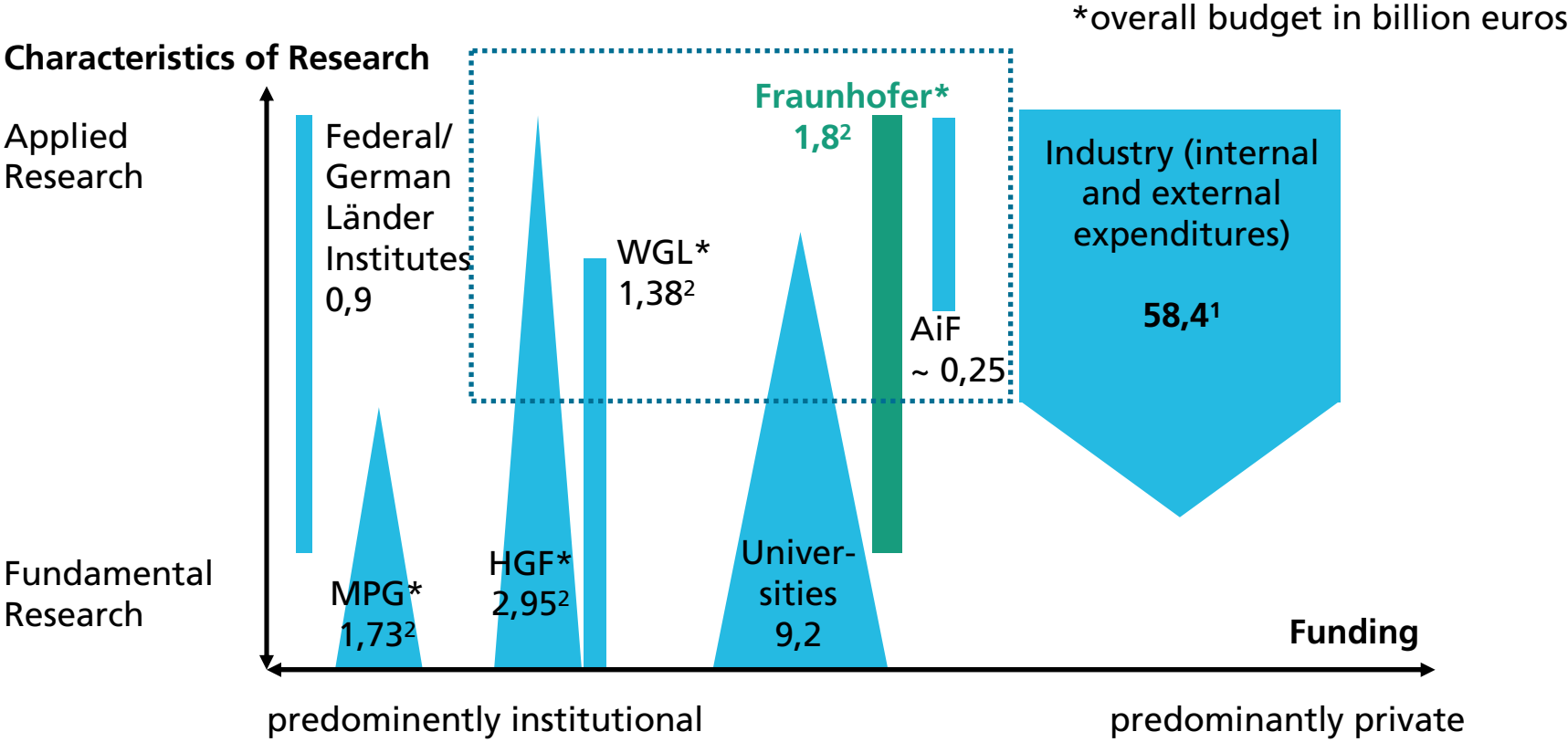

The Connection Between Research and Industry in Germany – The Fraunhofer Model

Dipl.-Ing. Angela Göschel
Chief Engineer Research Management and International Affairs

The German Research Landscape



Archivierungssangaben

- HGF** Hermann von Helmholtz-Gemeinschaft
- WGL** Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz
- AiF** Arbeitsgemeinschaft industrieller Forschungsvereinigungen
- MPG** Max-Planck-Gesellschaft

¹ estimation Wissenschaftsstatistik 2010, Stifterverband
² 2010

Source: Stifterverband für die Deutsche Wissenschaft, Destatis, research organizations



The Fraunhofer Gesellschaft



The Fraunhofer-Gesellschaft



The Fraunhofer-Gesellschaft undertakes applied research of direct utility to private and public enterprise and of wide benefit to society.

Our Customers:

- Industry
- Service sector
- Public administration

Archivierungsangaben



Joseph von Fraunhofer

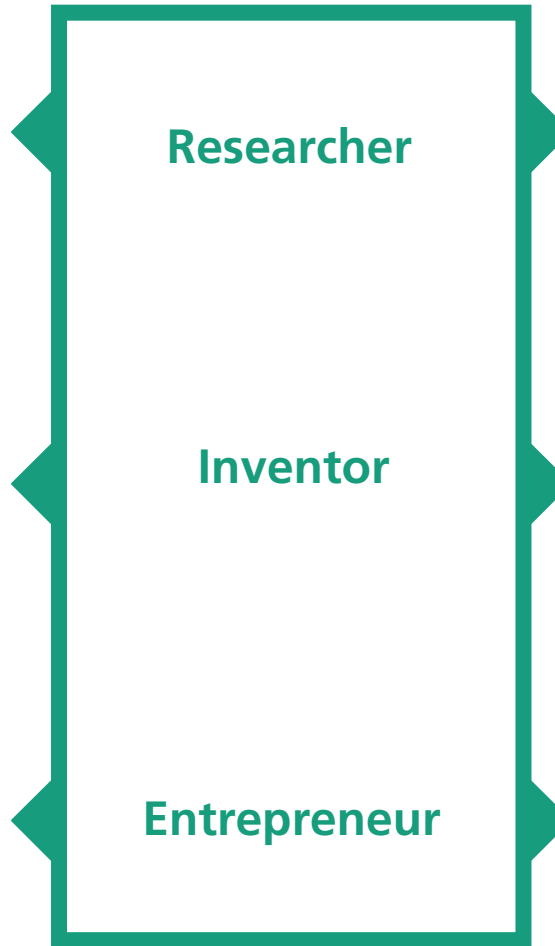


The Fraunhofer-Gesellschaft

Discovery of "Fraunhofer Lines" in the sun spectrum

New methods of lens processing

Head of Royal Glass Factory



Research and development by order of industry and state

Music format MP3, white LED, high-resolution infrared camera

Research Volume: ~ 1.66 billion euro per year

Archivierungsangaben

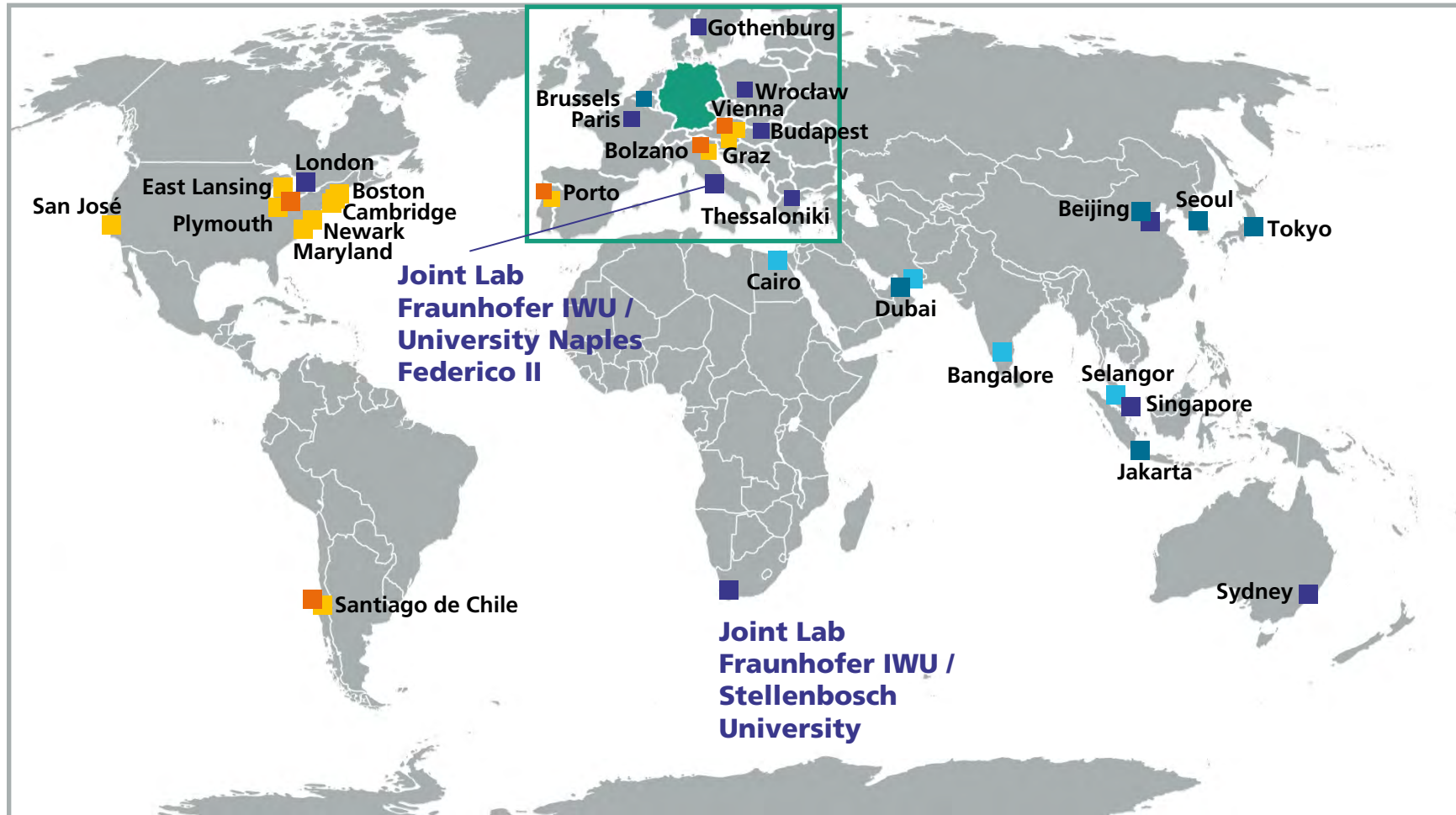
The Fraunhofer-Gesellschaft in Germany

- 60 Institutes
- more than 20,000 employees
- Research Volume:
~ 1.8 billion euro per year



Archivierungsangaben

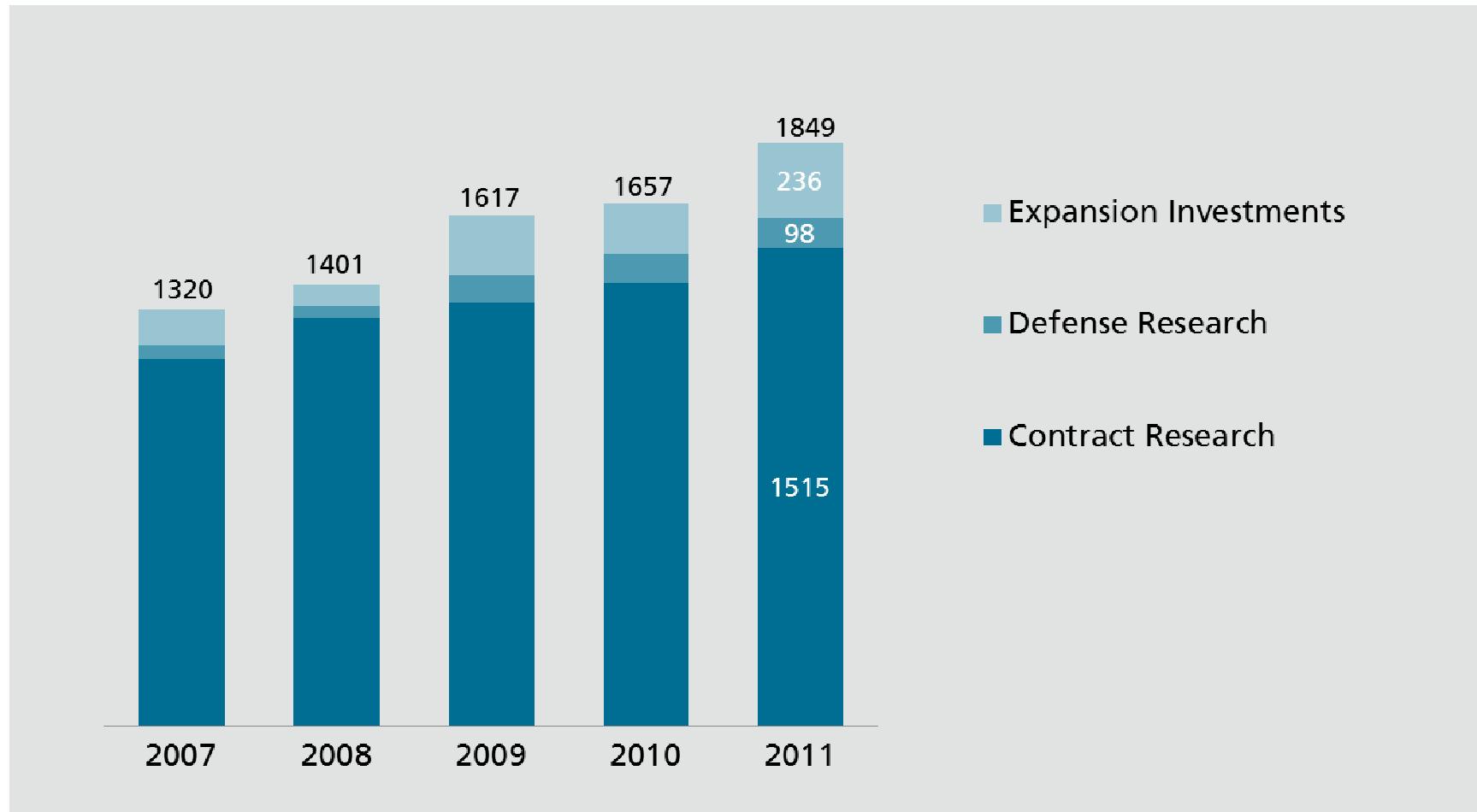
Fraunhofer Worldwide



Archivierungssangaben

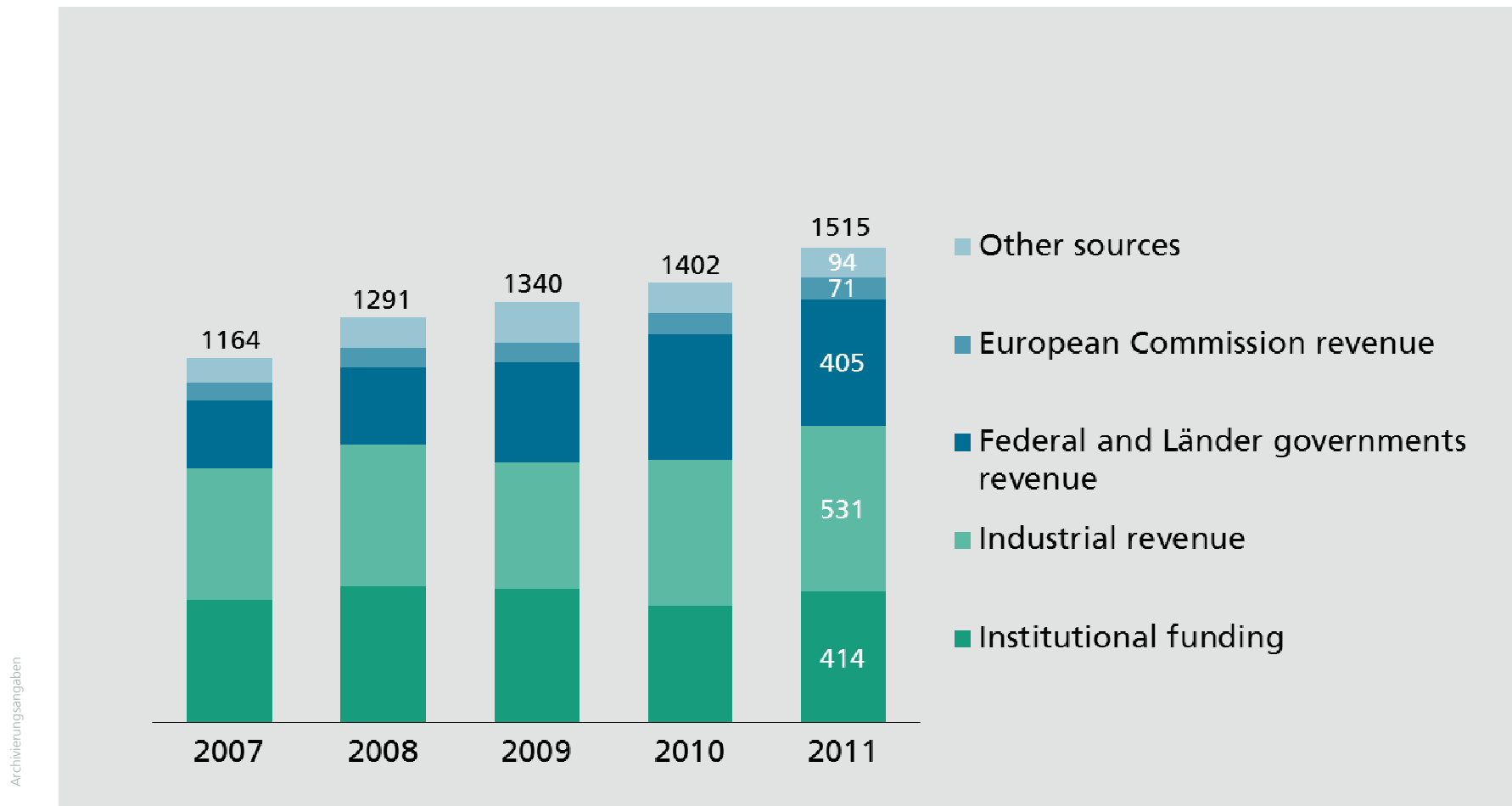
- Subsidiary
- Center
- Project Center / Strategic Cooperation
- Representative Office
- Senior Advisor

Financial Structure of the Fraunhofer-Gesellschaft (2007-2011, in € million)



Contract Research

(2007-2011, in € million)



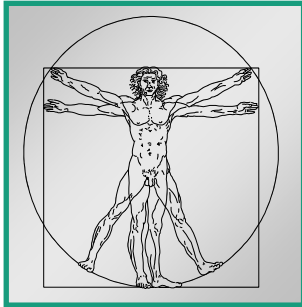
Basic funding for the Fraunhofer-Gesellschaft



Archivierungsangaben

- 90:10 split between the German federal government and the *Länder*
- “Performance-based” – annual negotiations between the Fraunhofer-Gesellschaft (Executive Board) with sources of funding (Policy Committee of the Fraunhofer-Gesellschaft)
- The basic funding is provided first to the Executive Board. The distribution of these funds across the Fraunhofer Institutes is exclusively the province of the Executive Board (autonomy, no individual control from outside)
- Management principles are in effect

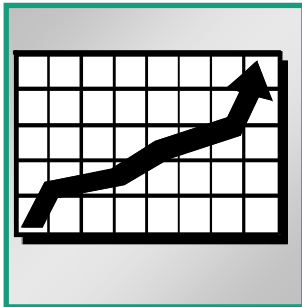
Demands on a Fraunhofer Institute



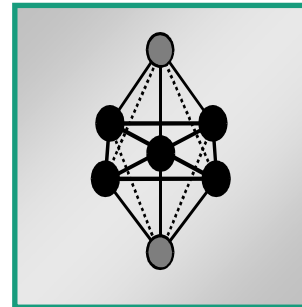
Scientific competence
proved by the
recognition of the
scientific community



**Well-balanced financial
mix**
of different independent
sources



**Market success and
entrepreneurial
competence**
proved by contracts with
industry and
government



Professional networking
with other Fraunhofer
Institutes and externals

COOPERATION MODELS

What are the different ways of working with Fraunhofer?

ONE-OFF CONTRACTS

- Solve the problem
- Launch the innovation in the business or the marketplace

LARGE-SCALE PROJECTS WITH MULTIPLE PARTNERS

- Cooperation between multiple Fraunhofer institutes, external partners and companies

INTERNATIONAL COOPERATION

- Fraunhofer offices abroad

STRATEGIC PARTNERSHIPS

- Long-term partnerships that evolve from non-contract, pre-competitive research

INNOVATION CLUSTERS

- Regional partners from research, industry and universities

SPIN-OFFS

- Fraunhofer researchers branch out on their own, often with the customer taking a stake

THE NUTS AND BOLTS OF COOPERATION

How does Fraunhofer help its customers?

IMPROVING PRODUCTS

- Enhanced performance
- Cost efficiency

MOVING FROM PRODUCT DEVELOPMENT TO SHORT-RUN PRODUCTION

- Prototypes
- Manufacturing methods
- Short-run batches

MARKET ANALYSIS AND INNOVATION CONSULTING SERVICES

- Monitoring of technological trends and market developments
- Feasibility studies and return on investment analysis
- Information on sources of funding

INCORPORATING NEW TECHNOLOGIES

- Fraunhofer is at the cutting edge of technological developments and understands how to funnel these into products

THE NUTS AND BOLTS OF COOPERATION

How does Fraunhofer help its customers?

ACQUIRING LICENSES

- Fraunhofer carries out independent pre-competitive research
- Inventions can be commercially exploited under license

OPTIMIZING EXISTING PROCESSES AND ORGANIZATIONAL STRUCTURES

- Pinpoint the best ways to make improvements
- Motivate people to generate innovative ideas
- Reveal and exploit potential

CHARACTERIZATION, TESTING AND CERTIFICATION

- High-quality equipment for a wide range of tests
- Preparation of test reports and certificates

Example

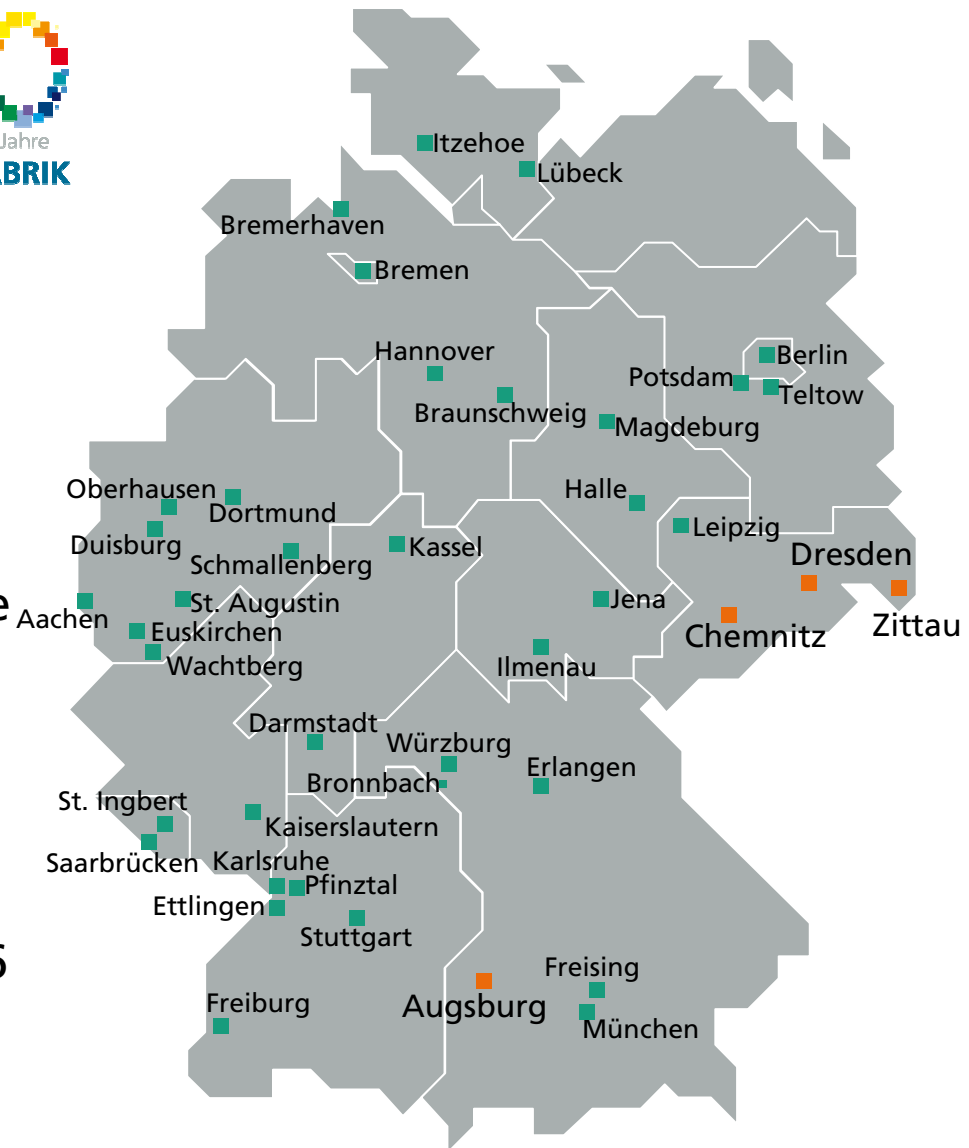


The Fraunhofer IWU



Facts and figures:

- founded on July 1st, 1991
- about 500 employees
- 30 million euro budget
- Project group in Augsburg since January 2009
- Project group in Zittau since October 2011
- Strategic Partnerships
 - Stellenbosch University 2006
 - University of Naples Federico II 2011



Archivierungsangaben

The Fraunhofer IWU Industry in Saxony



Cradle of Machine Building

- Machine tools
- Weaving and spinning machines
- Special-purpose machines

Archivierungssangaben

The Fraunhofer IWU Industry in Saxony



Autoland Saxony

- 3 vehicle manufacturers (OEMs): Volkswagen (three production sites) as well as Porsche and BMW
- Approximately 750 suppliers, service providers and equipment providers
- Approximately 70,000 employees in the automotive supply industry



Archivierungszugaben

Working in Networks

- **Fraunhofer Networks**
- **Regional Networks**
- **International Networks**
- **Large Industrial Projects**

Fraunhofer Networks

Fraunhofer Alliances



Adaptronics



Additive Manufacturing



AdvanCer



Ambient Assisted Living AAL



Automobile Production



Building Innovation



Cleaning Technology



Cloud Computing



Digital Cinema



E-Government



Embedded Systems



Energy



Food Chain Management



Lightweight Structures



Nanotechnology



Optic Surfaces



Photocatalysis



Polymer Surfaces POLO



Simulation



Traffic and Transportation



Vision



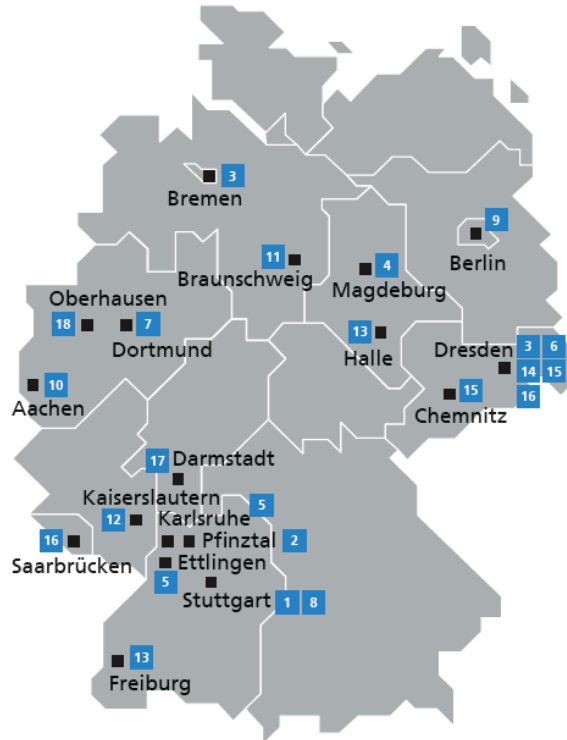
Water Systems (SysWasser)

red framed - involvement Fraunhofer IWU

Fraunhofer-Alliance AutoMOBILproduktion

Partner of the Automotive Industry

Initiator: Fh-IWU Speaker: Prof. Neugebauer

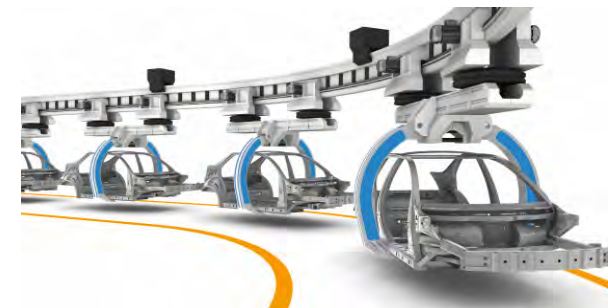


Fraunhofer-Institut für

- 1 Arbeitswirtschaft und Organisation **IAO**
- 2 Chemische Technologie **ICT**
- 3 Fertigungstechnik und Angewandte Materialforschung **IF**
- 4 Fabrikbetrieb und -automatisierung **IFF**
- 5 Optronik, Systemtechnik und Bildauswertung **IOSB**
- 6 Keramische Technologien und Systeme **IKTS**
- 7 Materialfluss und Logistik **IML**
- 8 Produktionstechnik und Automatisierung **IPA**
- 9 Produktionsanlagen und Konstruktionstechnik **IPK**
- 10 Produktionstechnologie **IPT**
- 11 Schicht- und Oberflächentechnik **IST**
- 12 Techno- und Wirtschaftsmathematik **ITWM**
- 13 Werkstoffmechanik **IWM**
- 14 Werkstoff- und Strahltechnik **IWS**
- 15 Werkzeugmaschinen und Umformtechnik **IWU**
- 16 Zerstörungsfreie Prüfverfahren **IZFP**
- 17 Betriebsfestigkeit und Systemzuverlässigkeit **LBF**
- 18 Umwelt-, Sicherheits- und Energietechnik **UMSICHT**



Demonstrator „Transparent Car“



Concentration of the competences of 18 Fh-Institutes for the process chain „Automobile“

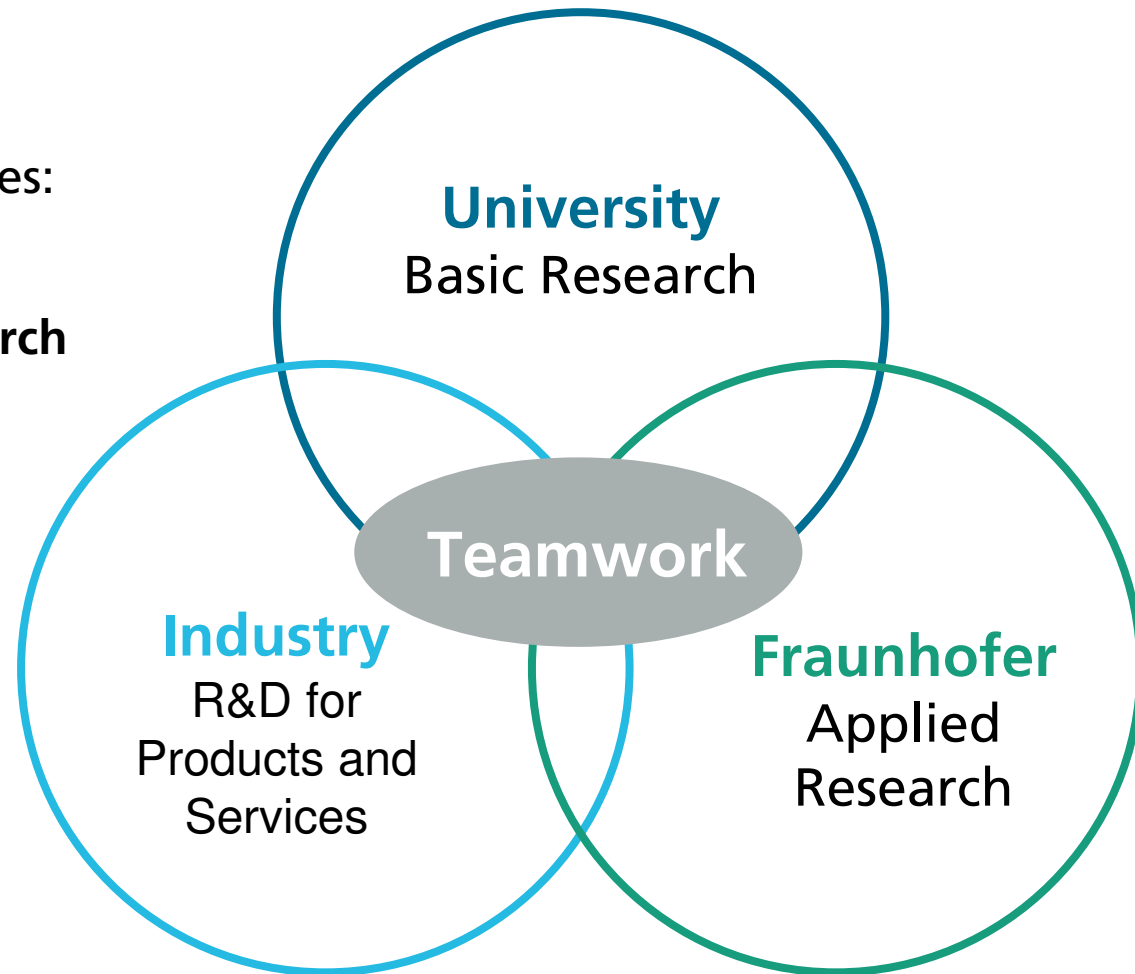
Archivierungsangaben

Fraunhofer Innovation Clusters

Accelerating innovation
by creating regional focuses:

Reinforcing strengths

Creating beacons of research



Research Area – Region – Fraunhofer

Innovation Cluster »Mechatronic Mechanical Engineering« of the Fraunhofer IWU

- **Innovation-Push** by adaptronic products
- **Design tools**
- **Production technologies**
for adaptronic materials

Involved companies:



Robotics



Automobile



Machine



Material



Medicine



Aerospace



Archivierungssangaben

Regional Networks

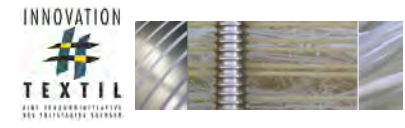
Initiatives in Saxony



Aerospace



Renewable Energies



Textile



Railway



Automobile

Archivierungssangaben

VEMAS – Verbundinitiative Maschinenbau Sachsen



Network of Machine Tool and Equipment Manufacturers in Saxony

Initiated: Saxony State Ministry for
Economic Affairs and Labour



Established: 2003

Programme
Management: Fraunhofer Institute for
Machine Tools and
Forming Technology (IWU)



VEMAS – Verbundinitiative Maschinenbau Sachsen

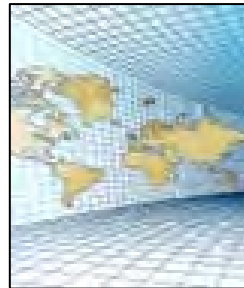


VEMAS supports **technology-driven collaborations**

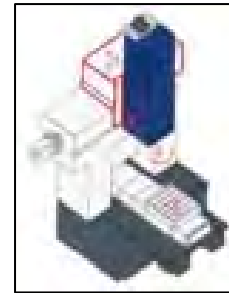
to overcome the inhibitive structures of **small and medium sized companies**
by cooperation → improvement of **market opportunities/chances**



Initiation of
networks



Strengthening of
**international
cooperation**



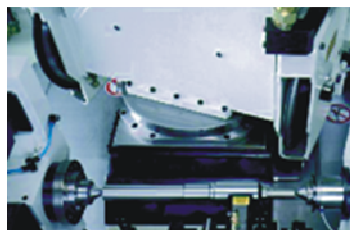
Promotion of
innovations



Keep **qualified
employees**
in the region

KMC – Kompetenzzentrum Maschinenbau Chemnitz Sachsen e.V.

Kompetenzzentrum
Maschinenbau



Archivierungsgablen

- Most important association of mechanical engineering companies in Saxony
- Founded in 1998
- Association of OEM's, suppliers, research organisations and service providers
- 30 members
companies with more than 4000 employees
- Annual turnover > 500 Mio. €
- Research Cooperation

International Networks

Cooperation with International Industrial Associations

Selected examples:



Spain – **CIC marGUNE**
Cooperative Research Centre in High Performance Manufacturing



Italy – **UCIMU-SISTEMI PER PRODURRE**
è l'associazione dei costruttori italiani di macchine utensili, robot, automazione e di prodotti a questi ausiliari



Swiss – **SWISSMEM**
unites the Swiss engineering, electrical and metal industry and associated technology-oriented sectors

Large Industrial Projects

Innovation Alliance „Green Carbody Technologies“



- Objective: resource efficient optimization of the process chain “Lacquered Car Body”
 - Reduction of energy
 - Saving of resources
- Partners:
 - Volkswagen (leading OEM), AUDI, Daimler
 - 60 companies (automotive supplier of OEM and steel industry)
 - 3 Fraunhofer Institutes
- Duration: 3 years (2009 – 2012)
- Total project budget ~ 30 M€
- General Management by Fraunhofer IWU

Innovation Alliance „Green Carbody Technologies“

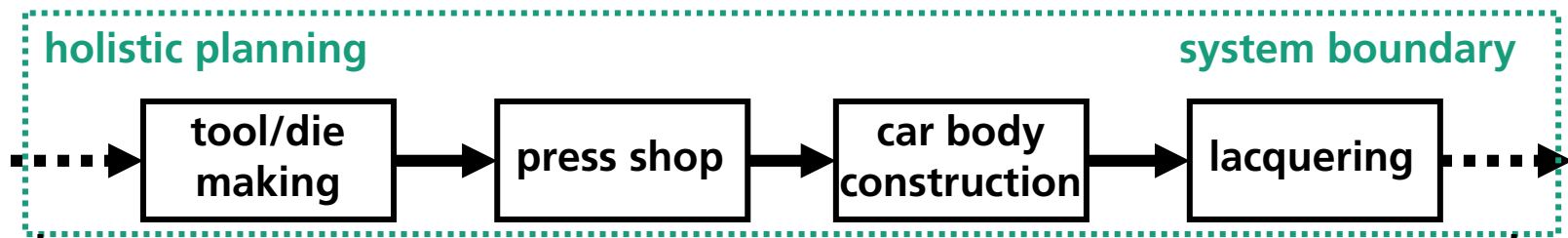
TODAY up to 50 (60) % cutting scrap

example
12 % scrap (failure);
65 % energy lost (press cushion)

example
energy need in joining:
mechanically/
thermally = 1/3

example
energy need in lacquering:
blank/structure = 1/5

research focus



TOMORROW

resource-optimized (costs, time, material, energy) car body manufacturing

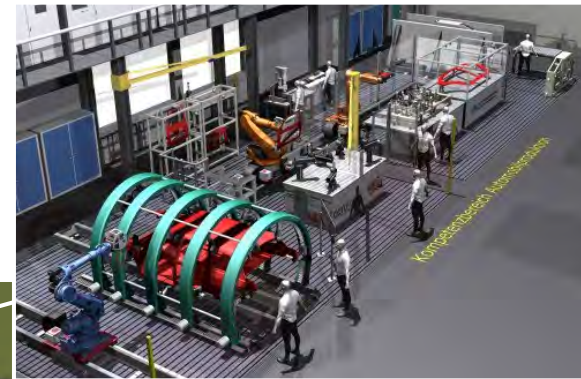
VISION: 50 % reduction of energy use possible?

Archiviert

“Research Plant Resource Efficient Production”

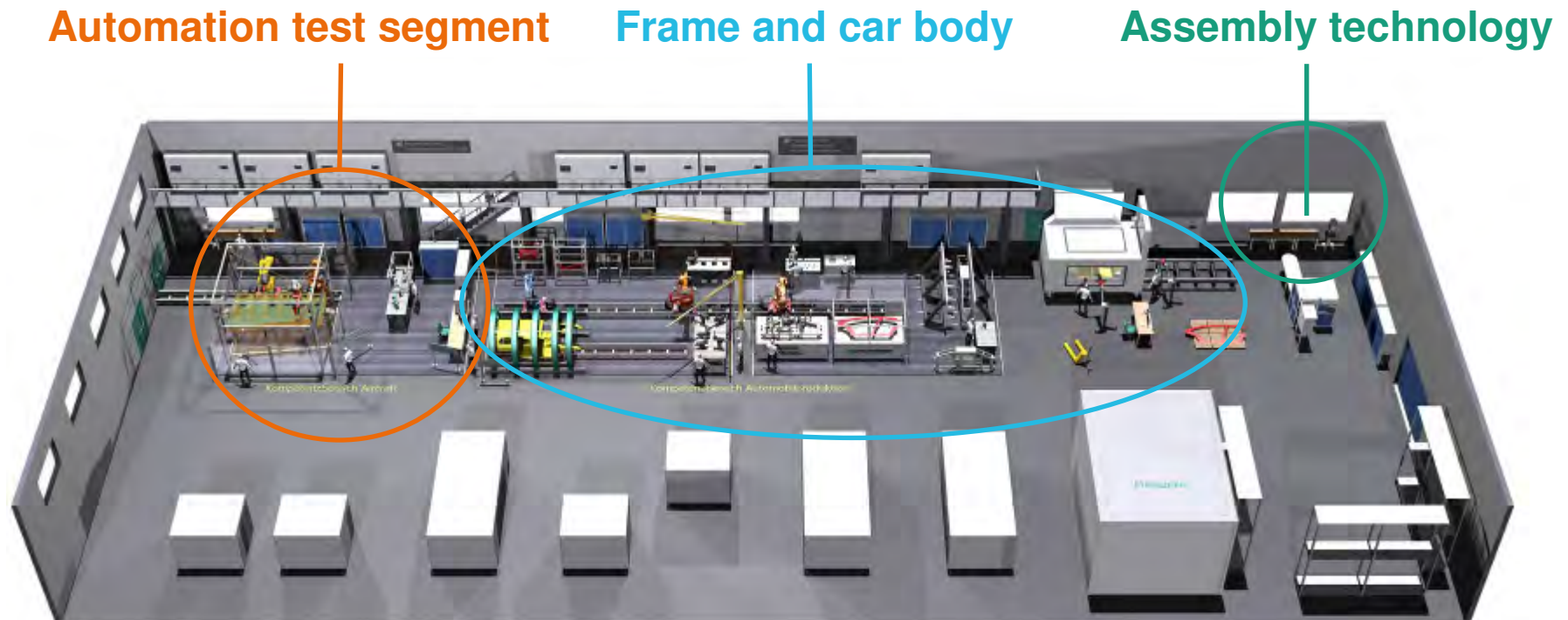
Fraunhofer IWU Strategy

1. Efficient production
2. Total energy management
3. Utilization of alternative energy sources



Archivierungsangaben

“Research Plant Resource Efficient Production”



Archivierungsangaben

The vision of the **Concept “E³ Plant”** is an energy-autarkic, emission-free and ergonomic production.

Centre of Excellence Car Manufacturing within the “Research Plant Resource Efficient Production”

Scientists and engineers from Volkswagen AG, Audi AG and Fraunhofer IWU work closely together to increase resource and energy efficiency based on innovative efficiency technologies and production devices.



Focus process chains:

- Tool making
- Press shop
- Carbody production

VOLKSWAGEN

MOBILITY MADE IN GERMANY

- Successful collaboration between Volkswagen and Fraunhofer in Saxony, including joint research projects.
- Common goal: To develop resource-efficient manufacturing solutions.
- Examples: Automotive Production Center of Excellence as an integral part of the "Research Factory for Resource-Efficient Production", "Green Carbody Technologies" innovation alliance.



"The Fraunhofer researchers' wealth of ideas and superb research skills will help us cope with the challenges that lie ahead – just as they have helped us jointly implement so many innovative processes and products in the past."

Prof. Dr. Jochem Heizmann, member of the Board of Management of Volkswagen AG



Thank you very much for your attention!