



Economic Centre **FREIBERG**

From SILVER to SILICON



*charming.
forward-looking.
strong.*

4 FROM SILVER TO SILICON

- Location
- Freiberg at a glance



*focussed.
innovative.
successful.*

6 ECONOMY I

- 60 years of electronic materials
- Expertise semiconductor materials
- Centre for renewable energies



*rich in tradition.
open-minded.
leading.*

10 SCIENCE

- University of Resources TU Bergakademie Freiberg



*creative.
practical.
connected.*

12 RESEARCH & DEVELOPMENT

- Helmholtz, Fraunhofer, DBI (German Fuel Institute)
- research-focused service



*diverse.
established.
competent.*

14 ECONOMY II

- Geological competence
- High tech materials
- Freiberg is sparkly and tasty



*flexible.
precious.
enticing.*

18 EDUCATION & CARE

- University City
- 500 years of school history
- Flexible child care



*exciting.
magical.
colourful.*

20 CULTURE & TRADITION

- Internationally renowned cultural monuments
- Silbermann organs
- Oldest City Theatre in the World



*unique.
lovely.
tolerating.*

22 LIVING & LEISURE TIME

- Historic old city centre worth living in
- Recreational fun for young and old
- International: Babies Frei and Berg

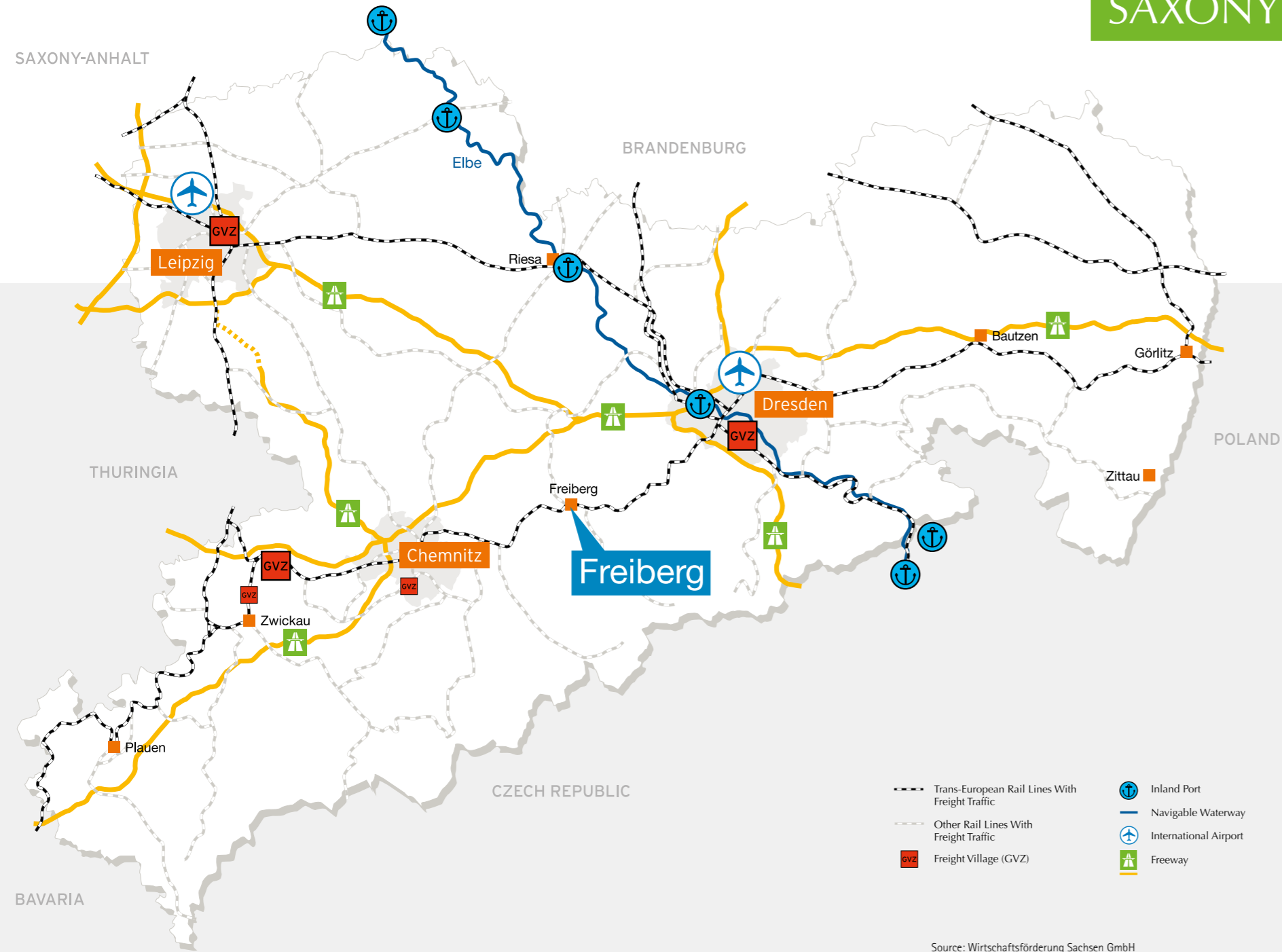
Glück auf!

Mining City, University City, Silver City – Freiberg has many faces. It fully bloomed during the Middle Ages due to silver mining. Today the "Stadt am Freyen Berge" (Town at the Free Mountain) presents itself as a modern and thriving centre of science and business, that fascinates both locals and visitors alike with its unique places of cultural interest and leisure activities. In Freiberg a future is born of a rich tradition. The first discovery of silver in the middle of the 12th century let the city grow quickly. Right into the 20th century the mining and smelting industry was the most important economic factor and this has laid a solid foundation for the establishment of Freiberg and the surrounding region as world-leading production and research location for the semiconductor industry. Mining created a unique culture, defining people and landscape up until today. The historical city center, which is almost completely rebuilt, with its precious monuments displays the city's previous richness, but also the proud, hard work and life of the miners. Everything comes from the mountain, as it is known in Freiberg, where it is still common to use the traditional miner's greeting "Glück auf".

Welcome!

Sven Krüger, Lord Mayor

SAXONY!



Facts and Figures

Information from October 2015

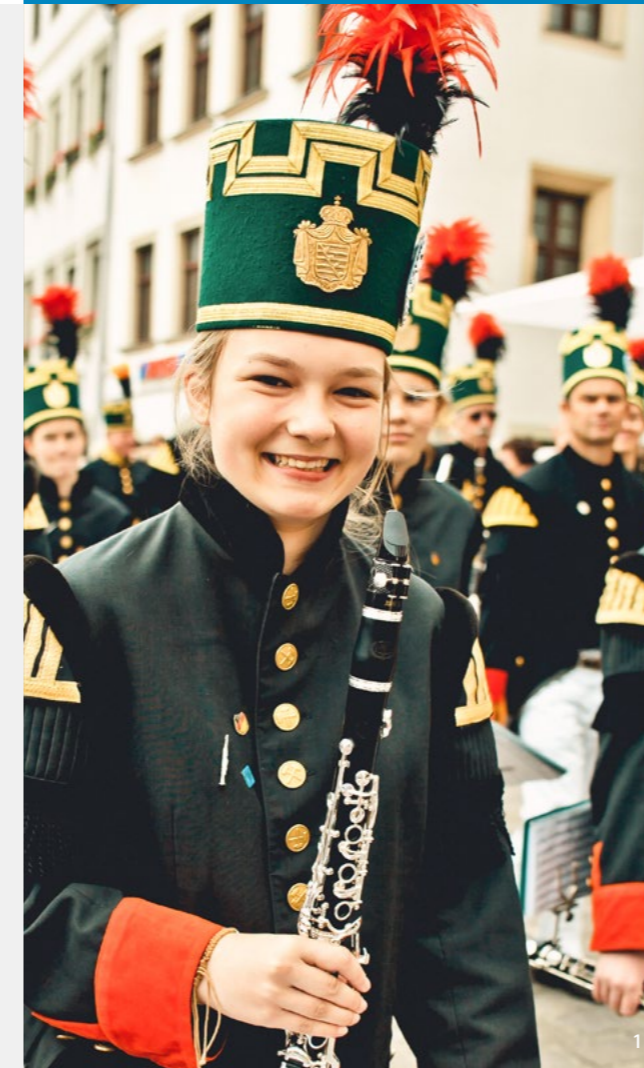
Inhabitants	41,507
Enterprises	2,641
Employees	20,457
Inbound commuters	11,763
Unemployment rate (in %)	6.3

From Silver to Silicon

charming. forward-looking. strong.

The University City of Freiberg with approximately 40,000 inhabitants is situated at the heart of Saxony, at the foot of the Eastern Ore Mountains. The economic centre is determined by tradition and innovation and today is an example of successful structural change from mining and smelting to a high technology centre. Attractive industrial estates, a wide industrial diversity and numerous renowned research facilities attract enterprises and employees. Roughly 12,000 people commute to Freiberg on a daily basis. Freiberg is closely linked to the Saxon cities of Dresden and Leipzig and their international airports by the nearby freeways 4 and 14. The Czech border is only 35 kilometres away and thus Freiberg is also a gate to Eastern Europe. Freiberg maintains lively partnerships with its twin towns Příbram in Czech Republic and Wałbrzych in Poland. Diverse international relations are kept up by the city, companies and institutions in regard to business and science, but also to culture and social affairs. Freiberg is the regional capital for the region of Middle Saxony, where approximately 313,000 people live. It is also administrative centre for 54 municipalities in total.

1 Major attraction: The traditional parade of Freiberg's Historic Miners' and Smelters' Guild make both locals' and visitors' hearts swell.





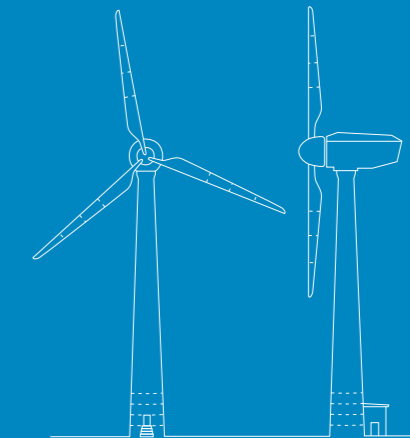
Economy I

focussed. innovative. successful.

Freiberg's success story, which started with silver, continues today with silicon. Freiberg is a globally leading centre in research and development of high-quality semiconductor material. This is based on 60 years of experience in electronic materials. The state-owned company VEB Spurenmetalle Freiberg (trace metals), which was founded in 1957, was of crucial importance to the microelectronics in East Germany as the most important supplier of germanium, silicon and III-V substrates. After German reunification new businesses emerged from this company, which still influence the economic centre today and secure thousands of jobs in the region: SolarWorld, Siltronic and Freiberger Compound Materials (FCM) are specialists of the semiconductor industry and act globally. They stand for innovation and quality "Made in Germany". In addition, Freiberg is a centre of renewable energies in all its facets: A large number of small and medium sized businesses focus on power of sun, wind and earth – photovoltaics and solar heat, geothermal and wind energy are growing and sustainable industries of the region.



- 1 Freiberger Compound Materials GmbH (FCM): Pre-Polishing.
- 2 Siltronic AG: silicon monocrystal.
- 3 Freiberger Compound Materials GmbH (FCM): Packing and certification.
- 4 Siltronic AG: Final cleaning machine for 300 mm wafers.
- 5 GeoENERGIE Konzept GmbH: With more than 1,500 successfully planned geothermal energy systems worldwide geoENERGIE Konzept belongs to the leading planning companies in the area of geothermal energy.



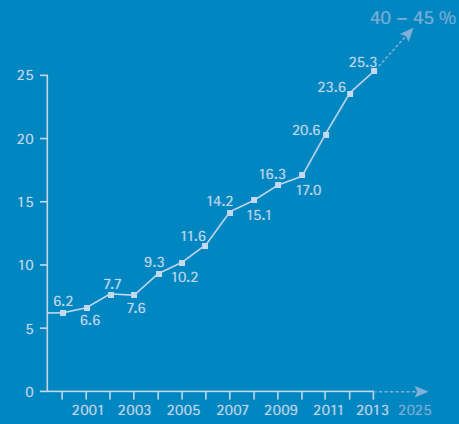
Pioneers of wind energy

Pioneers of wind energy like Sabowind and eab New Energy have been active on the market since the early 1990s and manage projects at home and abroad from Freiberg.



Share of renewable energies

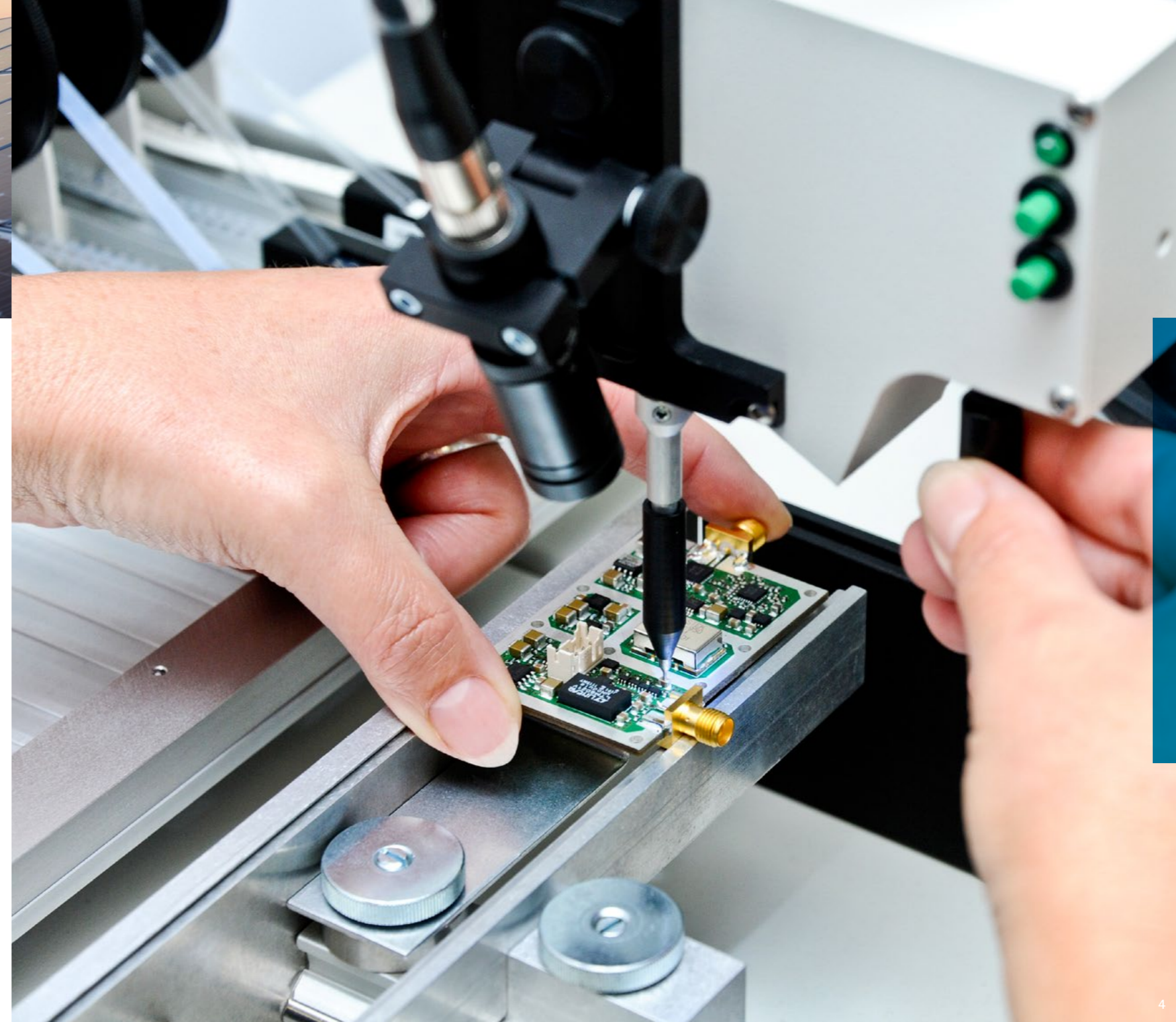
Development of share of renewable energies of gross electricity consumption (in per cent)



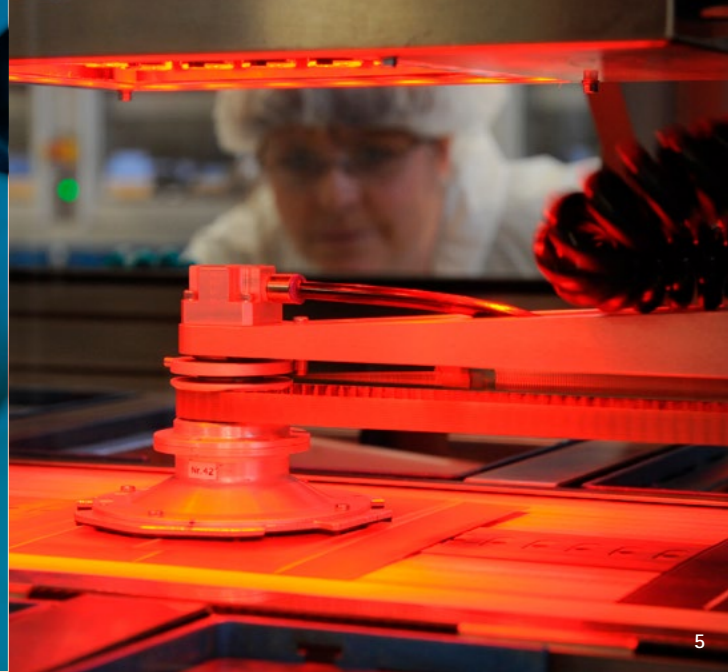
Source: Federal Ministry for Economic Affairs and Energy, based on statistics provided by the Renewable Energies team

Technologies for tomorrow's energy supply are developed and produced here: As a Centre for Regenerative Energy Freiberg is a location with a future.

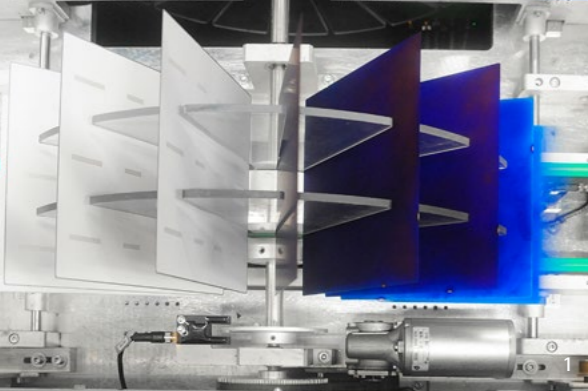
SolarWorld remains one of the most important competitors of the solar energy industry. With 1150 employees Freiberg is the group's biggest production site. All production steps from raw material to wafer to cell to module to the complete solar energy system are established here. Siltronic is a global market leader in wafer production from high-purity silicon and partner of many leading chip manufacturers. The company operates production sites in Europe, Asia and the United States. Siltronic's Freiberg site features state-of-the-art facilities and production lines for silicon monocrystals with a diameter of up to 300 mm and 300 mm silicon wafers. FCM is No. 1 on the world market as an expert for compound semiconductors: FCM products for the high frequency electronics and optoelectronics have an excellent reputation globally. The mobile information society is inconceivable without GaAs substrates, which can be found in mobile phones, the wifi functionality of PCs, notebooks and tablets, Facebook, Cloud, etc. In addition these optoelectronic components are necessary for laser, LEDs and automobile electronics.



- 1 Clean room of the cell production facility of SolarWorld AG.
- 2 Module manufacturing at SolarWorld AG.
- 3 Solar park of SolarWorld AG.



- 4 Circuit board production at Freiberg Instruments GmbH. The company is an expert in wafer metrology and received the Innovation Prize of the Free State of Saxony in 2011.
- 5 SolarWorld AG: Classification, cell production.



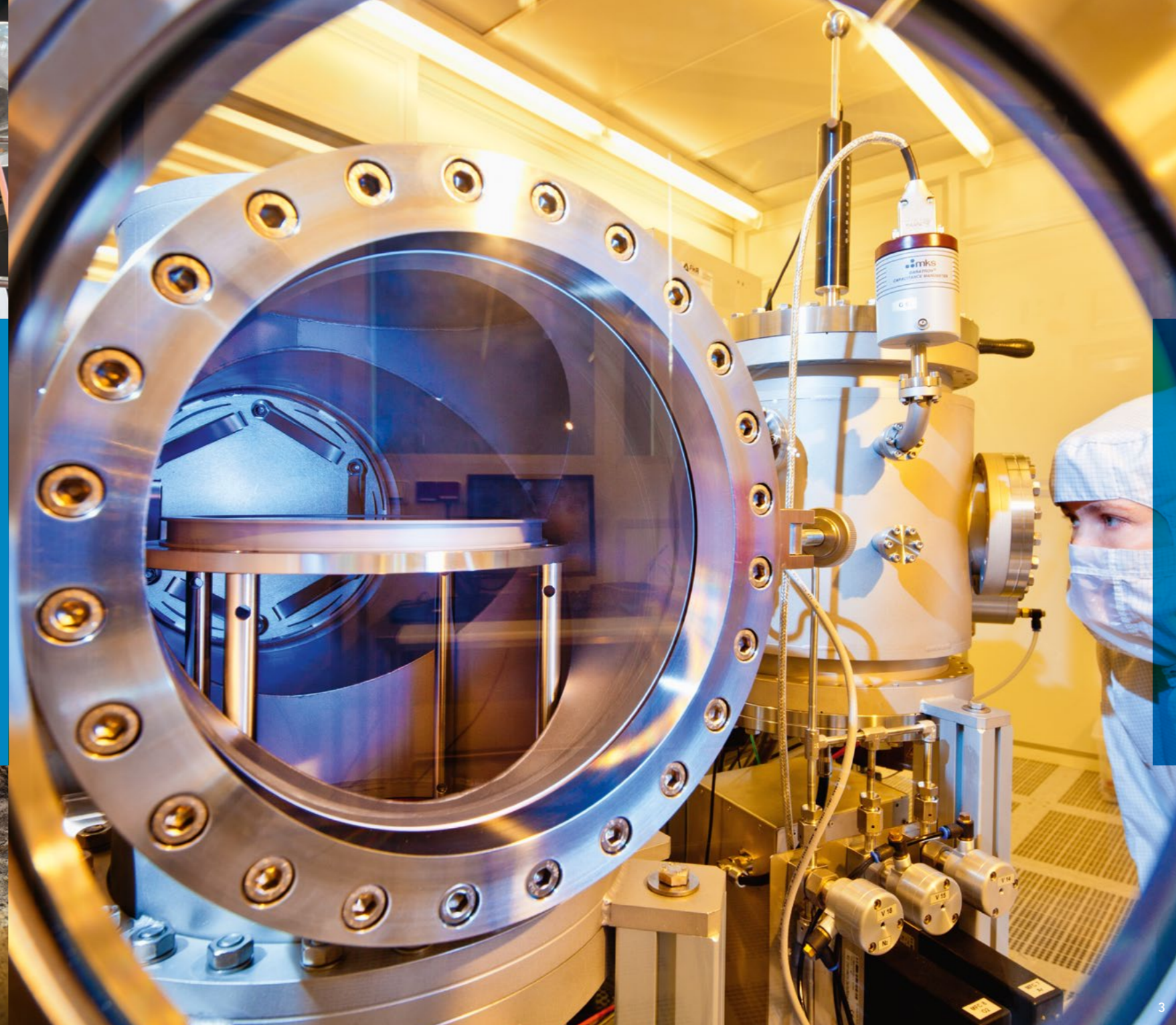
Science

rich in tradition. open-minded. leading.

The technical university TU Bergakademie Freiberg is the national University of Resources and as the region's biggest employer it dominates one of the most important science centres of Saxony. Its research potential and its links to the industry and other top-ranking research institutions attract innovative companies. In 2015 the Bergakademie celebrates its 250th anniversary and is the oldest mining university in the world. Since its foundation in 1765 it has focused on securing natural resources in regard to research and teaching. The idea of sustainability – first coined by Freiberg's Chief Mining Officer Hans Carl von Carlowitz more than 300 years ago – is then as now, main idea and goal of all developments. Scientists research along the entire supply chain from exploration and extraction of the resources to preparation and refining to recycling. The core fields Geo, Materials, Energy and Environment give the university an unmistakable profile today.



250 years of Bergakademie
Founded in 1765, TU Bergakademie Freiberg is the German University of Resources today.



- 1 Exciting also for young researchers – the laboratories of TU Bergakademie Freiberg.
- 2 The Bergakademie is the only German university which owns a research and training mine. Tourists may also experience the fascination of mining at the “Reiche Zeche”.



- 3 The Central Clean Room Laboratory of TU Bergakademie is used by the Physical Institutes and the Institute of Electronic and Sensor Materials for teaching and research.
- 4 TU Bergakademie Freiberg: Mitsubishi Electric Vehicle measuring the lithium ion battery.



1 Latent storage balls for storing thermal energy at the GIZEF GmbH – Zentrum für Innovation und Unternehmertum, where PCM (Phase Change Materials) are developed.

2 The tradition of the 1st German tannery school is continued by the Forschungsinstitut für Leder- und Kunststoffbahnen gGmbH (FILK), which has been standing for competence in material research and testing for 125 years. Here the behaviour at permanent folding of leather is tested, among others.

3 Bacteria and other microorganisms can extract metals from their ores by metabolic processes. In laboratories bioreactors are used for that process. The scientists of the Helmholtz Institut Freiberg für Ressourcentechnologie at the HZDR research biotechnical extraction and processing of metals and rare earths.

Research-focused service providers

The company Eurofins Umwelt Ost is a leader in chemical, physical and biological analyses of soil, water, air and waste products. The DBI Gas- und Umwelttechnik and DBI Gas-technologisches Institut stand for practical oriented applications in the field of gas extraction, preparation and storage.



2



3

Research & Development

creative. practical. connected.

Freiberg is a city of science. In addition to TU Bergakademie a large number of renowned non-university research institutes came to Freiberg, developing innovative solutions for present and future challenges in close cooperation with the industry. The foundation of the Helmholtz Institut Freiberg für Ressourcentechnologie shows the importance of Freiberg for the German government's raw materials strategy. The German Fuel Institute DBI | bergakademie, which researches fuel and coal use with reduced levels of CO₂, is another national competence centre of the city. The Fraunhofer Technologiezentrum Halbleitermaterialien THM researches in the fields of crystalline materials and wafer production. It is closely connected to the Bergakademie, just as the affiliated institute UVR-FIA for mechanical process engineering. Local networks such as the GIZEF – Zentrum für Innovation und Unternehmertum, Chamber of Industry and Commerce Region Middle Saxony, the start-up network SAXEED or SAXONIA Standortentwicklungs- und -verwaltungsgesellschaft create a fruitful environment for founders and the setting up of new and established businesses.



Economy II

diverse. established. competent.

The mining city of Freiberg is a centre of geoscience and mining science and Saxony's most important industrial site in this field. Closely linked to the TU Bergakademie – the only German university that covers the whole range of geoscience on a high level – a complex network in the fields of geology and geological engineering, resource and environmental technology was developed. This expertise is combined at the Geocompetence Centre Freiberg. More than 150 members – businesses, research institutes and administrative bodies – create a unique environment, together with the Saxon Mining Archives, the Mining Authority and the State Office for Environment, Agriculture and Geology. Next to that Freiberg is also a centre of the recycling and waste disposal industry. In the state-of-the-art facilities at Muldenhütten Recycling und Umwelttechnik (MRU) lead-acid batteries are fully recovered – from separating into their components to casting of the lead and the recycling of polypropylene. Befesa Zinc Freiberg recycles zinc-containing steel dust using an innovative waelz technology which creates metallic zinc again. Freiberg's excellent reputation in the field of materials technology is based on businesses like GfE Fremat, Sächsisches Metallwerk or ACTech.



1 Secondary lead smelter with integrated incineration facility. Pictured here is the external plant of the Muldenhütten Recycling und Umwelttechnik GmbH (MRU).

2 Pressure equipment, apparatus, burners, heat exchangers and reactors are produced by Thermische Apparate Freiberg GmbH (TAF), pictured here during the company presentation at the Science and Business Night 2015.

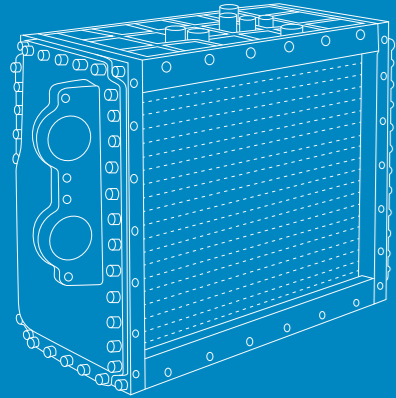
3 Steel pouring at ACTech GmbH, a leading company in the production of casting prototypes.

4 Centrifugal casting at SM Sächsisches Metallwerk GmbH produces a very dense and neat structure by high centrifugal forces and a directed solidification from the outside to the inside.

5 Geological competence at TU Bergakademie. Prof. Dr.-Ing. Matthias Reich is an expert in drilling engineering and special civil engineering and mining machinery.



MAHLE Charge Air Cooler



Thanks to re-engineered geometries and manufacturing processes, the weight of the charge air cooler of MAHLE Industrial Thermal Systems Reichenbach GmbH could be kept constant, in spite of larger cooling surfaces and significantly improved component robustness and durability. The reduced installation depth of the cooling module optimizes the air flow. As a result, the power requirement of the fan can be reduced without impairing cooling performance.



The innovative environment of the city of science and qualified workers in the region make Freiberg an attractive location for mechanical engineering and plant construction as well as for assembly and precision mechanics industry. MAHLE Industrial Thermal Systems is one of the globally leading suppliers of engine cooling. TAKATA Sachsen produces gas generators for airbags as a supplier of the automobile industry. With the production of high-performance furnaces Xerion Ofentechnik became a recognized partner for high tech materials. WECO, Europe's number one in pyrotechnics, produces a big range of products for the international market in Freiberg. The food sector is also represented with varied products. The roots of the Saxon art of brewing can be found in Freiberg, where beer has been brewed for 750 years. Today Freiberg Pils is one of the most successful brands in Saxony. The neighbouring dairy factory Molkerei Hainichen-Freiberg processes around 150 million kilogramme of untreated milk per year.



3



4

1 Dairy factory Molkerei Hainichen-Freiberg GmbH & Co. KG: Barbara Klepsch (Saxon State Minister of Social Affairs and Consumer Protection) together with Jörg Henkel (Division Manager Yoghurt/Dessert) in the production hall.

2 Freiberger Brauhaus GmbH: Production line.

FREIBERG is tasty and sparkly.

3 WECO Pyrotechnische Fabrik GmbH: Fireworks at the Festival of the Mining City.

4 Energy supplier Stadtwerke Freiberg AG: Main features of the heating plant are two new state-of-the-art gas engines with heat storage. Up to 90% of the heat can be produced by combined heat and power.

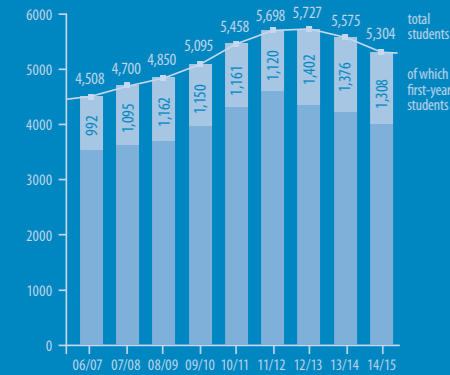


1 Only in the University City of Freiberg you can get the "Diploma Fribergensis". It is awarded to each student that completes twelve tasks within the first semester, in order to get to know and love the city. It includes climbing the highest point of the city, to go down into the world of crystals or to experience all the world's a stage.

2 New day care centre Albert-Funk-Straße.

3 Freiberg Public Library, since 2015 in the rebuilt medieval Kornhaus (the former granary) in the city centre.

Development of student numbers (at TU Bergakademie Freiberg)



Source: TU Bergakademie Freiberg



Education & Care

flexible. precious. enticing.

Education for all generations and family friendliness is a general principle of the city of Freiberg. TU Bergakademie Freiberg with more than 5,000 students is the city's most important educational institution and has an impact on the whole society with its public offers like Studium Generale, Junior University or Science and Business Night. Seven municipal day-care centres, 15 facilities run by independent service providers and a large number of childminders provide extensive and individual childcare facilities. The school system is as diverse – from primary school to secondary school to vocational training centre. The Freiberg Geschwister-Scholl-Gymnasium is Saxony's oldest humanist grammar school and celebrates its 500th anniversary in 2015. It houses the Andreas-Möller-Bibliothek, a 450 year old library. It constitutes a unique historic treasure with authentic records of past centuries, just as the Saxon Mining Archives at Freudenstein Castle. Modern scientific literature and fiction are provided by the university and municipal library. Music school, adult education centre and many associations complete the extensive educational offer of Freiberg.



1 The special exhibition of the terra mineralia impressively presents "Flying Jewels". The exhibition shows 300 "unequal" partners from the organic and inorganic nature, which were matched to 150 couples.

2 Middle Saxon Theatre: View to the auditorium and to the stage of the "Little Semper Opera".

3 The Freiberg Christmas Market, one of the most beautiful Christmas Markets in Germany, turns the Saxon Ore Mountains into Christmas Land during Advent.

4 March up at the Annual Festival of the Mining City and the Mettenschicht (last shift of miners before Christmas): Freiberg's Historic Miners' and Smelters' Guild.

5 On the way to UNESCO World Heritage: The Mining Region Ore Mountains. The decision will be made in 2016.

6 The singers of St. Mary's Cathedral Freiberg in front of one of the two famous Silbermann organs.



Culture & Tradition

exciting. magical. colourful.

The discovery of silver in the Middle Ages did not only lead to Freiberg's economic success but also led to a rich cultural offer. Up until today the Silver City at the foot of the Ore Mountains is full of various traditions, important monuments and precious cultural treasures. Visitors from all over the world are fascinated by the mediaeval historic city centre, which is almost completely preserved: St. Mary's Cathedral with its Silbermann organ – more than 300 years old – and the famous Golden Portal or Freudenstein Castle with terra mineralia, one of the largest and most beautiful mineral collections in the world. In the visitor mine "Reiche Zeche", in the City and Mining Museum and through the Miners' Parades 850 years of mining tradition come to life. The Middle Saxon Theatre offering acting, musical theatre and concerts is considered to be the oldest city theatre in the world and goes into its 225th season in 2015. Jazz Festival, Freiberg Summer Nights and Evening Music in the Cathedral are further constants of the cultural calendar. End of June the Annual Festival of the Mining City attracts more than 100,000 visitors to Freiberg.



Living & Leisure time

unique. lovely. tolerating.

The city of Freiberg is lovely and worth living in and as a successful centre of industry and science always attracted people from regions all over Germany and the world. In Freiberg an international mix and cosmopolitanism meet centuries-old traditions and cosy flair. In the historical city centre a large number of specialist owner-managed stores off the large shopping centres as well as restaurants and bars of different styles can be found. Manifold possibilities to spend your leisure time are offered by Freiberg's modern sport facilities and abundant societies. The Johannis Swimming Bath with a large sauna world offers swimming fun and relaxation in any season. The ice-skating rink in the castle courtyard invites you to a special winter enjoyment. Its situation at the foot of the Ore Mountains makes the city a perfect starting point for hiking and ski trips. It only takes 40 minutes to get to Dresden or Chemnitz by train or car. Freiberg stands for high quality of life for everyone. The municipal property company and the housing association offer comfortable and cheap housing. Students can find accommodation in one of the many student dorms. Exclusive flats for an expensive taste can be found in the historical city centre in particular.



Homage to Freiberg



Two Chinese met during their studies at TU Bergakademie and fell in love: Their two children, born in 2012 and 2015, bear the names Frei & Berg. This remarkable declaration of love by the parents was honoured with a hand and foot print in the "Silver Book".



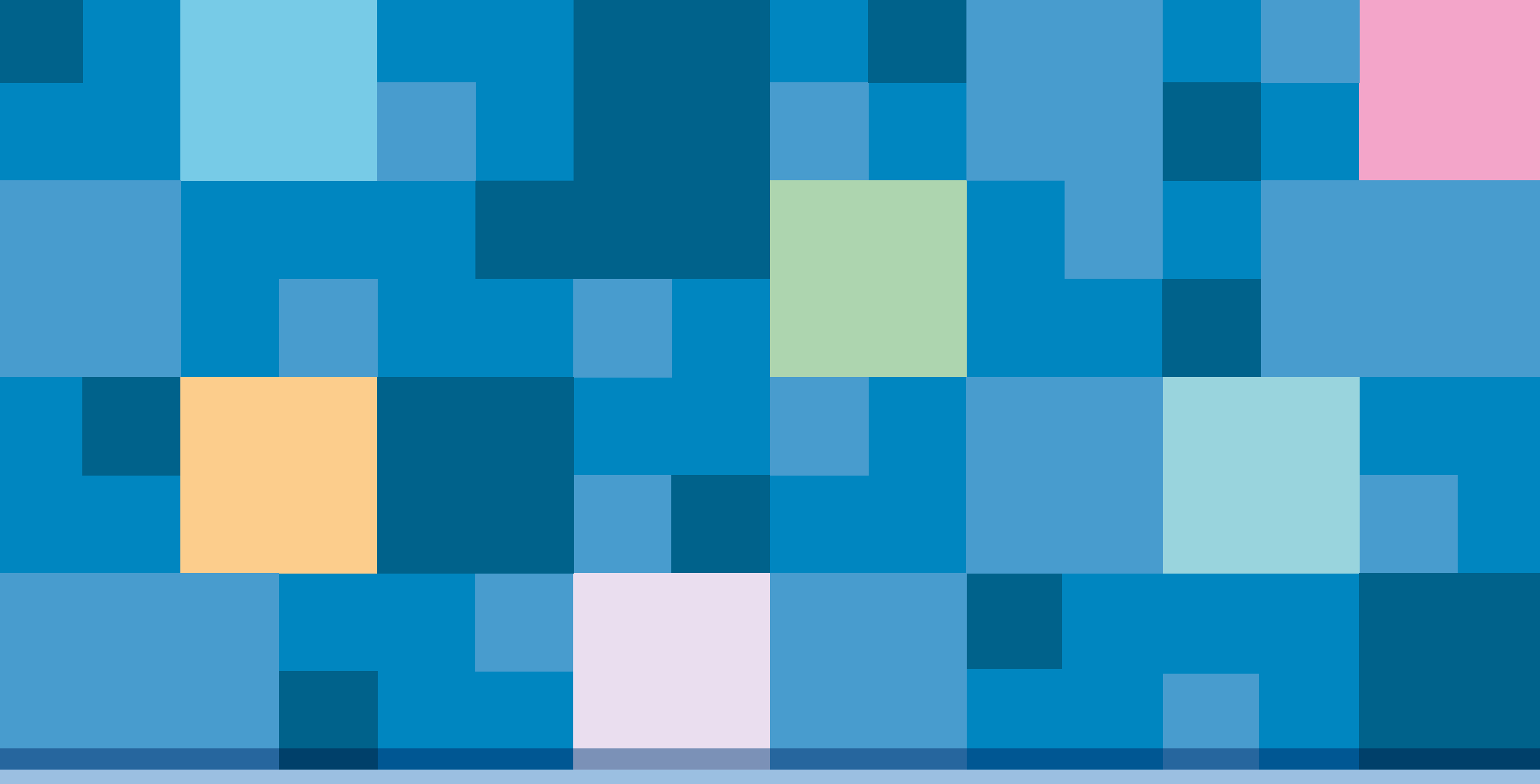
1 View of the city with the tower Donatsturm and the city's oldest gate Donatstor, in historic city setting.

2 Over 90 years of handball in Freiberg – the HSG Freiberg, nicknamed "The Badgers", continue a success story: For two periods they played in the youth national league and achieved success both national and international.



3 Fun and relaxation for families at the Albertpark.

4 Freiburger Stadtwirtschaft: Unwind with good Bohemian cuisine at this cosy restaurant.



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