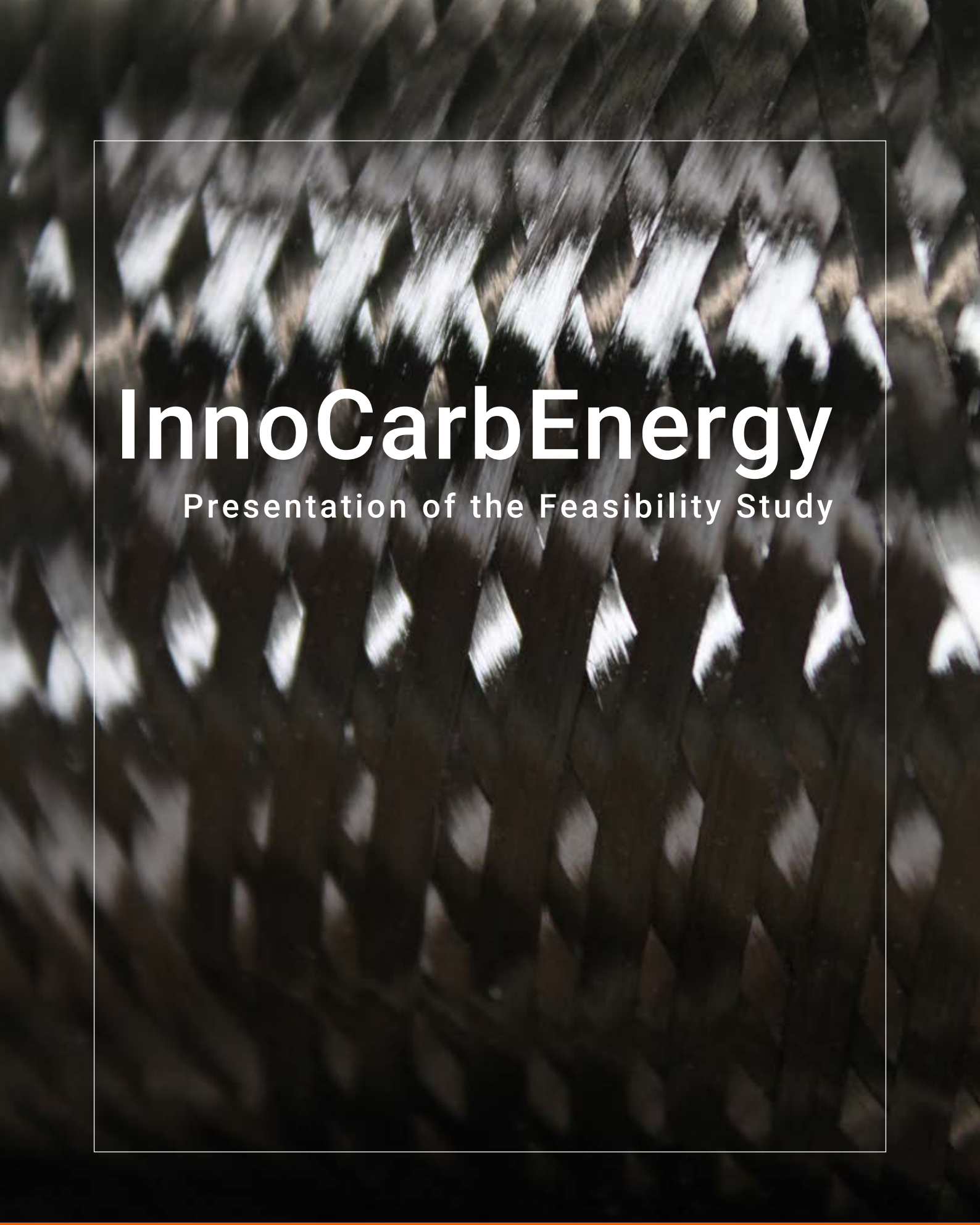

InnoCarbEnergy

Presentation of the Feasibility Study

InnoCarbEnergy is one of the first structural change projects of the Cluster of Excellence MERGE in cooperation with the Fraunhofer IWU and Fraunhofer IAP.

TECHNISCHE UNIVERSITÄT CHEMNITZ

MERGE
Cluster of Excellence

Contact

innocarbenergy@iwu.fraunhofer.de

innocarbenergy.de

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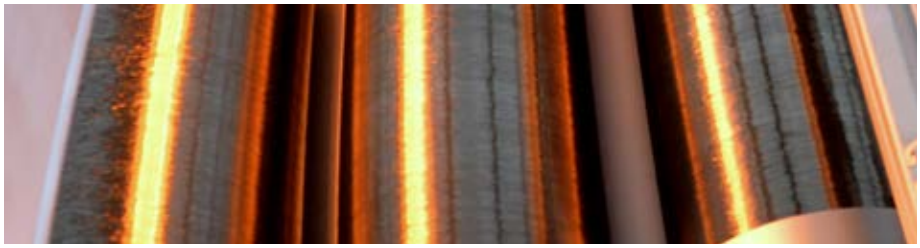
Project coordination

Univ.-Prof. Dr.-Ing. habil. Lothar Kroll

Head of Department of Lightweight Structures and Polymer Technology
and CEO of the Cluster of Excellence MERGE
at Chemnitz University of Technology

lothar.kroll@mb.tu-chemnitz.de
+49 371 531 35706

Project partners



Project Idea

Planning of the Carbon LabFactory Lausitz

The properties of carbon fibres are as diverse as their potentials. By applying carbon fibres in multifunctional lightweight structures, wind turbines, for example, can generate the basis for a CO_2-free economy. Mobility, on the road, water, rail and in the air achieves greater ranges with lower greenhouse gas emissions through the use of carbon fibres and the resulting mass reduction. While the potential of carbon fibres as a future technology has already been confirmed, their industrial production has so far been based primarily on petrochemical base materials and energy-intensive processes, with high costs compared to metals.

Future-oriented change of perspective

In order to achieve the paradigm shift to a product-specific precursor and carbon fibre production with modified polyacrylonitrile (PAN) on the one hand and sustainable raw materials on the other hand in combination with renewable energy, the Cluster of Excellence MERGE of the Chemnitz University of Technology, the Fraunhofer Institute for Machine Tools and Forming Technology IWU, the Fraunhofer Institute for Applied Polymer Research IAP and the BTU Cottbus/Senftenberg cooperate within the scope of the feasibility study InnoCarbEnergy. Together with stakeholders from politics and industry, the potential of a fully equipped research and pilot line is being discussed, ranging from the production of precursor materials, stabilisation, carbonisation and post-treatment of carbon fibres to textile processes on a semi-industrial scale.

As part of the InnoCarbEnergy feasibility study, in addition to central technical and economic issues, sites within the municipality of Boxberg/Oberlausitz are analysed, which are particularly well suited for the establishment, operation and maintenance of a research facility as well as the settlement of industrial partners. This process is accompanied on the business side by the Lausitz Energie Bergbau AG and Lausitz Energie Kraftwerke AG (LEAG) and on the research side by the Chemnitz University of Technology and Brandenburg University of Technology BTU Cottbus–Senftenberg.

Carbon LabFactory Lausitz

With the common vision of a climate-friendly transformation of the region from the coal economy of the past and present to a self-supporting bio-economy, sustainable technology paths for the production of carbon fibres are being discussed and the necessary infrastructure for the operation of the research and pilot plants is being planned within the consortium. The aim is to position the research site permanently and independently in the research landscape as the “Carbon LabFactory Lausitz”. Due to the growing importance of carbon fibres and the steadily increasing demand for lightweight, energy-saving components, the planned research operation will result in a further global competitive advantage for the regional industrial landscape.

Project Objectives

1

Provide prospects

The structural change in Lusatia requires sustainable value chains interwoven with the European economic area to compensate the loss of well-paid jobs. The InnoCarbEnergy feasibility study aims to develop a long-term perspective for the region in the fields of carbon fibre research, production and their application in lightweight structures. The concept of research and pilot lines linked to existing and newly developed innovation clusters consisting of local and international companies and research institutions is unique throughout Europe. Given the Saxony-Brandenburg cross-border linkage of competencies from leading scientific institutions, this perspective has the best possible starting conditions.

2

Identify technology pathways

The high lightweight potential of carbon fibres makes them more suitable than any other material for reducing global greenhouse gas emissions in a wide range of applications. For a more profound integration of carbon fibres into industrial value chains, the existing carbon fibre production must be adapted to the specific product properties and integrated into energy concepts based on renewable resources. In addition, new precursors have to be developed that rely on renewable raw materials instead of conventional petrochemical base materials. The feasibility study aims to identify particularly suitable technology paths for this development and to discuss the necessary infrastructure. Thereby, the objective of reducing manufacturing costs is closely connected to product- and material-specific adaptations.

3

Interconnecting science and business

The vision behind the InnoCarbEnergy feasibility study is to establish a self-supporting carbon fibre research at Boxberg, embedded in the regional, national and international scientific and economic landscape. The European lighthouse character of the research location will create a unique space in the field of lightweight structural engineering, which will serve as an innovation driver for regional companies and a centre of attraction for start-ups and international companies. In order to address the needs and expectations of regional, national and international stakeholders from the outset, the InnoCarbEnergy feasibility study aims to establish an information network that promotes the open exchange of ideas and includes them in the implementation of the feasibility study.

Verify boundary conditions

The establishment of the Carbon LabFactory Lausitz with upstream processes, research and pilot lines for precursor and carbon fibre production and downstream textile processes has specific requirements on the location and infrastructure. It is the aim of the InnoCarbEnergy feasibility study to discuss these necessary conditions and define the optimal location for the future research facility in cooperation with the municipality Boxberg/O.L. and LEAG. In order to achieve the research goals, a recommendation for the organisational structure and its personnel is developed within the study. Finally, based on the findings of the feasibility study, the aim is to identify the necessary financial requirements for the subsequent development and consolidation phase.

4

Background

Structural change in Lusatia

The response to the anthropogenic climate change is of crucial importance for the preservation of prosperity and quality of life. Based on this motivation, the German federal government has decided to reduce greenhouse gas emissions by at least 95 percent until 2050 compared to 1990. One of the key factors for achieving this ambitious goal is the conversion of electricity and heat generation from fossil fuels to renewable energies. With this in mind and following the suggestion of the Commission "Growth, Structural Change and Employment", the generation of electricity from hard coal and lignite in Germany will be phased out by 2038.

The macrosocial task

In the concerned regions, coal mining and its conversion into electricity has remained a central pillar of the economic structure to this day and provided a reliable source of income for thousands of households for decades. Especially in the Lusatia region, the upcoming coal phase-out is for many people already the second structural change (German: Strukturwandel) since the reunification process in the 1990s. As a result of the collapse of the German Democratic Republic and its economy, more than 90 per cent of the coal workforce was laid off, numerous power plants and opencast mines were closed, and realities believed to be safe were called into question. The repeated, indispensable transformation process to a largely greenhouse gas-neutral economy and society by the middle of the century therefore should not be a one-sided burden on coal power producing regions and municipalities. This results in the overall social task of "structural change" for new, sustainable value chains with profitable and sustainable jobs.

New visions for Lusatia

The "Investitionsgesetz Kohleregionen" (English: Coal Regions Investment Act) will make structural aid of over 17 billion euros available in Lusatia over the next two decades. This financial basis for structural change must be invested in visionary ideas and realised by courageous institutions, companies and people.

The Carbon LabFactory Lausitz as a follow-up project to the InnoCarbEnergy feasibility study represents such a trend-setting opportunity and offers a long-term perspective for the Lusatia region. The idea of a research campus for precursors, carbon fibres and textile processes all the way to the component, which can similarly only be found in the USA and Australia, has the potential to expand the state of science and technology in carbon fibre research and production far beyond the region's borders.

The scientific focus of the Carbon LabFactory Lausitz on product-specific adaptations of current, petrochemical-based carbon fibres and on the development of new processes using renewable raw materials can make a valuable contribution to lightweight construction and climate protection today and in the future. The integration of carbon fibre processing companies in the region allows the direct economic utilisation of scientific findings and products on the one hand and creates a perspective beyond the coal mining through numerous new jobs on the other.

STRUKTURWANDEL

"The cooperation of the university and research institutes with the company LEAG is exemplary of how sustainable structural change can succeed."

Thomas Schmidt
Minister for Regional Development,
Free State of Saxony

Design of the Study

InnoCarbEnergy feasibility study

A B C

Location

The necessary conditions of a research site for the production of product-specific and sustainable carbon fibres, including upstream and downstream processes, are to be analysed and examined in more detail. These requirements are compared with the conditions of the future site and necessary investment needs are identified. The target region for the pilot scale is the municipality of Boxberg/Oberlausitz, which is affected by structural change.

Technology

For the scientific orientation of the Carbon LabFactory Lausitz, the technology paths to be followed are defined, taking into account existing boundary conditions and the project goals. The analysis is carried out with the aim of its central implementation in Boxberg/O.L. An important boundary condition is carbon fibre research and development under semi-industrial circumstances.

Utilisation

The future results of the intensive research at the Carbon LabFactory Lausitz allow a direct (e.g. product development and licensing) and indirect (e.g. agglomeration effects at Boxberg/O.L.) transfer into economic applications. For this purpose, in work package C, necessary scientific and economic exploitation strategies will be developed.

DE

Partners

The Carbon LabFactory Lausitz is intended to be permanently and independently established in the national and international research landscape. The questions addressed in the research operation will decisively influence technology paths from the basics to application. In order to continuously work on key challenges, an international partner network is established during the feasibility study.

Financial needs

Based on the results of the work packages A to D, the expected investment and consumption requirements of the Carbon LabFactory Lausitz are determined. The analysis differentiates in the forecast of the use and origin of funds as well as the expected income and expenses during the development and consolidation phase. The objective is to establish a research institution that fits into the funding scene.

Location

Municipality Boxberg/Oberlausitz

The municipality Boxberg/Oberlausitz has about 4,400 inhabitants and is located in the north-west of the district Görlitz in the Free State of Saxony. With an area of 217 km², it is the largest municipality in the district and the largest district municipality in the Free State of Saxony.

The bilingual municipality in the middle of the Lusatian Heath is surrounded by opencast mines in the north and east, Lake Bärwalde in the south and the Upper Lusatian Heath and Pond Landscape Biosphere Reserve in the west. The contrast between coal mining and a unique landscape of heathland, floodplains and ponds still characterises the landscape of the region today. With LEAG's power plant site and the associated potential for regenerative energies, energy storage solutions and pioneering energy management systems, the location has perfect prerequisites for establishing energy-intensive processes.

History

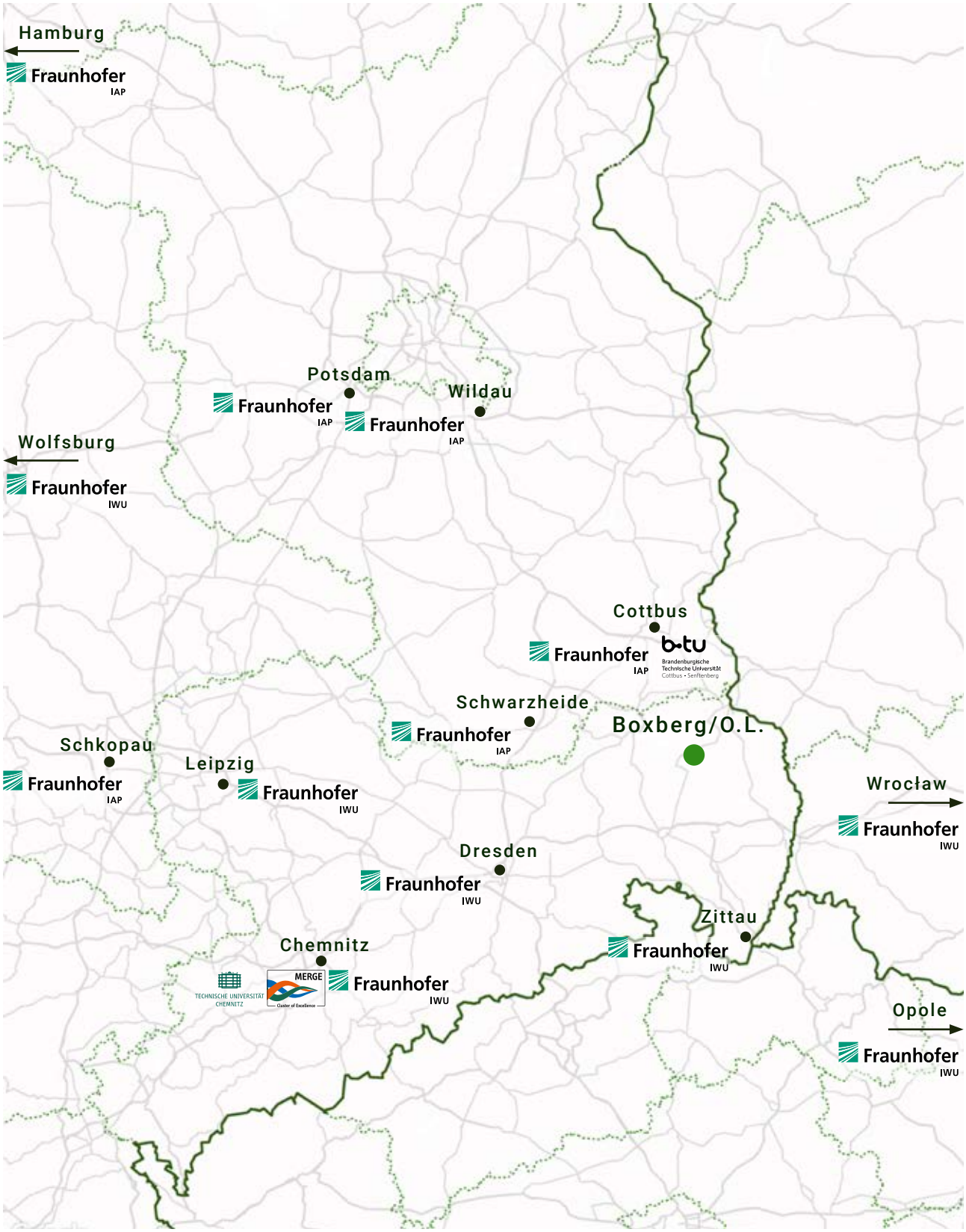
The municipality Boxberg (Sorbian name Hamor) was first mentioned in 1366 in connection with a hammer mill. Boxberg was a remote heathland village, where until 1884 bog iron ore was processed into iron. With the construction of the power plant in 1965 on a coal-free area in the middle of large coal deposits and the associated workers' housing, Boxberg grew into an industrial community. The municipality Boxberg/O.L., since 1998 with the addition O.L. for Oberlausitz (Upper Lusatia), became known far beyond the state borders. Today, the municipality Boxberg/O.L. offers more than just the name for an energy location. Boxberg/O.L. enjoys public attention as a young, dynamic and aspiring municipality.

Economy

Already in 1968, the foundation stone was laid in Boxberg for Germany's largest lignite-fired power plant, until well into the 1990s. The power plant started with 3,520 megawatts and is operated by Lausitzer Energie Kraftwerke AG since 2016. The LEAG energy site Nochten/Reichwalde/Boxberg with the opencast mines Nochten/Reichwalde and the power plant in Boxberg continues to be an important part of the common future strategy despite the decision to phase out coal.

After 1990, as a result of the structural changes and spin-offs at the Boxberg power plant, many companies have been newly formed and settled near the power plant. The site has a total area of 326.5 ha and is divided into the industrial zones west with an area of about 18 ha and south with an area of about 15 ha. The remaining area is covered by the power plant. The number of companies and businesses located at the Boxberg industrial site (as of December 2015) has reached 403 registered businesses - divided into trade 82, crafts 80, service providers and others 231, and industry 25.

For more information, please visit
www.boxberg-ol.de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Chemnitz
TECHNISCHE UNIVERSITÄT CHEMNITZ
MERGE Cluster of Excellence
Fraunhofer IWU
Opole
Fraunhofer IWU

Project Partner

Chemnitz University of Technology, Cluster of Excellence MERGE

Based on Germany's first and only Federal Cluster of Excellence in the field of lightweight construction research and the largest professorship in Germany concerning lightweight construction (Department of Lightweight Structures and Polymer Technology), fundamental research questions relating to the key technology lightweight construction are answered at Chemnitz University of Technology. The central focus is on the technology fusion for multifunctional lightweight structures. By combining the areas of plastic, metal, textile and smart systems, innovative products and production processes are developed. The aim is to achieve improved resource and energy efficiency throughout the entire life cycle. In this way, the numerous researchers and technicians at Chemnitz University of Technology and, in particular, the Cluster of Excellence MERGE and the Institute of Lightweight Structures make a significant contribution to environmental protection while strengthening the cross-border research cooperation through international, national and regional collaborations.

TECHNISCHE UNIVERSITÄT
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Fraunhofer Institute for Machine Tools and Forming Technology IWU

The Fraunhofer Institute for Machine Tools and Forming Technology IWU is an innovation driver for new advances in the field of production technology research and development. With around 670 highly qualified employees at the locations Chemnitz, Dresden, Leipzig, Wolfsburg and Zittau, IWU opens up potential for competitive production in automotive, mechanical engineering, aerospace, medical technology, electrical engineering as well as precision engineering and microtechnology. The focus is on components, methods, processes and complex machine systems - the entire factory. The goal of IWU, the leading institute for resource-efficient production, are technologies based on renewable energies with newly conceived information and visualisation technologies for the people as guarantors of success in the factory of tomorrow.

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Fraunhofer Institute for Applied Polymer Research IAP

The Fraunhofer Institute for Applied Polymer Research IAP makes materials fit for the future. Creative solutions are the key to mastering the challenges of the present and the future - whether climate change, pandemics, energy transition, structural change or new mobility concepts. At the Fraunhofer IAP, scientists are tackling this task with innovative materials, processes and technologies. They address the entire value chain - from the idea to the customised prototype. The topics include bioeconomy and sustainability, energy transition and mobility, health and quality of life as well as industry and technology.

Fraunhofer
IAP

Project Coordination

Univ.-Prof. Dr.-Ing. habil. Lothar Kroll

Director of the Institute for Lightweight Structures and CEO of the Cluster of Excellence MERGE at Chemnitz University of Technology

Lothar.Kroll@mb.tu-chemnitz.de

+49 371 531 35706

Prof. Dr. Lothar Kroll is CEO of the Cluster of Excellence MERGE, director of the Institute for Lightweight Structures at Chemnitz University of Technology and the affiliated institute Cetex. With his scientific work and his membership in numerous research associations, he is strongly committed to the research and further development of fibre-reinforced plastics and hybrid structures. Through the combination of high-performance materials and resource-saving manufacturing and processing methods, efficient and high-performance lightweight products of the future are created. In 2020, Prof. Dr. Lothar Kroll received the Order of Merit of the Free State of Saxony for his special scientific achievements and his commitment to strengthening the Polish-German relations.

Dr. rer.nat. Isabelle Roth-Panke

Head of the Endowed Professorship High-Performance Fibers and Processing and Administrative Director of the Cluster of Excellence MERGE at Chemnitz University of Technology

Isabelle.Roth-Panke@mb.tu-chemnitz.de

+49 371 531-35632

Dr. Isabelle Roth-Panke is the Administrative Director of the Cluster of Excellence MERGE, head of the Endowed Professorship High-Performance Fibers and Processing and head of the research area Polymer- and Interface Chemistry at the Department of Lightweight Structures and Polymer Technology at Chemnitz University of Technology. With her scientific work, she is increasingly committed to research and teaching in the fields of interface design for fibre-plastic composites and carbon fibres based on alternative fibre precursors

Advisory Board

Hubertus Altmann

Member of the Joint Management Board
Lausitz Energie Bergbau AG
Lausitz Energie Kraftwerke AG

Prof. Dr. rer. nat. Alexander Böker

Director
Fraunhofer IAP

alexander.boeker@iap.fraunhofer.de
+49 331 568-1112

Prof. Dr.-Ing. Welf-Guntram Drossel

Executive Director
Fraunhofer IWU

welf-guntram.drossel@iwu.fraunhofer.de
+49 371 5397-1400

Project Team

Dipl.-Ing. Mario Naumann

Research Associate
Fraunhofer IWU
Department of Lightweight Structures and Polymer Technology

mario.naumann@iwu.fraunhofer.de
+49 371 531-38758

Dr. rer.nat. André Lehmann

Head of Department Fiber Technology
Fraunhofer IAP

andre.lehmann@iap.fraunhofer.de
+49 331 568-1510

Dr.-Ing. Jens Erdmann

Head of Laboratory Carbon Fibre Production
Fraunhofer IAP

jens.erdmann@iap.fraunhofer.de
+49 331 568-1252

Dipl. Wi.-Ing. Maximilian Schwarz

Research Associate
Cluster of Excellence MERGE

maximilian.schwarz@mb.tu-chemnitz.de
+49 371 531-36365

Maximilian Kroll, M.Sc.

Research Associate
Fraunhofer IWU

maximilian.kroll@iwu.fraunhofer.de

Falco Lehmann

Research Associate
Fraunhofer IWU

falco.lehmann@iwu.fraunhofer.de

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Freistaat Sachsen