



Fraunhofer
ISI

FRAUNHOFER INSTITUTE FOR SYSTEMS AND INNOVATION RESEARCH ISI



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COMPETENCE TO SUPPORT DECISION-MAKING

What we see depends on our standpoint. An object of interest can be regarded from a distance or close up. Only by changing our perspective can we get the full picture and ensure that we are not overlooking important details. In order to identify as many of these details as possible, we need a trained and analytical eye – in a figurative sense, this also applies to finding solutions to the societal challenges of our time. It is precisely the systemic view taken by the Fraunhofer ISI – resulting from a combination of different disciplines – that is valued by our clients from government, industry, science and society. This is based on many years of scientific expertise and even allows us to take a look ahead at possible developments in society.

We regard innovations as a complex process. Researching them is a difficult but not unsolvable task. This was our motivation once again in 2014 to conduct research on socially relevant topics such as the Energiewende, data security or the mobility of the future. Our core competences “Understanding innovation systems”, “Empirical evidence”, “Holistic evaluation”, “Designing futures” and “Policy analysis and design” help us to address these important topics. These core competences dovetail, complement each other and are applied to all the institute's research topics and research fields. Their interplay forms the foundation of the research and consultation activities of the Fraunhofer ISI and ensures our clients receive scientifically-sound results.

The Fraunhofer ISI put forward various proposals related to the fourth industrial revolution “Industry 4.0” at the Hannover Messe on how enterprises can ensure their viability in the future and adapt to rapidly changing conditions. Research results on the factory of the future were presented that can help companies improve their competitiveness and flexibility. It is becoming increasingly important for decision-makers in industry and government to develop strategies for tomorrow today and not only be prepared for social and technological trends, but actively participate in shaping them.

Like this year's annual report, the Fraunhofer ISI also takes different perspectives when analyzing and evaluating complex issues: areas like technology and ecology play a role here as do politics, society, the economy and science. The possibility to assess the potentials and consequences of



political or economic actions and their limits is only given by combining all the fields. To arrive at holistic solutions, we need the described ability to change our perspective.

Around 170 researchers from a wide range of different disciplines ensure that this happens. They applied their expertise to about 370 research projects in 2014 and opened up new perspectives for our clients as well as giving them strategic recommendations for action and design options. This generated an operating budget for the Fraunhofer ISI of almost 23 million euros.

At present, about half the institute's staff is working at the former Pfizer building in nearby Karlsruhe-Hagsfeld while building renovations are being carried out to the institute's west wing. These are due to be completed during the course of 2015 and all 240 members of staff will then be reunited again under one roof in the Breslauer Strasse.

The Fraunhofer ISI will continue to regard the researched topics from different, unusual and completely novel perspectives next year as well. We look forward to working on the Grand Challenges in many fascinating projects for our clients and together with our partners. We contribute to managing overarching social, ecological and economic problems and issues by using our skills and by developing and applying innovative technical and non-technical solutions. This is how the Fraunhofer ISI helps to improve the sustainability and innovativeness of Germany's economy and society.

Prof. Marion A. Weissenberger-Eibl
Director of the Institute

Dr. Harald Hiessl
Deputy Director of the Institute

INFORMATION, PERSPECTIVES AND GUIDANCE FOR STRATEGIC DECISIONS

The Fraunhofer ISI offers actors in industry and politics strategic advice for very different facets of innovation. It has the core competences “Understanding innovation systems”, “Empirical evidence”, “Holistic evaluation”, “Designing futures” and “Policy analysis and design”. On this basis, the institute offers its clients from industry, politics and science information, perspectives and guidance for strategic decisions.

Discussion between the Chairman of the Board of Trustees, Dr. Manfred Wittenstein, and the Director of the Institute, Professor Marion A. Weissenberger-Eibl

Frau Weissenberger-Eibl, in 2014, the Fraunhofer ISI again proved to be a pioneer for industry, politics and society. What characterizes the work of the institute?

Weissenberger-Eibl: The Fraunhofer ISI has a remarkable team of highly competent scientists from completely different disciplines. This combination of experts makes it possible to deal with problems systemically and thus tackle them holistically. In this way we systemically develop the topic areas energy, environment, sustainability, mobility, production, services, biotechnology, health, ICT, industrial and raw materials, security and innovation management and policy.

“THE COMBINATION OF EXPERTS MAKES IT POSSIBLE TO DEAL WITH PROBLEMS SYSTEMICALLY.”

Wittenstein: As an entrepreneur, I appreciate being able to consult experts for sustainable decision-making. The different perspectives which the Fraunhofer ISI offers are very helpful here. The competences of the Fraunhofer ISI are a special support for politics and industry.

Do companies today have strategies to adequately deal with their future?

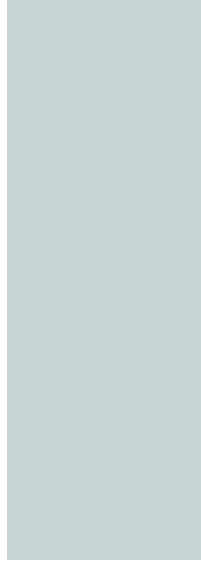
Wittenstein: I do not take it upon myself to make a general judgment here. But during day-to-day business it often seems more obvious to focus on the short and medium term and to consider the future more operationally. Strategic thoughts about the future too often fall by the wayside and that is dangerous. In order to remain competitive, possible developments should be taken into account in good time.

Weissenberger-Eibl: And this is precisely what the Fraunhofer ISI offers. We provide support for all issues regarding innovation and make use of our core competences.

What do you understand by core competences?

Weissenberger-Eibl: Well, we at the Fraunhofer ISI understand by core competences those exceptional qualifications which cut across all competence centers regardless of organizational units and which are the basis for our work.

Wittenstein: I also think it is highly relevant that the existing competences mesh together and become tightly intertwined. Only then is it possible to thoroughly consider an issue.



What does the competence "Understanding innovation systems" mean?

Weissenberger-Eibl: With the aid of our innovation approaches, the Fraunhofer ISI conducts integrated innovation analyses. It is particularly noteworthy that the Fraunhofer ISI does not conduct its analyses from the perspective of the individual actor or the individual sector, but takes the bigger picture into account. We therefore evaluate the entire sector starting with the individual workplace, then the company and then the industry.

“THE FRAUNHOFER ISI DOES NOT CONDUCT ITS ANALYSES FROM THE PERSPECTIVE OF THE INDIVIDUAL ACTOR OR THE INDIVIDUAL SECTOR, BUT TAKES THE BIGGER PICTURE INTO ACCOUNT.”

Wittenstein: This way the Fraunhofer ISI successfully manages the balancing act between methodologically sound highly complex scientific work and research which is applied in practice; in my opinion a remarkable achievement.

And what does "Empirical evidence" mean?

Weissenberger-Eibl: Our recommendations are empirically sound. The outstanding characteristic is that we combine the understanding of the innovation system with the wealth of methods we have at our disposal and our knowledge of industries and sectors.

Wittenstein: I very much value the empirical basis of the analyses of the Fraunhofer ISI. It is an important foundation of the research results and is often incorporated into concrete applications. Clients of the Fraunhofer ISI particularly appreciate this.

Frau Weissenberger-Eibl, which methods are referred to here?

Weissenberger-Eibl: We use a large number of different methods, for example primary and secondary databases, sets of indicators as well as qualitative methods from which we derive information. We are talking about stakeholder processes or acceptance surveys and similar methods here.

A similarly complex construct as the core competence "Holistic evaluation"?

Weissenberger-Eibl: Precisely this core competence has played an outstanding role since the Fraunhofer ISI was established. Holistic evaluation is an analysis in terms of content, method and process, that is to say, a sound and integrative evaluation from a complex technological, economic, ecological and societal perspective.

Wittenstein: The Fraunhofer ISI has a multi-dimensional, integrated approach. It is all about comprehensive scientific decision support to diagnose challenges and problems and to identify and evaluate innovations for decision-makers.

“THE CLIENTS DO NOT BENEFIT FROM RESEARCH RESULTS ALONE UNLESS THEY CAN BE USED TO DERIVE RECOMMENDATIONS FOR ACTION.”

And this helps clients?

Wittenstein: Yes, and exactly this is the crux of the matter: the clients do not profit from research results alone unless they can be used to derive recommendations for action. However, the Fraunhofer ISI is well positioned here.

Another important core competence is "Designing futures". How would you describe the achievements behind this core competence?

Weissenberger-Eibl: Here the focus is on possible futures. Actors who deal with possible and desired future developments strengthen the knowledge basis for decision-makers. We think it is very important to address futures to explore design options, prepare for possible difficulties and ask the right questions.

Which questions need to be asked?

Weissenberger-Eibl: How will we live and work tomorrow? What do we need to prepare ourselves for? What could lie ahead? We have to develop strategies for action and design our future. Only if we recognize possible developments can we prepare ourselves or react.

"THE FRAUNHOFER ISI TRANSLATES INSIGHTS INTO RECOMMENDATIONS FOR ACTION WHICH CAN BE IMPLEMENTED."

Finally, a very important core competence of the Fraunhofer ISI: "Policy analysis and design". What are its characteristics?

Wittenstein: The Fraunhofer ISI issues policy advice by conducting scientifically sound analyses and by using a broad spectrum of methods in a transparent and understandable manner. In addition, the Fraunhofer ISI translates these insights into recommendations for action which can be implemented. And this is the point at which the wheat is separated from the chaff.

Weissenberger-Eibl: It is important that we operate on different levels, in politics or in industry where we can also find political actors. Only then can we as THE policy advisory institute of the Fraunhofer-Gesellschaft provide the support which policy-makers need.

The Fraunhofer ISI offers its clients perspectives for decisions. Why are different perspectives important?

Wittenstein: Different perspectives are relevant in order to work systemically. The Fraunhofer ISI is for its clients and partners one of the few European research institutes, which at the same time has technical expertise, knowledge of innovation processes in industry and society as well as political understanding to this extent.

Weissenberger-Eibl: From my point of view, a key factor is that we establish a close link between these three areas. Our work is characterized by the fact that we recognize relevant topics and issues at an early stage and explore them systematically.

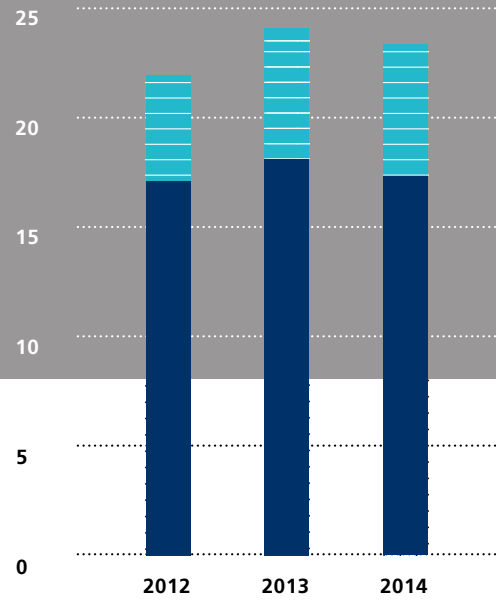
Wittenstein: The Fraunhofer ISI contributes continually to the further development of the systemic research and consulting approach and takes up new issues and spheres of activity.

Weissenberger-Eibl: The substantial contributions our scientists have made show that it is essential to consider technological, economic and socio-political aspects systemically. In this way, basic and applied research are intertwined more closely.

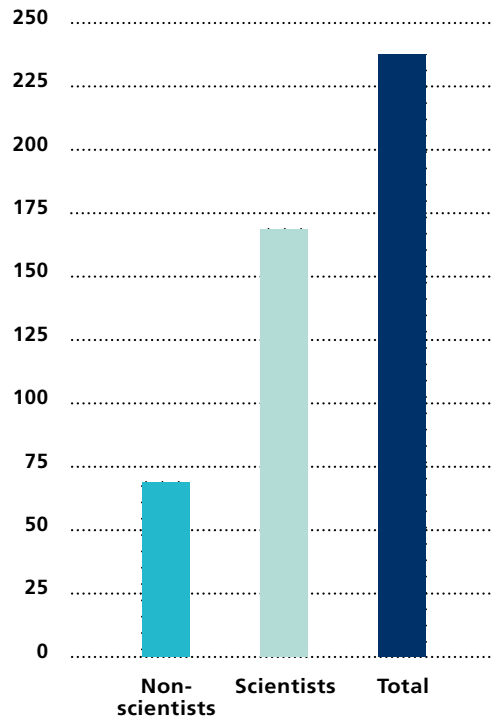
Thank you for your time!

This interview was conducted by Anne-Catherine Jung.

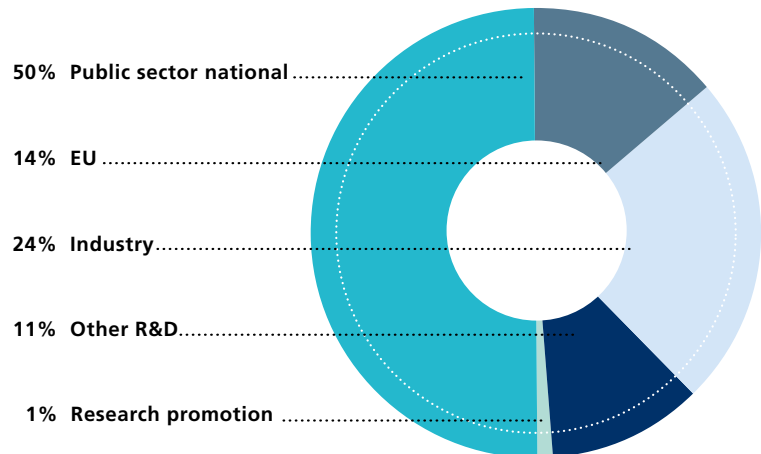
● Basic funding ● Earnings
 Development of turnover 2012–2014 (in million euros)



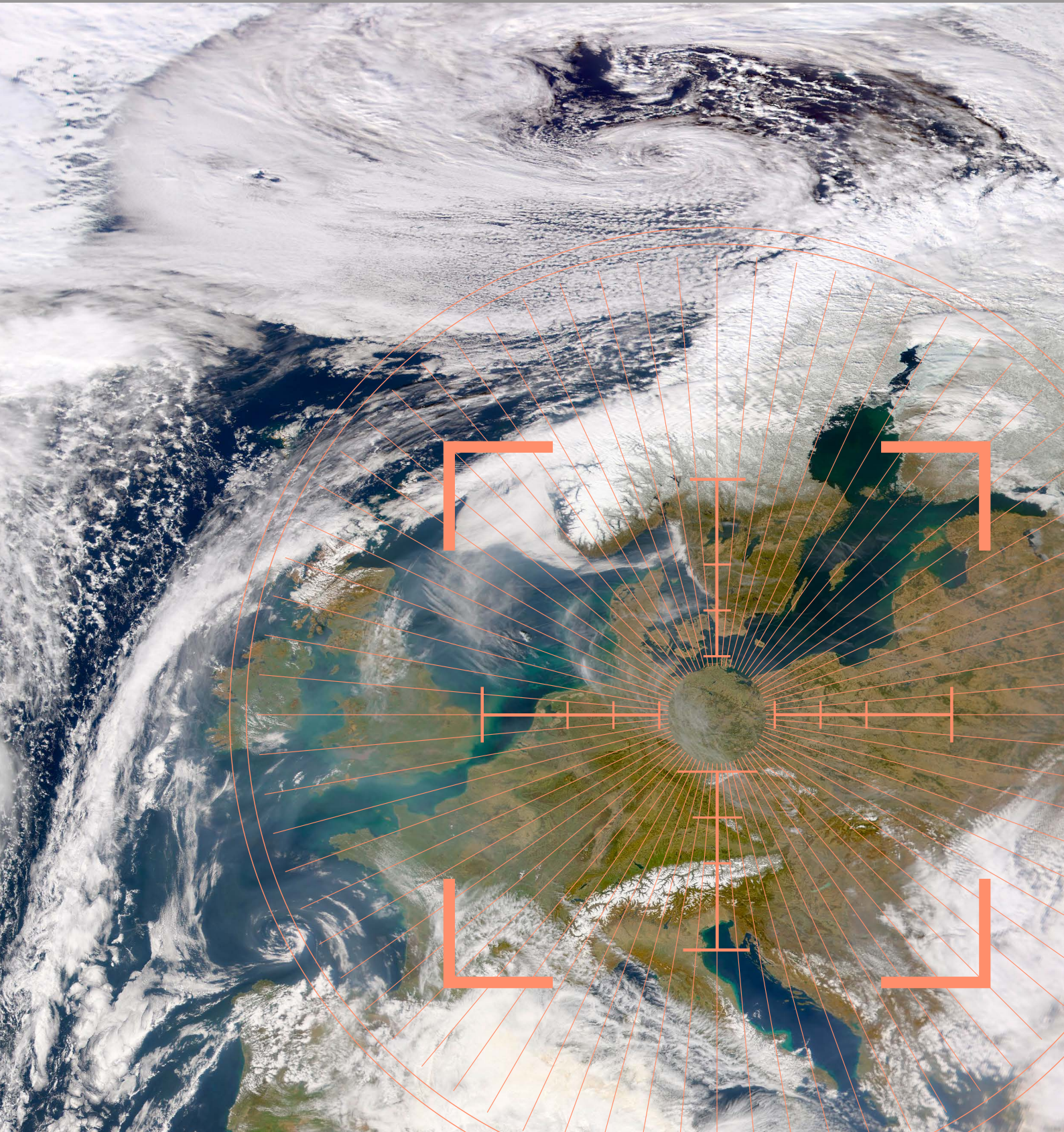
Number of staff



Clients



CORE COMPETENCE 1



HOLISTIC UNDERSTANDING OF COMPLEX INNOVATION SYSTEMS

When the Fraunhofer ISI was first established, its aim was to research the consequences and potentials of technologies and innovations in order to develop strategies for industry and policy-makers that can be used to put innovative solutions into practice. To do so, it is necessary to have a holistic understanding of how innovation takes place in many different innovation systems. The core competence “Understanding innovation systems” is therefore a key element of the research conducted at the Fraunhofer ISI.

In innovation processes there are numerous interdependent developments between technical, organizational and institutional innovations.

The innovation system is made up of individuals, teams, research organizations, educational and administrative bodies, companies, political decision-makers, the financial system's actors, international organizations, society's and the economy's needs, demand, competition, political and legal frameworks – and their interactions. There are numerous interdependent developments between technical, organizational and institutional innovations in dynamic and complex innovation processes. Understanding this and the systemic way of looking at each innovation system characterize the research conducted at the Fraunhofer ISI.

The foundation of many studies was and is the concept of innovation systems at national, regional, sectoral and technological level. The Fraunhofer ISI examines these levels and pools the results in overall analyses. Its conclusions about how well innovation systems are functioning, taking actor structures and economic-political incentive mechanisms into account, and its analyses of both obstructive and supportive constellations add to the understanding of socio-technological change and to identifying options for shaping and steering this. Its systemic view enables the Fraunhofer ISI to span the entire spectrum from the perspective of the individual through the organization up to the sectoral and macroeconomic level.

Analysis of the innovation system electric mobility

The Fraunhofer ISI has analyzed different fields of application using its innovation system approach. The “EMOTOR” project is one example of this systemic approach in the transport sector. The “electric mobility innovation system” was subjected to closer examination here – focusing on research, industry, competition, demand and policy-making. Analyzing and then pooling these individual subsystems helped to discover whether Germany is on the way to becoming a lead market and supplier for energy storage systems for electric mobility. The researchers concluded that Germany has made huge progress over the last five years as far as research and technology in the field of lithium-ion batteries for electric vehicles is concerned. This can be attributed among other things to increased industrial and public spending on research and development. As a result, Germany



has been able to shorten the gap to the leading countries of Japan and Korea. Germany is now in a good position with regard to its technological knowledge, but this is not yet noticeable in installed or planned battery cell production capacities for electric vehicles. It still lacks experience with production process technology as well.

Overall, Germany is still not close to becoming a lead market and supplier for energy storage technologies for electric mobility applications. The current challenge is to turn the scientific and technological know-how gained over the last few years into creating domestic value added. This urgently requires a joint strategy of the key stakeholders from industry supported by policy-makers.

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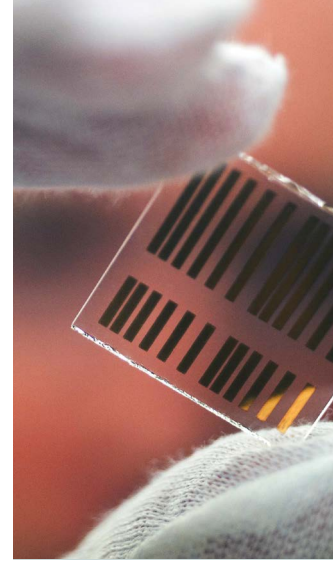
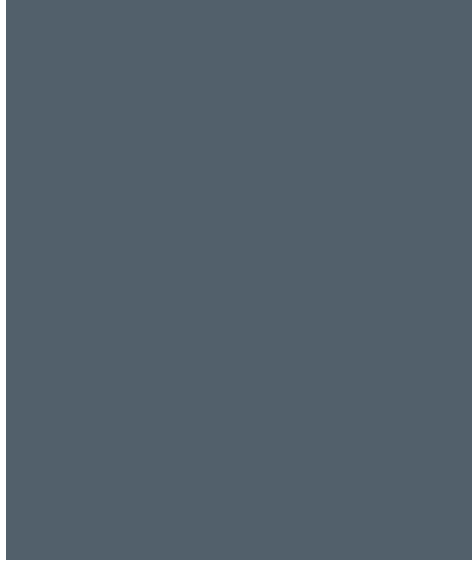
Research for better health care

Health care is another example of the analysis of innovation systems – focusing on scientific actors and practitioners on the ground: a Fraunhofer ISI project accompanying scientific research supports the initiative “Health care regions of the future”. This initiative promotes the development of regional networks with all the stakeholders involved in the innovation process. These include clinicians, hospitals, health insurance providers, patient associations and medical technology manufacturers. The aim of these networks is to improve health care provision, activate the regions' innovation and research potentials as well as strengthen regional health sector value chains and make them more sustainable.

As part of the accompanying research project, the researchers provide the regions with information on relevant topics such as funding options after the end of the official funding period, and communicating with different stakeholder groups. In addition, they organize workshops for sharing information and networking. The key objective of the accompanying research is to support the health care regions in becoming self-sustaining and in developing innovations and structures that can also be transferred to other regions.

Informal networks enrich regional innovation systems

“Informal Networks” was another project concerning regional innovation systems: future councils or innovation councils are being set up in an increasing number of German federal states, in order to develop innovation strategy and advise political decision-makers. Similarly, there are working groups, clubs and other committees that have been around for a long time on a regional level and that work on stimulating the flow of information and exchange between policy-making, the economy and science, independent of the regional authority's activities. Many of these groups that have been set up in bottom-up processes are key players in the regional innovation system, even though they do not belong to the group of regional policy actors as such.



Within the project “Informal Networks”, it was investigated which forms these groups take, which goals they pursue, which outcomes they have achieved, what influence they have and how relevant they are compared to state institutions. The project aims to contribute to a better understanding of these groups as an element of regional innovation systems, to give them the necessary attention and integrate them in innovation processes.

Possible cooperation between the European Union and China

One development that is especially important within the scope of the Fraunhofer ISI's internationalization strategy was the analysis of national and regional innovation systems in China. This further consolidated Fraunhofer ISI's cooperation with the Institute of Policy and Management in the “Joint Center” in Beijing. In addition, the research and innovation cooperation between the EU Member States and China was analyzed, for example, in the context of “Horizon 2020”, the EU's funding program for research and innovation.

Among other things, the researchers discovered that the best opportunities for cooperation between EU countries and China are in basic research and societal challenges – for example, demographics, environment, energy and urbanization. Complementary cooperation is possible in these areas and both sides could profit from cooperation. In the field of industrial leadership, however, suitable cooperation examples in practice are still difficult to find due to the simultaneously competitive market situation, although cooperation is desired. Last, but not least, EU-China cooperation could go more in the direction of research and innovation systems and their framework conditions, because the science and research support programs of both sides are very similar.

The best opportunities for cooperation between EU countries and China are in basic research and societal challenges.

The Fraunhofer ISI's work on innovation research and innovation system analysis has also achieved a high level of international recognition based on the wide variety of applications and the Institute's ability to integrate its conceptual understanding of innovation systems and methods of measuring and modeling innovation system components in practice-oriented research studies.

CORE COMPETENCE 2



PUSHING THE ENERGIEWENDE – FROM A HOLISTIC PERSPECTIVE

For Germany to be in a better position to address societal challenges like the Energiewende, these have to be regarded holistically and from different perspectives. Only then is it possible to expose problem areas and take action where it is needed. The Fraunhofer ISI contributes to understanding societal issues with its systemic approach and its specialized set of skills and methodologies – the holistic evaluation shows perspectives for the success of the Energiewende.

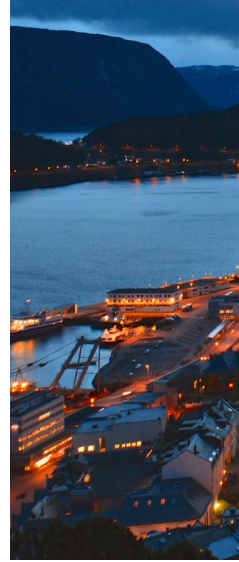
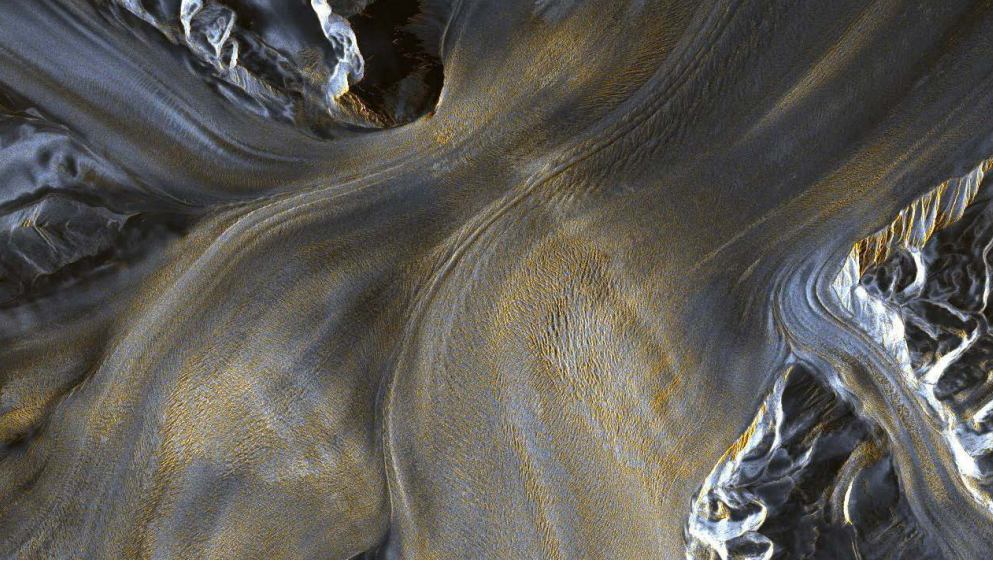
Mammoth tasks can only be effectively addressed if all the subfields and subsystems are included in the search for solutions. This also involves analyzing problems from several perspectives.

The mammoth tasks society is facing such as the Energiewende can only be effectively addressed if all the relevant subfields and subsystems are included in the search for solutions. This also involves considering problems from several perspectives and analyzing economic, technological and social aspects alongside ecological ones, and their interrelation using the relevant research methods. In the case of the Energiewende, this holistic perspective starts at the policy level, because the framework conditions for this are created by international, European and national climate policy and even by policies at the local or regional level. The developed policy strategies require an estimation of the possible impacts on national economies or economic sectors that the Fraunhofer ISI can provide due to its expertise in the field of modeling and the simulation of complex socio-economic systems for its clients from politics and industry.

Substantial need for action and saving potential in the European building sector

In spite of the climate policy efforts made so far, there are a number of areas in Europe where there is still a substantial need for action and a high potential for energy savings. The Fraunhofer ISI was part of the European research consortium "ENTRANZE", which shows there is considerable scope for improvements in the building sector: space heating, hot water, air conditioning and lighting currently account for around 40 percent of total final energy consumption in Europe. Savings of 20 to 30 percent are possible up to the year 2030 according to the consortium's calculations that were based on evaluating data from the building and energy sectors, analyses of building renovation and simulating different policy scenarios. In order to realize these savings, however, additional laws and support measures are needed, such as low-interest loans for building renovations as well as providing home owners with better information and professional training regarding the possibilities for improving energy efficiency.

For the holistic evaluation of the Energiewende, it is also essential for political decision-makers to obtain feedback about the success and effect of policy measures in the field of renewable energies. These include primarily the German Renewable Energies Act (EEG), whose innovation



effect has been shown by the Fraunhofer ISI in several research projects. In “GRETCHEN”, for example, a research project conducted together with the University of Jena and the GWS Osna-brück and coordinated by Fraunhofer ISI, the researchers looked at what impact the policy mix (which includes the EEG alongside other innovation and climate policy instruments and long-term targets) has on the further development and diffusion of renewable energy technologies. This enables conclusions to be drawn about what consequences this policy mix has for innovation activities in enterprises and what changes to the innovation system and macroeconomic effects this implies. Alongside these different levels of analysis, holistic evaluation also includes the use of diverse research methods like evaluating patent data and conducting company surveys. For example, the *German Manufacturing Survey*, conducted by the Fraunhofer ISI, found out that 18 percent of firms in the manufacturing sector already used technologies to generate their own power in 2012 and that this share could rise to 28 percent by 2015. The studies conducted as part of the “GRETCHEN” project indicate that, apart from the EEG and its design, a consistent and credible policy mix and ambitious political targets influence technological and structural changes in renewable energies. External factors like foreign markets and global competition play an important additional role.

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Networks for more energy efficiency

Precisely because energy policy in Germany has so far primarily targeted the rapid expansion of renewable energies and focused less on the topic of energy efficiency, a “two-speed Energiewende” is becoming apparent. And yet, in the industrial sector alone, which consumes around 2,600 petajoules of energy each year, there is the potential for cost-effective energy savings of 10 percent up to 2020. The “30 Pilot-Networks” project monitored by the Fraunhofer ISI shows that the increase in energy efficiency can be doubled compared to the industrial average to 2.1 percent per year in these Learning Energy Efficiency Networks (LEEN). Based on an energy audit, ten to 15 participating companies in a region exchange their knowledge and experiences with the topic of saving energy at regular chaired meetings. Annual monitoring records the successes. Using this “instrument of industry for industry”, the 370 participating companies were able to save approx. 200,000 euros in energy costs per company and year on average, which corresponds to almost one million megawatt hours and 350,000 tonnes of CO₂. This is roughly equivalent to the energy consumption of 67,000 two-person households. Based on this success, the German government signed an agreement with German industry at the beginning of December 2014 that plans to set up 500 new Energy Efficiency Networks by 2020. Under particularly favorable energy and climate policy conditions, up to 700 networks may even be possible in the future, which could include medium-sized municipalities and rural districts with up to 200,000 inhabitants alongside large companies and SMEs. The LEEN concept has been especially adapted to this target group.



Technological and social aspects also have to be considered in a holistic evaluation of the Energiewende and the question of how energy efficiency and the expansion of renewable energy sources can continue to be pushed. Without the relevant technological conditions for energy generation and storage, the transition to renewable energies is not really feasible. As a study by Fraunhofer ISI shows, nanotechnology could play a major role here in the future. This can be used to improve the material efficiency of solar systems, for example, or energy storage systems and to reduce manufacturing costs. This means that solar cells could not only be produced at lower cost in the future, but their lifespan can also be increased, as can the storage capacities of batteries.

Acceptance issues as part of holistic evaluation

Germany's leading position in fields like energy storage for electric mobility has been confirmed by a study of the Fraunhofer ISI that was funded by the German Federal Ministry of Education and Research (BMBF). This is very important for the country as a location for industry, research and technology. And yet, the technological innovations resulting from this have to prove themselves on the respective markets and especially to ordinary citizens and be accepted by them. This is especially true for renewable energy technologies such as wind power turbines (for example in the "WISE Power" project) or large solar parks that are a fundamental component of the Energiewende, but cannot be realized if they are not accepted by the population. This is why Fraunhofer ISI explores the evaluation of energy technologies like CCS (Carbon Capture and Storage), a method for subterranean storage of CO₂, which are viewed critically by the population. The focus here is less on the individual technology and more on the search for suitable ways and means to achieve a stronger participation of the population and of science that are relevant for siting decisions, for instance. Increasing the participation of all the stakeholders involved in the Energiewende is an essential prerequisite for its success and for the willingness of individuals to help shape the Energiewende through their own actions. A multi-dimensional view that links contents, methods and processes and analyzes problems from different perspectives is decisive here. Only this holistic approach makes it possible for decision-makers from government, industry and science to coordinate their respective know-how and proposals and arrive at the best possible solutions.

Renewable energy technologies such as wind power turbines or large solar parks are a fundamental component of the Energiewende, but cannot be realized if they are not accepted by the population.



EMPIRICAL EVIDENCE AS A KEY ELEMENT FOR DECISION SUPPORT

Decision-makers from politics, industry and society increasingly include scientific research in decision processes to help them assess the efficiency of past and future political or entrepreneurial actions. In each case, specific questions are asked which require expertise related to topics, industries and business as well as broad methodological competence and the ability to integrate research methods. In addition to an extensive pool of methods, the Fraunhofer ISI analyzes data from a wide variety of sources and derives recommendations for effective decision-making.

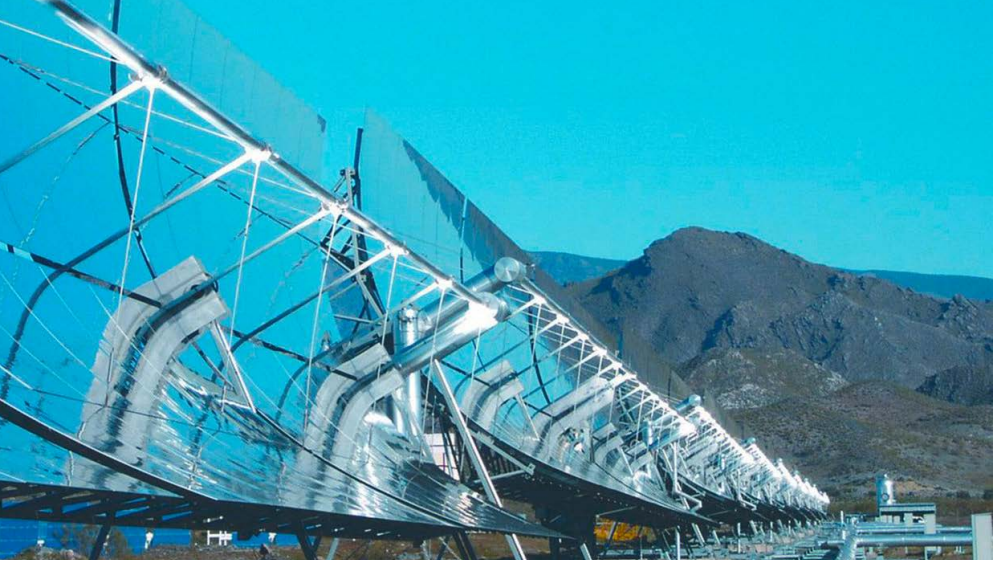
Especially when issues of great social importance such as economic growth and competitiveness are at stake, decision-makers from politics and industry have to create the best possible conditions for future developments and draw the right conclusions from the past. To this end, more and more frequently empirical analyses are consulted for decision-making. To research specific issues, the Fraunhofer ISI is able to apply different scientific research methods and with the aid of its interdisciplinary staff the necessary data can be collected and analyzed in-house. The core competence "Empirical evidence" is particularly useful when no research results for a particular problem are available and research has to be conducted or new models and instruments have to be created to analyze a complex situation.

For a sound scientific assessment of growth and competitiveness, the innovation activities of companies and the whole economy play a key role.

For a sound scientific assessment of growth and competitiveness, the innovation activities of companies and the whole economy play a key role. In 1993, the Fraunhofer ISI developed the *German Manufacturing Survey* to overcome the reduction of innovation in industry to product innovations and to allow a broad review of modernization processes. This business survey, which is conducted every three years, is the most comprehensive survey of modernization trends in production- and technology-oriented companies in Europe. The data allows conclusions to be drawn about how value creation processes can be optimized by technological or organizational modernization or how new business models can supplement the existing product range. In cooperation with 18 research institutes and universities in and outside Europe, the *German Manufacturing Survey* was internationalized in 2001 and extended to the *European Manufacturing Survey* (EMS).

Collecting primary data and developing indicators

Before new products and technologies are introduced, it is essential to know how well the public or potential consumers will accept these novelties. This applies particularly to future-oriented technologies such as electric mobility, which is highly significant, not only for climate protec-



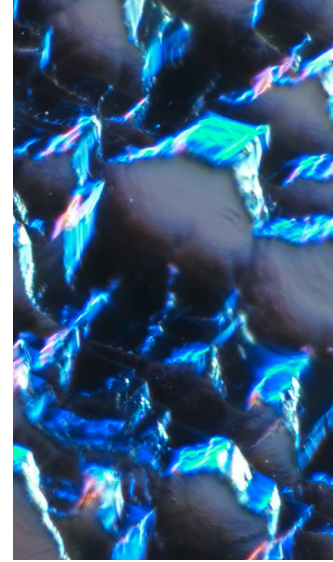
tion and sustainability reasons, but also because of the high economic performance of the German automobile industry. In this context, the Fraunhofer ISI together with research partners is carrying out the project "Regional Eco Mobility 2030", which, as part of a systemic view of future mobility, also examines the user acceptance of integrated mobility options in local public transport and car sharing, infrastructure systems as well as new mobility concepts. In addition, primary data of commercial traffic driving profiles are collected in the project for a minimum of three weeks by GPS data loggers. This data serves as a basis to investigate the market potential of electric vehicles.

Alongside data collection, analyzing internal and external data such as the international patent statistics in "Patstat" or the energy data in the "Odyssee" database is a characteristic component of the Fraunhofer ISI's core competence of "Empirical evidence". The institute has the ability to connect data from different sources and to develop new analysis tools and indicators on this basis. One example is the "Innovation Indicator 2014", an international innovation ranking, which is established by the Fraunhofer ISI, the Center for European Economic Research (ZEW) and the Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT). This study of the innovative capabilities of states and regions is based methodologically on 38 individual indicators, which each allow for statements related to social subsystems such as industry, science, the state or the education sector. For example, key figures such as the share of patents from public research per inhabitant or the share of researchers per 1,000 employees indicate how innovative science is in the respective country. Altogether, the individual indicators make up an overall indicator, which guarantees the comparability of different countries. As was the case in 2013, Germany ended up in sixth place in 2014 and was beaten by Switzerland, Singapore, Sweden, Belgium and Finland in terms of innovative capability.

Models simulate complex socio-economic systems

For issues such as the future innovative capability, it is also important to be able to assess the short-, medium- and long-term consequences of political and economic decisions as well as their impacts on other subsystems and the macroeconomic or sectoral costs of measures. The Fraunhofer ISI has proven expertise in the area of modeling and is thus able to simulate complex socio-economic systems and make statements on national and supra-national developments. For example, the ASTRA-EC assessment model developed as part of the project "ASSIST" makes it possible to evaluate the social and economic impacts of national and European transport and environmental policies. If, for example, the government of a particular country is planning new legislation such as the introduction of road tolls, it is possible to use the model to calculate how the incurred costs can be reimbursed by tax relief. The model allows transport-related, economic and social effects to be viewed in parallel. The PowerACE model, which analyzes energy markets and the possibilities of expanding renewable energy sources, and the FORECAST platform for

The ASTRA-EC assessment model makes it possible to evaluate the social and economic impacts of national and European transport and environmental policies.



the analysis of energy demand are other modeling instruments that enable the Fraunhofer ISI to simulate various scenarios for different sectors which can become an important source of information for decision-makers.

Many studies by the Fraunhofer ISI are also based on multiple method concepts which focus on the complexity of the individual problem. A research project on the influence of nanotechnologies in the areas of solar energy and energy storage, for example, identified different nanotechnology profiles on the basis of bibliographic analysis methods and visualized their future potentials in a meta roadmap. On the other hand, official statistics (e.g. micro census and national accounts) were analyzed and patent and qualitative content analyses were used to investigate the future potentials and strategies of traditional industries in Germany, to deliver information about the overall economic importance, the technological performance of different sectors as well as the innovation capabilities and competitiveness of companies operating locally.

A research project on the influence of nanotechnologies in the areas of solar energy and energy storage identified different nanotechnology profiles on the basis of bibliographic analysis methods and visualized their future potentials in a meta roadmap.

Classifying research results and deriving recommendations for action

The core competence “Empirical evidence” of the Fraunhofer ISI is not only based on proven expertise in applying qualitative and quantitative research methods, but also includes years of experience in analyzing data and modeling. For its clients from politics, industry and society, the Fraunhofer ISI also classifies the research results in each context and derives relevant recommendations which contribute to making prompt and effective decisions. Together with sound knowledge of technologies, sectors, industries or companies and peoples' attitudes, the value added of the core competence “Empirical evidence” is the ability to cover all levels of decision support from a single source – starting with analyzing the problem to working out concrete solutions.



SOUND POLICY ADVICE WITH COMPREHENSIVE ANALYSES AND NEW DESIGN CONCEPTS

The Fraunhofer ISI supports political decision-makers at supra-national, national, sub-national and municipal government levels with thorough analyses, sustainable concepts and strategic recommendations for action on innovation policy issues. It also advises representatives from research and industry who are active at the political level. The core competence "Policy analysis and design" is based on scientifically founded policy advice.

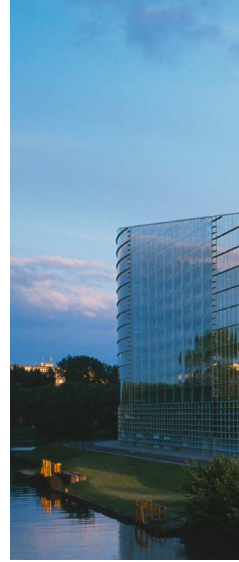
The Fraunhofer ISI has formulated criteria of good practice for its policy advice and uses a broad spectrum of methods.

The Fraunhofer ISI has formulated criteria of good practice for its policy advice. These include investigations and their results being independent and free from influence, interdisciplinary scientific competence as well as internal and external networking to appropriately cover different facets. The scientists use a broad spectrum of methods: the research portfolio includes innovation system analyses, studies of innovation economy, foresight processes, analyses of policy areas and evaluations, modeling, dialog-oriented and participative approaches, as well as analyses of governance of research, technology and innovation. These methods combine inter- and transdisciplinarity as well as application orientation.

Recommendations for action guided by the addressee's scope for action

Policy advice given by Fraunhofer ISI is characterized by a distinct awareness of socio-economic challenges and a profound understanding of political decision-making processes. Successful advice and implementation are based particularly on sound knowledge of political and administrative decision-making routines, as well as on the logic underlying departments' and actors' actions. Communication and result processing are done accordingly. The researchers take the actors, their beliefs and conflicting political interests into consideration so that the recommendations for action are not only accurate, but are also oriented towards the addressee's scope for action.

The fact that the Fraunhofer ISI staff are members of high-level scientific consultation institutions and political advisory bodies shows that policy-makers recognize their excellent scientific policy advisory skills. The Fraunhofer ISI was also involved in the further development of the German federal government's High-Tech Strategy (HTS). The High-Tech Strategy, which was first published in 2006, envisaged comprehensive coordination of innovation policy action across departmental boundaries and therefore was a milestone of innovation policy. The new – third edition – High-Tech Strategy, announced in September 2014, is intended to safeguard the principles, but at the same time set new priorities.



HTS 2020: societal needs instead of a technology-oriented perspective

The connection between these two versions is the HTS 2020, in which the Fraunhofer ISI was involved: in contrast to the first High-Tech Strategy, societal needs which are oriented towards future challenges were at the center of the second edition, and not technology areas. This problem-oriented perspective instead of a so-called “technology push” orientation is typical of the policy advice issued by Fraunhofer ISI. This approach emphasizes the interfaces of different technology areas and the resulting opportunities more clearly; it also makes possible a flexible and needs-oriented modification and a shift of the priorities. The HTS 2020 focuses on a comprehensive definition of innovation which includes technological as well as social innovations. The objectives encompass better transfer via new instruments for networking science and industry, greater innovation dynamics by supporting in particular small and medium-sized enterprises as well as technology-oriented founders, optimizing fundamental framework conditions of the German innovation system and a stronger dialog, utilizing elements such as openness towards technological ideas, public participation and social innovations.

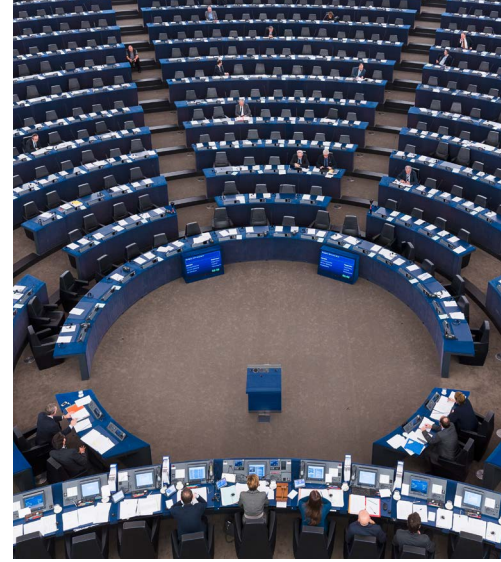
By orientation towards societal future tasks, the new HTS fits into the current paradigm change of European research, technology and innovation policy. Essentially, the issue is the orientation and impacts of research and innovation with social values and needs better than in the past. The concept “Responsible Research and Innovation (RRI)” focusses this approach: particularly, the early involvement of stakeholders, users and laymen as well as accessing additional sources of knowledge aims to align research and innovation processes more with economic, social and ecological challenges while taking ethical principles and normative objectives into consideration. The Fraunhofer ISI deals intensely with RRI and contributes to further developing and substantiating the concept. For example, the EU-funded project “Res-AgorA” is developing a governance frame which is intended to support the implementation of RRI into European research and innovation policy.

Assessing the impacts of data protection on fundamental rights

Other research conducted at the Fraunhofer ISI is also directly implemented into policies, for example, private sphere and data protection in the context of innovation policy and the harmonization of European support systems for renewable energies.

One of the topics researched within the project “SAPIENT” investigated privacy and data protection. In some EU Member States there are approaches to assessing the inherent risks of information technology systems and applications, however, they are mostly restricted to questions of data protection. But the fundamental rights affected also include the protection of privacy, which called for so-called Privacy Impact Assessments (PIAs). Within the framework of “SAPIENT” existing PIA procedures were examined and assessed. The best elements were selected to develop their own assessment process. This can help companies and organizations to assess

In the HTS 2020 societal needs which are oriented towards future challenges were the main focus. This approach emphasizes the interfaces of different technology areas and the resulting opportunities.



the risks of surveillance to fundamental rights, to informational self-determination and privacy, to identify potential risks and take appropriate counter-measures. Such assessments should be implemented as early as possible into the development cycle of a technology and are in future part of European data protection legislation: the draft of the EU data protection regulation formulates principles such as the restricted deployment of surveillance instruments, time limits on storing data and the consideration of citizens' rights. In addition, risk management is called for.

Research on harmonization of support measures for renewable energies

The Fraunhofer ISI also advises in the policy area energy which included, for example, the project "Beyond 2020" that dealt with the different support systems for renewable energy within EU Member States. Under the current target structure – a 20 percent reduction in greenhouse gas emissions, a 20 percent share of renewables in gross final energy consumption and a 20 percent improvement of energy efficiency by 2020 – the Member States have developed individual and therefore very different support measures. A possible harmonization of support after 2020 has been discussed for years and has both advantages and disadvantages. As part of a European research consortium, the Fraunhofer ISI developed and analyzed several possible ways to harmonize support for renewables in Europe and compared this to a non-harmonized scenario. Armed with this knowledge, political measures can be developed, evaluated, improved and introduced. Based on this, policy recommendations were developed for the medium- to long-term policy frame for renewables support in Europe and a gentle transition from the current to the future system.

In addition to research projects for external clients, the possibility to further develop its methods through strategic in-house research is important for the Fraunhofer ISI. This emphasizes the principle of the Fraunhofer ISI's independence – also and especially as opposed to private sector competitors and the institutional self-interests of scientific technical institutions. The independent and sound work pays: the Fraunhofer ISI is well known among national innovation policy players, and the Fraunhofer ISI is also a respected cooperation partner at the European and international level.

The harmonization of support for renewables after 2020 has been discussed for years and has both advantages and disadvantages.

CORE COMPETENCE 5



DESIGNING FUTURES TO IDENTIFY TOMORROW'S INNOVATION POTENTIALS

Decision-makers from politics, industry, science and society have to address future questions early on in order to develop successful strategies for the future. As part of the core competence "Designing futures", the Fraunhofer ISI develops possible desired and alternative future scenarios and supports its clients in developing responsible attitudes towards societal and technological change. Awareness of environmental change creates confidence when making decisions and increases the future compatibility of organizations.

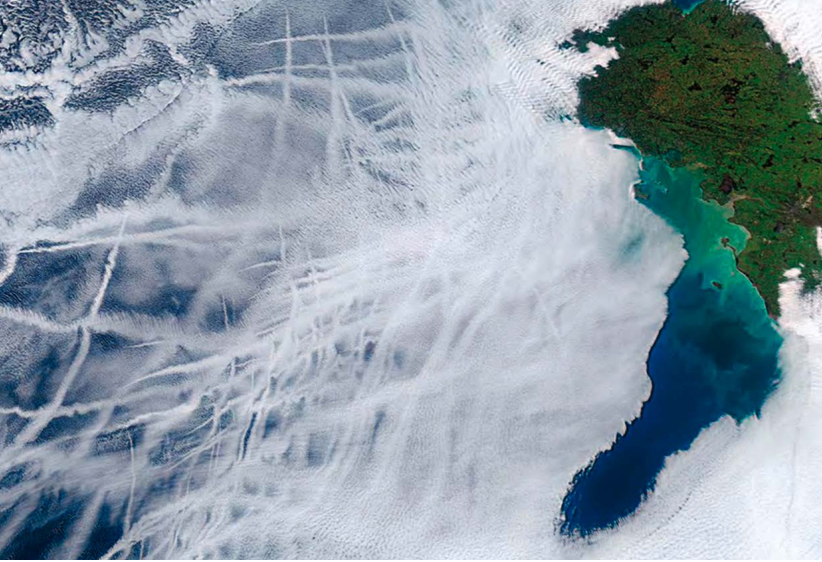
Together with its clients, the Fraunhofer ISI develops possible desired and alternative futures scenarios.

Which societal and technological challenges will Germany be facing in the coming decades? How will society and industry cope with the ensuing changes? And what can politics and industry contribute so that Germany remains innovative and fit for the future? In order to research these questions the Fraunhofer ISI develops alternative future scenarios together with its clients and takes into account different stakeholders' perspectives. This helps decision-makers from politics and industry to identify scope for action and to develop and implement concrete innovation and futures strategies. Thus, the Fraunhofer ISI not only contributes towards strengthening the knowledge about the future and innovation capability in industry and society, but also supports decision-makers in actively co-designing future developments.

Alternative futures designs strengthen the German innovation system

The futures designs of the Fraunhofer ISI are based methodologically on a transparent approach which complements the clients' perspective with the views of experts from different technology and research areas. They also take the public's needs into account. Different research methods such as interviews with experts, scenario and dialog processes, model developments or futures workshops are used here. Causal relationships, assumptions about the future and scenarios are subject to consistency and plausibility checks, and are visualized and documented for further use in the strategy process.

In the "BMBF Foresight Cycle 2" the Fraunhofer ISI, together with the VDI TZ, investigated challenges and opportunities for the German innovation system until 2030 for the Federal Ministry of Education and Research (BMBF) (see www.bmbf-foresight.de). The Foresight Process of the BMBF is based primarily on the assumption that innovations are a result of the interplay of technological possibilities ("technology push") and societal demands ("demand pull"). In a first step, important future trends in society were identified which are the basis for formulating



possible innovation policy challenges in the future. These challenges which focus on aspects such as quality of life, learning and working in the future or the protection of privacy through increasing online activities were then combined with future technological developments.

Participatory processes to research future societal trends

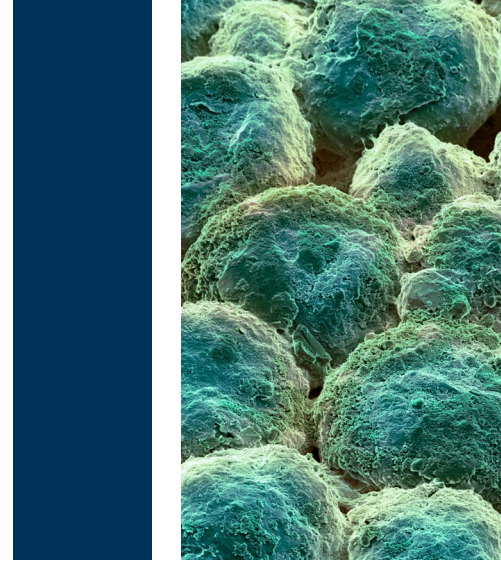
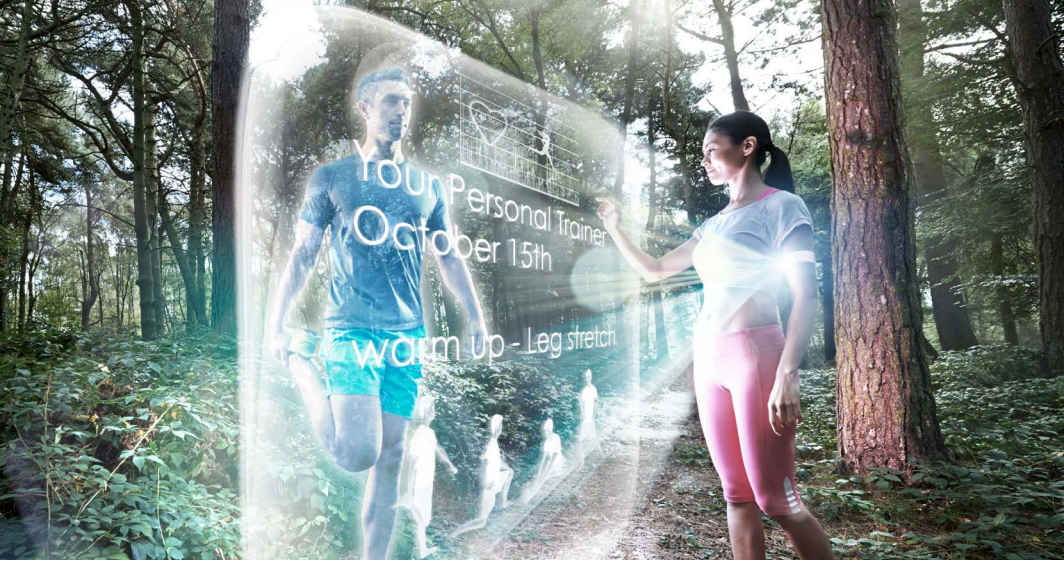
In the “BMBF Foresight Cycle 2” literature analyses and expert interviews and particularly participatory processes were applied in order to obtain realistic assessments of the future. For example, a creative workshop brought together experts from research and development and members of the public as specialists for concrete societal needs. The exchange about societal needs and the resulting perspectives for research and technology helped to identify approaches for future innovations. The perspectives generated in the workshop were used as key inputs, for the development of futures scenarios which have been used by the BMBF in the further development of the German federal government's High-Tech Strategy. The futures scenarios were illustrated in “Stories from the future”.

Participatory processes such as creative workshops facilitate an exchange about tomorrow's societal trends and identify the resulting perspectives for research and technology.

One of these “stories” is the scenario “Germany do-it-yourself”. For the Fraunhofer ISI this trend is particularly relevant for the German innovation system. It is based on the assumption that activities such as inventing, manufacturing, programming, modifying or repairing broken items are becoming increasingly important to the public. Such a “do-it-yourself economy” with a fluid transition from manufacturer to consumer could become increasingly important by the year 2030 and pose new challenges for established enterprises. Overall, this could have a positive impact on the sustainability of products and the competitiveness of the whole economy and enhance education and social cohesion in Germany.

Analyzing societal opportunities and threats with futures scenarios

The core competence “Designing futures” does not only play an important role when possible societal opportunities are identified, but at the same time is used to analyze potential risks. On behalf of the European Commission, the Fraunhofer ISI addressed these risks and the question of how possible threats can be met at an early stage in the project “European Threats and Trends in Society” (ETTIS). Alternative scenarios for possible future threats were developed for the areas environment and cyber infrastructure. The analysis of these future scenarios was supplemented with findings from expert surveys and stakeholder workshops. The futures designs on national, European and international network infrastructure and the requirements of internet users, which were developed, show that cyber threats can only be met by increasing international coordination and cooperation. Creating and raising awareness of the threats of the internet as well as educating users in handling the net are important needs put forward by the players questioned.



Integrating different stakeholder perspectives

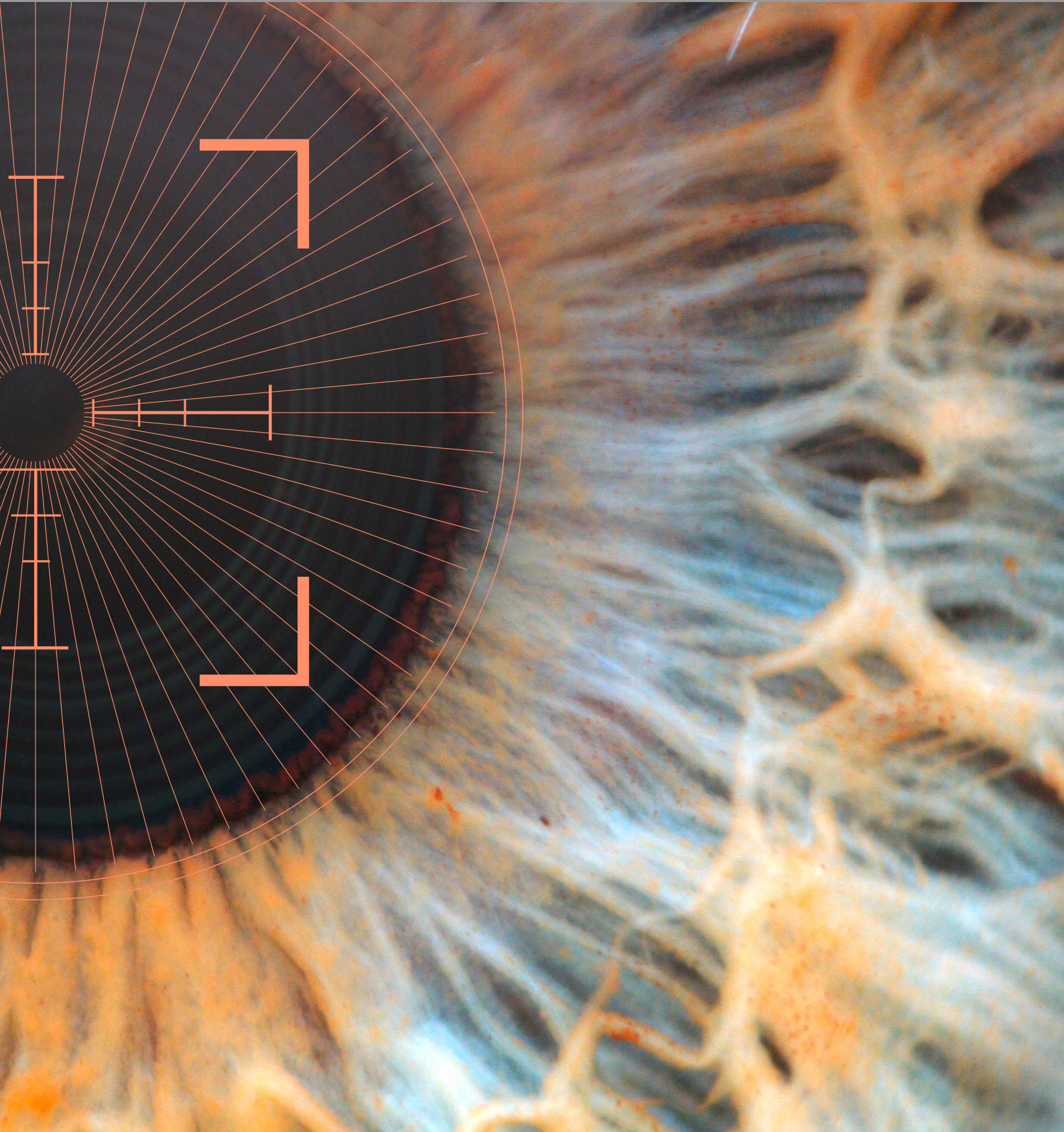
Integrating different stakeholder perspectives – a central component of the core competence “Designing futures” – also characterizes other research projects of the Fraunhofer ISI: for example, the project “Molecular Sorting” analyzed the potentials and challenges of future recycling technologies. The focus here was on how recycling processes down to the molecular level can use important raw and processed materials such as glass, waste wood and metal salt solutions more efficiently in future. Together with experts from six Fraunhofer Institutes important factors were identified which could influence current and future recycling processes. Then assumptions about future developments of some particularly important factors were made in special scenario workshops and three consistent scenarios were developed: a positive, a neutral and a negative future scenario each paint a particular picture of the future context of resource efficiency and can be used to develop innovation strategies in research and industry.

The results of the project enable interested companies to adapt to future production and technology trends in time or even help to actively shape them. These scenarios are important requirements for future competitiveness and the sustainable use of energy and resources which are becoming scarcer. If companies have the necessary vision they can adapt their actions to possible changes in time and are a step ahead of competitors at home and abroad.

The examples show that the core competence “Designing futures” goes far beyond preparing future prognoses. The Fraunhofer ISI uses empirically sound statements about possible technological and societal developments and their interactions to tailor all possible developments for their clients. These are analyzed from different angles and the resulting opportunities and challenges are discussed with the decision-makers and options for action are derived. The blueprints for the future developed by Fraunhofer ISI therefore support the active shaping of the future of innovation in Germany.

Integrating different stakeholder perspectives is a central component of the core competence “Designing futures”.

STAFF AND COMPETENCE CENTERS



INTERDISCIPLINARY COOPERATION FOR A SYSTEMIC PERSPECTIVE

The interdisciplinary and the systemic approach enable the Fraunhofer ISI to regard complex issues holistically and from different perspectives.

169 members of staff from the natural sciences, engineering, economics and the social sciences conduct research at the Fraunhofer ISI. This interdisciplinarity enables them to regard complex issues holistically and from different perspectives – for their clients from government, industry, academia and society, this systemic approach ensures new insights and creates a firm foundation for decision-making.

Supported by 69 administrative staff, the researchers work on about 370 projects each year to provide answers to socially relevant questions. They apply a wide range of advanced scientific theories, models, methods and social science measurement tools in their research. They use the insights and findings from the research projects to continuously develop and expand the Fraunhofer ISI's portfolio.

The staff at the Fraunhofer ISI conduct research in seven Competence Centers (CC) with a total of 24 Business Units that are characterized by their close cooperation:

- The CC Energy Policy and Energy Markets (CC X) explores how the political and institutional framework for sustainable energy systems can be designed, further developed and evaluated.
- The CC Energy Technology and Energy Systems (CC E) analyzes innovative energy technologies and their contribution to a sustainable energy system from a strategic perspective.
- The CC Foresight (CC V) develops methods to identify and analyze long-term developments in society, the economy and technology.
- The CC Industrial and Service Innovations (CC I) researches how technical and organizational innovations help to safeguard Germany as a production location.
- The CC Sustainability and Infrastructure Systems (CC N) analyzes the prerequisites and possibilities to reduce emissions, improve resource efficiency and make infrastructure systems more sustainable.
- The CC Emerging Technologies (CC T) analyzes the potentials, impacts and design conditions of emerging technologies and develops policy options.
- The CC Policy and Regions (CC P) examines how research and innovation systems function and change.



STRATEGIES FOR RENEWABLE ENERGIES, ENERGY EFFICIENCY AND CLIMATE PROTECTION

CC ENERGY POLICY AND ENERGY MARKETS

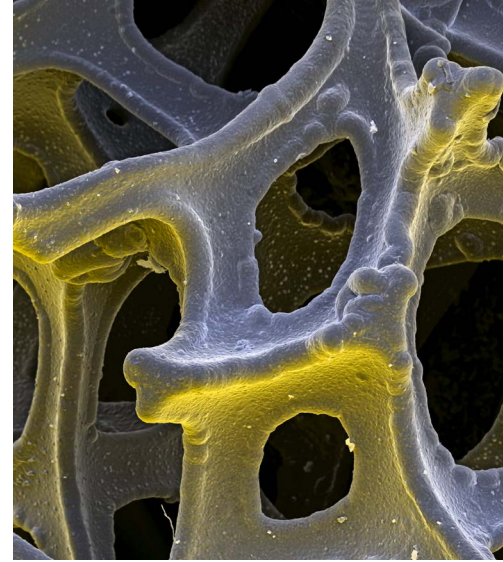
The Competence Center Energy Policy and Energy Markets researches key strategies for the political and institutional framework of a sustainable energy system and contributes in this way to the transformation of the energy system.

The planned reform of the German Renewable Energies Act (EEG) will introduce competitive, technology-specific auctions from 2017 onward. The Business Unit *Renewable Energies* is examining how such auctions should be designed. In order to use this instrument to determine prices efficiently, a design has to be selected that induces competition, has low investment risks and enables a wide range of actors to participate. A poor design can threaten the expansion targets set for renewables and increase overall costs, so that it is important to enable maximum learning by testing different design variants in the pilot calls for tenders.

More possible reforms of a future-oriented EEG are being developed by the “Think Tank Renewable Energies”. These include synchronizing the expansion of the electricity grid and renewable energies, options for site control, the risk premiums of different funding instruments, the effects of the self-consumption of photovoltaic power, the interactions between RE support and electricity market design and the design of different RE support instruments. The project showed that the type of remuneration, the level of support, the degree of technology specification, the differentiation by location and the existence of a quantity control or cap on expansion can be combined relatively freely in each instrument. Other research topics include designing RE policy at EU level as well as further developing the rules for supplying your own power using renewable energies.

More possible reforms of a future-oriented EEG are being developed by the “Think Tank Renewable Energies”.

The Business Unit *Electricity Markets and Infrastructures* develops lead scenarios on transforming climate and energy policy for the German Federal Ministry for Economic Affairs and Energy that



play an important role when defining future energy policy targets and instruments. The topic of coupling sectors, for example, the electricity market and the heat market, is becoming increasingly relevant when analyzing the transformation of the electricity sector. This creates greater flexibility when integrating fluctuating energy. The reorganization of the electricity sector as part of the transformation of the energy system plays an important role in the current discussion. The Business Unit is actively accompanying this discussion within the projects “Coupling electricity and heat markets” and “Lead study electricity market”.

In order to still have a chance of meeting the two degree target by 2050 despite not very ambitious international climate protection targets up to 2020, it is necessary to introduce additional greenhouse gas reduction measures in the short term. The Business Unit *Climate Policy* is studying already tried and tested instruments in four promising fields that can serve as a role model for other countries: renewable energies, electrical appliances, the transport sector and the reduction of methane emissions in oil production with an annual reduction potential of 1.4 to 4.4 gigatonnes CO₂ equivalents. The methodological foundations were laid for evaluating the EU emission trading scheme, especially its cost efficiency, and tested for the years 2008 to 2012. In spite of today's low prices for certificates, these climate policy instruments are important from a global perspective and will remain so; this is shown by the development of regional pilot systems in China, among other things. In a special issue, authors from the Fraunhofer ISI, the Chinese Academy of Sciences and other experts highlight the challenges to be faced when developing a national emission trading scheme in China.

Analyses conducted in the Business Unit *Energy Policy* of the current framework conditions for energy efficiency in the EU revealed a gap of 1.5 to 3.3 percentage points that still needs to be filled to reach the 2020 target, and the existence of substantial cost-effective efficiency potentials up to 2030. However, these can only be exploited if economic and non-economic obstacles can be overcome by ambitious, energy-efficiency policies and measures at EU and national levels. The study provided important contributions to the European discussion of the 2030 target framework for greenhouse gas emissions, renewable energies and energy efficiency. In Germany, the Fraunhofer ISI helped the German Federal Ministry for Economic Affairs and Energy to compile and implement the “National Action Plan on Energy Efficiency (NAPE)”. Suggestions of how to upgrade existing instruments and design new ones to accelerate the progress made in energy efficiency in Germany were developed and assessed. In particular, the number of Learning Energy Efficiency Networks in industry and commerce is to be increased to 500 from the present 30 pilot networks that are being monitored by the Fraunhofer ISI.

In order to still have a chance of meeting the two degree target by 2050, it is necessary to introduce additional greenhouse gas reduction measures in the short term.

Head Dr. Wolfgang Eichhammer, Phone +49 721 6809-158,
wolfgang.eichhammer@isi.fraunhofer.de



RESEARCH FOR GREATER ENERGY EFFICIENCY AND ACCEPTANCE

CC ENERGY TECHNOLOGY AND ENERGY SYSTEMS

Using energy more efficiently strengthens the competitive position of industrial locations and the export-oriented capital goods industry. Energy services harbor a high potential as well and there are numerous market opportunities opening up here in Germany and abroad. The work of the Competence Center Energy Technology and Energy Systems on the effects on employment, income, economic structure and the environment of the increased use of energy-efficient technologies help decision-makers to design effective sustainability strategies. The researchers also develop instruments for the more rapid diffusion of sustainable energy technologies and strategies for research and development.

One focus in the Business Unit *Energy Efficiency* was on the Learning Energy Efficiency Networks. These are made up of ten to 15 companies that work together and learn from each other how to save as much energy as possible at the lowest possible costs. The completed 30 pilot networks project that involved almost 370 companies showed that the energy efficiency of the participants increased almost twice as quickly as the industrial average. It is planned to add more networks to the 30 pilot and around 30 other ongoing networks in Germany: the German government and 18 industrial associations signed an agreement in December 2014 to set up a total of 500 Energy Efficiency Networks by 2020 in medium-sized and large companies. This is expected to reduce energy consumption by 75 petajoules each year from 2020, which corresponds to around three percent of the total energy consumption in industry. Furthermore, an additional reduction of the energy-based greenhouse gas emissions of five million tonnes is possible. In 2020, 1.1 billion euros could be saved due to investments in energy efficiency.

The German government and 18 industrial associations signed an agreement in December 2014 to set up a total of 500 Energy Efficiency Networks by 2020.

Another project in this Business Unit analyzes the potential energy savings in industrial steam generators up to 2030 due to measures conducted as part of the European Union's Ecodesign Directive. This involves savings of about eight terawatt hours per year at an annual consumption



of around 1,150 terawatt hours per year. This ongoing study shows that the product-based optimization of steam generators harbors large energy saving potentials when designing ecological framework conditions in industry. A voluntary commitment of the producers could achieve roughly similar energy savings, probably with less bureaucracy.

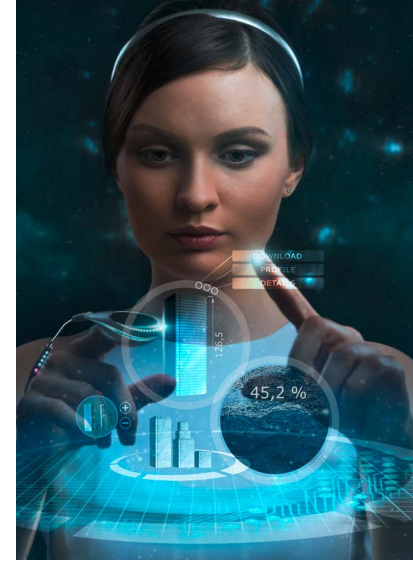
Changes in the acceptance of subterranean CO₂ storage in Germany were examined in the Business Unit *Energy Economy*, among other things. For a long time this technology was regarded as an effective way to protect the climate. But concerns about potential hazards for the environment, health and safety meant that there is little acceptance of the technology in German society: a survey of 1,800 citizens, for example, shows that they rejected the subterranean storage of CO₂ from burning coal. Storage of the CO₂ emitted by biomass power stations or industrial plants is not evaluated quite as badly by those surveyed, but is still a concern.

Acceptance research has also been conducted in the Business Unit *Demand Response and Smart Grids* – this time with regard to the transformation of the energy system (“Energiewende”) in Germany. This is important for sustainable development, but it could also increase Germany's economic strength by serving as a showcase for green technology. Without the broad acceptance of the population, however, the Energiewende cannot succeed. The objective of the project is to find out how to increase participation and acceptance in all social groups and evaluate this. On the basis of several supply scenarios, transformation pathways are developed considering costs, ecological objectives and minimum vulnerability. Strategies and recommendations for actions are derived from these for instruments and products that support a socially accepted, robust and future-oriented transformation to a sustainable energy system.

Long-term scenarios were developed by the Business Unit *Demand Analysis and Projections* for the Brazilian power market. The researchers constructed scenarios of the annual electricity demand and hourly load in Brazil using the FORECAST and eLOAD models developed at the Fraunhofer ISI. The project – the first comprehensive analysis of Brazil's future electricity demand – also includes training researchers at the University of Rio de Janeiro in the models and represents the beginning of a longer term cooperation: an agreement on scientific exchange is to be signed between the University and the Fraunhofer ISI at the same time as the project.

Head Professor Harald Bradke, Phone +49 721 6809-153,
harald.bradke@isi.fraunhofer.de

For a long time subterranean CO₂ storage was regarded as an effective way to protect the climate. But concerns about potential hazards for the environment, health and safety meant that there is little acceptance of the technology in Germany.



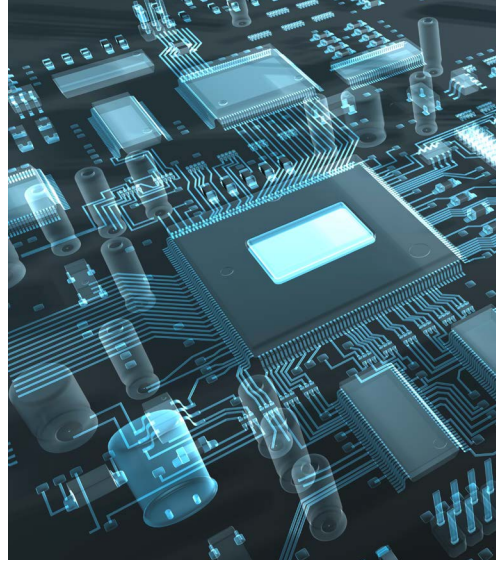
USING FORESIGHT TO UNDERSTAND CHANGE AND RECOGNIZE INNOVATION POTENTIALS

CC FORESIGHT

The future cannot be predicted due to the complex interaction between numerous social and technological changes. Therefore, innovators often have to base their strategic decisions on uncertain assumptions. The Competence Center Foresight supports its clients from policy, industry and society in proactively dealing with uncertainty. Our qualitative and quantitative foresight processes are characterized by a methodologically transparent and sound approach, comprehensible documentation and the visualization of impacts as well as plausibility and consistency checks. The researchers use the following methods, which they continually develop further with an application-oriented approach:

- Scanning, scouting, patent and publication analyses (bibliometry) for early recognition of trends
- Analyses of the potential of innovations using an own system of multi-criteria assessment
- Expert interviews and surveys to integrate expertise from diverse disciplines
- Delphi and future surveys for the quantitative mapping of future expectations
- Discourse-based scenario processes for the interactive development of alternative future pathways
- Futures laboratories and dialogs with the public to integrate stakeholders into decision processes
- Creative workshops such as world cafés to develop new ideas and approaches
- Visioning processes to jointly generate inspiring images of a desirable future
- Technology, product and industry roadmaps to structure and visualize entrepreneurial and policy options for action

Foresight processes are characterized by a methodologically transparent approach, comprehensible documentation and the visualization of impacts as well as plausibility and consistency checks.



The Competence Center Foresight is highly experienced in designing and implementing scenarios, visioning and roadmapping processes of future markets and products for industry. Secondly, it has long-standing expertise in setting up foresight processes for national and regional innovation policy which give policy actors the orientation and tools to focus their technology and innovation policies with a long-term time horizon.

The focus of the Business Unit *Future Alternatives and Society* is the investigation of the future interactions between societal domains such as civil society, industry, policy, technology and environment. The clients receive systematic search results, analyses and assessments of societal change and alternative blueprints for the future. In the Foresight Process of the Federal Ministry of Education and Research (BMBF), the Fraunhofer ISI has recently analyzed hidden trends and developed "Stories from the future" for underpinning future-oriented innovation policy strategies.

The Business Unit *Future Thinking and Dialogs* develops scenarios and visions in interactive dialogs among actors with diverse perspectives and backgrounds. As a basis for our futures dialogs, we analyze the expectations different actors have of the future as well as the dynamics and interactions of trends. The scenarios for the future of social cohesion in Germany commissioned by the Bertelsmann Foundation (together with the Jacobs University) are one example.

The Business Unit *Foresight for Strategy Development* supports clients, mainly from industry, to develop robust blueprints for the future and strategic measures. Together with the clients, we identify influencing factors, develop scenarios and roadmaps, analyze markets and trends, and assess decision options.

Head Dr. Simone Kimpeler, Phone +49 721 6809-318,
simone.kimpeler@isi.fraunhofer.de

Long-term foresight processes give policy actors the orientation and tools to focus their technology and innovation policies.



SUSTAINABLE SOLUTIONS INCREASE THE VALUE ADDED IN INDUSTRY

CC INDUSTRIAL AND SERVICE INNOVATIONS

The Competence Center Industrial and Service Innovations analyzes and evaluates how to use innovations to design industrial value added processes in a way that safeguards and develops industrial production in Germany and Europe in the long term, not just economically in terms of global competition, but also ecologically and socially. Innovation is regarded as an integral part of every phase of industrial value added. Individual companies, their internal processes and external networks, are the main starting point for the range of research offered in the Competence Center. Based on this integrated understanding of innovation, the Fraunhofer ISI develops sustainable solutions and strategies with the potential for high value added for companies, value networks and entire industries on the basis of advanced business management and socio-economic analyses.

The research fields of the Competence Center include the diffusion and impacts of technical and organizational process innovations, the design of local and global innovation and value chains, the management and development of industrial services and service-based business models as well as the assessment and design of innovation, technology and economic policy measures. The Competence Center has at its disposal an exclusive and internationally recognized set of primary data at company level in the *European Manufacturing Survey* (EMS), which serves as the foundation for comprehensive analyses at the level of individual companies or sectors. Three current project highlights which are representative of the Competence Center's range of subjects and clients should be mentioned here.

The European Manufacturing Survey is an exclusive and internationally recognized set of primary data at company level.

Today, small and medium-sized enterprises (SMEs) of the manufacturing industry contribute significantly to the productivity of the German economy. Particularly in the metropolitan region of Stuttgart, small and medium-sized enterprises are traditionally important. But, how well are the SMEs in the area prepared for future challenges regarding technology and the market situation?



The Chamber of Industry and Commerce of the Stuttgart region commissioned the Business Unit *Industrial Innovation Strategies and Systems* to analyze this question. The study confirms the current leading position of the enterprises in the metropolitan region of Stuttgart. But it also reveals clear weak points, some of which are worrying: SMEs are not sufficiently prepared for technological and demographic change and therefore not well prepared for the future. The results also show that many SMEs do not sufficiently focus on future markets and technologies. In addition, the range of the innovative strength in the Stuttgart metropolitan area is not supported by the many SMEs, but only by a few large companies. The results of the study and recommendations for action to maintain the leading position, which are primarily addressed to policy-makers but also to chambers and organizations, were received with great interest by policy-makers from the state and federal governments.

The innovative strength in the Stuttgart metropolitan area is not supported by the many SMEs, but only by a few large companies.

For over 20 years lean production has been an important paradigm for the design of industrial value chain processes and is becoming more and more widespread. The impact this has on the productivity of enterprises and also on the individual employees has been the subject of controversial debate for some time. The Business Unit *Innovative Production Systems and Value Chains* investigated these questions for the first time empirically in the project "Holistic Production Systems, Diffusion and Impacts". This project was supported by the Hans Böckler Foundation. The results show a differentiated and above all empirically resilient picture beyond individual opinions and are an important contribution to making the debate about lean production more objective.

Knowledge-intensive service providers play a major role for the innovation strength of the German economy. For example, on behalf of aircraft manufacturers, development service providers developed complete systems and modules for new aircrafts. Efficiency and effectiveness are the decisive criteria to assess the cooperation between clients and knowledge-intensive service providers. But also the contribution to innovation has become a key assessment tool. The joint project "INPROWID", funded by the Federal Ministry of Education and Research (BMBF), which was addressed in the Business Unit *Industrial Services*, investigated which criteria measure productivity with particular regard to innovation for the area of knowledge-intensive services. On this basis, new methods to assess productivity were developed and tested in practice.

Head Dr. Christoph Zanker, Phone +49 721 6809-186,
christoph.zanker@isi.fraunhofer.de



SECURING THE FUTURE WITH SUSTAINABLE DEVELOPMENT

CC SUSTAINABILITY AND INFRASTRUCTURE SYSTEMS

Resource scarcity and diverse pollutant emissions are underlining the necessity to manage natural resources in a sustainable way and avoid polluting the environment. Considerable progress has been made with reducing emissions in some areas like SO₂ emissions and nutrient discharges from sewage treatment plants, but actions still need to be taken in other areas like greenhouse gases and micropollutants or resource consumption. On the other hand, new challenges also harbor economic opportunities for those developing and commercializing environmentally friendly and socially acceptable innovations. The Competence Center Sustainability and Infrastructure Systems expands the knowledge of the necessary innovation processes so that policy-makers and companies can make decisions that promote sustainability.

Considerable progress has been made with reducing emissions in some areas like SO₂ emissions and nutrient discharges from sewage treatment plants.

Questions concerning the reduction of micropollutants in wastewater are currently the focus of several projects in the Business Unit *Water Resources Management*. Starting from the different technical options, these projects aim to find a sufficiently effective and efficient mix of source-directed and end-of-pipe measures and prepare their implementation. The challenges accompanying climate change, demographic changes and pollution problems also require a shift towards new water infrastructure concepts. Together with 15 partners, technology and software components for innovative designs are being developed and planned for three very different model regions and their transferability subsequently analyzed within the collaborative project “TWIST++” for the German Federal Ministry of Education and Research (BMBF).

Measures and strategies that contribute to modernizing transport infrastructures, vehicle fleets and protecting the climate are topics in the Business Unit *Transportation Systems*. Important future options that are assessed from a systemic perspective include integrated concepts and altered mobility behavior. New mobility concepts that contribute to the transition to a sharing economy were developed in the “LivingRail” project in an international stakeholder process



coordinated by the Fraunhofer ISI and gave rise to the vision “Bahn2050”. New transport strategies and policies also have substantial impacts on the overall economy: in the EU project “Cost-of-NO-TEN-T”, the ASTRA model was used to estimate the macroeconomic losses the EU would incur if trans-European transport networks and the associated innovative control and logistics technologies were not implemented. These losses amount to several percentage points of European GDP.

Work in the Business Unit *Systemic Risks* focuses on understanding and reducing the risks associated with the supply of natural resources. The key risks here are those associated with the supply of raw materials. The researchers describe the affected systems, examine the impacts of changing framework conditions and identify and assess the options for business and policy-makers. In a group of projects for the International Copper Association, the modeling of dynamic material flows is further expanded and implemented for additional countries and regions. This is able to trace the whereabouts of raw materials in the macroeconomic system. This method is also used in other projects to help forecast future shortages, for example in the “Lighthouse Project Rare Earths Criticality”. In addition, the EU project “CRM_InnoNet” analyzes raw material policies regarding the substitution of critical raw materials in EU and selected non-EU countries.

The Business Unit *Sustainability Innovation and Policy* studies the instruments best suited to efficient resource use, and the interfaces and complementarities with the German raw material strategy. To be able to do this, it is necessary to know the raw material demands and the potentials for improving efficiency in all the relevant economic sectors, as analyzed in the project “Structural and production technology determinants of resource efficiency” for the Federal Environment Agency. The mass raw materials used in especially large quantities are of particular interest as are the raw materials for high-tech products that have an unusually large ecological footprint. To assess the sustainability of resource efficiency innovations and strategies, the methods of the “r² Integration and Transfer project” were refined and used to quantify the impacts of the innovations on the non-energy-related rebound effect and raw material productivity. Another focus is how the interaction of different policy instruments can be assessed from a systemic perspective. The EU project “Assessment of Policy Interrelationships and Impacts on Sustainability in Europe” is working on expanding impact assessment by the aspects of policy consistency and coherence.

The mass raw materials used in especially large quantities are of particular interest as are the raw materials for high-tech products that have an unusually large ecological footprint.

Head Professor Rainer Walz, Phone +49 721 6809-236,
rainer.walz@isi.fraunhofer.de



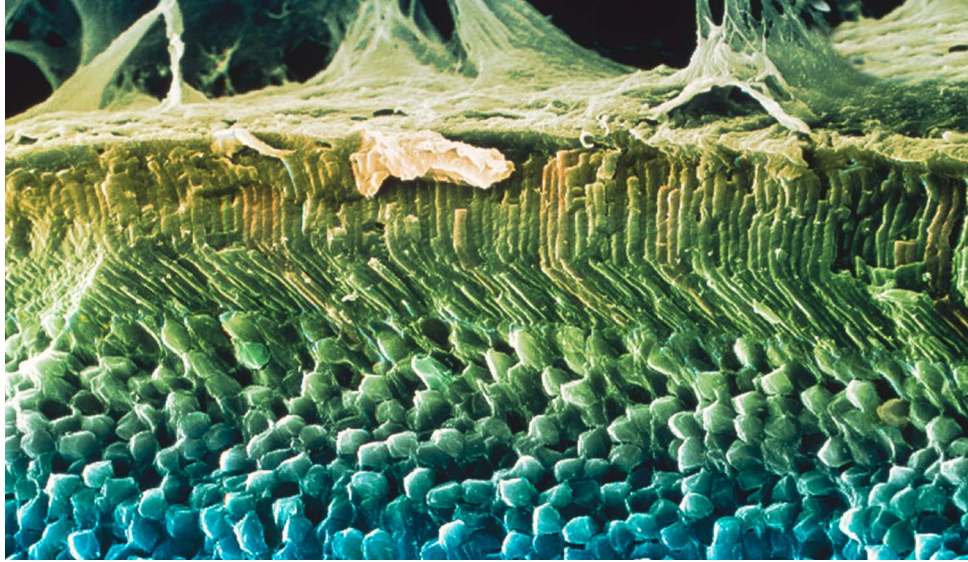
RECOGNIZING CHANCES AND CHALLENGES OF NEW TECHNOLOGIES AND EVALUATING CONSEQUENCES

CC EMERGING TECHNOLOGIES

Information and communication technologies have significantly changed communication patterns in society and have also made communication more vulnerable. In the age of big data and cloud computing, people will be even more concerned with data protection and privacy. The health system is also facing new challenges, driven by the demographic change and the increase in chronic and mental illnesses – but also driven by changes triggered by new (medical) technologies. In the area of innovative materials, graphene could soon substitute existing materials and lead to significant progress. The Competence Center Emerging Technologies examines these issues and others and evaluates the scientific and economic potentials of new technologies. The analysis includes social and political framework conditions as well as the economic, ecological and social impacts resulting from the application of the new technologies.

In 2014, the Business Unit *Information and Communication Technologies* worked – among others – on the following projects: in the “Forum Privacy”, which was initiated by the Federal Ministry of Education and Research (BMBF) and coordinated by Fraunhofer ISI, experts dealt in an interdisciplinary manner with issues concerning the protection of privacy in the Internet age. In the EU-project “SAPIENT”, a process was developed which assesses how surveillance affects personal data and other fundamental rights. This can help industry and public offices to assess whether a new technology or service should be used and which consequences for data protection arise as a result. Also, the researchers analyzed and evaluated potentials, application areas and challenges of big data, particularly in combination with cloud computing for the Office of Technology Assessment at the German Bundestag. Here the societal, economic, legal and technical framework conditions also played an important role.

Information and communication technologies have significantly changed communication patterns in society and have also made communication more vulnerable. In the age of big data and cloud computing, people will be even more concerned with data protection and privacy.



The Business Unit *Innovations in the Health System* analyzed – among others – the health system from the system of innovation's perspective. The performance and efficiency of the German health system, its structures and financing and governance instruments are constantly being discussed. At the same time, the system faces enormous challenges such as demographic change, financial viability and the skills shortage. New ideas and concepts are needed to improve its efficiency and sustainability. To this end, the innovation systems approach of the Fraunhofer ISI finds new solutions. Another project, the "Health Regions of the Future" aims at better patient care through networking. The BMBF finances five regions in which medical care will be improved and innovation potentials will be developed applying a specific network approach. The focus here is on the areas cell and tissue substitutes, telemedicine, electronic patient files, combating multi-resistant viruses, and better care for mental illnesses. The Fraunhofer ISI scientifically accompanies these regions and others.

New ideas and concepts are needed to improve the efficiency and sustainability of the German health system. To this end, the innovation systems approach of the Fraunhofer ISI finds new solutions.

The Business Unit *Bioeconomy and Life Sciences* supported the Bioeconomy Council of the German federal government with expertise. They determined potentials and obstacles of the bioeconomy for the automotive, construction, energy, chemistry, ICT and plant engineering sectors. The analysis showed the role of specific actors in the innovation system and measured how competitive Germany is. In the project "Cell-free biotechnology", a consortium of eight Fraunhofer Institutes further developed a biotechnical production process which had previously only been used in the laboratory and which in the future can be utilized for high-quality proteins in industrial production. The Fraunhofer ISI provided substantial support for the strategic orientation of the development work in terms of market demands, a roadmap, the systemic survey of customer requirements and market studies.

The thematic field of nanotechnology, coordinated by the Competence Center Emerging Technologies, was – among others – occupied with the "magic material" graphene. The material is 200 times more resistant than steel and is characterized by a high conductivity of electricity and temperature. The new material could substitute existing materials and lead to significant technological and social progress. Since 2014, the Fraunhofer ISI has been participating in the EU flagship initiative on graphene research, one of the biggest European research initiatives ever. Together with 140 partners from 23 countries, the Fraunhofer ISI is responsible for the investigation of the potential applications of the new material and will further develop and update the strategic technology and application roadmaps for the "flagship graphene". These roadmaps help the consortium to better assess important drivers for further developing graphene as well as future areas of application.

Head Dr. Thomas Reiß, Phone +49 721 6809-160,
thomas.reiss@isi.fraunhofer.de



HOLISTIC EVALUATION TO STRENGTHEN COMPETITIVENESS

CC POLICY AND REGIONS

The Competence Center Policy and Regions evaluates the competitiveness of research and innovation systems on a supra-national, national and regional level, in order to analyze the way they function and how they change as well as to derive conclusions about the way structures and developments can be shaped politically. The results can help to design political decision processes more systematically and to justify decisions more rationally. Actors and strategies which produce knowledge and innovations in industry and science are analyzed, and instruments are designed and evaluated which are used by the state to support innovations.

The Business Unit *Policy and Evaluation* evaluates innovation policy measures and programs and conducts policy analyses in the fields of research, technology and innovation policy. The focus is on the analysis of the contexts and conditions for successful innovations and the policy design initiatives taken by political institutions and actors.

Since 2008, the German Federal Ministry of Economics and Technology has sponsored universities, enterprises and independent inventors with the program "SIGNO – Protection of Ideas for Commercial Use" to legally secure and make commercial use of their innovative ideas. The Fraunhofer ISI measured the success which included the attainment of objectives, the impacts and the implementation of the program as well as an evaluation of the economic viability. The conclusions drawn from this include statements on the efficiency and the success of "SIGNO"; in addition, explicit proposals to further develop the program approach were drawn up.

The Business Unit *Regions and Clusters* analyzes and evaluates innovation- and technology-related potentials and processes in regions and functional spaces. The Fraunhofer ISI prepares scientifically sound analyses of the structure and dynamics of regional innovation systems and technology clusters and evaluates regional support programs and initiatives of innovation and structural policies.

The research topics include the evaluation of innovation policy measures and programs, and policy analyses in the fields of research, technology and innovation policy.



In the project “Regional Innovation Monitor (RIM-Plus)”, which was launched in 2009, the Fraunhofer ISI, together with Technopolis Belgium and UNU-MERIT, compiles information on innovation policy trends in European regions. Currently the focus is on the pioneering agenda of smart specialization and the increased funding of advanced production technologies planned by the Directorate-General for Enterprise and Industry. This is particularly relevant for European regional policies.

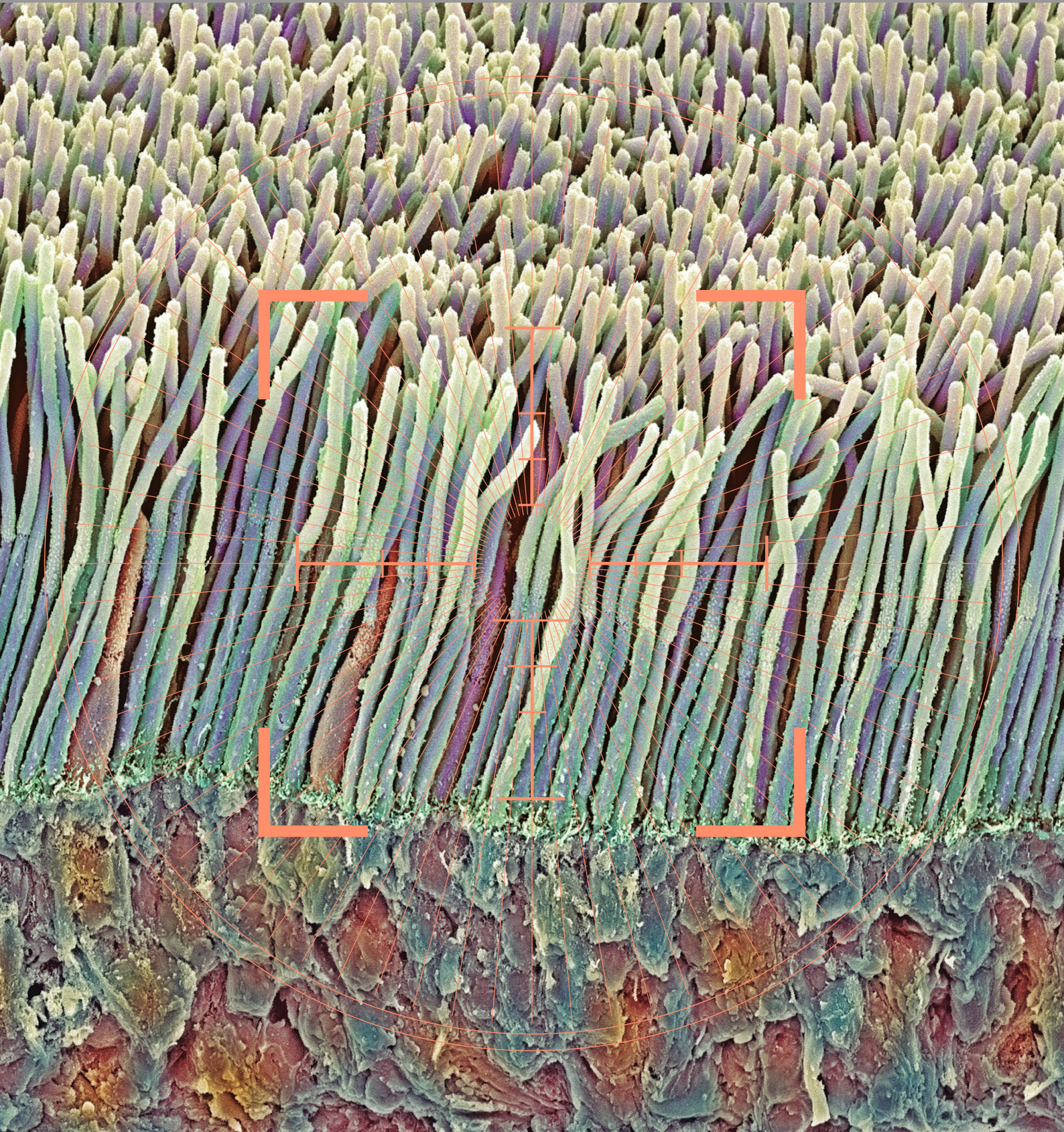
The focus of “RIM-Plus” is on smart specialization and the increased funding of advanced production technologies which is a pioneering agenda for European regional policy.

At the beginning, the project primarily aimed at developing an online platform with information on innovation policies, but the focus has since shifted to thematic workshops with representatives of the European Commission and different regions. The objective is to improve the orientation of regional funding policies towards specific local challenges and to improve the effective use of public funds by modifying and discussing the information basis prepared within the project.

The Business Unit *Innovation Indicators* describes and analyzes innovation systems and evaluates their competitiveness. To this end, the scientists use quantitative economic and social science methods. In a study about the impacts of public funding of science and research on the economic development of the state of Baden-Württemberg, the Fraunhofer ISI's investigations included the effects research institutions have on the regional GDP, employment, productivity of enterprises and the state's tax revenues. A distinction was made between impacts which result from generating innovative research results, the contribution of the research institutions to human capital formation and the research institutions as economic actors.

A study the Fraunhofer ISI is conducting for the Technology, Innovation and Investment Council e.V. (TIIC) identifies the importance of computer-implemented inventions for the German and European economy with a focus on SMEs. In addition, the study examines the consequences a change in the patent law towards abolishing patent protection for computer-implemented inventions can have and which impacts on the international competitiveness of German and European companies would have to be expected.

Head Professor Knut Koschatzky, Phone +49 721 6809-184,
knut.koschatzky@isi.fraunhofer.de



ACADEMIC TEACHING

ACADEMIC TEACHING

Daniel Bachlechner

SEMINAR

Management von Informationssystemen
University of Innsbruck, Austria

Simon Berner

LECTURE

Lebensmitteltechnologie
University of Würzburg

Tobias Boßmann

LECTURE (once)

Doctoral School Unit Sustainable development applications
University of Lille 1, France

Harald Bradke

LECTURE

Energiewirtschaftliche Aspekte der Energietechnik I
University of Kassel

SEMINAR

Energiewirtschaftliche Aspekte der Energietechnik II
University of Kassel

Barbara Breitschopf

LECTURE

Socio-economic aspects of development planning
Karlsruhe Institute of Technology

Kerstin Cuhls

ADVANCED SEMINAR

Zeitkonzepte und der Umgang mit Zeit in Ostasien
Heidelberg University

BLOCK SEMINAR

Methoden der Zukunftsforschung: Teil Szenarien und Roadmaps
Freie Universität Berlin

COURSE

Implementation von Foresight
Freie Universität Berlin

Ewa Dönitz

BLOCK SEMINAR

Projektmanagement im Rahmen des Graduiertenkollegs 1483
Karlsruhe Institute of Technology

BLOCK SEMINAR

Innovationswerkstatt: Innovations- und Projektmanagement
Femtec Berlin

Elisabeth Dütschke

LECTURE CONTRIBUTION

Renewable Energy
Karlsruhochschule International University, Karlsruhe

Matthias Gotsch

LECTURE

Dienstleistungsökonomik
Karlsruhe University of Applied Sciences

LECTURE

Strategisches Management
Baden-Wuerttemberg Cooperative State University, Karlsruhe

Bruno Gransche

SEMINAR

Erzählen in einer unsicheren Welt
Karlsruhe Institute of Technology

Anne Held

LECTURE

Energy Industry Management
Karlsruhochschule International University, Karlsruhe

Nils Heyen

SEMINAR

Moderne Medizin und Gesellschaft
University of Konstanz

Simon Hirzel

LECTURE

Energy Efficiency
Karlsruhochschule International University, Karlsruhe

Eberhard Jochem

LECTURE CONTRIBUTION

Environmental impacts of energy conversion and use
ETH Zurich, Switzerland

Daniel Jeffrey Koch

SEMINAR

Technologiebewertung
Karlsruhe Institute of Technology

SEMINAR

Technologien für das Innovationsmanagement
Karlsruhe Institute of Technology

SEMINAR

Methoden im Innovationsmanagement
Karlsruhe Institute of Technology

Knut Koschatzky

SEMINAR

Angewandte Wirtschaftsgeographie: Grundlagen der regionalen Innovationsforschung
Leibniz Universität Hannover

SEMINAR

Angewandte Wirtschaftsgeographie: Theoretische Ansätze der Wirtschaftsgeographie und ihre Anwendungsrelevanz in der Regional- und Innovationspolitik
Leibniz Universität Hannover

SEMINAR

Angewandte Wirtschaftsgeographie: Kooperation zwischen Wissenschaft und Wirtschaft – Modelle, Förderansätze und regionale Perspektiven
Leibniz Universität Hannover

Henning Kroll

IN-DEPTH MODULE

Innovation und Transfer
German University of Administrative Sciences, Speyer

Christian Lerch

LECTURE

Dienstleistungsökonomik
Karlsruhe University of Applied Sciences

Ralf Lindner

LECTURE

Akteure der Interessenvertretung und Parteien
Quadriga University of Applied Sciences, Berlin

Björn Moller

SEMINAR

Technologie-Roadmapping
Karlsruhe Institute of Technology

Peter Neuhäusler

TUTORIAL

Management neuer Technologien – Technikbewertung mit Patentanalysen
Karlsruhe Institute of Technology

Anja Peters

SEMINAR

Umweltpsychologie
University of Basel, Switzerland

Patrick Plötz

SEMINAR

Elektromobilität – Konzepte, Treiber und Potenziale
Karlsruhe Institute of Technology

LECTURE

Quantitative Methoden der Energiewirtschaft
Karlsruhe Institute of Technology

Martin Pudlik

LECTURE

Renewable energy in the MENA (Middle East & North Africa) for Small and Medium Enterprises
RWTH Aachen

LECTURE

Renewable Energy Policy, Modeling and Analysis of Potential
University of Cranfield, Great Britain

Mario Ragwitz

LECTURE

Climate and Energy Policy
University of Freiburg

LECTURE

Wind Energy
University of Freiburg

Thomas Reiß

LECTURE

Management neuer Technologien
Karlsruhe Institute of Technology

Karoline Rogge

LECTURE

Climate Change and Energy Policy
University of Sussex, Brighton, Great Britain

LECTURE

Introducing Energy Policy and Sustainability
University of Sussex, Brighton, Great Britain

SEMINAR

Technological Innovation Systems
University of Sussex, Brighton, Great Britain

Clemens Rohde

LECTURE

Energieeffizienz
Technische Universität Darmstadt

LECTURE CONTRIBUTION

Regenerative Energien
Technische Universität Darmstadt

ACADEMIC TEACHING | DISSERTATIONS | PRESENTATIONS

Joachim Schleich

LECTURE

Energy Marketing and Strategy
Grenoble Ecole de Management,
France

LECTURE

Managerial Economics
Grenoble Ecole de Management,
France

LECTURE

Advanced Econometrics
Grenoble Ecole de Management,
France

Ulrich Schmoch

LECTURE

*Das deutsche Wissenschafts-
system*
German University of Administra-
tive Sciences, Speyer

LECTURE

Innovation und Transfer
German University of Administra-
tive Sciences, Speyer

LECTURE

*Internationalisierung der Wissen-
schaft*
German University of Administra-
tive Sciences, Speyer

SEMINAR

*Hospitation Wissenschafts-
management*
German University of Administra-
tive Sciences, Speyer

Torben Schubert

SEMINAR

New Public Management
German University of Administra-
tive Sciences, Speyer

NORSI-PING-COURSE

Applied Econometrics
Lund University, Sweden

Oliver Som

SEMINAR

Executive Education
Open Innovation
Management Center Innsbruck,
Austria

LECTURE

*Organizations in Complex Envi-
ronments*
Furtwangen University

LECTURE

Managing Innovation Creativity
Furtwangen University

Thomas Stahlecker

SEMINAR

Begleitstudium und Studium
Generale
*Grundlagen der Angewandten
Innovationsforschung*
Karlsruhe Institute of Technology

Jan Steinbach

LECTURE

Energy Efficiency
Karlsruhochschule International
University, Karlsruhe

Ulrike Tagscherer

LECTURE

*Kulturgerechtes Bauen am Bei-
spiel Chinas*
University of Stuttgart

Felix Tettenborn

LECTURE

*Socio-economic aspects of devel-
opment planning*
Karlsruhe Institute of Technology

Rainer Walz

LECTURE

Umwelt- und Ressourcenpolitik
Karlsruhe Institute of Technology

LECTURE

*Umweltökonomik und Nachhal-
tigkeit*
Karlsruhe Institute of Technology

Marion A. Weissenberger-Eibl

LECTURE

Innovationsmanagement
Karlsruhe Institute of Technology

SEMINAR

*Wissenstransfer im Innovations-
management*
Karlsruhe Institute of Technology

SEMINAR

Fallstudienseminar
Karlsruhe Institute of Technology

Martin Wietschel

LECTURE

Energiepolitik
Karlsruhe Institute of Technology

SEMINAR

*Themenfelder Energie und
Umwelt*
Karlsruhe Institute of Technology

LECTURE

*Technologischer Wandel in der
Energiewirtschaft*
Karlsruhe Institute of Technology

DISSERTATIONS

Simon Hirzel

*Analyse und Bewertung industri-
eller Energieeffizienzmaßnahmen:
Ein multikriterieller Ansatz für
Gruppenentscheidungen unter
Unsicherheit dargestellt am Bei-
spiel von Druckluftsystemen*
Prof. Dr. Grit Walther
RWTH Aachen

Carolyn Mund

*Identification of emerging
scientific topics in bibliometric
databases*
Prof. Rudi Studer
Karlsruhe Institute of Technology

Benjamin Pfluger

*Assessment of least-cost
pathways for decarbonising
Europe's power supply – A
model-based long-term scenario
analysis accounting for the char-
acteristics of renewable energies*
Prof. Martin Wietschel
Karlsruhe Institute of Technology

Barbara Schlomann

*Design of effective energy effi-
ciency policies. An analysis in the
frame of target setting, moni-
toring and evaluation*
Prof. Dr. Kornelis Blok
Utrecht University, The Nether-
lands

Etienne Vignola-Gagné

*Gaps, Pitfalls and the Valley of
Death: Translational research
and the reform of biomedical
innovation*
Univ.-Prof. Dr. Herbert Gottweis
University of Vienna, Austria

PRESENTATIONS

EXAMPLES

Marlene Arens

*Energy efficient technologies in
the German steel industry – Low
hanging fruits?*
► eceee 2014 Industrial Summer
Study, Arnhem, The Netherlands

Daniel Bachlechner

*Big Data in der Cloud: Chance
oder Gefahr für die Gesellschaft?*
► Informatik 2014 – 44. Jah-
restagung der Gesellschaft für
Informatik, Stuttgart

Antje Bierwisch

*Civil Security Research – Future
challenges and methodological
outlook*
► Shaping societal security in the
European Union – A High Level
Event (ETTIS Project), Brussels,
Belgium

*Co-Design and Multi-Criteria
Assessment for Future Passenger
Controls at Airports*
► 5th International Conference
on Future-Oriented Technology
Analysis (FTA) – Engage today
to shape tomorrow, Brussels,
Belgium

*Forschungsprojekt SIRA – Sicher-
heit im öffentlichen Raum.
Empfehlungen für Luftsicherheits-
kontrollen*
► Fachtagung des Bundesministe-
riums des Inneren: Die Luftsicher-
heitskontrolltechnik – aktuelle
Entwicklungen und Einbindung in
die Kontrollprozesse, Leipzig

Inga Boie

*Promoting renewable energies
in the MENA region: Regulatory
developments and possible inter-
actions with future EU support
schemes for RES-E*
► 14th IAEE European Energy
Conference, Rome, Italy

Esther Bollhöfer

Aufbau und Gestaltung von Serviceketten in der Investitions-güterindustrie

- ▶ Regionaler Dialog Produktbegleitende Dienstleistungen der Wirtschaftsförderung Stuttgart, Stuttgart

Harald Bradke

Nachhaltige und innovative Energiesysteme an Industriestandorten – Strategien für Forschung und Entwicklung

- ▶ Konferenz Green Economy 2014, Berlin

Das Projekt 30 Pilot-Netzwerke – Rückblick und Ergebnisse

- ▶ Abschlusskonferenz 30 Pilot-Netzwerke, Berlin

Trends und Herausforderungen des internationalen Erdgas-handels – Auswirkungen auf Energiemärkte, Energie- und Klimapolitiken

- ▶ Energiepolitische Diskussion Energien der Zukunft, Hans-Seidel-Stiftung, Wildbad Kreuth

Sibylle Braungardt

Innovation impact of the Eco-design and Energy Labelling directives

- ▶ eceec 2014 Industrial Summer Study, Arnhem, The Netherlands

Towards Green growth – the Influence of European product policy on innovation

- ▶ Governance of a Complex World Conference (GCW), Turin, Italy

Modelling the effect of the Ecodesign and Labelling directives – Bottom-up analysis of EU-27 residential electricity use

- ▶ International Energy Program Evaluation Conference (IEPEC), Berlin

Susanne Bühner

Evaluation of Research and Innovation Policy in Germany

- ▶ Visit of the Korean Evaluation Institute of Industrial Technology (KEIT) at Fraunhofer ISI, Karlsruhe

Daniela Buschak

Benefits and Sacrifices of After-Sales Services in the German Machine Building Industry

- ▶ Spring Servitization Conference 2014, Birmingham, Great Britain

Kerstin Cuhls

Mental Time Travelling in Foresight Processes – Cases and Applications

- ▶ 5th International Conference on Future-Oriented Technology Analysis (FTA) – Engage today to shape tomorrow, Brussels, Belgium

Foresight – How to Cope with Demographic Changes

- ▶ Summer School Politics of Near Futures: Possibilities, Prophecies, Prognoses, Heidelberg

Megatrends mit Auswirkungen auf Rolle und Aufgaben der Ingenieurwissenschaften

- ▶ Tagung des Hochschulrates, Reutlingen University

Stephanie Daimer

The VERA project findings

- ▶ 5th Meeting of 2014 of the ERA Stakeholder Platform, Brussels, Belgium

Societal Challenges: Shapers of Profoundly Different STI Futures

- ▶ 5th International Conference on Future-Oriented Technology Analysis (FTA) – Engage today to shape tomorrow, Brussels, Belgium

Implementing challenge-orientation in the non-hierarchical setting of R&I policy: Old wine in new bottles or real transformation?

- ▶ Eu-SPRI Conference 2014: Science and Innovation Policy: Dynamics, Challenges, Responsibility and Practice, Manchester, Great Britain

Claus Doll

Natural Hazard Management in Transport – Good Practices in Europe, US and Australia

- ▶ RMIT University, Platform Technology Research Seminar, Melbourne, Australia

Success Factors for Public Transport: the Role of Green Communities

- ▶ Transportation Research Board – 93rd Annual Meeting, Washington, D.C., USA

Alternative Wege der Wegekostenrechnung: Bedeutung von Risiken und Unsicherheiten

- ▶ Konferenz Verkehrsökonomik und -politik, Technische Universität Berlin

Vicki Duscha

Climate Policy Analysis with Sectoral Targets for the Steel Sector

- ▶ 14th IAEE European Energy Conference, Rome, Italy

Employment and Growth Impacts of Renewable Energy in the EU: Objectives and methodological approach of the Employ-RES II project

- ▶ Final Conference Employ-RES II, Brussels, Belgium

Elisabeth Dütschke

Zeit- und lastvariable Tarife

- ▶ Prosumer Fachgespräch der Verbraucherzentrale NRW, Düsseldorf

Linking the energy sector with transportation – what do consumers think?

- ▶ Behave Energy Conference, Oxford, Great Britain

Wolfgang Eichhammer

Global Cost Competitiveness of Heating through Energy Efficiency

- ▶ Berlin Energy Forum 2014, Berlin

Financing the “Energiewende” (Energy transition) in Germany

- ▶ International Conference on Innovations of Policy Instruments and Financing Schemes for Green Investments, Taipei, Taiwan

Effizienzsteigerungen in der Metallgewinnung und -verarbeitung

- ▶ Round-Table bei der Wirtschaftsvereinigung Stahl, Düsseldorf

Cheng Fan

Research and Innovation cooperation between the EU and China

- ▶ Tag der Politikwissenschaft, Vienna, Austria

(with Andrea Zenker)

VERA – Forward Visions on the European Research Area. Insights into ERA Scenario Building

- ▶ evoREG Workshop Innovation, territories and policies, Strasbourg, France

Tobias Fleiter

What about the long term? Using experience curves to describe the energy-efficiency improvement for selected energy-intensive products in Germany

- ▶ eceec 2014 Industrial Summer Study, Arnhem, The Netherlands

Energy management and energy audits – some experiences from Germany

- ▶ Workshop on Energy Audits and Energy Management Systems under Energy Efficiency Directive Article 8, Madrid, Spain

How did the EU ETS affect CO₂ emissions? A model-based ex-post assessment of the German manufacturing industry

- ▶ 4th IAEE Asian Conference, Beijing, China

Michael Friedewald

Privacy Practices in Biometrics

- ▶ 7th Computers, Privacy & Data Protection conference CPDP 2014, Brussels, Belgium

Privacy and Security Perceptions of European Citizens: A first look into the mirror

- ▶ 9th International Summer School organised jointly by the IFIP Working Group 9.2, 9.6/11.7, 11.4, 11.6, Patras, Greece

Six approaches to privacy risk assessment

- ▶ 9th International Summer School organised jointly by the IFIP Working Group 9.2, 9.6/11.7, 11.4, 11.6, Patras, Greece

Rainer Frietsch

Sino-German S&T Ties

- ▶ Conference on The Role of Science & Technology in China's International Relations, Arizona State University, Tempe, USA

Measuring the Efficiency of Innovation Systems – Results from the Innovation Indicator

- ▶ Telfer-Fraunhofer Workshop Perspective on R&D Efficiency, University of Ottawa, Canada

Cooperation Fraunhofer – Carnot. Transfer of the Fraunhofer Model to France

- ▶ 3rd Sino-German Innovation Policy Conference, Beijing, China

PRESENTATIONS

Simon Funke

A Comparison of Different Means to Increase Daily Range of Electric Vehicles

- ▶ VPPC 2014, Coimbra, Portugal

Joachim Globisch

Acceptance of Electric Vehicles by Commercial Users in the Electric Mobility Pilot Regions in Germany

- ▶ KOTI-OECD/ITF EV Seminar, Paris, France

Kerstin Goos

Critical Assessment of Public Engagement in STI policy

- ▶ Manchester International Summer School on Emerging Technologies, Manchester, Great Britain

(with Ralf Lindner)

Institutionalising RRI – the case of a large research organisation

- ▶ Biennial Conference of the European Association for the Study of Science and Technology (EASST 2014), Torun, Poland

Bruno Gransche

Game-Literacy – Interaktionskompetenz und -anspruch in einer massiv spielenden Gesellschaft

- ▶ Cult-Media Jahrestagung, Institut für Technikfolgenabschätzung und Systemanalyse ITAS, Karlsruhe

Vorausschauendes Denken – Philosophie und Zukunftsforschung jenseits von Statistik und Kalkül

- ▶ ITAS-Kolloquium 2014, Institut für Technikfolgenabschätzung und Systemanalyse ITAS, Karlsruhe

Die Gamesindustrie als Teil der Creative Industries – Kreatives Mana für Innovationen

- ▶ Gamescom Congress 2014, Cologne

Sandra Güth

Willingness to learn and willingness to innovate of semi-skilled and unskilled labor

- ▶ International Workshop on Teamworking (IWOT 18), Girona, Spain

Andrea Herbst

Modelling recycling and material efficiency trends in the European steel industry

- ▶ eceee 2014 Industrial Summer Study, Arnhem, The Netherlands

Nils Heyen

Auf dem Weg zu einer technologischen Biomedizin? Soziologische Analysen am Beispiel der prädiktiven Gendiagnostik

- ▶ Jahrestagung der Akademie für Ethik in der Medizin, Ulm

(with Anne Brüninghaus)

Wissenstransfer 2.0 – Formen und Potenziale nicht-zertifizierter Expertise für Lebenswissenschaften und Medizin

- ▶ Kick-off-Meeting BMBF-Förderprogramm Wissenstransfer, Berlin

Thomas Hillenbrand

Perspektiven zum nachhaltigen Umgang mit Niederschlagswasser

- ▶ Regenwassertag: Umgang mit Regenwasser – Status Quo und Perspektiven, Gelsenkirchen

Innovationen durch Neuartige Sanitärsysteme

- ▶ Praxis-Seminar Mut zu neuen Wegen, Technische Akademie Hannover, Lünen

New technical standards for resource-oriented sanitation systems in Germany

- ▶ 12th IWA Specialized Conference on Small Water and Wastewater Systems & 4th IWA Specialized Conference on Resources Oriented Sanitation, Muscat, Oman

Simon Hirzel

Verpuffte Möglichkeit? Ansatzpunkte und Potenziale der industriellen Abwärmenutzung

- ▶ VDMA-Infotag Ressource 2.0 – Intelligente Abwärmenutzung und Gebäudetechnik, Frankfurt

Bärbel Hüsing

Wie können wir die Medizin individualisieren?

- ▶ Workshop und Podiumsdiskussion Wie können wir die Medizin individualisieren? – Neue Konzepte, Methoden und Strukturen, Göttingen

Sechs Jahre TAB-Bericht Individualisierte Medizin – Ein Rückblick

- ▶ 5. Klausurtagung Medizinische Forschungsethik im Kontext Individualisierter Medizin, Greifswald

Eberhard Jochem

Energy efficiency policy as a multi-level governance task

- ▶ eceee 2014 Industrial Summer Study, Arnhem, The Netherlands

Entscheidungsroutinen bei der Energieeffizienz – meist falsch und von den Herstellern und Banken bekräftigt

- ▶ Berliner Energietage 2014, Berlin

Energieeffizienz: "Low hanging fruits" oder aufwändiger Prozess?

- ▶ Konferenz Energieeffizienz entlang der Wertschöpfungskette, Velden, Austria

Petra Jung Erceg

Innovation – Ressourcen und Handlungsfelder "Von der Idee zur Innovation"

- ▶ OWL-Fachgruppe Ideen- und Innovationsmanagement auf Initiative von OWL MASCHINENBAU e.V. bei der Firma Wincor Nixdorf, Paderborn

Presentation of Fraunhofer ISI and the DanKETwork-Initiative

- ▶ Successful behavior of entrepreneurs, managers and companies in international (global), multicultural business environment: opportunities for Bulgarian business, Sofia, Bulgaria

Presentation of DanKETwork-Initiative

- ▶ High level event on the Scientific Support to the Danube Strategy, Vienna, Austria

Victoria Kayser

Generating Futures from Text: Scenario Planning using Text Mining

- ▶ 5th International Conference on Future-Oriented Technology Analysis (FTA) – Engage today to shape tomorrow, Brussels, Belgium

Thematic Change and technological Progress: a Mapping Approach (Poster presentation)

- ▶ 4th Annual Global Tech Mining Conference, Leiden, The Netherlands

Jan Kersting

Cooperation of climate clubs

- ▶ 20th Conference of the International Federation of Operational Research Societies (IFORS), Barcelona, Spain

The impact of shale gas on the costs of climate policy

- ▶ 14th IAEE European Energy Conference, Rome, Italy

Marian Klobasa

Ausrichtung von Industrieprozessen auf fluktuierende Energieversorgung

- ▶ Agendakongress des Forschungsforums Energiewende – ACATech, Berlin

Hemmnisse der Flexibilisierung der Stromnachfrage

- ▶ Sitzung der AG Flexibilisierung der Plattform Strommarkt des BMWI, Berlin

Industrial Smart Energy und Industry 4.0

- ▶ Symposium Energie des Beirats WIE, Leipzig

Jonathan Köhler

Foresight Modelling

- ▶ DG RTD/CSA Barroso, Brussels, Belgium

System dynamics modelling of transitions and technological innovation systems

- ▶ Utrecht University, The Netherlands

Aviation Award 2014 – Vorstellung der Shortlist-Beiträge

- ▶ Airport Stuttgart

Knut Koschatzky

Regional Engagement of Universities – Starting Points for Strategic Partnerships with Industry

- ▶ Kolloquium, Faculty of Business Studies and Economics, University of Bremen

The role of associations in regional innovation systems

- ▶ RIP 2014 – 9th Regional Innovation Policies Conference, Stavanger, Norway

Collaborative Networks – Which ways to go?

- ▶ 2nd European Headquarters Congress 2014, Vienna, Austria

Michael Krail

Conventional versus Alternative Drives for Passenger Cars – The Role of the European CO₂ Regulation

- ▶ 8. Jahrestagung der Deutschen Gesellschaft für System Dynamics, Karlsruhe

Measures to promote the diffusion of alternative fuel vehicles in EU27

- ▶ Transport Research Arena 2014, Paris, France

Henning Kroll

Intelligente Spezialisierung – Neues Paradigma oder alter Wein in neuen Schläuchen

- ▶ Clusterix-Fachtagung, Bolzano, Italy

On universities' effects on regional value creation and unemployment – The case of Germany

- ▶ DRUID Conference, Copenhagen, Denmark

Smart Specialisation in Practice, a joint analysis of our 2013 and 2014 studies

- ▶ RIP 2014 – 9th Regional Innovation Policies Conference, Stavanger, Norway

Marianne Kulicke

Herausforderungen des Wissens- und Technologietransfers an Hochschulen – Gestaltung erfolgreicher Transferprozesse

- ▶ Auftaktworkshop Gründungspartner Hochschulverwaltung, Freie Universität Berlin

EXIST-Gründerstipendium: Realisierungs- und Überlebensquoten sowie ökonomische Entwicklung der jungen Unternehmen

- ▶ Tagung Universitäre Spin-off-Gründungen und ihre Förderung: Forschungsergebnisse und Erfahrungen aus der Praxis, Hanover

Evaluation und Wirkungsanalyse – Elemente der Erfolgskontrolle für öffentliche Förderung wirksam einsetzen

- ▶ 7. Projektträgertag, Karlsruher Institut für Technologie, Campus Nord, Karlsruhe

Christian Lerch

Service Offers as Competitive Strategy in Industrial Firms

- ▶ Spring Servitization Conference 2014, Birmingham, Great Britain

System Dynamics zur Analyse und Gestaltung von Innovationsstrategien in Industrieunternehmen

- ▶ 8. Jahrestagung der Deutschen Gesellschaft für System Dynamics, Karlsruhe

Ralf Lindner

Res-AGorA – Addressing the Governance Challenges of RRI

- ▶ ESOF – European Science Open Forum 2014, Copenhagen, Denmark

Divided worlds: Framings and frameworks of responsible research and innovation

- ▶ Biennial Conference of the European Association for the Study of Science and Technology (EASST 2014), Torun, Poland

Responsible Research and Innovation: Konturen eines europäischen Governance-Rahmens für RRI

- ▶ Internationale Konferenz NTA6 – TA14, Vienna, Austria

Frank Marscheider-Weidemann

Rohstoffe für Zukunftstechnologien

- ▶ Workshop zum Rohstoffmonitoring der Deutschen Rohstoffagentur (DERA), Berlin

Katharina Mattes

Wie grün ist Deutschlands Industrie wirklich? Verbreitung von erneuerbaren Energietechnologien im Verarbeitenden Gewerbe

- ▶ Energy for Industry, Stuttgart

Mirja Meyborg

Firms' innovation capacities in a metropolitan context – the example of Karlsruhe

- ▶ evoREG Workshop: Innovation, territories and policies, Karlsruhe

Niclas Meyer

Institutional change in a multilevel governance context: an analysis of the evolution of the institutional framework for investment in the EU and Germany

- ▶ Annual Conference of the Society for the Advancement of Socio-Economics, Chicago, USA

Julia Michaelis

The influence of individual wind feed-in time series on electricity spot market prices and their effect on the economic evaluation of storage systems

- ▶ 14th IAEE European Energy Conference, Rome, Italy

Emmanuel Muller

Smart specialisation strategies – the Fraunhofer ISI survey(s)

- ▶ evoREG Workshop Innovation, territories and policies, Strasbourg, France

Peter Neuhäusler

Identifying the technology profiles of R&D performing firms – A matching of R&D and patent data

- ▶ 4th Annual Global Tech Mining Conference, Leiden, The Netherlands

SME patenting – an empirical analysis in nine countries

- ▶ BETA/IEEPIE Workshop – Developments in Economics of Intellectual Property Rights, Strasbourg, France

Jutta Niederste-Hollenberg

Infrastrukturen der Zukunft – Keynote

- ▶ Austrian Power Grid APG – Strategietage, Vienna, Austria

Katrin Ostertag

Evaluation von Forschungsergebnissen als Voraussetzung von gelungenem Transfer

- ▶ Sondierungs-Workshop Wege zum erfolgreichen Wandel Richtung Nachhaltigkeit: Transformations-, Transformative und Models of Change Forschung, Bonn

Patrick Plötz

The probability of long phases of very high and low wind power feed-in and residual load

- ▶ 14th IAEE European Energy Conference, Rome, Italy

Martin Pudlik

Renewable Energy Promotion in Oman – Design and Implementation of a PV roof-top program in Oman

- ▶ Support to the implementation of the Mediterranean Solar Plan, Muscat, Oman

European Electricity Grid System and the importance of interconnectors for RES implementation

- ▶ International Symposium Roadmap to Asia Super Grid, Tokyo, Japan

Implications of the European electricity interconnection experiences for the region of Northeast Asia and the German case study on RE Implementation

- ▶ Energy Charter Forum: Developing Renewable Energy across Gobitec and Asian Super Grid in Northeast Asia, Ulaanbaatar, Mongolia

Mario Ragwitz

Strommarktdesign bei einem hohen Anteil erneuerbarer Energien

- ▶ Plattform Strommarkt beim BMWi, Berlin

How can policy-makers help create the right framework for innovation?

- ▶ IEA Working Party on Renewable Energy Technologies, Paris, France

Energy transition in Germany

- ▶ Brookings Institution, Washington, D.C., USA

Thomas Reiß

Programme effectiveness: Scientific results

- ▶ Ex post evaluation and impact assessment of the FP7 NMP thematic area, final workshop, Brussels, Belgium

Das deutsche Gesundheitswesen aus Innovationssystemperspektive

- ▶ Arbeitskreis Gesundheit des DGB, Cologne

Integrierte Bewertung neuer Technologien am Beispiel der Synthetischen Biologie

- ▶ Masterkolloquium Ökonomie Technik Praktiken, University of Frankfurt

Karoline Rogge

The impact of the policy mix for renewable power generation on invention: a patent analysis for Germany

- ▶ 15th International Conference of the International Joseph A. Schumpeter Society (ISS), Jena

Clemens Rohde

Energieeffizienz in der Produktion – Potenziale und Hemmnisse

- ▶ Umwelttechnik BW After Work Event, Böblingen

PRESENTATIONS | PROJECTS

Wolfgang Schade

New Mobility Concepts: a case for applying innovation indicators to measure system innovations
▶ 3rd TIP Thematic Workshop on System Innovation, OECD-BMBF Workshop, Berlin

The German Automotive Innovation System

▶ The Swedish strategic vehicle research and innovation programme (FFI) – Annual Conference, Goteborg, Sweden

Wie Phönix aus der Asche?

Zukunft der Automobilindustrie in Deutschland

▶ Podiumsdiskussion der Friedrich-Ebert-Stiftung im Haus der Bayerischen Wirtschaft, Munich

Joachim Schleich

A brighter future? Quantifying the rebound effect in energy efficient lighting

▶ 14th IAEE European Energy Conference, Rome, Italy

Private provision of global public goods: the role of perceptions of international climate policy for climate-friendly activities

▶ World Congress of Environmental and Resource Economists (WCERE), Istanbul, Turkey

Die Bedeutung der Energieeffizienz im Rahmen der Energiewende

▶ Ringvorlesung Die Energiewende in Deutschland, University of Cologne

Barbara Schломann

Neue Instrumente für die Energieeffizienz in Deutschland

▶ Berliner Energietage 2014, Berlin

Wirkung und Finanzierung neuer Effizienzmodelle

▶ Handlungsempfehlungen für eine verbrauchergerechte Energiepolitik. Fachgespräch 4, Berlin

The European Savings Potential in Buildings: Which Policy Measures are Needed to Harvest these Potentials

▶ eceee annual policy seminar: Capturing the vast energy savings potential in Europe's buildings, Brussels, Belgium

Ulrich Schmoch

Angewandte Forschung – Implikationen für Universitäten

▶ Chancen und Risiken universitärer Sicherheitsforschung – Zur Problematik von Vernetzung, Dual-Use und Anwendungsorientierung, Freiburg

Der Studiengang M.P.A. Wissenschaftsmanagement in Speyer

▶ Wege ins Wissenschaftsmanagement, Göttingen

Uta Schneider

Familien in Städten: Alltagsmobilität und Wahrnehmung neuer Mobilitätsformen

▶ Workshop Mobilitätsbiografien & Mobilitätssozialisation, Dortmund Konferenz Raum- und Planungsforschung, Dortmund

What if the car was electric? An analysis of mobility related "Leitbilder" in families with children

▶ Behave Energy Conference, Oxford, Great Britain

Torben Schubert

Regionale und wirtschaftliche Effekte von Hochschulen: Zum ökonomischen Wert der öffentlichen Bildung

▶ Sustainable Science, Berlin

Infringement of Intellectual Property Rights and in Innovation Partnerships

▶ Summer Global Business Conference, Dubrovnik, Croatia

Hochschulen als regionaler Wirtschaftsfaktor

▶ Jahrestagung der Deutschen Universitätskanzler, Ulm

Oliver Som

The impact of the economic crisis on European SMEs

▶ Interdisciplinary European Conference on Entrepreneurship Research, Chur, Switzerland

Same but Different – Specific Barriers to Non-Technological Innovation

▶ XXV International Society for Professional Innovation Management (ISPIM) Conference, Dublin, Ireland

Open Innovation – Chancen und Herausforderungen

▶ Steinbeis Open Innovation Kongress, Karlsruhe

Thomas Stahlecker

Regionale Technologie- und Innovationspolitik in Deutschland

▶ Fachveranstaltung der GIZ VR China in Zusammenarbeit mit der Provinz Jiangxi, Eschborn

Smart specialisation strategies in European regions: Really smart or misleading?

▶ Telfer-Fraunhofer Workshop Perspective on R&D Efficiency, University of Ottawa, Canada

Monitoring & Evaluation of Smart Specialisation Strategies

▶ Workshop der Weltbank Polen zu S3-Strategien, Poznan, Poland

Jan Steinbach

Chancen und Hemmnisse des EEWärmeG

▶ Klima.Werkstatt – Gemeinsam handeln: Energetische Gebäudesanierung neu denken!, Düsseldorf

Ulrike Tagscherer

Innovating together – Collaborations between multi-national companies and academia in China

▶ Cooperative Research Innovation Conference France-Chine, Paris, France

Innovation Made in China – Fiction or Reality?

▶ German University Chancellors Visit to China, Beijing, China

Assessment of China's Innovation Capability

▶ 3rd VDMA Mechanical Engineering Summit 2014, Shanghai, China

Luis Tercero Espinoza

Akteursplattform Ressourceneffizienz Baden-Württemberg: Ressourceneffiziente Rohstoffgewinnung und Rohstoffversorgung der Wirtschaft

▶ Ressourceneffizienz- und Kreislaufwirtschaftskongress Baden-Württemberg, Karlsruhe

A dynamic analysis of global copper flows

▶ 3rd Copper Recycling Conference, Stockholm, Sweden

Informing policy and strategic decisions pertaining to raw materials availability

▶ MIT Materials Systems Laboratory Seminar, Cambridge, Massachusetts, USA

Felix Tettenborn

Morgenstadt: A multi-disciplinary approach to urban development

▶ World Water Week 2014 – Water, Energy and Urban Development: The Potential for Integrated Approaches, Stockholm, Sweden

Rainer Walz

Rohstoffe – Politik und Strategie

▶ Netzwerktreffen Nachhaltigkeit der Fraunhofer-Gesellschaft, Würzburg

Do the different narratives about raw materials supply and use add up to a promising Natural Resource Based Development Scenario?

▶ Globelics Seminar: From resource-based to knowledge-based economic development, Copenhagen, Denmark

Innovationen und Fortschrittskultur für eine nachhaltige Entwicklung: Impulsbeitrag

▶ Konferenz von Chemie³ & RNE Nachhaltige Entwicklung – eine Frage der richtigen Chemie?, Berlin

Philine Warnke

Visioning Theory and Practice

▶ Foresight Essentials. DG RTD Foresight Training, Brussels, Belgium

Foresight 4 Innovation Strategies

▶ Sino-German Innovation Forum, Beijing, China

Marion A. Weissenberger-Eibl

Dienstleistung in der Digitalen Gesellschaft – Chancen und Herausforderung der Dienstleistungsforschung

▶ Dienstleistungstagung des BMBF im Wissenschaftsjahr 2014, Berlin

Innovationsmanagement und Zukunftsforschung

▶ Bayerische Elite Akademie, Feldkirchen

Innovation und Vielfalt

▶ Charta der Diversity Veranstaltung – Führungsfrauen bei MTU, Munich

Julius Wesche

Integrating demand side management with new mobility. A consumer survey

▶ 10th Cosmopolitanities Network Conference and Mobile Art Exhibition, Copenhagen, Denmark

Martin Wietschel

Künftige Rolle der Elektromobilität im Wirtschaftsverkehr

▶ Workshop Wirtschaftsverkehr und Logistik im Wandel, Berlin

Market Penetration of Electric Vehicles and Conclusions for the Battery Research

▶ Konferenz Kraftwerk Batterie, Münster

Marktentwicklungen bei Batterie-fahrzeugen und Perspektiven der Batterieentwicklung

▶ 8. CTI-Konferenz, Stuttgart

Katharina Wohlfarth

Nutzungskonzepte für Elektro-fahrzeuge im Stadtbetrieb – eine Marktstudie

▶ 6. Wissenschaftsforum Mobilität, Duisburg

Christoph Zanker

Reicht eine einzige Innovations-strategie aus?

▶ VDMA-Tagung Innovationsmanagement – Innovativ für eine globalisierte Welt, Bonn

Wertschöpfungsfaktor Innovation – fällt der Mittelstand zurück?

▶ Zukunft.Dialog.Nürnberg, Nuremberg

Andrea Zenker

La France vue à travers l'European Service Innovation Scoreboard

▶ Workshop, Ministère de l'Economie, Paris, France

(with Emmanuel Muller)

Introduction to the European Service Innovation Scoreboard (ESIS)

▶ European Service Innovation Centre (ESIC) conference, Helsinki, Finland

Peter Zoche

Subjektive Sicherheit mit Hilfe von Smart Security Devices?

▶ Auf dem Weg zu einer sicheren Gesellschaft? Sicherheitskulturen – Kriminalpolitik – Kriminologie, ZIV Zentrum für interdisziplinäre Forschung Bielefeld, Bielefeld University

Technisierung von Sicherheit – Partizipation von BürgerInnen

▶ 19. Deutscher Präventionstag 2014, Karlsruhe Convention Centre

Integrierte Geistes- und Gesellschaftswissenschaftliche Forschung zur zivilen Sicherheit in Deutschland

▶ Fünfter Kriminologischer Sommerkurs Sicherheit, Sicherheitsgefühl, Sicherheitsforschung, University of Pécs, Hungary

PROJECTS

ENERGY POLICY AND ENERGY MARKETS

• Egypt Energy Master Plan: Consultancy Services for a Combined Renewable Energy Master Plan for Egypt
Inga Boie

• SuperGrid: Komponenten und Systeme zur Gleichspannungskopplung von Erzeugern, Speichern und Verbrauchern im europäisch-afrikanischen Netzverbund
Inga Boie

• Klimaschutzszenario 2050
Sibylle Braungardt

• Innovation Impact of Ecodesign: Study on the impact of ecodesign and energy label/tyre labelling implementing measures on R&D and technological innovation
Sibylle Braungardt

• ImpRES: Analyse zu übergreifenden einzel- und gesamtwirtschaftlichen Nutzen- und Verteilungswirkungen des Ausbaus EE unter Berücksichtigung der Wechselwirkungen zwischen den Bereichen Strom, Wärme und Verkehr
Barbara Breitschopf

• Strompreiswirkung: Überprüfung der aktuellen Ausnahmeregelungen für die Industrie im Bereich des EEG im Hinblick auf Treffsicherheit und Konsistenz mit anderen Ausnahmeregelungen im Energiebereich unter besonderer Berücksichtigung der internationalen Wettbewerbsfähigkeit und Strompreissituation
Barbara Breitschopf

• RE-ValuePolicies: Policy Instruments to Support RE Industrial Value Chain Development
Barbara Breitschopf

• Klimaregime 2012 – VI: Emissionsminderung in Industriestaaten und Entwicklungsländern – Kosten, Potenziale und ökologische Wirksamkeit
Vicki Duscha

• EU-ETS 5: Evaluierung und Weiterentwicklung des EU-Emissionshandels
Vicki Duscha

• CORE: Cooperative regimes for future climate policy – Teilvorhaben 1
Vicki Duscha

• Begleitforschung Klimaökonomie: Begleitforschung des BMBF zum Förderschwerpunkt Ökonomie des Klimawandels – Themenschwerpunkt Internationale Klimaverhandlungen und Regime
Vicki Duscha

• Employ-RES II: Technical assistance in preparation of the 2014 report on progress in renewable energy sustainability of biofuels and renewable energy modelling
Vicki Duscha

• Ambition2020: Instrumente zur Erhöhung weltweiter Klimaschutzanstrengungen vor 2020 – ökonomische und politische Implikationen in ausgewählten Industrie- und Schwellenländern
Vicki Duscha

• MinderungPost2020: Minderungsverpflichtungen und faire Lastenteilung in einem neuen umfassenden Klimaschutzabkommen ab 2020
Vicki Duscha

• EED Implementation Luxembourg: Unterstützung bei der Umsetzung der Energieeffizienz-Richtlinie der EU (EED) in Luxemburg und Erstellung des nächsten Nationalen Energieeffizienzplans für Luxemburg
Wolfgang Eichhammer

• ODYSSEE MURE 2012: Monitoring of energy efficiency in Europe
Wolfgang Eichhammer

• PolicyEval_Framework – PwC: Study evaluating the current energy efficiency policy framework in the EU and providing orientation on policy options for realising the cost-effective energy-efficiency/saving potential until 2020 and beyond
Wolfgang Eichhammer

• Rahmenvertrag GIZ II: Deutsch-Chinesische Energiepartnerschaft (3. Phase)
Wolfgang Eichhammer

• UBA Netzentgeltregulierung: Anforderungen der Integration der erneuerbaren Energien an die Netzentgeltregulierung
Nele Friedrichsen

• ETS 6: Untersuchung der klimapolitischen Wirksamkeit des Emissionshandels – Erweiterte Analysen
Nele Friedrichsen

• EE-Ausschreibungsdesign: Unterstützungsleistungen bei der Ausgestaltung eines Ausschreibungssystems für erneuerbare Energien
Anne Held

• Coop-Mechs: Cooperation between EU Member States under the Renewable Energy Directive and interaction with support schemes
Anne Held

PROJECTS

- ResCost2030: Estimating costs of renewable energies compared to conventional energy sources up to 2030 and beyond
Anne Held

- Towards2030-dialogue: Dialogue on a RES policy framework for 2030
Anne Held

- DIA-CORE: Policy Dialogue on the assessment and Convergence of RES policy in EU Member States
Anne Held

- EEG Erfahrungsbericht III: Rechtliche und instrumentelle Weiterentwicklung des EEG (Vorhaben III des EEG-Erfahrungsberichts)
Benjamin Pfluger

- Leitstudie: Langfristszenarien und Strategien für den Ausbau der Erneuerbaren Energien in Deutschland unter besonderer Berücksichtigung der nachhaltigen Entwicklung sowie regionaler Aspekte
Benjamin Pfluger

- Gobitec: Regional study on the Gobitec and Asian Super Grid for renewable energies in North-East Asia
Martin Pudlik

- Marktdesign der Zukunft: Erneuerbare Energien als Leitlinie für das Marktdesign der Zukunft – Untersuchung zu Leistungsfähigkeit und Weiterentwicklungsoptionen der Strommärkte für die effektive und effiziente Integration erneuerbarer Energien
Martin Pudlik

- GIZ Oman: Support to the implementation of the Mediterranean Solar Plan
Martin Pudlik

- Feed-in Coop III: Wissenschaftliche Begleitung und Unterstützung der International Feed-in Cooperation (IFIC)
Mario Ragwitz

- Keep-on-track!
Mario Ragwitz

- Flex-Mech-BMU II: Wissenschaftliche Unterstützung bei Fragen der Weiterentwicklung der europäischen Rahmenbedingungen zur Förderung erneuerbarer Energien im europäischen Energiemarkt
Mario Ragwitz

- PROGRESS III: Technical assistance in preparation of the 2014 report on progress in renewable energy, (sustainability of biofuels and renewable energy modelling)
Mario Ragwitz

- MSP-UfM: Wissenschaftliche Begleitung bei der Förderung der erneuerbaren Energien im Rahmen des Mittelmeersolarplanes (MSP) und der Kooperation mit dem Sekretariat sowie den Mitgliedsstaaten der Union für das Mittelmeer (UfM)
Mario Ragwitz

- ECFIN: Cost effectiveness of support to electricity generation
Mario Ragwitz

- Auktion – Agora: Auktionen zur Förderung von Strom aus Erneuerbaren Energien
Mario Ragwitz

- NL Review 2014: 2014 review of Dutch SDE+ cost assessment (especially of correction rates)
Mario Ragwitz

- LUX-RES II: Wissenschaftliche Beratung zu Fragen der Energiestrategie Luxemburgs mit besonderem Fokus auf Erneuerbaren Energien
Mario Ragwitz

- Energieversorgungssicherheit: Wissenschaftliche Unterstützung bei der Vorbereitung der G7-Energieministerkonferenz
Mario Ragwitz

- GRETCHEN: The impact of the German policy mix on technological and structural change in renewable power generation technologies
Karoline Rogge

- PATHWAYS: Exploring transition pathways to sustainable, low carbon societies
Karoline Rogge

- Volfair: The Relevance of Voluntary Efforts and Fairness Preferences for the Success of International Climate Policy: A Theoretical and Empirical Analysis at the Individual Level
Joachim Schleich

- Kenndaten Klimaschutz: Methoden- und Indikatorenentwicklung für Kenndaten zum Klimaschutz im Energiebereich
Barbara Schlomann

- GHD-Erhebung 2011–2013: Energieverbrauch des Sektors Gewerbe, Handel, Dienstleistungen (GHD) in Deutschland für die Jahre 2011 bis 2013
Barbara Schlomann

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Christoph Zanker

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Claus Doll

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Claus Doll

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Carsten Gandenberger

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Christian Sartorius

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- EFL_Universitätsmedizin: Publikationen und Patente in der Universitätsmedizin
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- Software_Pat_2013: Computerimplementierte Erfindungen
Rainer Frietsch

- R&D Efficiency WS Canada: Perspectives on R&D Efficiency
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- Innovationsindikator 2014
Rainer Frietsch

- AMCAP: Assessing companies capability to develop advanced manufacturing technologies in selected industrial sectors
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- Eval_IRO: Provision of Consultancy to undertake a review, report on, and make recommendations on Ireland's membership of International Research Organisations
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- ERP-Indikator (LOT2): Data collection and performance indicators to monitor European research policy
Knut Koschatzky

- Forschungscampus – pro aktiv: Erfahrungsaustausch und Integration im Rahmen der Förderinitiative Forschungscampus – öffentlich-private Partnerschaft für Innovation
Knut Koschatzky

- RIM Plus: Regional Innovation Monitor 2013–2014
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- NetPartFP7: Network analysis of the FP7 participation
Henning Kroll

- BJASt IV: Research Project for BRCSS Technology Transfer
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- Finanzierungsinstrumente_BLN: Ex-ante-Bewertung der Finanzierungsinstrumente des Operationellen Programms des Landes Berlin für den Europäischen Fonds für regionale Entwicklung EFRE in der Förderperiode 2014 bis 2020
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- Finanzierungsinstrumente_MV: Erstellung einer Ex-ante-Bewertung zum Bedarf und Angebot von Risikokapital in Mecklenburg-Vorpommern
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- InnoFound_Canada: Examining the balance between direct research and infrastructure support both in Canada and abroad
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- RIS3_EFI: Kurzstudie zu Prozess und Auswirkungen der Entwicklung von Strategien intelligenter Spezialisierung in deutschen Ländern
Henning Kroll

PROJECTS | VISITING RESEARCHERS

- RIM Plus 2015–16: Regional Innovation Monitor 2015–2016
Henning Kroll

- EXIST V: Wissenschaftliche Begleitung und Evaluation des BMWi-Programms Existenzgründungen aus der Wissenschaft (EXIST)
Marianne Kulicke

- SIGNO_2014: Erfolgskontrolle des Programms SIGNO – Schutz von Ideen für die gewerbliche Nutzung des Bundesministeriums für Wirtschaft und Energie
Marianne Kulicke

- Global Challenges: The challenge of globalization: Technology-driven Foreign Investment (TFDI) and its Implications for the Negotiation of International (bi and multilateral) Investment Agreements
Niclas Meyer

- Eval_Schrödinger: Impact Evaluation – Erwin Schrödinger Fellowships with Return Phase
Niclas Meyer

- Eval_START: Evaluation START Programme & Wittgenstein Award
Niclas Meyer

- EFL_Pub_2014: Ergebnisse von öffentlicher und privater Forschung: Publikationen
Carolin Mund

- Swedish_Scientists: Bibliometrics for Swedish Scientists
Carolin Mund

- EFL_Pat_2013: Ergebnisse von öffentlicher und privater Forschung: Patente
Peter Neuhäusler

- EFL_Pat_2014: Ergebnisse von öffentlicher und privater Forschung: Patente
Peter Neuhäusler

- MIP3: Erhebung des Innovationsverhaltens der Unternehmen in der produzierenden Industrie und in ausgewählten Dienstleistungssektoren in Deutschland in den Erhebungsjahren 2013, 2014, 2015 und 2016
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- Hochschulen_BaWü: Erstellung einer wissenschaftlichen Studie über die Wirkungen der öffentlichen Finanzierung von Wissenschaft und Forschung in Baden-Württemberg auf die wirtschaftliche Entwicklung des Landes
Torben Schubert

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Thomas Stahlecker

- Biotech_BY: Durchführung einer Studie zur Biotechnologiebranche in Bayern
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- Sachsen_S3-Indikatorik: Entwicklung einer Indikatorik für die Schnittstellen der sächsischen intelligenten Spezialisierung
Thomas Stahlecker

- China_UNI_2014: Update of Study MNC R&D collaboration in China
Ulrike Tagscherer

- establishESIC-CC P: Establishment of a European Service Innovation Centre
Andrea Zenker

- GIZ_Mamsi: Proposition de mission d'assistance au marketing des services innovation
Andrea Zenker

VISITING RESEARCHERS

Bruno Bastos

Catholic University
Rio de Janeiro, Brazil
May to June 2014

I-Ying Chang

Chinese Academy of Sciences /
Institute of Policy and Management (IPM-CAS)
Beijing, China
October 2013 to October 2014

Gregor Clemens

Karlsruhe Institute of Technology
Karlsruhe
Since August 2014

Dr. Giacomo Copani

Institute of Industrial Technologies and Automation / National Research Council (ITIA-CNR)
Milan, Italy
March to December 2014

Wesley Faguendo

Catholic University
Rio de Janeiro, Brazil
May to June 2014

Dr. Ali Hasanbeigi

Lawrence Berkeley National Laboratory /
China Energy Group
Berkeley, USA
June to August 2014

Maria Karaulova

Manchester Business School
Manchester, Great Britain
April to May 2014

Danilo Lopez

Catholic University
Rio de Janeiro, Brazil
May to June 2014

Paula Maçaira

Catholic University
Rio de Janeiro, Brazil
May to June 2014

Prof. Dr. Francois Marmier

Centre Génie Industriel / Ecole des mines d'Albi-Carmaux Albi, France
22 to 23 July 2014

Cristina Pizarro-Irizar

Department Foundations of Economic Analysis II, Faculty of Economics and Business Studies University of the Basque Country (UPV/EHU), Bilbao, Spain
May to July 2014

Prof. Dr. Jasna Prester

University of Zagreb / Faculty of Business and Economics Zagreb, Croatia
2 to 13 November 2014

PD Dr. Daniel Schiller

Leibniz Universität Hannover / Niedersächsisches Institut für Wirtschaftsforschung e. V. (NIW), Hanover
8 to 12 September 2014

Sandra Smalina

University of Latvia, Institute of Atomic Physics and Spectroscopy Riga, Latvia
May 2014

Dr. Guoling Yang

Chinese Academy of Sciences Beijing, China
January to December 2014

Dr. Liying Yang

Chinese Academy of Sciences Beijing, China
January to December 2014

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Fraunhofer Institute for Systems
and Innovation Research ISI
Breslauer Strasse 48
76139 Karlsruhe, Germany

Phone +49 721 6809-0
Telefax +49 721 689-152
E-Mail presse@isi.fraunhofer.de

Editors

Anne-Catherine Jung
(responsible)
Ulrike Aschoff
Dr. Jacob Leidenberger
Katja Rische
▸ Assistance
Julia Emmler and Anna-Lena Hechler

Graphic design

▸ Concept, layout, typesetting and
illustrations
Jeanette Braun and Sabine Wurst
▸ Assistance
Julia Emmler

Translations

Gillian Bowman-Köhler
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