

Clean Energy – Saxon economic potential

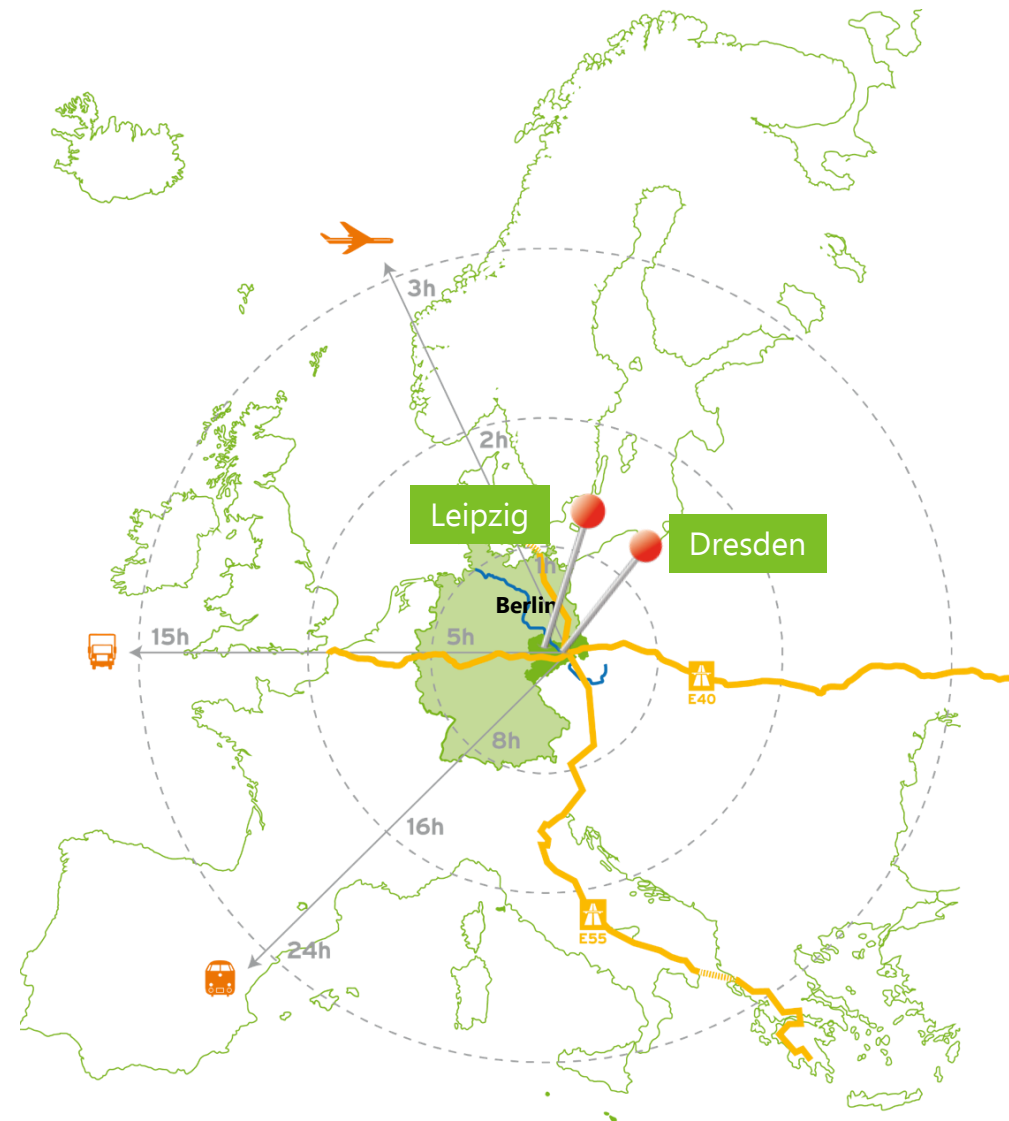
Industry overview and current trends

Estonia and Saxony – on the way forward to Clean Energy. Research – Innovation – Realization
2.5.2023

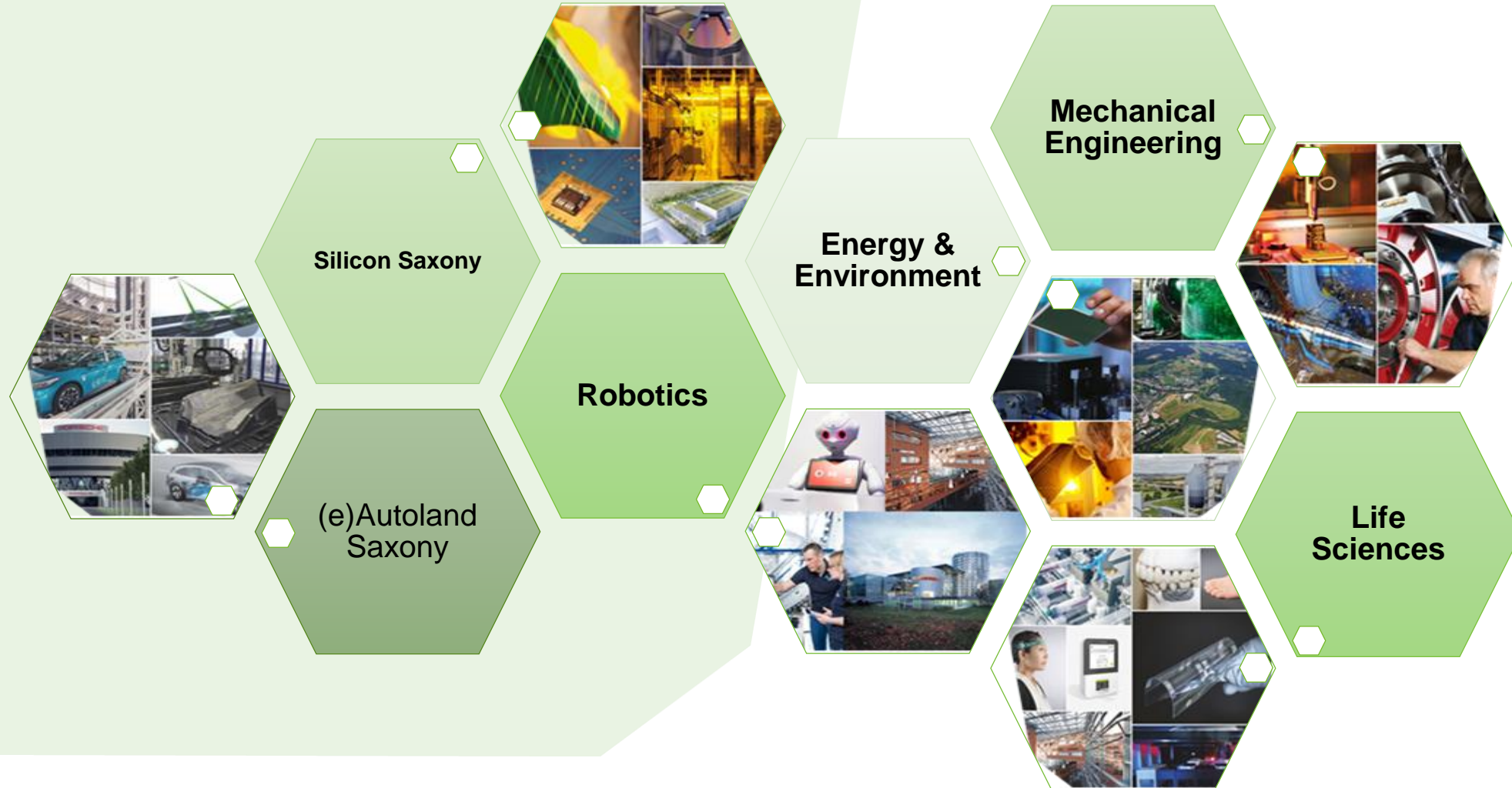


Located right at the heart of Europe

- Saxony – German federal state and business venue with a surface area of 18,5K square kilometers
- Saxony has 4.1 million inhabitants, Leipzig about 600.000 and Dresden 550.000 inhabitants (both cities have a high economic growth potential)
- **Leipzig & Dresden rank among the top 10 fDi European Cities 2022/23 when it comes to “Large City - FDI Strategy” and “Human Capital & Lifestyle”**
- Saxony has a traditionally strong industrial base, and Dresden is its brain (the largest R&D hotspot)
- Dresden and Leipzig both have international airports and fast connections via train + motorway
- **A bridge to Central and Eastern Europe**



Diversified industry & strong sectors





Good reasons for Saxony

- **Dynamic economy**
above-average growth rate of 30% since 2000, 5.3%
above the growth rate for Germany as a whole
- **Strong industrial base**
Europe's largest microelectronics / ICT cluster; Europe's
No.1 production location for electric vehicles
- **Highly qualified workforce**
best educational system in Germany and talent forge for
engineers
- **Global logistics hub**
Leipzig - among the TOP 5 largest cargo hubs in Europe
(the largest and most modern of the
3 DHL hubs worldwide)
- **Highest investment funding in Germany**
up to 45% in the EU funding period until 2027

Good reasons for Saxony

- **Competitive production location**
production and automation know-how
- **Excellent research landscape**
Dresden as the largest location of the Fraunhofer-Gesellschaft and with the TU Dresden we have a “University of Excellence” in Saxony
- **Focus on future technologies**
Saxon Hydrogen Strategy & Saxon AI Strategy
- **Livable and lovable cities**
with comparatively low rents (in a comparison of major German cities: € 17 top rent per m² for office space with good utility value in Leipzig and Dresden (comparative example: Munich € 41)



ENERGY AND ENVIRONMENTAL TECHNOLOGY FROM SAXONY

The Innovative Topics of Saxon Stakeholders from the Energy / Environmental Technology Branch



About **17,200** employees



More than **730** companies

Where environmentally friendly ideas take off,
Saxon experts are often just a heartbeat away.
Just scan the QR code and be inspired!

Annual turnover of
€ 3.7 billion



Environmental & energy technology

- **Excellence build on tradition:** know-how at companies and research institutions in mining rehabilitation and resource technologies e.g. at the Helmholtz Institute Freiberg for Resource Technology
- **Pole position thanks to technology leadership:** Saxon companies at the very top in the fields of recycling management and renewable energy e.g. at the Environmental Research Center in Leipzig
- **German centre of excellence:** in renewable energy, energy efficiency issues and energy storage
- **Future in the making:** research focus on fuel cell and hydrogen technologies

Unique location for the development of Hydrogen & FC Technology

- Ideal **infrastructure** for research, development and production
- Excellent **research and education**:
material, fuel cell, chemistry, machines and plants
- World's **fifth largest microelectronics/ICT cluster (Silicon Saxony)**
- **Vibrant networks**
Hzwo e.V., HYPOS e.V. , Energy Saxony e.V.
- **Fast growing industry**
with Sunfire GmbH, AMBARtec AG, WätaS Fuel Cell Saxony GmbH & many more...
- Excellent **research**:
Dresden is German city with the most Fraunhofer Institutes
- Promotion of hydrogen drives through **state support & programs**



Germany launches first tender for import of green hydrogen

December 08, 2022 — 07:27 am EST

Written by Markus Wacket for Reuters →

Source: Reuters

15 Dec 2022, 13:43 Benjamin Wehrmann

Construction of Europe's first hydrogen pipeline network to begin in Germany

#Grid #Hydrogen



Clean Energy Wire

Source: Clean Energy Wire



High potential for innovative mobility concepts

- **Innovation areas:** electromobility, (functional) lightweight construction, automated / autonomous driving
- **Top in Europe: nowhere else so many e-vehicles are being built**
60% of all e-vehicles manufactured in Germany come from plants of e.g. Volkswagen, BMW and Porsche located in Saxony
- **Networks & Competence centers**
(Saxon Energy Agency & Efficient Mobility Competence Centre)
- **Important manufacturing plants for electric cars**
 - BMW competence center for production BMWi3, i8 (Leipzig)
 - Daimler: production of batteries for the EQC (Kamenz)
 - VW: production plant of the e-golfs (Zwickau, Home of ID. in Dresden)
 - Porsche: One of the most modern factories in the world in Leipzig (Panamera, Macan)

Freistaat bleibt Top-Region der E-Mobilität: Sächsische Automobilindustrie fertigte 2022 rund 243.000 vollelektrische PKW

15.03.2023, 17:53 Uhr — Erstveröffentlichung (aktuell)

Source: Medienservice Sachsen



Source: BMW



Source: SAENA

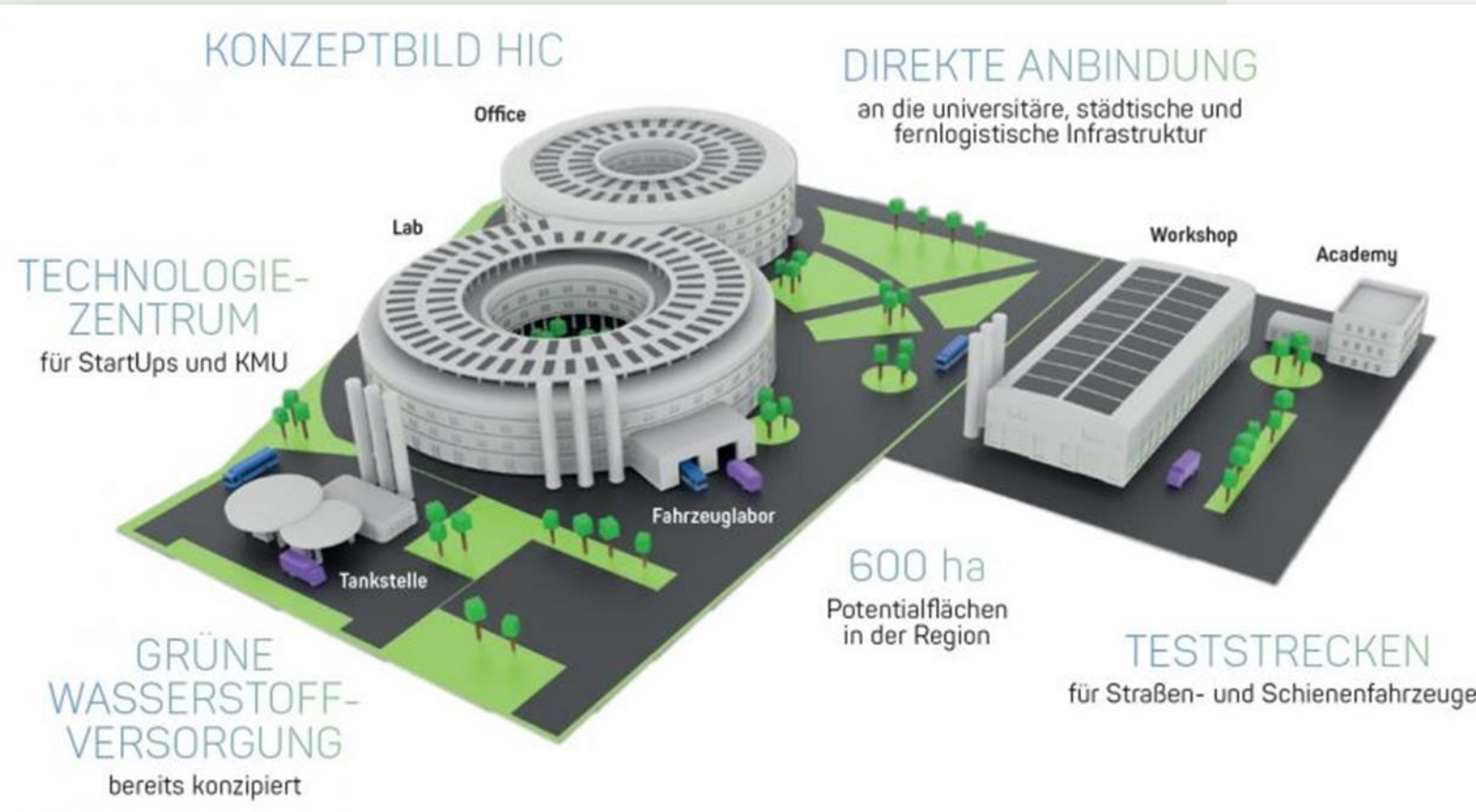


Volkswagen

Source: Volkswagen

→ The next big thing: **Chemnitz is the national innovation centre for hydrogen technologies in vehicles**

HIC – Hydrogen Innovation Center, Chemnitz



Source: HZwo e. V.

With the **HIC – Hydrogen and Mobility Innovation Center**, one of four German hydrogen technology centers will be built in Chemnitz by 2025.

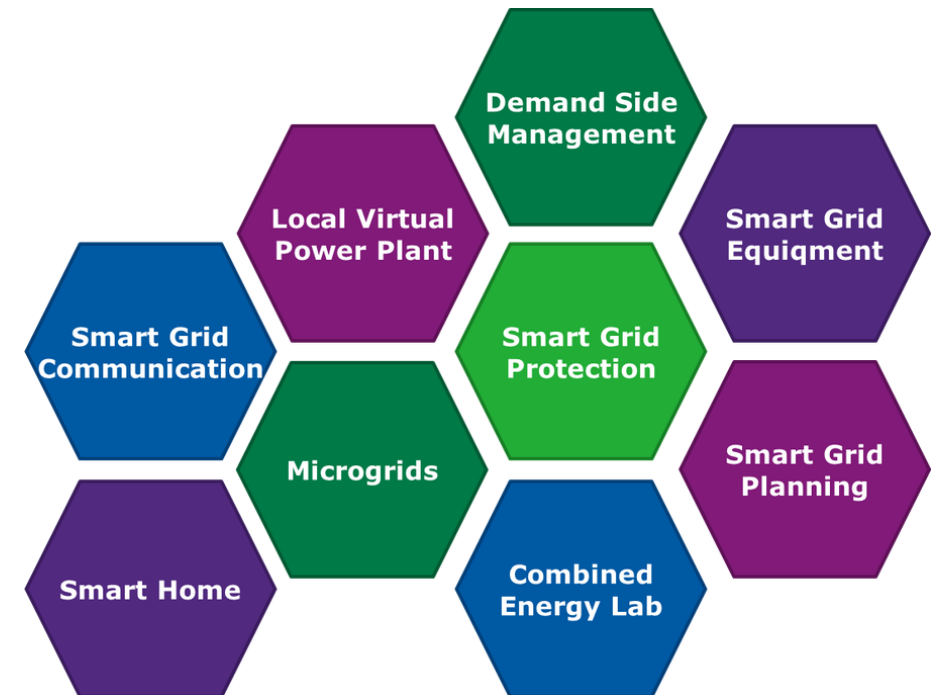
It will be a **unique industrial research, test, and certification campus in Europe for fuel cells and drive systems for hydrogen propelled road and rail vehicles**

Future energy system: decentralized, green & smart

Digitalisierung der Energiewirtschaft – Herausforderungen und Chancen erkennen

Source: Medienservice Sachsen

- **State initiative: Digitalisation in the energy sector**
- **Project WindNODE:**
focus on intelligent integration of renewable energy sources into electricity, mobility and heating sector
- Joint project TU Chemnitz: **AI for the power grid of tomorrow**
- **TU Dresden:**
 - Smart Energy Management
 - Regional virtual power plant
 - Combined Energy Lab - thermal and electrical test facility
 - Intelligent load control to avoid grid shortfalls
 - Grid condition identification in low and medium voltage grids
 - Grid-compatible integration of electromobility



Source: TU Dresden, Chair of electrical power supply (Mr Dipl.-Ing. Tobias Heß)

Smart City: decentralized, sustainable & efficient

- **innovation friendly firms** in the areas of sensors, microelectronics and software
- **highly qualified work force** (significantly above OECD average)
- **strong network structures**
- **National and European funding programs**
 - German funding scheme Digital Hub for Smart Cities in Dresden and Leipzig
 - EU Projects [MatchUp](#) (Dresden) and [Triangulum](#) (Leipzig)

In Bitkom's Smart City Ranking, Dresden achieved 3rd place among major German cities in 2022.

- **cluster [Silicon Saxony](#)** provides ideal prerequisites for the development of smart city technologies



Source: WFS GmbH, Smart City Expo 2022.



Source: Digital Campus Leipzig



Source: City of Dresden



Source: City of Leipzig

Sector coupling for a successful energy transition

Objective: One necessary approach to shaping the energy system of the future is integrative and intelligent sector coupling. The project LHyVe in Leipzig is an example of this.

The joint project **LHyVE** (Leipzig Hydrogen Value chain for Europe) aims to establish an **intelligent and regionally networked green H2 system** as a lighthouse for efficient sector coupling and to integrate it into the European H2-infrastructure.

With LHyVE, the **entire value chain from production, storage, transport and distribution to final consumption** is to be realized in the Leipzig region.

- LHyVE Generation: **generation of climate-neutral H2**
- LHyVE Systems: **use of hydrogen in the region**
- LHyVE Transport: creation of a **hydrogen ring** around and for the Leipzig region and **integration into the European hydrogen infrastructure** (H2 backbone)

Source: LHyVe, <https://lhyve.de/>

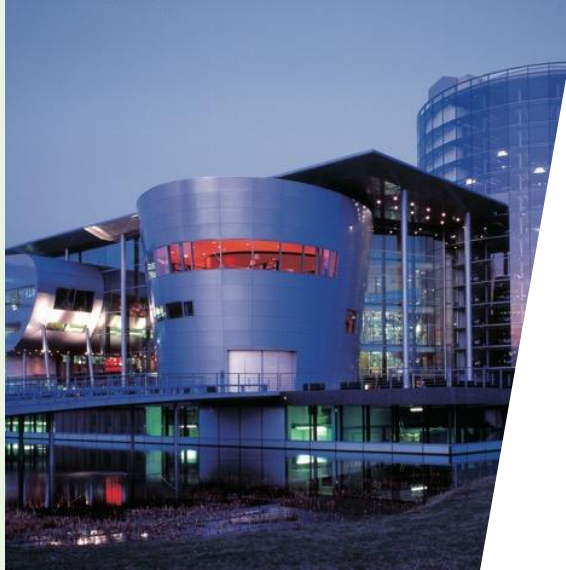


High innovative strength

- Saxony is listed as “**Strong Innovator**” region on the EU Regional Innovation Scoreboard 2021
- Highest research intensity of the EU regions (the region of Dresden)
- **Germany’s most innovative universities** can be found in Saxony
- Nationwide **most patents from universities** and universities of applied sciences
- Nationwide leading universities and universities of applied sciences competing for innovation funding
- High level of R&D cooperation between SMEs and universities
- Very high R&D activity in Saxon SMEs

Sources: EU Regional Innovation Scoreboard 2021, "Ländercheck Innovationsmotor Hochschule" by the Stifterverband and the Heinz Nixdorf Foundation.





Launch pad for start-ups

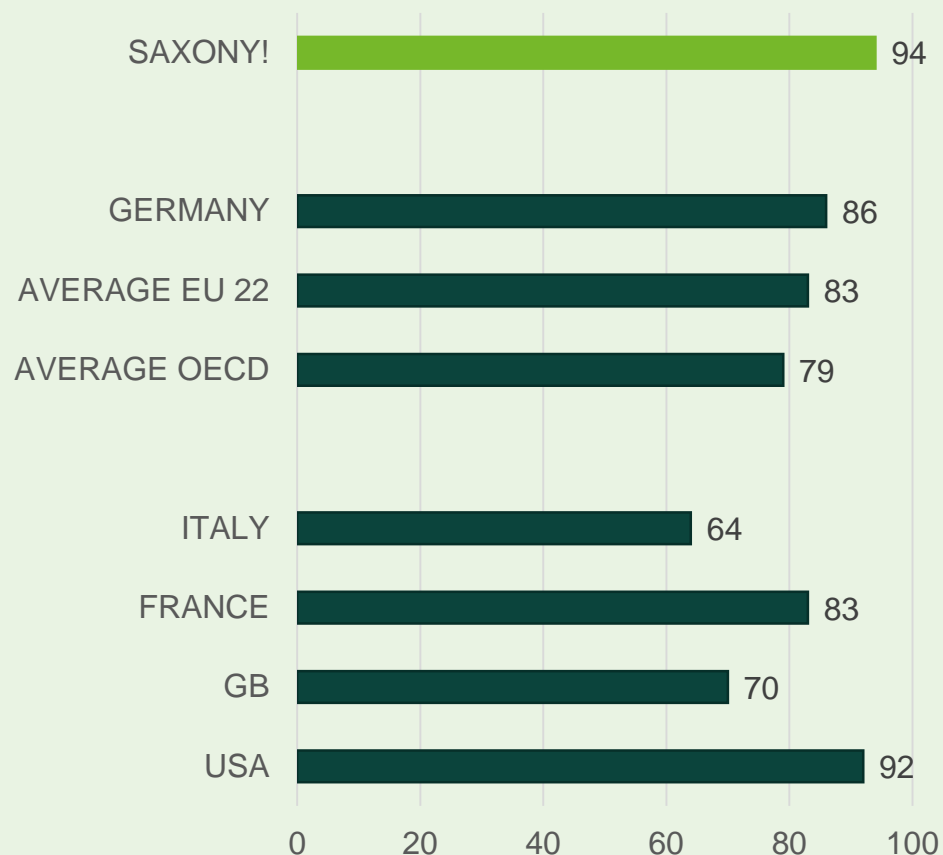
Saxony has become increasingly important in the start-up scene in recent years. This is not only due to the fact that two of the BMBF's **Digital Hubs in Leipzig (focusing on smart infrastructure, energy and e-health) and Dresden (smart systems)** act as important nodes for founders, innovators and established companies, but probably also because of Saxony's history:

From the Melitta coffee filter and the thermos flask from Chemnitz to the Zeiss Ikon AG 35 mm camera: we owe all of these objects to inventors from the region.

Speaking of inventors: According to the German Patent and Trademark Office, **667 patents** were registered from Saxony last year. **Saxony's universities are the most successful in this regard, both in attracting research funding and in registering patents.**



A Comparison of the Educational Levels of Employees (At Minimum General University Entrance Qualification / Completed Vocational Training)



Source: Education at a Glance 2021: OECD Indicators, OECD, and Internationale Bildungsindikatoren im Ländervergleich 2021 [International Education Indicators in a Comparison of Countries 2021], Federal Statistical Office (destatis) and Statistical Offices of the German Federal States

Bright minds

- **Above-average qualifications:** Share of highly qualified workers above EU and OECD level
- **Saxony is attracting more people:** Since 2011, Saxony has seen an increase in the number of migrants (2020: +14,000, 30% of whom coming from abroad).
- **Busy & ambitious:** 39 annual working hours more than the German average.
- **Loyal:** Saxons change jobs less frequently than the German average.
- **Women power:** at 65%, Saxony has the highest female labour force participation rate in Germany.

Investment promotion & funding

The grant provides investment incentives to create and secure permanent jobs in the Free State of Saxony.

- **Funding programme:** Joint Task "Improvement of the Regional Economic Structure" (GRW)
- **Eligible to apply:** Companies in the commercial sector, including the tourism industry, as well as non-profit, non-university research institutions.
- **Application and approval body:** Saxony Development Bank
- **Legal basis:** GRW RIGA Directive of the Free State of Saxony.
- GRW grant related to **physical capital** or **wage costs**



Funding rates

Funding rates (regional and SME subsidies) according to the bonus model of environmental sustainability

FUNDING AREA

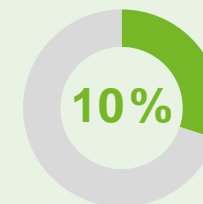
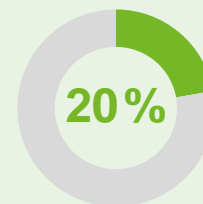
Small enterprises

Medium-sized enterprises

Large enterprises

Basic funding with **simple** sustainability certificate

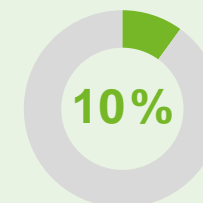
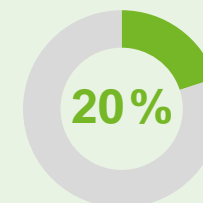
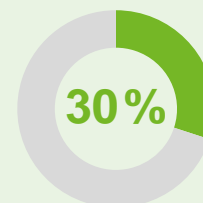
in C and D funding areas



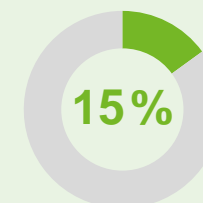
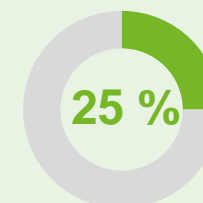
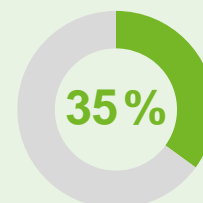
Extended sustainability certificate

Qualified sustainability certificate

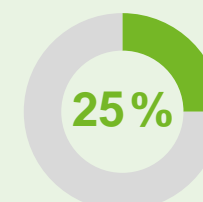
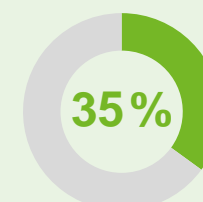
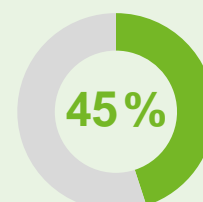
in the C funding area of the city of Chemnitz



in C funding areas (Zwickau district, parts of Leipzig and North Saxony districts)



in C funding areas (Districts of Görlitz, Bautzen, Central Saxony, Erzgebirgs-kreis, Vogtlandkreis, parts of Sächsische Schweiz-Osterzgebirge)



Saxon Technology Funding



European Regional Development Fund: Technology funding

- a. R&D individual and joint projects incl. R&D pilot lines
- b. Technology transfer projects
- c. InnoPrämie (innovation bonus)
- d. Validation funding

**€600 million for
technology funding
(2021-2027)**

MINT-Professionals Programme

State technology funding

- a. HORIZON, Patents & more
- b. Participation in IPCEI & more
- c. Support for non-university external research institutions


Energy Innovations from Saxony

SAXONY!

Wirtschaftsförderung Sachsen

saena
Sächsische
Energieagentur GmbH

**Energieinnovationen aus Sachsen
Energy Innovations from Saxony**



Mehr Informationen und Details im ePaper

AMBARTEC
HYBRID TECHNOLOGY

AMBARTEC AG

KURZPROFIL:
Die AMBARTEC AG ist ein Technologie-Startup in der Energie- und Wasserstoffsparte. Für unsere Kunden planen und entwickeln wir Lösungen rund um die komplexe und langfristige Energieversorgung für Transport, dezentrale Rückverstromung mit Kraft-Wärme-Kopplung und Lastmanagement sowie für die Mobilität von morgen.

KOMPETENZEN UND HAUPTANWENDUNGSGEBIETE:

- Energie- und Wasserstoffversorgung – komplexe, effizient, nachhaltig, sicher
- Technologieentwicklung
- Planung

SHORT PROFILE:
AMBARTEC AG is a technology startup active in the energy and hydrogen storage sector. For our clients, we plan and develop solutions revolving around the complex and long-term energy storage for transport, de-centralised regeneration with combined heat and power (CHP) and peak shaving as well as for the mobility of tomorrow.

COMPETENCES AND PRIMARY ACTIVITIES:

- Energy and hydrogen (H₂) storage – complex, efficient, sustainable, safe
- Technology development
- Engineering and planning

Unternehmen • Companies

Fraunhofer
IKTS

Fraunhofer-Institut für Keramische Technologien und Systeme IKTS
Fraunhofer Institute for Ceramic Technologies and Systems IKTS

KURZPROFIL:
Das Fraunhofer IKTS bietet als Forschungs- und Technologiezentrale innovative Komponenten, Module und Systeme sowie Plattformen für die Energietechnik. Den Schwerpunkt bilden mobile und stationäre Battersysteme sowie Elektrolyseure und Power-to-X-Technologien für die Wasserstoffwirtschaft.

KOMPETENZEN UND HAUPTANWENDUNGSGEBIETE:

- Energiepuffer (Li-Ionen- und Natrium-Ionen-, Superkondensatoren, Wasserpuffer)
- Elektrolyse und Power-to-X (Hochtemperatur-Elektrolyse, Reaktoren, Katalysatoren, techno-ökonomische Bewertung)
- Überwachung und Structural Health-Monitoring von Energiespeichersystemen wie P₂-Ladungen/Tanks, Windkraftanlagen, Offshore-Geländegestrukturen
- Brennstoffzellenmodule und -komponenten (SOFC, PEMFC und MCFC)
- Photovoltaik, Solarthermie (Pumpen, System, Reaktorstrukturen)
- Wasserstoff (Verfahren- und Werkstoffentwicklung)
- Solartechnische Kernentwicklungsprojekte, Analyse, Prozessumsetzung
- Hochtemperaturgestützte Hochtemperaturreaktoren, Feuerwandentwicklung, Chemietechnik (Hydrogen)
- Energy Harvesting (thermoelektrische und piezoelektrische)

SHORT PROFILE:
As a research and technology center provides the Fraunhofer IKTS offers innovative components, modules, and systems as well as testing services for energy systems. The focus is on mobile and stationary battery systems as well as electrolyzers and power-to-X technologies for the hydrogen economy.

COMPETENCES AND PRIMARY ACTIVITIES:

- Energy storage systems (lithium-ion and sodium batteries, supercapacitors, thermal storage devices)
- Electrolysis and power-to-X (high-temperature electrolysis, reactors, catalysts, techno-economic analysis)
- Structural health monitoring (SHM) of such energy infrastructures as hydrogen pipelines/tanks, wind turbines, and offshore foundation structures
- Fuel cell systems and components (SOFC, PEMFC, and MCFC)
- Photovoltaics, solar thermal systems (pumps, solar receiver materials)
- Biomass (process engineering and materials technology)
- Deep gravitational energy (reservoir-resistant components, analysis, process optimization)
- High-temperature gas turbines (high-temperature ceramics, ceramic matrix composites, environmental barrier coatings)
- Energy harvesting (thermoelectric and piezo generators)

Forschung, Entwicklung und Ausbildung • Research, Development & Training

energy saxony

Energy Saxony e.V.

KURZPROFIL:
Energy Saxony ist das sächsische Energie- und Umwelttechnologieforum, welches mit seinen Mitgliedern aus Industrie und Forschung gemeinsamen Lösungen zu den künftigen zu Sicherung einer nachhaltigen, ressourcen- und klimaschonenden Energieversorgung. Gestaltung der Wärme- und Mobilitätssektors unter der Führung einer Green Economy durch Kraftstofftechnologien realisiert.

KOMPETENZEN UND HAUPTANWENDUNGSGEBIETE:

- Brennstoffzellen- und Wasserstofftechnologien, Versorgungssysteme und Anwendungsfälle für grünen Wasserstoff
- Batterietechnologien
- Digitalisierung der Energiewirtschaft
- Gebäudetechnik und Smart-City-Anwendungen
- Energieeffiziente Produktion
- Ressourcen, Recycling und Kreislaufwirtschaft
- Wärme- und Kälteversorgung
- Energiepuffer und Netzdienstleistungen
- Energieeffiziente Komponenten

SHORT PROFILE:
Energy Saxony is Saxony's energy and environmental technology cluster which works together with its members from industry and research to develop promising solutions for securing a sustainable, resource- and climate friendly energy supply, advancing the heat and mobility transition, and establishing a green economy based on the circular economy.

KOMPETENZ- UND ANWENDUNGSGEBIETE:

- Fuel cell and hydrogen technologies, supply infrastructure, and application scenarios for green hydrogen
- Battery technologies
- Digitalization of the energy industry
- Energy technology solutions for buildings and smart city applications
- Energy efficient production
- Resource efficiency, and circular economy
- Supply of heating and cooling energy
- Energy storage systems and grid services
- Energy technology components

Netzwerke, Verbände und Initiativen • Networks, Associations and Initiatives

- production, research, and development activities in the energy technology sector
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Energy Storage Technology Summit Summit 2023



CLEAN HYDROGEN CONVENTION
mit internationaler Begleitmesse
für Wasserstoff- und
Brennstoffzellentechnologien
25. - 26.10.2023 | Messe Dresden

WASSERSTOFFLAND SACHSEN
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  energy saxony

SAVE THE DATE
25. - 26. Oktober 2023 | Messe Dresden

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- ✓ Providing information on financial support options
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- ✓ Follow-up services, consultation, and support
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