comerc Eficiência is another possible partner that could help assess economic feasibility in this research.

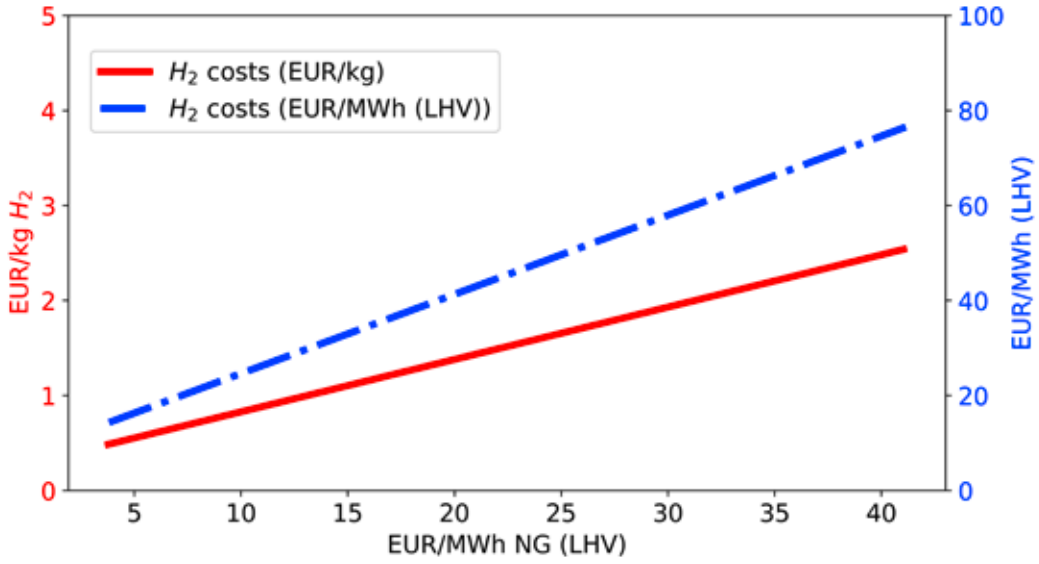
The targets of this research will be met through standardised communication and data exchange technologies, the well coordinated collaboration of all the partners, and regular meetings to align all the actors involved.



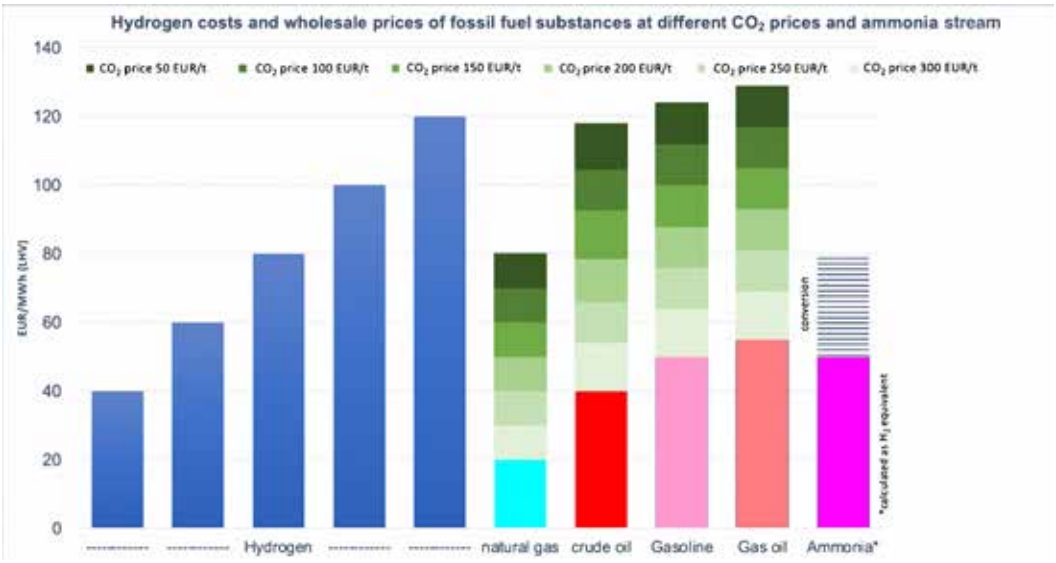
Route for green hydrogen: from green energy via green hydrogen production through electrolysis to distribution

▶ THE INTENDED IMPACT

Identifying the best way to transfer green hydrogen from Brazil to Germany is the main goal of this research. Determining the real costs of green hydrogen produced in Brazil and how much it will cost in Europe will contribute to satisfying Europe's energy demand. It will also show how competitive Brazil can be on the global market, have a significant and positive impact on the environment, and open up new opportunities in the employment market.



Costs of conventional hydrogen production using steam reforming without CO_2 capture and without CO_2 costs



Hydrogen costs and wholesale fossil fuel prices at different CO_2 prices, plus ammonia steam reforming without CO_2 capture and without CO_2 costs

CONTACT

Prof. Dr.-Ing. Karla Ohler-Martins
Professor for Industrial Services
Institute of Business Administration
Ruhr West University of Applied Sciences
Duisburger Straße 100, Gebäude 3
45479 Mülheim an der Ruhr, Germany
E-mail: Karla.Ohler-Martins@hs-ruhrwest.de
Internet: www.hochschule-ruhr-west.de

Prof. Dra. Amanda Lemette Teixeira Brandão
Professor of the Chemical Engineering and Materials Science
Department of Pontifical Catholic University of Rio de Janeiro
Marquês de São Vicente, Rio de Janeiro, RJ, Brazil
E-mail: amanda.lemette@puc-rio.br
Internet: deqm.puc-rio.br/en/home/

A MULTICRITERIA COMPUTATIONAL METHOD AND TOOL (TECHNICAL-ECONOMIC-ENVIRONMENTAL) TO SUPPORT THE DECISION MAKING OF ACTIONS FOR HYBRIDISATION WITH H2 IN THE ENERGY TRANSITION OF ENERGY SYSTEMS TO CARBON NEUTRALISATION.

GENERAL INFORMATION

Scientists and Institutions:
Valentina Vásquez Arango (UNILA); Fabiano Salvadori (UFPB); Oswaldo Hideo Ando Junior (UFRPE); Jorge Javier Gimenez Ledesma (UNILA); Thayce Luan Souza Bastos (UNILA); Icoana L. Martins (UNILA); Camilo Guerrero-Martin (UFPA); Nuri E. Sarango (UNILA)

National Collaboration Network: Itaipu Technological Park Foundation – Brazil; Brazilian Association of Microgrids; State University of Western Paraná (UNIOESTE); LACTEC Institutes; University of Brasilia (UnB); State University of Campinas (UNICAMP); Federal University of Campina Grande (UFCG); Federal University of Paraná (UFPR); Federal University of Rio de Janeiro (UFRJ); Federal University of Santa Catarina (UFSC); Federal University of Santa Maria (UFSM); Federal University of Rio Grande do Norte (UFRN); Federal University of Rio Grande do Sul (UFRGS); University of São Paulo (USP); Federal Technological University of Paraná (UTFPR); Federal University of Pará (UFPA).

International Collaboration Network: National University of Asunción (Paraguay); National University of Cordoba (Argentina); National University of Missions (Argentina); University of Florida (USA); Intelligent Hybrid Electric Microgrids with High Penetration of Renewable Energies – MEIHAPER/CYTED; Itaipu Technological Park Foundation – Paraguay and Columbia University (USA), Peruvian Hydrogen Association.

▶ THE CHALLENGE

To seek alternatives for the energy transition (ET) and to act on the hybridisation of energy systems with H2 for a NetZero solution in order to enable the maintenance and renewal of contracts for energy systems with high GHG emissions. The research aims to develop a new multi-criteria-methodology (MCM) for the ET using H2 in association with fossil fuels. The proposed tool will consist of digitising the knowledge of the technical team using MCM and artificial intelligence to create a best-option ranking to support decision-making regarding the appropriate technology for the use of H2 as an energy source, and to promote hybridisation as a primary source, aiming to enhance and optimise the use of H2 and promoting the ET.

Computer department - UFRPE [1]

▶ THE APPROACH

It was decided to create a schedule of stages in which the team's activities are laid out. Subsequently, a meeting to define the activities will be held, where individualised actions will be created for each member by stage with a deadline for execution. Monitoring the progress of the project will be carried out through the "REDMINE" tool which allows for detailed monitoring of progress.

The method will consist of 5 steps:

A- Problem identification

B- Problem characterisation

C- Range of solutions identification

D- Solution set evaluation

E- Solution ranking

In steps A-C, the systematic review method Proknow-C and/or *Methodi Ordinatio* will be used to outline the current situation. In Stages C-E, the analytic hierarchy process and preference ranking organisation method for enrichment evaluation methods will be used, in order to rank the best solutions for hybridisation with H2.

▶ THE INTENDED IMPACT

The intended outcome is the development an H2 applicability technological roadmap of the Brazilian electric sector in order to serve as a reference for future actions to promote the energy transition through the hybridisation of UTE to gas with H2. The MCM simulation tool (Tec-Eco-Amb) will allow an analysis of several scenarios for the promotion of NetZero by hybridisation with H2, helping in decision-making and prioritising investments with greater assertiveness, allowing for the maintenance of the operation of energy systems, promoting the energy security and sustainability of the energy matrix, and maintaining the supply and availability of electric energy. The result will be the creation of a H2 applicability roadmap, and the development and registration of a tool to support decision-making hybridisation actions with H2 in the ET.

UNILA [2]

Technology centre - UFPB [3]

CONTACT

Valentina Vásquez Arango
Federal University of Latin American Integration (UNILA)
valentina.arango@aluno.unila.edu.br; vvasquezar@gmail.com
Telephone contact: (45) 9944-8501

Fabiano Salvadori
Federal University of Paraíba (UFPB)
fabiano.salvadori@pq.cnpq.br
Telephone contact: (83) 9121-7506

Oswaldo Hideo Ando Junior
Federal Rural University of Pernambuco (UFRPE)
oswaldo.junior@pq.cnpq.br
Telephone contact: (51) 981784234

Jorge Javier Gimenez Ledesma
Federal University of Latin American Integration (UNILA)
jorge.ledesma@unila.edu.br
Telephone contact: (45) 9855-7557

Thayce Luan Souza Bastos
Federal University of Latin American Integration (UNILA)
hayceluanb@gmail.com
Telephone contact: (62) 9821-1886

Icoana Laís Leitão Mascarenhas Martins
Federal University of Latin America Integration (UNILA)
icoanalais@gmail.com

Camilo Andrés Guerrero-Martin
LOTEP - Laboratory of Operations
and Energy Technologies Applied in the Oil Industry
Federal University of Pará (UFPA)
camiloguerrero@ufpa.br

Nuri Esperanza Sarango Sarango
Federal University of Latin American Integration (UNILA)
ne.sarango@gmail.com

SMART CITIES – SUSTAINABLE MOBILITY CONCEPTS

GENERAL INFORMATION

Hochschule für Technik Stuttgart
University of Applied Sciences

Prof. Dr. Paul Rawiel,
Hochschule für Technik Stuttgart

▶ THE CHALLENGE

There is a need to develop metropolitan areas for tomorrow that meet the needs of present and future generations. Liveable, interconnected, and resilient living and working spaces for the future – that is what we want to shape with our research. Many different aspects are interconnected, and sustainable mobility concepts are one area that can contribute to decreasing the total number of vehicles and improve air quality and noise pollution in metropolitan areas. The challenge is to develop public transport and vehicle sharing concepts that are complementary, viable, and acceptable to a wide range of possible users. In addition, the mobility concept should be integrated into a high-level energy system concept in the context of a smart city.

▶ THE APPROACH

HFT Stuttgart is currently working on a project called "iCity: intelligent cities". In this project, highly interdisciplinary research is being done in a total of 20 subprojects that address different aspects of a smart city in several fields of action. One such field is about sustainable urban development and energetic neighbourhood concepts; another deals with an information platform and urban simulation. The third field of action is about energy management and information and communication technologies. Another field is sustainable mobility. In these fields of action, different subprojects have been realised together with external partners from both industry and municipal administration (to represent the political viewpoint). The partners involved in a subproject about the conception of an e-bike sharing system for Stuttgart and Tuttlingen, for example, were Daimler TSS GmbH and the city of Tuttlingen. Other subprojects have other external partners. A complete list of the partners in the iCity project can be found at https://www.hft-stuttgart.com/research/projects/i-city/partnership#subnavigation.

Fields of action for iCity [1]

To transfer knowledge and findings from the iCity project to Brazilian metropolitan regions, local partnerships are needed. Brazilian cities and Brazilian society have preconditions and requirements that are different from European cities and society. Therefore, study projects about viability and user acceptance should also be done to enable the adaption of the concepts to the needs of Brazilian cities.

The inhabitants of a metropolitan region are often on the move – from the surrounding area into the city, from neighbourhood to neighbourhood, from work to home, or during their leisure time. A project about sustainable mobility has to research organisational, technological, and infrastructural solutions for sustainable mobility services. The important topics include reducing emissions, increasing traffic safety, changing forms of propulsion, urban-rural relationships, increasing the attractiveness of urban spaces, the digitalisation of mobility, and sustainable operating strategies for transport infrastructures. In this way, a project like this can contribute to the upcoming transition in transport .

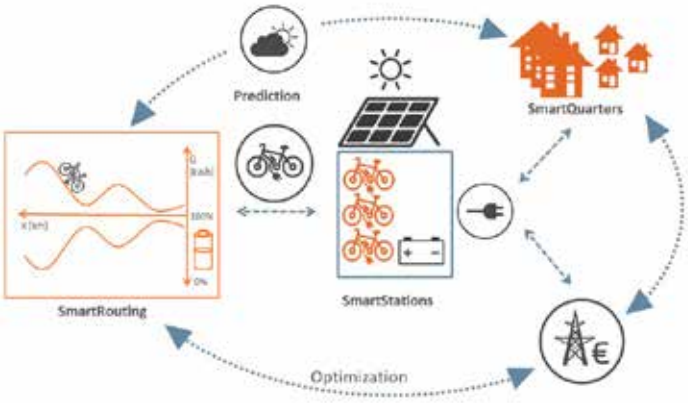
Innovative mobility concepts like sharing systems with free-floating vehicle fleets can contribute to the reduction of the total number of vehicles and a more sustainable way of moving in urban areas. Sharing systems can include cars, e-bikes, and other vehicles. The conception and realisation of such a mobility concept is a demanding task that requires much research on how to operate such a system. Many processes for data acquisition and use are needed. To mention just one area here, there is the communication between vehicles and a backbone system where data on things like vehicle location, battery status, reservations, and renting needs to be exchanged.

If the fleet of a car sharing system is electric, the vehicles are possibly not only energy consumers, but also energy providers when not in use. This idea can be expanded to include private electric cars and other public fleets. If the idea is further extended to include energy that comes, for example, from the solar panels of private homes and can be fed into an existing grid, research needs to be done on the state of the existing infrastructure of the current ener-

gy system to build a data model with complete information about the energy grid, including an accurate topology of the energy network. Based on this, algorithms for simulations can be developed that allow for predictions regarding the behaviour of the grid under different scenarios, which will contribute to a more efficient, stable, and reliable electrical system. These research activities are meant to create a smart grid for the electric system.
The research about sharing systems for mobility and the research about efficient, reliable energy infrastructure are strongly interlinked. They require an advanced information platform on which intelligent algorithms can be implemented to explore data and improve the concepts of a smart city open to data not only on mobility and energy infrastructure, but also on things like smart buildings, energy management, and climates. This will make it possible to integrate all the relevant data for the different aspects that play a role in future-oriented urban planning.

▶ THE INTENDED IMPACT

The sustainable city is increasingly digital and connected. It uses resources efficiently, implements smart mobility concepts, and ensures that its infrastructure is supplied with high shares of renewable energy via grid-connected infrastructure. It is also characterised by operating in an inclusive, connected, and flexible manner. In addition to these technical aspects, approaches to intelligent cities are increasingly human-centred and thus place citizens' well-being and a better quality of life at the heart of their development.



Intelligent interaction in the energy system [2]

Accordingly, the essential part of the intelligence of future cities involves not only driving technical innovations, but also systemically integrating social, ecological, and economic aspects.
The research in question focuses on methods, services, and products for highly efficient energy, building, and mobility systems in neighbourhoods that are intelligently connected by means of information and communication technologies in order to operate them in an efficient, renewable, sustainable, and socially acceptable manner.
In the long term, the project should be transformed into a technically autonomous and politically independent body that acts as an interface between research and the partner companies involved in the innovation process.

Mapping of e-bike sharing [3]

CONTACT

Prof. Dr. Paul Rawiel, HFT Stuttgart,
Schellingstraße 24, 70174 Stuttgart, Germany
paul.rawiel@hft-stuttgart.de

Photo & graphic credits (image rights):
[3]: Santhanavanich, T. (2018): Visualization and Analysis of E-bike usage in 3D City model by integration of heterogeneous sensor data. Stuttgart: Master-Arbeit, HFT Stuttgart, unpublished.

RESEARCH, TECHNOLOGY AND HUMAN RESOURCES DEVELOPMENT TOWARDS INNOVATION IN THE FIELD OF GREEN HYDROGEN FREE OF CO_2 EMISSIONS IN THE TRANSPORT SECTOR: A FOCUS ON ENERGY EFFICIENCY AND THE SUSTAINABLE USE OF NATURAL RESOURCES IN BRAZIL AND GERMANY.

GENERAL INFORMATION

Andreas Nascimento, Prof. Dr
Federal University of Itajuba – UNIFEI
Institute of Mechanical Engineering – IEM
Energy Group, Green Hydrogen Research Centre (CH2V)

▶ THE CHALLENGE

Challenges:
- RH development and knowledge enhancement;
- Bond and structure a consistent networking group in the field of hydrogen application;
- Explore green H2 contribution to decarbonisation in the transport sector;
- Deep understanding about safety standards and measures by handling H2.

▶ THE APPROACH

There are already hydrogen-related projects under development at UNIFEI, being the following CH2V sponsored by GIZ. The project "Green Hydrogen Cluster – CH2V" aims to cover the main elements in the hydrogen value chain, from its production to its use in the modern hydrogen economy. A 1 [MW] power electrolysis plant would produce 200 [Nm2/hour] of hydrogen and provide 800 [m2] of facilities suitable for the undertaking of research and development projects, technological innovation, and the demonstration of hydrogen use as a source of energy in mobility and power generation, as well as a raw material for industrial applications. Sponsored by GIZ at a cost of 5 million euros, it has as its main objective the implementation of a production and storage unit of green hydrogen free of CO2 emissions, where research can be undertaken into the applications with the greatest potential in the fields of mobility, power generation and industrial uses. Two further relevant projects would feed into this one. The first, entitled "Experimental study of dual-fuel technology in compression ignition engines using renewable diesel with hydrogen, biogas and ethanol", is a project under development through ROTA 2030, an initiative of the Brazilian Federal Government, described in Federal Law n. 13.755/2018, aiming at stimulating invest-

[1]

ment and strengthening the Brazilian companies in the automotive sector through the development and application of new technologies. Sponsored at a cost of approximately 5.5 million reais, it is being carried out in partnership with the company FPT Industrial. The second additional project is entitled “Theoretical-experimental evaluation of the production and use of green hydrogen in Minas Gerais”, and is sponsored by the Foundation for Research and Support from the State of Minas Gerais (FAPEMIG).

▶ THE INTENDED IMPACT

(a) mobility with green hydrogen; (b) application technologies along with policy related studies; (c) evaluation of benefits and the decarbonisation potential in the transport sector by H2; (d) establishment of partnerships with institutions and companies along with HR development in a global perspective.

Thematic projects and theses under development at UNIFEI:
- Industrial uses of hydrogen and traceability of green hydrogen;
- Environmental and economic performance calculator;
- Energy transition and use of H2 in motors;
- Use of H2 in public transport and heavy vehicles;
- Analysis of electrolysis process with PV systems;
- Water quality for electrolysis processes;
- Fuel cell powered grid forming converters;
- Economic arbitrage for H2 and electricity production;
- Numerical simulations and models with H2 and H2 burning;
- Studies of the main safety standards in handling storages of combustible gases;
- Assessment of the degree of maturity of technological routes for the production and use of green hydrogen;
- Technical, economic and ecological aspects of the use of HVO and Hydrogen in cogeneration systems with Diesel engines.

[2]

[3]

CONTACT

Andreas Nascimento, Prof. Dr
Federal University of Itajuba – UNIFEI
andreas.nascimento@unifei.edu.br

Address:
Av. BPS, n. 1303 - Pinheirinho, Itajubá - MG, CEP 37500-903, Brazil
Phone: +55 (35) 3629-1101

SHORT PROFILES OF THE PROJECT PARTICIPANTS

(in alphabetical order)

Dr Jose Tavares
ARARUNA JUNIOR

Adjunct Professor
Pontifical Catholic University of Rio de Janeiro

Brazil

José Araruna Jr is a full-time adjunct professor at PUC-Rio, involved with teaching and research. His academic duties include teaching courses at undergraduate and postgraduate levels. His research interests include sustainability, environmental site investigation, solid waste disposal and site remediation. As a consultant, Dr Araruna has extensive experience in environmental impact assessment, site assessment, and environmental monitoring.

araruna@puc-rio.br

Beyond providing education, PUC-Rio undertakes the task of assisting the community, based on Christian ethical values, solidarity, and human respect. It represents a space for achievement, overcoming challenges, and the development of its students.

www.puc-rio.br/english/#aboutpuc

Janayna
BEHRING

Business development
FUNDEP - Research Development Foundation

Brazil

Janayna Behring is a specialist in business development who holds bachelor's and master's degrees in food science and technology. She also has experience in advising projects in the private and public sectors in connection with creating innovation policies and technology transfer.

www.linkedin.com/in/janayna-bhering-cardoso-26583512

With 46 years of history, the research development foundation Fundep is among the main managers of science, technology, and innovation in Brazil. The institution is a point of reference for support foundations based on its vanguard actions and advances in processes, systems, and innovations. Fundep focuses on the administrative and financial management of research, teaching, courses and events, competitions, and the institutional development of the initiatives it supports.

www.fundep.ufmg.br

Professor Dr Iury Valente de
BESSA

Adjunct Professor
Federal University of Amazonas

Brazil

Iury Bessa received his BSc in 2014, his master's degree in electrical engineering from the Federal University of Amazonas (UFAM), Brazil in 2015, and his PhD from the Federal University of Minas Gerais. In 2020, while working on his PhD, he was a visiting scholar at the Advanced Control Systems group (ACES) at the Polytechnic University of Catalonia (UPC) in Spain. Since 2015, he has been an adjunct professor in the Department of Electricity and is part of the e-Controls research group at UFAM. In October 2016, he was a visiting scholar in the Department of Computer Science at Oxford University in the UK. His research interests include control theory, fault-tolerant control, fault diagnosis, prognostics and health management, formal methods, learning-based control, cyber-physical systems, and computational intelligence.

iurybessa@ufam.edu.br

The Federal University of Amazonas aims to cultivate knowledge in all subject areas through teaching, research and extension, contributing to the formation of citizens, and the development of the Amazon.

https://ufam.edu.br/

Dr Guilherme
BOTELHO MEIRELES DE SOUZA

Researcher
Federal University of Goiás

Brazil

Guilherme de Souza is a post-doctoral researcher responsible for the production of hydrogen from renewable sources such as biomasses, urban residues and agro-industrial waste, via supercritical water technology. The position is the result of a partnership project signed between the ProQR program developed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Ministry of Science, Technology and Innovations of Brazil, and the Federal University of Goiás (UFG), the ultimate goal of which is the continuous production of synthetic crude oil via Fischer-Tropsch integrated into a hydrogen generation system. Despite being a young researcher, Dr De Souza has been involved in research related to sustainable processes, the generation of combustible gasses, and liquid/solid residue treatment for the last five years.

botelhg@gmail.com

UFG is a teaching, research and extension institution that aims to produce, systematise and socialise knowledge and the training of professionals and citizens committed to the transformation and development of society. Importantly, UFG is a public, secular and free University.

www.ufg.br

Professor Dr Flávia
CONSONI MELLO

Associate Professor
University of Campinas

Brazil

Flavia Consoni Mello has been an associate professor in UNICAMP's Department of Science and Technology Policy since 2013, and created the Laboratory of Electric Vehicle Studies (LEVE) in 2014. The studies carried out by LEVE researchers have been focused on low-carbon mobility, especially e-mobility to tackle the transition to sustainability in a broader way. The group is also dedicated to a critical reflection on the role that Brazil can play in the context of low-emission mobility, public policy, and governance. She has coordinated research projects (with GIZ and Brazilian partners) and is also the coordinator of the extension course "Electric Mobility: Policies, Planning and Business Opportunities" with UNICAMP's extension school. Since 2020, she has been a member of the National Platform for Electric Mobility (PNME).

fconsoni@unicamp.br

UNICAMP produces the highest number of published articles per faculty member of all the Brazilian universities, as well as the highest number of patents claimed by an academic institution. According to the World University Rankings, UNICAMP was ranked first among the Latin American universities and twenty-eighth on the list of the top 100 universities from BRICS in 2017.

https://portal.ige.unicamp.br/en

Ilona
DAUN

Programme Manager
German Academic Exchange Service (DAAD)

Germany

Ilona Daun is a senior desk manager in the development cooperation division at the DAAD. She studied Spanish and English at the TH Köln University of Applied Sciences and holds a diploma in translation. Having grown up in southern Switzerland, she is also fluent in Italian. Ilona Daun joined the DAAD in 2008 and has been responsible for study and research programmes for Germans in South Asia. Since 2012, she has been coordinating higher-education cooperation projects carried out with the GIZ in the department "Development Cooperation – Institution-Building in Higher Education" (P31). She was also responsible for the first German-Brazilian research cooperation programme NoPa, as well as programmes in Bangladesh, Senegal, Mexico and Ecuador.

daun@daad.de

The motto of the DAAD is "Change by Exchange" – a concept that applies to more than the students and researchers they support. For the DAAD as a funding organisation, change means welcoming the challenges of this dynamic process and participating in shaping it.

www.daad.de

Aschkan
DAVOODI

Technical Advisor
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Brazil

Aschkan Davoodi is the technical advisor for the project H2Brasil, which promotes green hydrogen expansion in Brazil. He is a specialist in renewable energies and Power-to-X, and has a master's in mechatronics as well as a master's in energy science and engineering from the Technical University of Darmstadt. Before joining GIZ in Brazil to work on projects regarding PtX and green hydrogen, he gained experience at the Fraunhofer Institute of Solar Energy Systems in the energy system analysis department. His current focus is on regulatory framework conditions and research cooperation for green hydrogen.

aschkan.davoodimemar@giz.de

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is a service provider in the field of international cooperation for sustainable development and international education work, dedicated to shaping a future worth living around the world.

www.giz.de

Professor Dr Sergej
DIEL

Professor
Technical University of Ingolstadt

Germany

Sergej Diel is Professor for Mechanics and Numerical Methods in the Faculty of Mechanical Engineering at the Technical University of Ingolstadt (THI). His research interests are the testing and modelling of batteries and fuel cells under mechanical loading and environmental conditions. Professor Diel is the programme director of the new master's programme "Hydrogen Technologies and Economics" at the THI. He is a founding member and session chair of the DVM conference "Fuel Cell, Battery, Electric Drive – Requirements and Validation". He also coordinates the THI research activities at the Innovation and Technology Centre for Hydrogen in Pfeffenhausen, one of the four national centres for hydrogen research in mobility applications in Germany.

Sergej.Diel@thi.de
www.linkedin.com/in/sergej-diel-80bbaa23/

The focus of the Technische Hochschule Ingolstadt is on technology and economics. In addition to outstanding practice-oriented teaching, THI is distinguished by its research strength. Linked to the regional economic structure, THI positions itself as Germany's leading mobility university.

www.thi.de

Fabíola Sposito
GERBASE

Deputy Director
German Academic Exchange Service (DAAD)

Brazil

Fabíola Gerbase is deputy director of the German Academic Exchange Service (DAAD) in Brazil, where she works to strengthen academic and scientific cooperation between Brazil and Germany. A graduate in journalism and design, she is also DAAD's communication coordinator in Brazil.

gerbase@daad.org.br

The DAAD is the world's largest funding organisation for the international exchange of students and researchers. Since it was founded in 1925, around 2.8 million scholars in Germany and abroad have received DAAD funding.

www.daad.de

Professor Dr Johannes
GULDEN

Head of the Institute for renewable energy systems
University of Applied Science, Stralsund

Germany

Joahnnes Gulden has a PhD in physics from the DESY in Hamburg. He is currently a professor in renewable energies in the Stralsund University of Applied Science, where he also heads the Institute for Renewable Energy Systems. His research focuses on methods for storing hydrogen through methanol as a green and renewable fuel.

johannes.gulden@hochschule-stralsund.de

The Institute for Renewable Energies at the University of Stralsund focuses its research on the renewable energy system as a whole. Hydrogen plays an especially important role, and the storage and use of hydrogen has been the centre of the institute's research for over 25 years.

www.hochschule-stralsund.de/forschung-und-transfer/institute/institut-fuer-regenerative-energiesysteme/

Professor Dr Markus
HOLZ

Professor
Anhalt University of Applied Sciences

Germany

Markus Holz has been a professor at the Anhalt University of Applied Sciences since 2020. He is the programme director for the master's study course "Logistics Management". Prior to taking up this professorship, he held key positions in various industrial companies. Most notably, he was the CEO of ALD Vacuum Technologies (part of the AMG group) from 2011 to 2019, the MD of Hempel Special Metals (2010 to 2011), the CEO of ThyssenKrupp Titanium (1999 to 2009), and the Executive Vice President, Technology (last position) at ThyssenKrupp Stainless (1994 to 1999). Professor Holz received his diploma in aerospace engineering from the University of the German Forces in Munich in 1986, and his PhD from the same university in 1992. He spent ten years in the German air force, leaving as a Captain in 1992.

markus.holz@hs-anhalt.de
www.linkedin.com/in/markus-holz-851923182

Anhalt University's key aim is to cultivate knowledge with strong ties to practice, consistently bringing together science and innovation. In Bernburg, Dessau, and Köthen, they provide innovative research and teaching at an international level.

www.hs-anhalt.de

Arne
JEPPE

Research Associate
Chair of General Business Administration and International Automotive Management
University of Duisburg-Essen
Germany

Arne Jeppe is a PhD candidate at Professor Dr Heike Proff's Chair of General Business Administration and International Automotive Management (IAM). He is a business economist, an industrial engineer (MSc) and a mobility and automotive expert. He conducts research on international and strategic (automotive) management, including business models, novel mobility networks (ecosystems) as well as electromobility and electric transportation in urban use. His work is closely related to sustainable transportation and Mobility as a Service (MaaS). He is member of the working group "Business Models and Governance" in the MaaS Alliance. He has co-developed several interdisciplinary research proposals about ecosystems, governance, and sustainable battery-electric mobility.

arne.jeppe@uni-due.de

Professor Dr Heike Proff's Chair of General Business Administration and International Automotive Management conducts research on international and strategic automotive management, including business models, novel mobility networks (ecosystems) and electromobility and electric taxis in urban use.

www.uni-due.de/iam/

Dr Johannes Michael
KISSEL

Director of Renewable Energy and Energy Efficiency
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Brazil

Johannes Michael Kissel is the director of renewable energy and energy efficiency at Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in Brazil. He holds a Ph.D. in renewable energy with a focus on distributed generation and incentive mechanisms. He has mainly worked in Germany, Brazil, and Bolivia.

johannes.kissel@giz.de

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is a service provider in the field of international cooperation for sustainable development and international education work. It is dedicated to shaping a future worth living around the world.

www.giz.de

Lisa
KRAUS

Research Associate
Chair of General Business Administration & International Automotive Management
University of Duisburg-Essen
Germany

Lisa Kraus has been a PhD candidate at the Chair of General Business Administration and International Automotive Management at the University of Duisburg-Essen in Germany for three years. She works on the research project InnaMoRuhr and is a lecturer on the course “Multinational companies in times of transformation”. Previously, she coordinated a feasibility study on the coupling of electrification of taxis and their business operations.
She is a member of the working group “Business Models and Governance” in the MaaS Alliance, promoting international exchange about the economic feasibility of, and necessary regulations for, integrated mobility systems. She also successfully completed a course in political consulting and has presented her research results at several international conferences in the USA, Norway, and Finland. She has co-developed several international research proposals.

lisa.kraus@uni-due.de

The Chair of General Business Administration and International Automotive Management at the University of Duisburg-Essen conducts research on international and strategic automotive management, including business models (for example Proff/Fojcik 2015), novel mobility networks (ecosystems) (Proff, 2019), and electromobility and electric taxis in urban use.

www.uni-due.de/iam/

Marcos
MALVEIRA

Researcher
Edson Mororó Moura Institute of Technology – ITEMM

Brazil

Marcos Roberto Rodrigues Malveira holds a degree in electrical engineering from the State University of Campinas (2010). He is currently a researcher at ITEMM. He has experience in the field of electrical engineering, with an emphasis on industrial electronics, electronic systems, and controls. For more than ten years he has worked on projects aimed at distribution automation and the application of algorithms to optimise electrical networks. He has been working as a specialist in the digital transformation process for five years, developing technological solutions for diagnostic monitoring and process optimisation.

marcos.malveira@itemm.org.br
www.linkedin.com/in/marcos-malveira-222a9526/

ITEMM was founded in 2012 as a science and technology institute in the Brazilian Northeast Region, with the mission of establishing itself as a centre of excellence in the development of solutions aimed at energy accumulation and its applications.

www.itemm.org.br

Ida Joana
MEISSNER

Project Assistant
German Academic Exchange Service (DAAD)

Brazil

Ida Joana Meissner is the project assistant for NoPa 2.0 in the foreign office of the German Academic Exchange Service (DAAD) in Rio de Janeiro. This means she is involved in organising matchmaking and all the other events regarding the NoPa2.0 programme.

meissner@daad.com.br

The DAAD is an association of German institutions of higher education and their student bodies. They convene in a general assembly to elect the Executive Committee, which oversees the organisation's day-to-day operations.

www.daad.de

Professor Dr Joel
MELO TRUJILLO

Professor
Federal University of ABC

Brazil

Joel David Melo Trujillo received his BSc from the Universidad Nacional Mayor de San Marcos (UNMSM) in Lima, Peru, in 2006, and his MSc and PhD from the Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP) Ilha Solteira in São Paulo, Brazil, in 2010 and in 2014 respectively. He has been a lecturer at international conferences and has published in major scientific journals. Currently, he is an associate professor at the Federal University of ABC (UFABC) Santo André in Sao Paulo, Brazil, and participates in developing research projects for electrical utilities. His main research interests are in the areas of electric power systems planning, specifically in applying spatial-temporal models to power systems analysis.

joel.melo@ufabc.edu.br
www.linkedin.com/in/joel-melo-2a378a45
http://lattes.cnpq.br/4396532007704107

UNICAMP produces the highest number of published articles per faculty member of all the Brazilian universities, as well as the highest number of patents claimed by an academic institution. According to the World University Rankings, UNICAMP was ranked first among the Latin American universities and twenty-eighth on the list of the top 100 universities from BRICS in 2017.

www.ufabc.edu.br

Ana Lúcia
MÜNZNER

Facilitator

Brazil

Ana Lúcia Münzner is a facilitator of participatory processes, multi-stakeholder engagement, and workshops and strategic planning with small and large groups (including both online and in-person).
She is experienced in cultural change processes in organisations in the public, private, and third sectors, as well as in international consulting (in Germany, Zambia, and Brazil). Ms Münzner works in the fields of mentoring, coaching, and thinking partnership for leaders. She also trains other facilitators and coaches herself with Time to Think (UK) accreditation. In addition, she has skills related to conflict mediation and awareness of multicultural environments.

ana@munzner.co
www.linkedin.com/in/anamuenznerwww.instagram.com/ana.munzner/
www.munzner.co

Anja
MUNZIG

Programme Administrator
German Academic Exchange Service (DAAD)

Germany

Anja Munzig is a project manager in the development cooperation division at the DAAD. She joined the DAAD in 2008 and has been responsible for scholarship holders from Pakistan and Brazil. Since 2013, she has been working as a project manager in higher-education cooperation projects carried out with the GIZ in the department "Development Cooperation – Institution Building in Higher Education" (P31). In the past, Ms Munzig worked for the German-Brazilian research cooperation programme NoPa, the German-Bangladeshi Higher Education Network for Sustainable Textiles (HEST), the German-Ecuadorian Research Program on Biodiversity and Climate Change (CoCiBio), and the German-Mexican University Collaboration Between Forensic Doctors (CoCiMex). She is now involved in NoPa 2.0.

munzig@daad.de

The motto of the DAAD is "Change by Exchange" – a concept that applies to more than the students and researchers it supports. For the DAAD as a funding organisation, change means welcoming the challenges of this dynamic process and participating in shaping it.

www.daad.de

Professor Dr Andreas
NASCIMENTO

Professor (Tenured)
Federal University of Itajuba

Brazil

Andreas Nascimento holds a technical degree in industrial computer science (UNESP), bachelor's degrees in computer engineering (UNIFEI) and mechanical engineering (UNESP), an M.Sc. in energy engineering (UNIFEI), a Dipl.-Ing. in petroleum engineering (Montanuniversität Leoben, Austria), a Dr.-Eng. in mechanical engineering (petroleum and petrochemistry, UNESP), and a post-doctoral degree from the International Institute for Applied Systems Analysis (Austria).
In his professional career, Dr Nascimento has held positions at Schlumberger Oilfield Services (Angola, 2010–2014), as a professor at the Federal University of Espirito Santo (UFES, Petroleum Eng. Group, 2016–2022), and as a visiting professor in the Department of Petroleum Engineering at Montanunversität Leoben (Austria, since 2019). He has been a tenured professor at the Federal University of Itajuba (UNIFEI, Energy Group) since 2022.

andreas.nascimento@unifei.edu.br

Motto: "We shall reveal ourselves more by deeds than by words, and be worthy of owning this great country." (Dr Theodomiro Carneiro Santiago, founder).

www.unifei.edu.br
https://en.unifei.edu.br/universidade-federal-de-itajuba/

Professor Dr Roberto
NETTO

Technical Coordinator
Research Institute FACENS

Brazil

Roberto Silva Netto has a degree in electrical engineering, a master's degree, and a sandwich doctorate from the Politecnico di Milano and the Federal University of Itajubá, where he carried out studies on ICT applied to smart grids. He has experience in electrical engineering with emphasis on communication systems and software development, and he has mainly worked on the following topics: information security, vulnerabilities, management, traffic analysis, smart grids, intelligent electrical grid frameworks, microgrids, real-time simulation, smart cities, and the IoT. He is responsible for the 5G project at Facens, where he has been developing use cases with partners such as Stellantis, Ericsson, Claro, Embratel, ABB, CPFL, CEMIG, Instor, Lenovo, Qualcomm, and Samsung.

roberto.netto@facens.br
www.linkedin.com/in/robertonetto

The purpose of this mission is to present the proposed project to other entities and start a new, prosperous, and lasting partnership in which all institutions can exchange information and develop relevant projects. Facens' mission is to develop professional citizens who are prepared to take on life's myriad challenges.

www.Facens.br

Professor Dr Karla
OHLER-MARTINS

Professor for Industrial Service
Ruhr West University of Applied Sciences

Germany

Karla Ohler-Martins was born in Rio de Janeiro and has been living in Germany since the end of 2002. Married with three children, she worked in the steel industry for 10 years before taking on her current position as a full professor in the Institute of Business Administration at the Ruhr West University of Applied of Sciences in 2017. She believes that engaging with the energy sector will be a very good experience to contribute with regard to both Brazil and Germany.

karla.ohler-martins@hs-ruhrwest.de
www.linkedin.com/in/karla-ohler-martins-4b668212/
Instagram: prof_ohlermartins

At HRW, internationalisation means providing access to international networks for knowledge building and mutual exchange in teaching, research, and transfer; facilitating new perspectives; and promoting a global mindset that encourages open and curious thinking.

www.hochschule-ruhr-west.de

Gianna-Maria
PEDOT

Advisor
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Brazil

Gianna-Maria Pedot graduated with a master's degree in economics and a master's degree in the environment and sustainability from the Catholic University of Milan. Since 2018, she has been working as an advisor for GIZ and has gained experience in the fields of climate, energy, and biodiversity in Colombia, Mexico, and Germany. She has been living in Brazil since 2020 and currently works for the Green Hydrogen Project (H2Brasil). Within H2Brasil, Ms Pedot is responsible for the implementation of the programme "German-Brazilian Research Cooperation in the Energy Sector – NoPa 2.0".

gianna-maria.pedot@giz.de

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is a service provider in the field of international cooperation for sustainable development and international education work. It is dedicated to shaping a future worth living around the world.

www.giz.de

Professor Dr Karen
PONTES

Professor
Federal University of Bahia

Brazil

Karen Pontes is an associate professor at the Federal University of Bahia (UFBA), as well as a member of the Industrial Engineering Graduate Program (PEI) and the Energy and Environment Graduate Program (PGENAM). She completed her master's degree (Unicamp, 2005) and Ph.D. (Unicamp, 2008) in chemical engineering with a sandwich period at the University of Aachen (Germany), where she also developed post-doctoral research. Since 2017, she has been a founding member of the Brazil-Germany Network of Higher Education (Rebralint). Dr Pontes' research interests focus on process system engineering as it applies to carbon capture and the conversion and production of H2 and sustainable fuels from biomass.

karenpontes@ufba.br
http://lattes.cnpq.br/5444380855577045

As a public institution, the Federal University of Bahia's mission is to produce and disseminate science, technology, art, and culture as a sound basis for shaping the professionals, teachers, and researchers of tomorrow.

https://ufba.br/

Professor Dr Paul Josef
Rawiel

Professor
HFT Stuttgart University of Applied Sciences

Germany

Paul Josef Rawiel studied surveying at the University of Karlsruhe until 1994, when he earned his Diplom-Ingenieur degree in surveying. He then worked on a project with the Max-Planck-Institut für Limnologie in the Pantanal in Brazil for a year and a half. On returning to Germany, he went back to the university of Karlsruhe to study towards a PhD in surveying, which he completed in December 2000. He then worked as a software engineer for a company in the southwest of Germany and has been Professor of Surveying at the HFT Stuttgart since 2005. One of his focus areas in recent years has been in the field of modern sustainable mobility. He has also conducted research into the detection of height changes in the Greenland ice sheet for a project funded by the Deutsche Forschungsgemeinschaft.

paul.rawiel@hft-stuttgart.de

An outstanding example of the research being undertaken at the HFT Stuttgart is the project “Intelligent City” (iCity). Ongoing subprojects on issues such as mobility are also good matches for the goals of the NoPa 2.0 programme.

www.hft-stuttgart.de

Marcus
REGIS

Consultant
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Brazil

Marcus Regis, an expert in German-Brazilian scientific cooperation, is a former NoPa coordinator.
NoPa (New Partnerships) is a German-Brazilian cooperation project that promotes the concrete application of research results by connecting science with practitioners in the private and public sectors and civil society at large.

In previous instances of NoPa (2013–2018), Mr Regis oversaw the project’s implementation and articulation with partners and stakeholders, particularly in 20 bilateral research projects in the two focal areas of German-Brazilian cooperation (protection and sustainable use of tropical forests; renewable energies and energy efficiency), which involved more than a hundred partners among research institutions and users in government and industry.

marcbina@gmail.com

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is a service provider in the field of international cooperation for sustainable development and international education work. It is dedicated to shaping a future worth living around the world.

www.giz.de

Pedro
RODRIGUES

Technical Advisor
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Brazil

pedro.rodrigues@giz.de

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is a service provider in the field of international cooperation for sustainable development and international education work. It is dedicated to shaping a future worth living around the world.

www.giz.de

Professor Dr Ricardo
RÜTHER

Full Professor
Universidade Federal de Santa Catarina

Brazil

Ricardo Rüther is a full professor in the fields of solar photovoltaics, electrochemical storage, green H2, and electromobility at Universidade Federal de Santa Catarina. He completed B.E. (1989) and M.Sc. (1991) degrees in metallurgy and material science at Universidade Federal do Rio Grande do Sul and a Ph.D. from the University of Western Australia's Department of Electrical & Electronic Engineering in 1995. He was also an Alexander von Humboldt post-doctoral research fellow at the Fraunhofer Institute for Solar Energy Systems in Germany (1995–1996) and was tenured at Universidade Federal de Santa Catarina in 2000. Prof. Rüther is also a guest lecturer in the M.Sc. programme in solar energy engineering at the University of Freiburg (Germany).

rruther@gmail.com

Advanced R&D in the fields of solar energy, green H2, storage, and electrical mobility towards a 100% renewable future

www.fotovoltaica.ufsc.br

Petra
SCHMIDT

Head of Cooperation for Sustainable Development
German Embassy

Brazil

Cooperation for Sustainable Development

Internationally, Germany is highly committed to sustainable development, especially climate protection and biodiversity conservation. In a country like Brazil with the largest tropical forest area in the world, holding about 20% of the global biodiversity, one of the pillars of cooperation is the protection and sustainable use of such resources. Brazil's unique capacity to produce clean energy also places the stimulus on renewable sources and energy efficiency at the heart of the partnership.
The Brazil-Germany Cooperation takes place from north to south, either in the countryside or in large cities; supporting small producers or training young people for jobs of the future; protecting traditional communities or developing state-of-the-art technology. The purpose is always the same: transform the present and build a fairer and more sustainable future.

Professor Dr Thorsten
SCHNEIDERS

Professor for Energy Storage
Head of Virtual Institute for Smart Energy
Cologne University of Applied Sciences
Germany

Thorsten Schneiders has 11 years of working experience at the energy company E.ON SE. Since 2013, he has been a professor of energy storage at the Cologne Institute for Renewable Energy (CIRE), which is part of the engineering department at the Cologne University of Applied Sciences.
Dr Schneiders' interests lie in teaching and research in the fields of sustainable energy systems, renewable energy, energy storage, sector coupling, hydrogen for power, and heat and mobility demand. He has experience in planning, applying for funding, and coordinating several interdisciplinary research projects on smart energy, energy systems, and green hydrogen. He is also the head of Virtual Institute Smart Energy, a regional research and cooperation platform for interdisciplinary research on the digitalisation of the energy industry.

thorsten.schneiders@th-koeln.de

The Cologne University of Applied Sciences offers praxis-oriented bachelor and master study courses on technology, arts, and sciences, including dedicated courses on renewable energy systems. Research activities in close cooperation with industry complement the university's activities.

www.th-koeln.de

Carmen
SILVA SANCHEZ

Deputy Superintendent of Research and Development and Energy Efficiency
Brazilian Energy Regulatory Agency (ANEEL)

Brazil

Carmen Silvia Sanches holds a PhD and a MSc in Business Management, a Master´s in Economics, Regulation, and Competition in Public Services, a Specialization in Science, Technology, and Innovation Policy, and a BSc in Economics Sciences. She has worked at ANEEL since 2007 as Specialist in Regulation of Public Services. Carmen is the Deputy Superintendent of the Superintendence of Research and Development and Energy Efficiency (SPE) at ANEEL – the Brazilian Electricity Regulatory Agency.

cssanches@aneel.gov.br

ANEEL was created by Law 9,427/1996 and Decree 2,335/1997 to regulate the Brazilian electricity sector. Its mission is to provide favorable conditions for the electric power market to develop with balance between the agents and for the benefit of society.

www.gov.br/aneel

Valentina
VASQUEZ ARANGO

Doctarade Aspirant
Federal university for latin american integration - UNILA

Brazil

Valentina Vasquez Arango is a doctoral candidate in the Interdisciplinary Post-Graduation Program in Energy and Sustainability at the Federal University of Latin American Integration (UNILA). She holds a master's degree in energy engineering (energy and sustainability) from the same institution. She is currently involved in a line of research on biofuels of lignocellulosic origin, energy markets, and energy transition processes through the use of hydrogen.

vvasquezar@gmail.com
linkedin.com/in/valentinavasquezarango

The Federal University of Latin American Integration is a Brazilian public institution of higher education located in the city of Foz do Iguaçu (Paraná), Brazil. Its institutional mission is to train human resources capable of contributing to Latin American integration, regional development, and culture.

https://portal.unila.edu.br/

Professor Sergio
VELHO

PhD Student
University of Brasília

Brazil

Sergio Velho holds a master's degree in engineering (PPGE3M / UFRGS, 2016), a degree in chemical engineering from the Pontifical Catholic University of Rio Grande do Sul (1991), and a degree in accounting from the Federal University of Rio Grande do Sul (1987). He is a specialist in occupational safety engineering and production management. In addition to being a doctoral student in mechatronics systems engineering at the University of Brasília (PPMEC/UnB), he is currently working as a science and technology analyst at the Brazilian Ministry of Science, Technology, and Innovation (MCTI).

knorrtec@gmail.com
linkedin.com/in/sérgio-knorr-velho-msc-709b9623
lattes.cnpq.br/1903156217708675

A transformative institution with a mission to produce, integrate, and disseminate knowledge and form citizens committed to ethics, social responsibility, and sustainable development: This is the University of Brasília, whose trajectory intertwines with the history of the country's capital.

www.unb.br

Miguel
FLORES TRAN

Coordinator for Master- and Doctorate programes; contact for NoPa in Brazil
German Academic Exchange Service (DAAD)

Brazil

Miguel Flores Tran coordinates master's and doctorate programmes for the DAAD in Brazil. Along with his colleague Ida Meissner, he is also one of the contact persons for NoPa 2.0 in Brazil.
In the past, Mr Flores Tran worked in the energy sector with the Hannover Metropolitan Area (Metropolregion Hannover-Braunschweig-Göttingen-Wolfsburg).

flores@daad.org.br

The DAAD is an association of German institutions of higher education and their student bodies. They convene in a general assembly to elect the Executive Committee, which oversees the organisation's day-to-day operations.

www.daad.de

Professor Dr Ralf
VOSS

Professor
Technische Hochschule Ulm

Germany

Ralf Voss is a professor of engineering design. His research focuses on probabilistic design and the numerical simulation of production processes with high plastic deformations using mesh-free finite-simulation methods. In a recent research project, such simulation methods have been used to evaluate the producibility of special micro-structured surfaces to increase heat transfer in a heat exchanger.

ralf.voss@thu.de

The Ulm University of Applied Sciences offers forward-looking, practically oriented study programmes with excellent support. Regionally anchored and internationally networked, it is a premium partner for applied research and technology transfer.

www.thu.de
www.thu.de/voss

INDEX
(in alphabetical order)

Index of the project participants

NOTES

IMPRINT

Organiser and Publisher
German Academic Exchange Service (DAAD)
Kennedyallee 50
53175 Bonn
+49 (228) 882-0
www.daad.de

Project Coordination
Ilona Daun
Daun@daad.de
Anja Munzig
munzig@daad.de

MICHEL International Relations & Services, Berlin
Rebecka Michel & Isabelle von Uslar-Gleichen
info@michel-irs.com
www.michel-irs.com

Layout and Typesetting
onegraphic, Berlin

Print
Europrint Medien GmbH, Berlin
http://europrint-medien.de/

Photo credits
© Adobe Stock Images (Titel)

October 2022

With the financial support of
Federal Ministry
for Economic Cooperation
and Development