



Fraunhofer














ISI

FRAUNHOFER INSTITUTE FOR SYSTEMS AND INNOVATION RESEARCH ISI



ANNUAL REPORT
2010

GRAPHIC TITLE: SOURCE OF INNOVATION

-  Within the enterprise or enterprise group
 -  Clients or customers
 -  Suppliers of equipment, materials, components or software
 -  Competitors or other enterprises of the same sector
 -  Conferences, trade fairs, exhibitions
 -  Scientific journals and trade/technical publications
 -  Professional and industry associations
 -  Consultants, commercial labs or private R&D institutes
 -  Universities or other higher education institutes
 -  Government or public research institutes
-
-  Between 10 and 49
 -  Between 50 and 249
 -  250 or more

FRAUNHOFER ISI

The Fraunhofer Institute for Systems and Innovation Research ISI analyzes the framework conditions for innovations. We explore the short- and long-term developments of innovation processes and the societal impacts of new technologies and services. On this basis, we provide our clients from industry, politics and science with recommendations and perspectives for key decisions. Our expertise lies in a broad scientific competence as well as an interdisciplinary and systemic research approach.

With 190 staff members from science, technology and infrastructure, we are a highly motivated team, whose scientific expertise and systemic research approach fulfills the diverse requirements of our clients. The increase of our annual budget to almost 20 million euros in 350 projects documents this successful work.

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RESEARCH AND INNOVATION ARE AN INVESTMENT IN THE FUTURE

Research and innovation are in a permanent state of change. We have to face these complex changes and new challenges every day. This determined our work in 2010.

An important project was to develop scenarios of the research and innovation area in 2025 for the Fraunhofer-Gesellschaft. One possible scenario assumes that research and development will be increasingly located in or return to Germany and Europe since positive framework conditions for innovations prevail here. In this scenario research institutions and enterprises cooperate closely, above all in areas where technological and European leadership should be further advanced. Chemicals, energy, the environment, automobiles, materials and optical technologies belong in this category.

In order for this desirable scenario to become reality, we must all help to create the right pre-conditions. It is essential that politics, industry and society regard the issues of research and innovation as important investments in the future. However, sound knowledge and a lively exchange among all stakeholders are required. By pointing out new perspectives, our scenarios enrich the necessary discussion about the future European Research and Innovation Area. This enables us to develop strategies to react to the needs and framework conditions of the future. Thus research institutions can direct their work towards future developments in a targeted manner. We at Fraunhofer ISI also regularly examine and update our strategies, in order to remain future-oriented.

As key issues for the sustainability of firms, last year we addressed the issues of sustainability and efficiency – whether by conserving resources, reducing emissions, saving energy or by using more efficient processes. We were able to show, for instance, that there is a vast untapped potential in the European Union to achieve cost-efficient energy savings – our research results prove that tripling energy savings by 2020 by implementing appropriate policy measures at the EU level is realistic.

Besides the subject of energy in all its forms, one of our main research focuses is electric mobility. Within the “Fraunhofer Systems Research Electric Mobility” project we are in charge of the “Focus Technical Systems Integration and Socio-political Issues”. Inter alia we develop new traffic



management concepts for motorized private transport and intra-city distribution, and investigate customer acceptance. As a worldwide boom in electric mobility involves the risk that rare metals for batteries and electronics will become scarce, we indicate possible bottlenecks and point out substitution strategies. A further work package is devoted to the question of how industry can and must prepare itself for the changing value-added structures in international competition.

Interdisciplinary knowledge is required for such wide-ranging research. Heterogeneous teams combining various age groups and different competences, as well as respecting all ideas, are part of the demography-adjusted human resources management, which also contributes to sustainable development as well as innovative technologies. In order to ensure performance and innovation capability, in spite of demographic change, and remain economically strong, employers must mobilize the potential of all employees – being innovative and creative is not a question of age or gender.

Our new and long-standing staff members prove that this works again and again: In the meantime, 190 persons from widely varying academic backgrounds – natural scientists as well as from the humanities – work with us, including many visiting scientists from all over the world. Besides the many new colleagues, we also value above all those who have been working here for a long time and yet still create something novel. In the cooperation between new and experienced colleagues, many years of experience are linked with different perspectives and new knowledge. In our mixed teams and in collaboration with our partners creative approaches for innovative research results emerge. We look forward to many interesting projects and fruitful cooperation in the future!

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

Dr. Harald Hiessl
Deputy Director of the Institute

STRATEGIES FOR APPLICATION-ORIENTED INNOVATIONS

Dr. Manfred Wittenstein has been Chairman of the Board of Trustees for one year. He conducts the on-going dialog with the Director of the Institute. Last year, they exchanged views inter alia on the topics of electric mobility, innovative companies as well as the sustainable planning of R&D.

Interview with the Chairman of the Board of Trustees, Dr. Manfred Wittenstein and Prof. Marion A. Weissenberger-Eibl, Director of the Institute

Herr Wittenstein, you have been Chairman of the Board of Trustees since the beginning of 2010. What do you think were the dominant topics in science over the past year?

Wittenstein: One major topic was certainly electric mobility. Intelligent propulsion systems are required here because the “e” in e-mobility no longer just means “electric”, but also stands for “ecological”, “economic” and “efficient”. With its wide research spectrum, Fraunhofer ISI is making an important contribution to the introduction of this emerging technology. This also involves energy efficiency: We need innovative technologies for sustainable resource use and environmental protection. But efficiency is not just important as far as energy saving is concerned, but also with regard to processes.

Weissenberger-Eibl: I agree; increasing efficiency is vital for the competitiveness of companies as well as its significance for protecting the environment. Innovation management is required to plan efficient processes or products. One example is the roadmap we drew up as part of the Innovation alliance “Lithium-ion batteries” (LIB2030).

What are the benefits of roadmaps like this one?

Weissenberger-Eibl: Roadmaps and scenarios can help companies to understand how their field of activity will develop in the future and what will be needed when. Only if they are properly prepared will they be able to exploit opportunities and overcome challenges. For example, the LIB roadmap shows manufacturers when which technology will be in demand for which application.

Armed with this knowledge, manufacturers are better able to plan the market maturity and availability of new technologies. The roadmap illustrates, for instance, which different types of battery will be needed for which types of vehicle and when they should be available on the market.

Wittenstein: Strategic and sensible planning like this is only possible if the company or research organization is in close touch with its environment. If this is the case, it can understand what people’s needs are and which innovations are really required. Only with this knowledge can innovations be shaped in a socially acceptable manner and be successful on the market.

“WE NEED INNOVATIVE TECHNOLOGIES FOR SUSTAINABLE RESOURCE USE AND ENVIRONMENTAL PROTECTION”

How do matters stand regarding knowledge transfer from research to practise in Germany?

Wittenstein: In general, the exchange between research and industry in Germany can still be improved. We need more joint projects like the LIB roadmap just mentioned. I, personally, have had very good experiences working in research networks: The market demands reliable products at ever shorter intervals. These cooperative networks can help, especially with on-time implementation and achieving substantial heights of innovation among new products.



Weissenberger-Eibl: Since you just mentioned cooperation: Our survey “Modernization of Production” revealed that especially non-research-intensive small and medium-sized companies stand to profit from innovation cooperations. They use the research and development done by research institutions to bring innovations to market. Another of our studies ascertained that innovations are good for exports – innovative companies export more than non-innovative ones. Because of the high relevance of exports for the German economy, policymakers should be promoting internationalization and innovations.

What actually comes under the heading of “innovations in industry”?

Wittenstein: I believe that innovations have to be considered holistically. Innovations in industry are not only new products, but also include business models, services and production processes.

Weissenberger-Eibl: I completely agree with you. Hybrid products, by which we mean a package comprising product plus services, represent one business model which is being applied more frequently. This means that whole solutions rather than only individual products are being sold. This concept aims at lowering the life cycle costs of products and increasing the benefits to customers.

This requires technical innovations to prolong the lifetime of products, among other things, and additional innovative services. Entrepreneurs have to rethink their business models where exports are concerned as well: So far, services for customers abroad were mainly there to support product sales. Now that services are becoming more significant, German industry has to find ways to systematically open up the service markets abroad. One guideline, which we developed together with VDMA (the German Engineering Federation), shows industrial enterprises how to recognize service potentials and be able to translate these into market strategies. The guideline contains an assessment scheme, for example, which can be used to reduce companies’ uncertainty about whether and how they can expand their services on foreign markets.

What is important for companies to be innovative?

Weissenberger-Eibl: Companies have to back the right ideas at the right time and successfully commercialize them. For this to happen, idea scouting and innovation management have to be suitably structured, and a supportive innovation culture has to be established in enterprises. Only a balanced mix of these factors will result in successful new product placement on the market.

Wittenstein: I can add to this based on my experience: Dialog is needed for all areas of a company to be innovative. It is also important that R&D processes are promoted to be open-ended and effective on a large scale so that every worker is given the best conditions for innovation.

“DIALOG IS NEEDED FOR ALL AREAS OF A COMPANY TO BE INNOVATIVE”

How can innovations be financed?

Weissenberger-Eibl: Developing innovative products, processes and services is always associated with risks and requires inputs. This isn’t possible without adequate financing. The existing financing options and public funding instruments are often not effective enough to guarantee the investment and innovation projects of industrial SMEs. In addition, the restrictive behavior of credit institutions tends to limit companies’ scope.

One approach we suggested for innovation financing is to take greater account of intangible assets when granting loans such as patents, brand names, copyrights, company expertise as well as stable customer and supplier relations. Other approaches include directly allocating low promotional loans to innovative SMEs as well as setting up a partnership fund which spreads the financial risk over more heads.

Research and development is very cost-intensive. How can Germany and Europe be safeguarded as locations?

Wittenstein: First of all by realizing just how good these locations are. I am an ardent supporter of Germany as an international location. Companies located here often supply better quality than outsourced factories; in addition to this they are able to react faster and more flexibly to specialized customer wishes. Then it is worth paying the higher labor costs here. It is true that labor costs often tend to be lower abroad, but, as a whole, these savings are often not as high as expected due to problems with quality and the necessary reworking required.

“THE CRUCIAL FACTOR FOR SUSTAINABILITY IS EDUCATION”

Weissenberger-Eibl: Not only production should be located here, but research and development as well. There is one scenario in our study of the research and innovation landscape in 2025 of how to make Germany and Europe attractive places: So that research and development as well as companies stay here, science, industry and politics need to work together and there has to be widespread social acceptance. Innovations and technologies need a positive image.

Wittenstein: Yes, technology is often regarded as something of a threat. Of course, skepticism is often advisable, but the opportunities should not be overlooked by only concentrating on the risks involved and the chances need to be communicated as well – precisely so that innovations are perceived as something positive by society and are supported.

Demographic change will probably result in a shortage of skilled workers. What do companies have to do to close this gap?

Weissenberger-Eibl: The ability to be innovative is not a question of age or gender. Sustainable personnel management, one

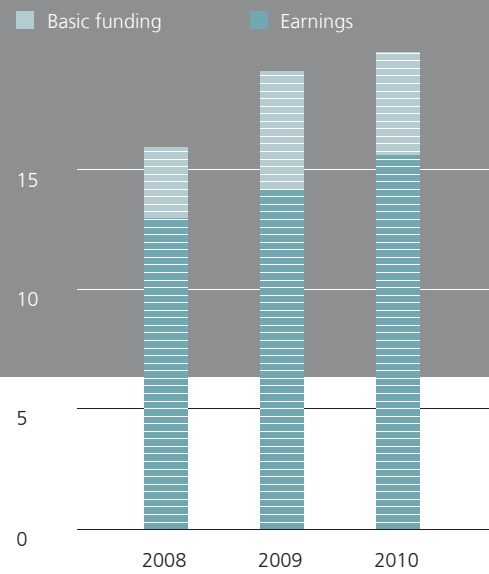
which supports older and more experienced workers and women – who are often not appreciated enough today – can help to ensure innovativeness.

Wittenstein: Precisely! We regularly take part in events like “Girls’ Day” to motivate girls to pursue careers in the natural sciences and engineering.

Weissenberger-Eibl: Motivation is a very good thing, but the crucial factor for sustainability is education; this is becoming ever more important for the innovation potential of a national economy. The structural shift towards a knowledge and service economy leads to a growing demand for highly qualified workers. This concerns both the scientists needed for well-founded, creative research and development and the personnel required for sophisticated service functions such as product and program planning, marketing, financing and construction. Because things are constantly changing, education and training should always be geared towards the qualifications that will be needed in the future. This is why it is important for innovative companies not only to upgrade the training programs for young workers, but also to offer all their staff further training on a regular basis.

The interview was conducted by Kathrin Schwabe.

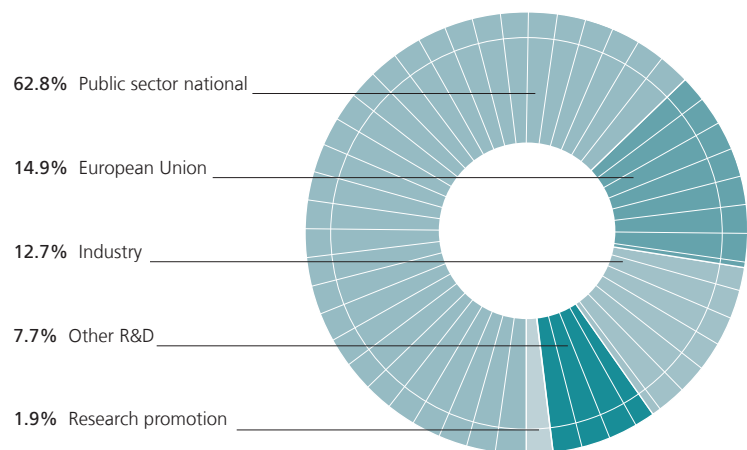
Development of turnover 2008–2010 (in million euros)

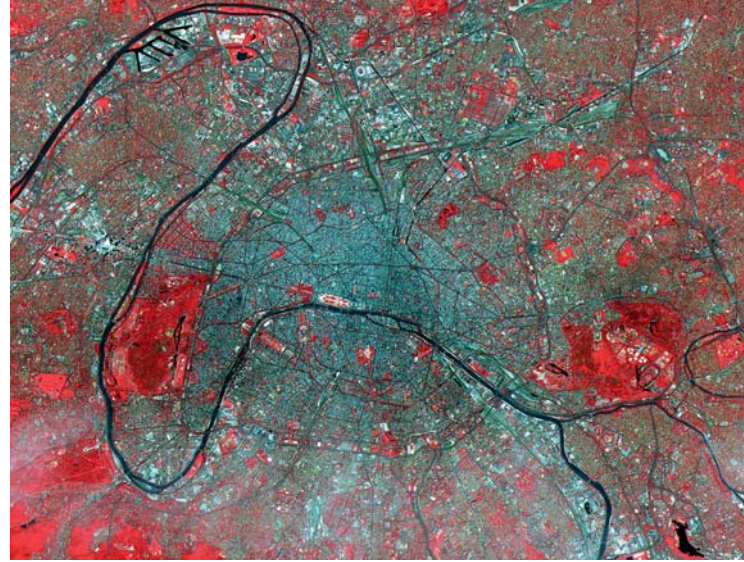


Number of staff



Clients





Amsterdam
Bern
Brussels
Clamart
Delft
The Hague
Giza
Gouverne
Harwell

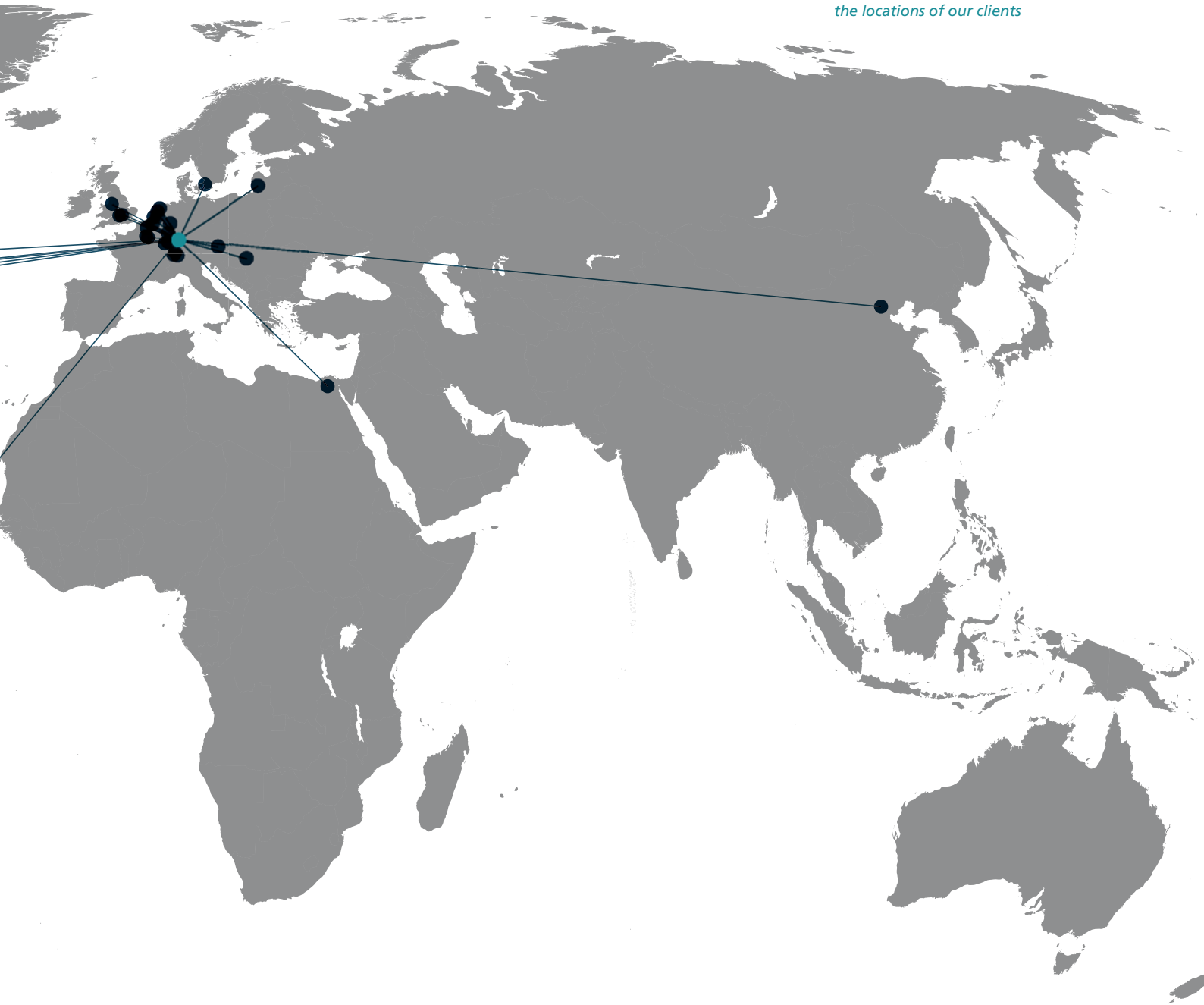
Illkirch
Jimbolia
Leuven
Lund
Luxembourg
New York
Ottawa
Paris
Beijing

Petten
Rüschlikon
San Francisco
Santiago de Chile
Strasbourg
Timonium
Utrecht
Vilnius
Warrington

Washington, D. C.
Vienna
Zurich

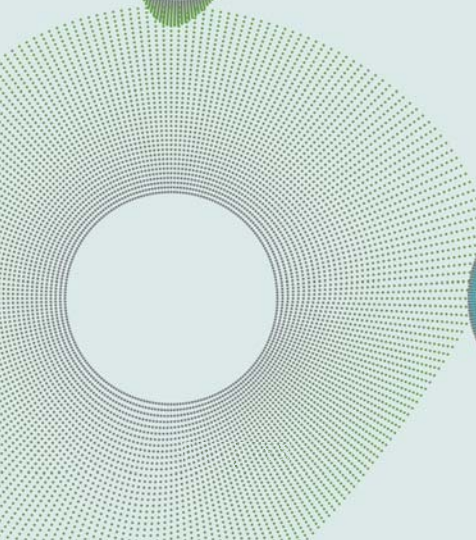
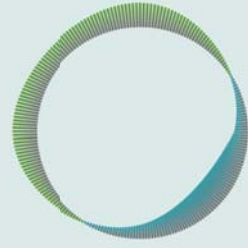
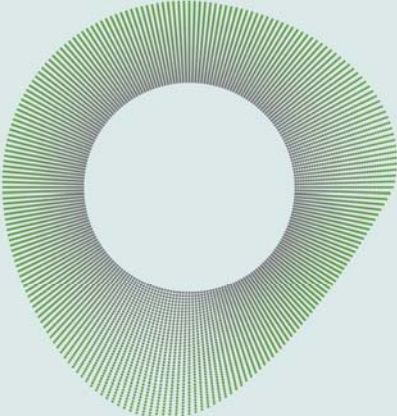
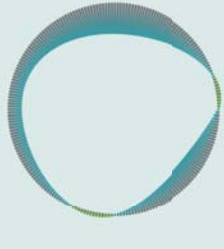
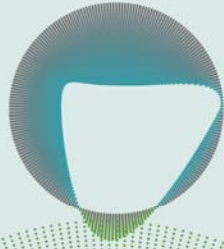
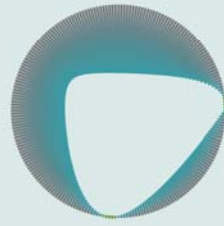
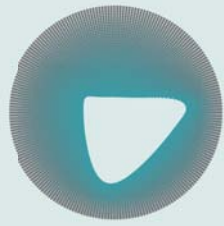
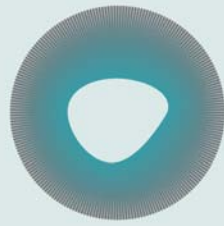
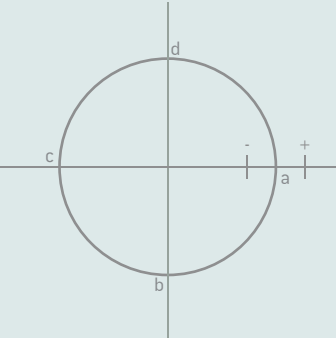
LOCATIONS OF OUR CLIENTS

*International projects:
the locations of our clients*



CHANGE IN WELFARE IN 2020

IN THE EU AND 13 STATES WORLDWIDE



a: Ambitious pledges, b: Weak pledges, c: 30 Percent Annex I, d: 40 Percent Annex I

INNOVATION AND EFFICIENCY

Raising efficiency is an important instrument companies can use to boost their competitiveness. Given the current megatrends and the insights provided by innovation research, it is becoming possible to think about efficiency in new terms: as the starting point and objective of innovations at different levels. The first thought is usually to increase efficiency when using resources. But innovation processes or designing policy programs are also increasingly facing the demand that they should achieve their objectives efficiently. Fraunhofer ISI deals with precisely these different facets of efficiency – in terms of sustainability objectives, operating efficiency and cost-effectiveness as well as in a policy context – in order to identify and assess the potentials and limits of increasing efficiency.

By means of appropriate policy measures, energy savings can realistically be tripled at EU level by 2020.

Using energy intelligently

Because of climate change and the finite nature of fossil energy sources, the efficient use of energy plays an important role in meeting climate targets and safeguarding economic competitiveness. The European Union has set itself the goal of reducing greenhouse gas emissions by 80 to 95 percent by 2050 compared to 1990 levels. An important interim step is the EU's intention to manage energy savings of 20 percent by 2020. However, so far, no compulsory performance targets have been set to meet this goal. A study of the Fraunhofer ISI concludes that a binding and ambitious target for energy efficiency would create much greater dynamics in order to also lower energy demand by 20 percent by 2020. According to current research results of Fraunhofer ISI, energy savings could be realistically tripled up to 2020 by applying suitable policy measures at EU level.

Every field in which energy is consumed offers starting points for improving energy efficiency. For example, considerable efficiency potentials can be realized in companies. Results from the survey "Modernization of Production" show that those companies which have greater transparency regarding their material and energy consumption due to the use of environmental performance indicator systems are increasingly backing the use of energy efficiency technologies. And companies which not only consider the initial purchasing costs in their investment decisions but the costs incurred over the entire product lifetime are more likely to use energy efficiency technologies in their production processes.



Using resources efficiently

Raw material supplies and their efficient use have become a central topic in politics and research in recent years. Globalization and rapidly growing economies like China have resulted in strong growth in demand and considerable price hikes. A recent example is the question of the supply of rare earths. Besides supply security, resource efficiency is also becoming more important under the aspect of environmental protection. The hopes of increasing resource efficiency aim at harnessing modernization and cost reduction potentials as well as generating positive economic impulses.

In principle, there are different approaches available for the efficient use of resources. In production, conserving materials in design and manufacturing can reduce resource consumption. Long-lived products also lower material use – but can also slow down technology progress. Finally, it has to be asked what happens to the goods after the end of their useful life. If these are recycled as raw materials, this saves the use of “fresh” raw materials. However, conflicts can arise between these approaches. Material savings can influence durability and the use of complex materials makes recycling more difficult which in turn consumes energy resources. The most suitable respective strategy can only be identified by systematically considering the entire process chain across the whole period of use. Possible conflicting targets between energy and resource efficiency and technology progress have to be considered while doing so.

Innovation efficiency

Nowadays, the importance of improving efficiency is no longer just limited to the use of energy and resources. Innovation processes as well as research and development are increasingly being discussed from the viewpoint of their efficiency and the targeted innovation results to be achieved. This not only affects individual companies but also the efficiency of entire innovation systems and of policy measures.

Costs and risks are relevant in innovation processes because these are becoming ever more complex. Shorter product life cycles, rapid changes in market requirements, policy framework conditions and the growing complexity of technologies make it necessary to carefully plan innovation processes in order to reach the set goals efficiently. Today, consistent innovation management relies on tried and tested instruments which make it possible to better estimate uncertainties when planning the future and to be able to identify opportunities and risks in good time. Technology foresight methods such as scenarios or technology roadmapping can contribute to the necessary resources being able to be designated and provided at an early stage of innovation processes. For example, using the technology roadmap for lithium-ion batteries, Fraunhofer ISI was able to point out in detail which development steps have to be taken in the next few years in order to harness these technologies for the daily use of electric mobility.

The significance of resource efficiency is steadily increasing under the aspects of security of supply and environmental protection.



Looking at innovation efficiency at a higher level cannot be restricted to simple efficiency correlations. Instead, efficiency has to be classified in a policy framework. For example, the failure to reach the target set in the EU of spending three percent of the gross domestic product on research and development led to the discussion to focus less on upping spending and instead on the more targeted use of existing resources.

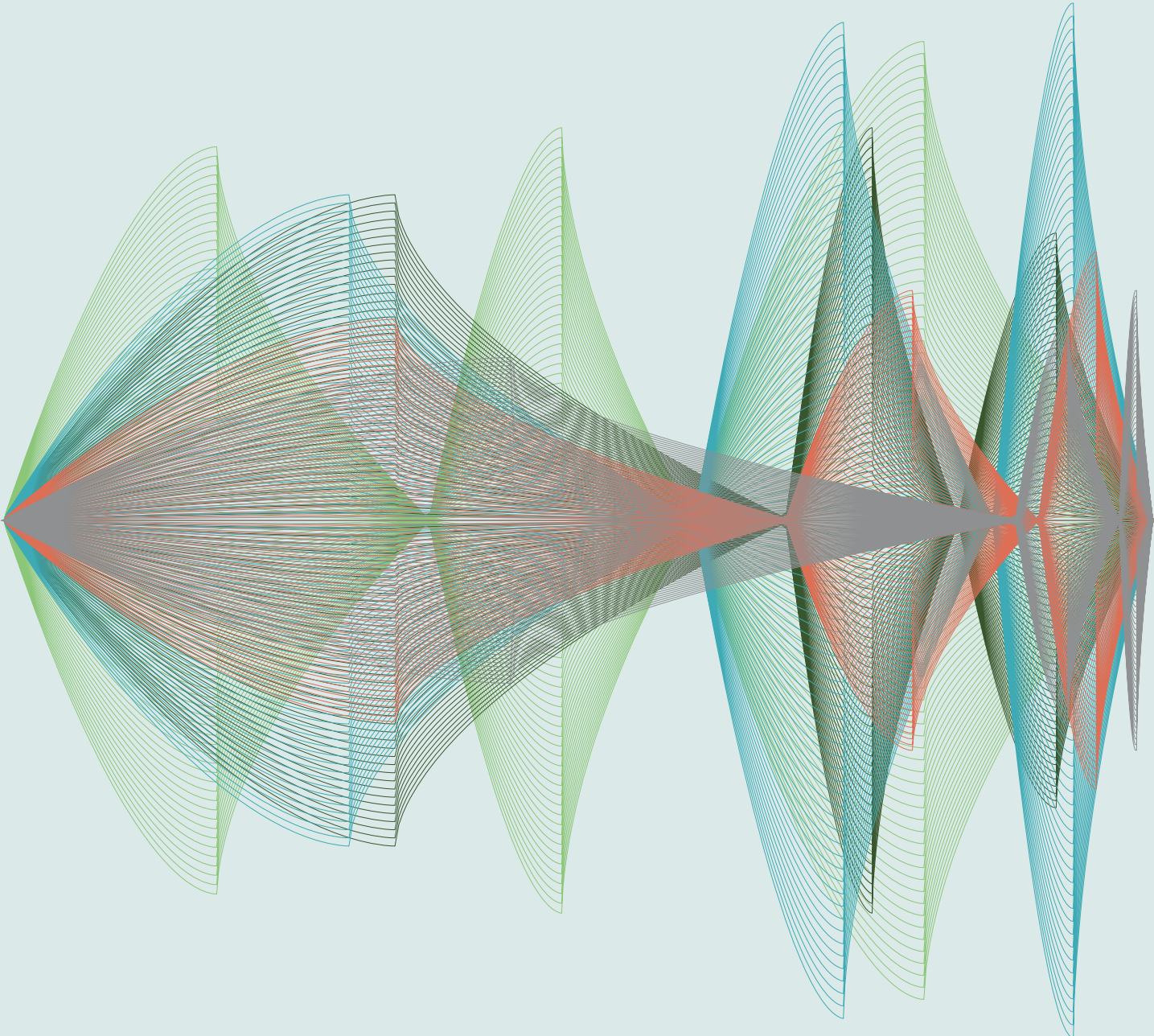
Improvements – new designs – new ideas

Efficiency improvements are both the cause and consequence of innovations at the same time. The targeted objectives can no longer be met by making only incremental improvements to existing systems and solutions. When heating buildings, for example, an impressive paradigm shift has taken place in the past few years. To start with, the traditional boiler was further developed into a condensing boiler, which significantly increased efficiency by using condensation heat. The use of heat pumps was able to additionally exploit thermal energy from the environment. These gradual, step-by-step increases in energy efficiency, however, have now culminated in a solution which actually represents the complete abandonment of the principle of using energy for heating: The passive house does without a traditional heating or cooling system and instead meets its heat demand completely from “passive” sources – from solar radiation or the waste heat of appliances and persons.

The passive house does not require classical heating or cooling and meets its heating demand completely from passive sources, such as sunlight or waste heat.

Sustainable management in the future will be dependent on blazing such new trails. Sometimes this requires the radical rethinking of technologies, processes and forms of organization. Only by using new approaches and systemic ways of thinking will it be possible to balance resource consumption and continued growth. However, it is important not to lose sight of the limits of efficiency increases. Efficient systems also tend to be more vulnerable since redundancies are avoided – for example in production logistics based on the model of lean production where supply bottlenecks can bring production lines to a standstill. The positive effects of efficiency increases therefore also have to be set against possible negative impacts in the future. These points still have to be debated.

OFFERING PRODUCT-RELATED SERVICES
IN FIVE SELECTED BRANCHES



Low-tech

Medium-tech

High-tech

SUSTAINABLE ENTERPRISES

The continuous implementation of innovations is considered a central success factor for the sustainability of enterprises. Global competition, shorter product life cycles, as well as the greater complexity of technologies and innovation processes force companies to intensify their innovation efforts. The innovativeness of a company, however, is not only linked to the expenditures for research and development (R&D). Further approaches in the innovation processes as well as their general strategic behavior permit firms to take up a sustainable, future-oriented competitive position.

Innovations without own research and development

R&D investments by enterprises represent a key lever for the development of innovations. However, small and medium-sized enterprises in particular undertake few or no R&D activities. Fraunhofer ISI analyzed the potentials of non-research-intensive industrial sectors and firms, among others, on behalf of the Office for Technology Assessment at the German Bundestag. The results reveal that non-research-intensive industries have considerable potentials for production and employment in Germany.

Non-research-intensive companies can successfully exploit the technological and methodological knowledge available from external sources and transfer it into innovative solutions.

Non-research-intensive firms frequently rely on the high quality of their products, customization to client specifications and short delivery times in primarily regionally-oriented niche markets. They invest their innovation outlays to a great extent in process innovations and new, product-related services. In addition, they can profit from their high absorptive capacity for technological innovations and customer-related needs. Thus non-research-intensive enterprises are able to exploit technological and methodological knowledge available from external sources, and based on their knowledge as users and from experience, either arrive at new combinations or re-combinations which can be finally transferred into new, innovative solutions. And with success: The firms succeed over long periods of time in adapting to new market requirements by means of innovations, and even in opening up new markets.

Organizing and managing cooperative innovation processes

Innovation cooperations with partners like suppliers, competitors, customers and research institutions offer the chance to tap external know-how and to extend own innovation competences.



The question for companies is which competences can be obtained from external partners and which should be supplied in-house, due to their high competitive relevance. If the decision is taken in favor of cooperation, then the successful design of inter-company interfaces, the adaptation of innovation management, and the organization of cooperative knowledge and technology transfer is the main focus. Together with partners from industry, Fraunhofer ISI has developed concepts and instruments to manage such innovation cooperations and has implemented them in practise. The approaches range from creating the position of a “process innovation manager” via designing the interfaces to the cooperation partners, up to methods of systematically evaluating external potentials.

Drafting and implementing sustainable enterprise strategies

The foundations for the competitiveness of companies are laid in the orientation of the firm's strategy: Firms which act in a consistently sustainable manner perform better than their competitors. In this context, sustainability goes further than pure resource efficiency – for instance, due to measures in the area of energy efficiency – and involves pursuing a structurally anchored and long-term-oriented corporate strategy.

A sustainable approach will become increasingly relevant for firms e.g. in the area of human resources: The demographic change in Germany and the prognosticated decline in population will lead to changes in the scale and composition of age and qualification structures of the working population. The demand for highly qualified workers in the labor market is higher than the supply. Firms must meet the challenge of maintaining their performance and innovation capability despite these threatening personnel bottlenecks. Besides promoting personal competences, a supportive and integrative entrepreneurial work environment, as well as human resources and innovation management adapted to the demographic change will be the decisive approaches for a successful development.

Sustainability goes beyond mere resource efficiency and involves implementing a structurally anchored and long-term-oriented corporate strategy.

In face of these challenges to companies, Fraunhofer ISI, in collaboration with German enterprises, is developing solutions for corporate organizational development and personnel policy, on behalf of the German Federal Ministry of Education and Research. The results, in the sense of a balanced equilibrium between flexibility strategies and stability needs, will be transferred with the help of pilot companies into a holistic concept, which will then be transferable and applicable to firms of all sizes and from all branches.

A comprehensive view to the future – Also for small and medium-sized enterprises

Further preconditions for sustainable company development are the ability to understand the markets, know customers' needs and to pursue the latest technological developments. A comprehensive look into the future is made possible with the help of innovation management methods, for example, through scenarios or roadmaps. Small and medium-sized enterprises in particular



often consider the resources required to implement such methods as a limiting factor. With the expert support of Fraunhofer ISI, however, small and medium-sized enterprises – despite lower resources at their disposal – can also carry out a systematic roadmapping in a well prepared way, even without previous detailed methodological experience. This was proved, for instance, for future-oriented information and media technologies and their application in firms from various branches.

Taking into account value-added shifts and raw material requirements

A sustainable approach also means being aware of which value-added context one's own firm is operating in and which structural changes it is subject to. Fraunhofer ISI has as an example analyzed the technical and economic implications of electric mobility for the automobile value-added chain. By identifying the actors involved and monitoring the market development of alternative drive systems, significant shifts in value added along the main modules of an automobile could be revealed. For the players in the automobile industry, this analysis enabled chances and risks for the development of value-added distribution to be identified and options for action to be developed.

With expert assistance, even small and medium-sized enterprises can carry out a systematic roadmapping process, despite low available resources.

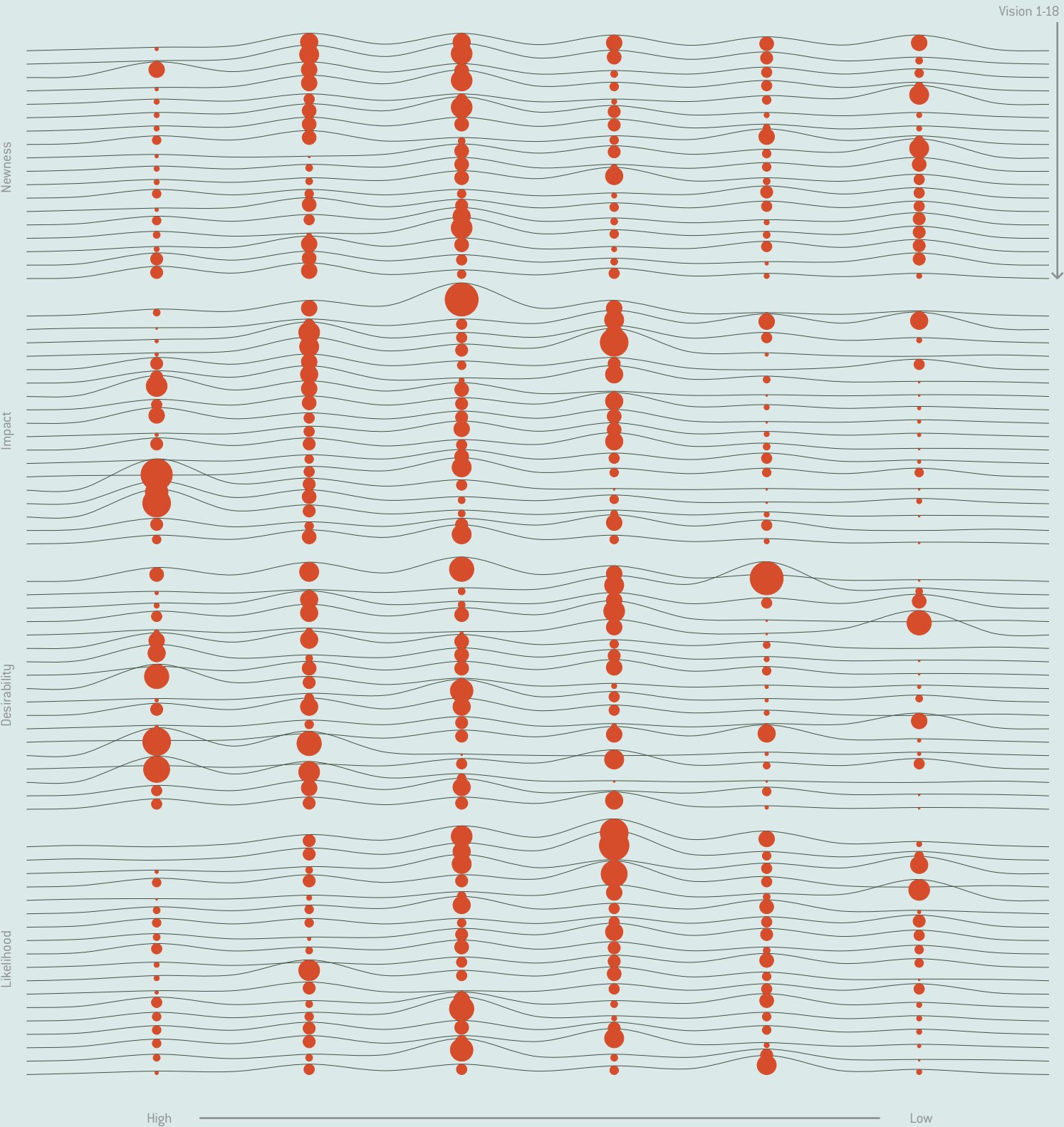
Strategic foresight can also include analyzing the future raw material demand for firms, while taking into account the availability of these materials. Fraunhofer ISI has analyzed the future availability of raw materials in various projects: The raw material demand for 32 emerging technologies was estimated up to the year 2030. More specifically, the future demand for the raw materials lithium and copper until 2050 was calculated for the area of electric mobility. Proceeding from these requirements, recommendations for action – for lithium, for example, the timely introduction of a recycling system and the development of alternative battery systems – were formulated as the future course of action in the field of electric mobility.

Fraunhofer ISI – A partner for future-oriented companies

The challenges for the future viability of companies range from a sustainable and forward-looking direction of corporate strategy over designing a cooperative innovation management, up to monitoring future developments in the value-added chains. Fraunhofer ISI helps companies to increase their innovation capacity and accompanies them throughout this process with scientifically sound advice. Through its research, Fraunhofer ISI supports its clients to the best of its ability with strategic decisions for the future of their firm.

INNOVATION MODELS OF THE FUTURE

EVALUATION OF TEN VISIONS DEVELOPED IN THE INFU PROJECT



BLURRING THE BOUNDARIES: HUMANS AND TECHNOLOGY IN THE 21ST CENTURY

“You write Miikka with two ‘i’s and two ‘k’s”, Miikka the test person points out to the researcher that he has written his name wrongly. This would not be unusual - but: Miikka is blind. At least, he was blind before a newly developed retina chip was implanted a short time ago which allows him to recognize objects and letters. This scene is not a daring future scenario, but reality in the year 2010.

Through the increasing convergence of ICT, bio- and nanotechnology, neurosciences and medicine, new human-technology boundaries are emerging.

People have always tried to use technology to improve the condition of their lives, expand their possibilities of perception, or to be better than others. With the increasing convergence of information and communication technology, bio- and nanotechnology, neuroscience and medicine, however, a new quality in the human-technology relationship is becoming apparent, which goes far beyond the instrumental utilization. Through applications like neural implants, augmented reality and bionic prostheses, as well as the development of humanoid robots or neuro chips, the boundaries between humans and technology are shifting.

The observation of this boundary shifting is based on a number of research and Foresight projects which Fraunhofer ISI carried out in the past years. This shift was seen most clearly in the BMBF Foresight Process. Based on a broad spectrum of subjects, which ranged from bio-, nano- and information technologies via optics, neurosciences and the health care area, up to materials research and complexity research, it became clear in the systematic consolidation of the emerging issues that technology is coming ever closer to man and that some real “fusions” are becoming apparent.

Independence through technology?

Technology can contribute towards expanding direct sensory perceptions and increasing an individual's physical and mental capability. The need for such services will rise in line with the demographic change in an ageing society. Solutions will be developed in the field of Ambient Assisted Living, which Fraunhofer ISI investigated among other issues within the project for present-day and future-oriented information and media technologies in Baden-Württemberg. Among these are age-appropriate assistance systems, which, based on information and communication technologies, safeguard and improve the quality of life, in particular of elderly and needy persons - even including the autonomous recognition of emergency situations. Possible



applications are in the areas of health and care, households and supplying basic needs, security and privacy, as well as communication and the social environment. In this context, technology will become an essential resource in the environment of elderly people, which can compensate for losses in performance and disabilities, as well as increasing their quality of life and enriching the daily ageing process.

Individualized medicine

Individualized medicine is in some areas already reality, and linked with great hopes for the improvement of health care, whose potentials Fraunhofer ISI has investigated on behalf of the Office for Technology Assessment at the German Bundestag. Proceeding from the finding that, despite the same diagnosis, diseases take different courses and therapies have different effects, individualized medicine pursues the goal of identifying the clinically relevant differences in order to treat patients in a targeted manner. This is done by identifying biomarkers as indicators characterizing normal and abnormally altered biological processes. On this basis, the possibilities of gathering information about the biological status of patients can be significantly extended. These data will enable drug therapies to be individualized. Whether the individual human being will actually become the focus of medical attention, however, will have to be proved - focusing on molecular disease factors could even achieve the opposite.

Individualized medicine aims to identify clinically relevant differences in diseases in order that patients can be treated in a differentiated manner.

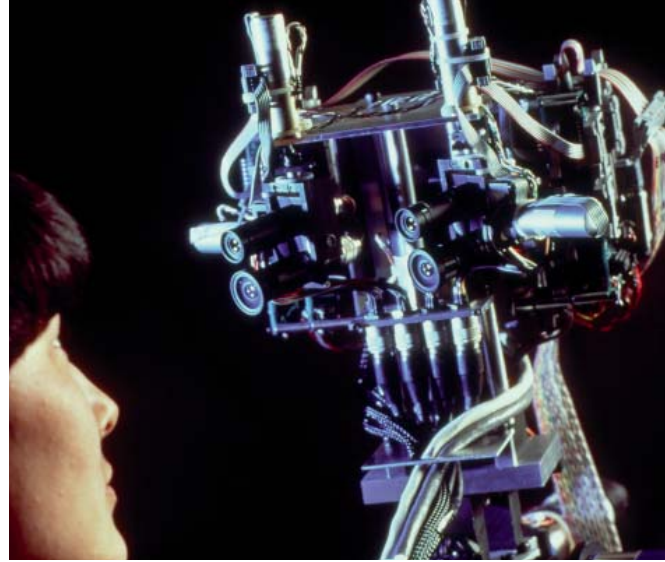
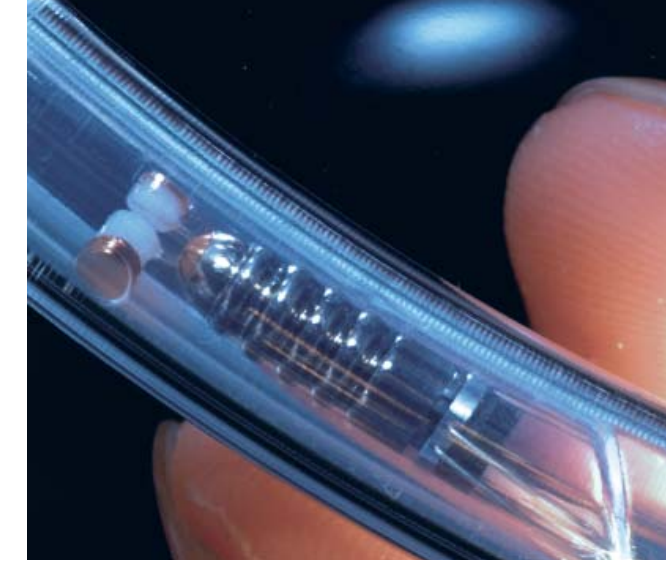
Fusions between people and technology

The blurring of boundaries between humans and technology could lead to different fusions: In adaptive learning settings, in which computers adapt to learning progress and attention phases, or in innovative virtual reality (VR) technologies, the degree of convergence between human beings and technology differs from brain-computer interfaces or from the cellular couplings of organisms with information technology in laboratories. Fundamentally, the boundary between humans and technology is shifting, via an ever closer intermeshing, up to "incorporating" technology.

This is especially clear in the field of bio-engineering, in which nano-, bio-, and information technology, as well as cognitive science approaches overlap. Basic research on how biological processes function, as well as the development of concrete applications, is conducted in parallel. The transfer between humans and technology is not a one-way street. In so-called brain-engineering, efforts are made to arrive at a better understanding of the brain by building a reproduction via computer hard- and software and by developing new tools and instruments with which the newly discovered functionalities can be translated into applications in the real world. Hybrid systems are established at the interfaces between both areas – interfaces enable a direct access to neuronal processes.

Living with artificial intelligence

The consequences of these developments could be more far-reaching than they appear at first glance. In brain-engineering, an engineering approach is pursued in generating knowledge and



translating it into applications: In order to understand how the brain functions, an artificial brain is constructed.

In the long term, implementing artificial intelligence will raise a number of ethical, legal, socio-cultural and political-economic issues. This goes so far, that dealing with a technology which is becoming increasingly human-like in form and function must be reconsidered: Should one be on first name terms with a robot?

Systemic research for innovations at the human-technology interface

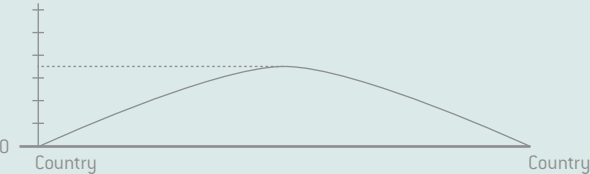
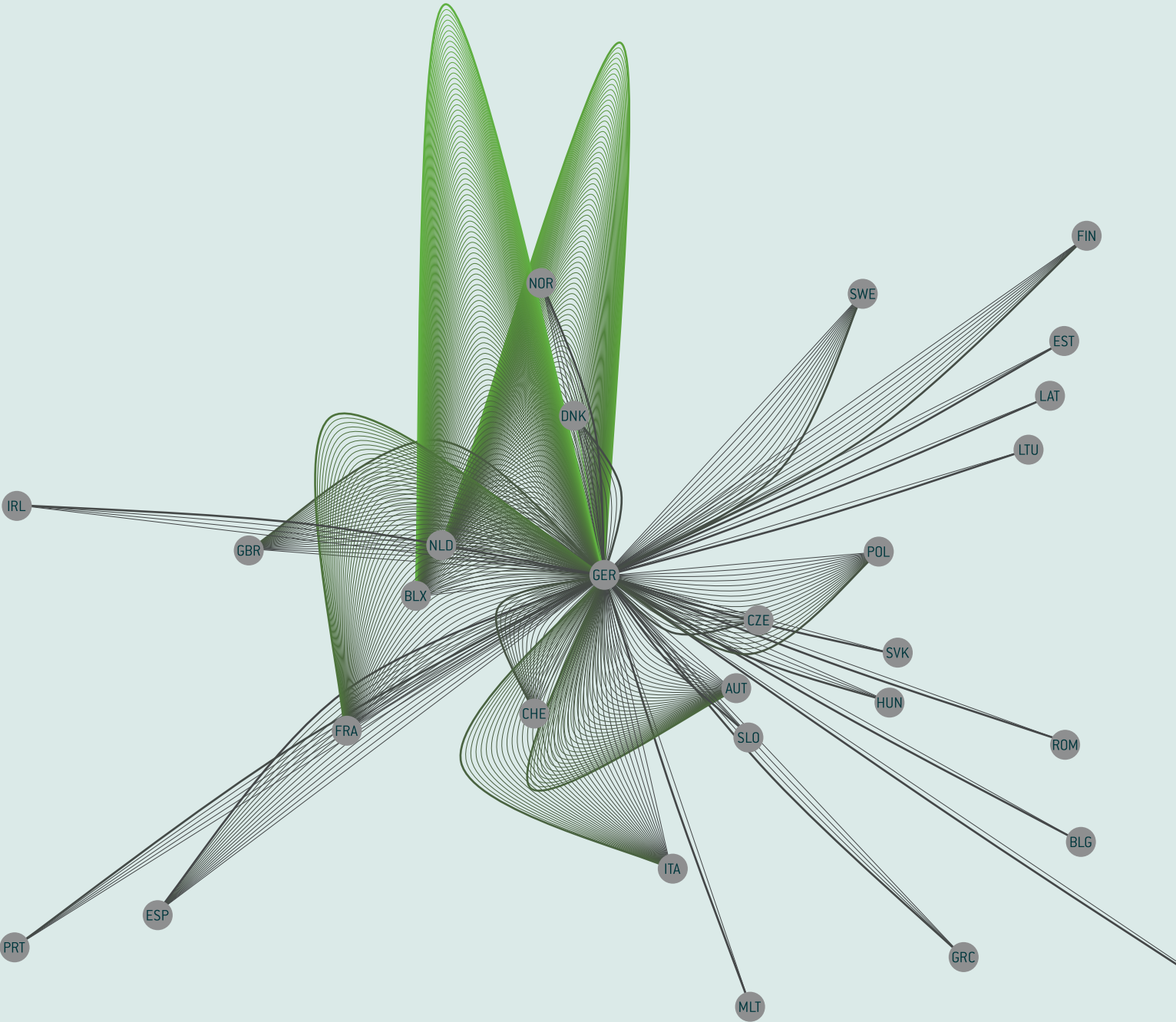
Shifting boundaries between humans and technology are seen as the cross-cutting structural characteristics of present-day technology developments in various areas. In order to tap the future potential of the diverse “innovations at the human-technology interface”, research integrating natural, technical, social sciences and the humanities is required, overarching all the technology fields involved. Fraunhofer ISI does just that, with its interdisciplinary approach in numerous projects. The newly defined thematic field “human-technology boundary shifts” leaves traditional disciplinary demarcations behind and sets its sights on new configurations of human beings and technology in its total complexity, by examining, from the outset, the technical and societal aspects of innovations at the interfaces between humans and technology. Changes in social relationships or in human self-understanding are not understood as the result of technical innovations, but in the same manner as legal and ethical aspects, as dimensions of a multi-layered change. The interplay of societal and technical change is the main focus of observation. Research policy is also taking this development into account.

As a reaction to the results of the Foresight Process, the German Federal Ministry of Education and Research (BMBF) established the Department “Demographic Change; Human-Technology Cooperation”. Fraunhofer ISI, in its capacity as advisor to the BMBF and by its integrative observation and foresight in developments in different research fields, is making a considerable contribution towards decisively shaping this new research field.

*Technology is becoming
more human-like:
How formally do you
address a robot?*

TRAFFIC FLOWS OF CROSS-BORDER BULK CARGOES

IN THE YEAR 2020 IN THE EU COUNTRIES PLUS NORWAY AND SWITZERLAND



QUO VADIS? – THE FUTURE OF THE EUROPEAN RESEARCH AND INNOVATION LANDSCAPE

The European research and innovation landscape is subject to continuous and occasionally also abrupt change. It is characterized by different actors like universities, publicly funded research organizations and companies. The wide variety of actors and the dynamics of the market for contract research result in a high degree of complexity, which makes it harder to make reliable predictions about future developments. In order to be able to design scenarios of the European research and innovation area despite the multi-layered nature of the future, Fraunhofer ISI has developed four alternative scenarios of the European research and innovation landscape in 2025 on behalf of the Executive Board of the Fraunhofer-Gesellschaft. Looking at different possible futures gives us the chance to discuss which developments are desirable and to be aware of emerging possibilities for formative action.

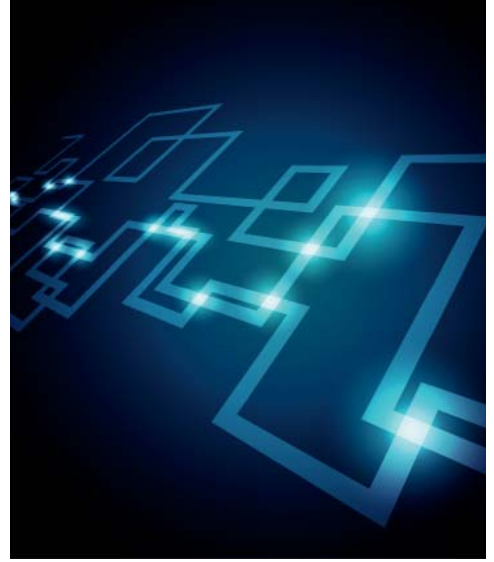
Responsible persons from research institutions and universities, representatives from associations, as well as entrepreneurs, jointly develop relevant scenarios.

Activating expertise in workshops

Two series of workshops were held in order to involve actors from the direct environment as well as experts from the Fraunhofer-Gesellschaft in the process of scenario development. These actors included the respective responsible persons from research institutions and universities, representatives of associations as well as entrepreneurs. The workshops with the experts served to generate, assess and select the relevant aspects for the scenarios, which are tied in with the current context of the global economy, the present political situation in Europe and the existing structures of the research landscape. Based on this, future assumptions were drafted for the year 2025, with the main focus on the research landscape and the contract research market.

Which future will we be doing research in?

In one of the four scenarios designed, it is assumed that the European research and innovation landscape in 2025 provides suitable conditions for generating innovations. Research and innovation are viewed as important investments in the future – not only by industry and policymakers, but also by society in general. Europe has emerged stronger from previous financial and economic crises, not least because of reforms of the financial markets and an extensively coordinated economic policy within the European Union. The global markets are undergoing a process of sustainable development which emanates from Europe, in particular, and from which Europe



profits economically. Europe, which has since become an attractive place to live and do research, once again offers global players the option of relocating their research and development (R&D) (back) to Germany or Europe. Public funds are being efficiently invested in transnational, European, multi-actor structures such as new public-private partnership approaches.

In this scenario, Europe becomes increasingly attractive and is viewed as a popular place to live in other parts of the world, mainly because of its pioneering role in sustainable development, its stable political relationships, the cultural variety of its different regions and a harmonized labor market.

An attractive Europe presumes that research is advanced within a social policy context. So in 2025, research is very highly rated and closely linked with society which is open to different technologies. Research institutions sharpen their profiles because of this requirement. Once again, they assign themselves more strictly to strategically clearly defined areas, modify fixed, historically determined structures and thus clear the way for a dynamically networked research landscape. High risk and non-mainstream research projects leave R&D workers extensive creative scope. Together with corporate R&D departments, research institutions concentrate on those driving topics in which technology leadership can continue to be extended in Europe. These include, for example, chemicals, energy, the environment, automotive, material sciences and optical technologies.

Europe can extend its technological leadership in the areas of chemistry, energy, the environment, automobiles, materials science and optics.

Designing alternative development versions

The European research and innovation landscape could also take quite different paths of development. In an alternative scenario, the economy in 2025 is generally stagnating at a low level since the necessary reforms have not been initiated. The established actors in static R&D structures only adapt slowly to being cooperative and to constructing suitable interfaces to other institutions or companies.

The financial markets continue to shape the development of the economy and companies are geared towards short-term profits. This leads to a marked economization of research among companies which has the consequence that only mainstream research is conducted and there is hardly any space left for creative peripheral research. Companies are risk-averse and try to avoid risks from the outset. This means that many opportunities remain unexploited. Necessary R&D knowledge tends to be purchased rather than developed autonomously. The companies are not able to cope with the requirements of networking with many actors worldwide and taking very dynamic developments into account. They tend to be rather reactive in their behavior and only enter short-term partnerships. New ideas and innovations are in short supply.

In spite of scarce funds, research and education continue to be promoted by public authorities, in both a national and a European setting. Along the lines of "carrying on as before", however, there are hardly any discussions about innovation rates of return as a result of an effective and



efficient use of funds. The old structures hinder European interconnectedness and new research activities regarding the exchange between the social user perspective and research which would be necessary to solve global problems. European research networks are only created focused on specific topics and are more or less cut off from innovation. Cooperations of companies, universities and research institutions are only formed here and there, which are managed by the innovation networks of globally active companies and work together over longer periods of time. With regard to the capacity of employees, Europe's diminishing attractiveness as a place to work and live represents a further problem. Europe is therefore internationally competitive only to a limited degree.

Two other scenarios complete the descriptions of the possible developments: In one scenario, in which strong company networks take over the leadership role, research and management in Europe is depicted as being under great pressure. Another scenario describes a Europe of different regions with only isolated successful locations. Only these smaller, so-called hotspots, meaning technology regions, manage to hold their own in international competition.

Scenarios reveal strategic perspectives

It is not possible to exactly predict the future. However: There are long-term trends which shape the future. There are predictable demographic, political, economic, social, scientific and technological development paths which can be integrated into possible futures. It is possible to foster awareness of potential changes using the scenarios constructed. These enrich the discussion about the future European research and innovation landscape by revealing new perspectives and make it possible to strategically construct reaction potentials to the needs and limitations in a future world. The four scenarios support orientation processes when setting directions for research institutions. In addition, they form a solid foundation for testing previous strategies and can serve as the base from which to develop new strategies.

The developed scenarios create awareness for potential changes and enrich the discussion about the future European research and innovation area.

SCENARIOS: USING VERSIONS OF THE FUTURE STRATEGICALLY

Anyone who knows how the future could turn out, its different possible versions, can develop strategies to exploit potentials and deal with challenges. Scenario methodology can help here as this is able to systematically analyze relevant and plausible visions of the future. Scenarios expand our field of perception, take complex interactions into account and, at the same time, highlight areas of uncertainty. They provide companies, research institutions and other organizations with a solid foundation for checking the measures implemented so far and a good starting point for developing new strategies.

On which basis are scenarios constructed?

The field of interest is defined thematically, spatially and temporally: The current situation is described, the most important issues and problems are characterized, and the time of investigation is fixed. The experts identify and structure all the internal and external factors of influence which can have an effect today and in the future. Possible alternative developments of these factors are identified and discussed.

What do scenarios look like?

Scenarios are described in the form of a comprehensible story which makes it easier for readers to identify with the respective vision of the future. This story includes a possible development of the environment and the field of investigation at the defined point in time. Interactions and ideas are often visualized using graphics.

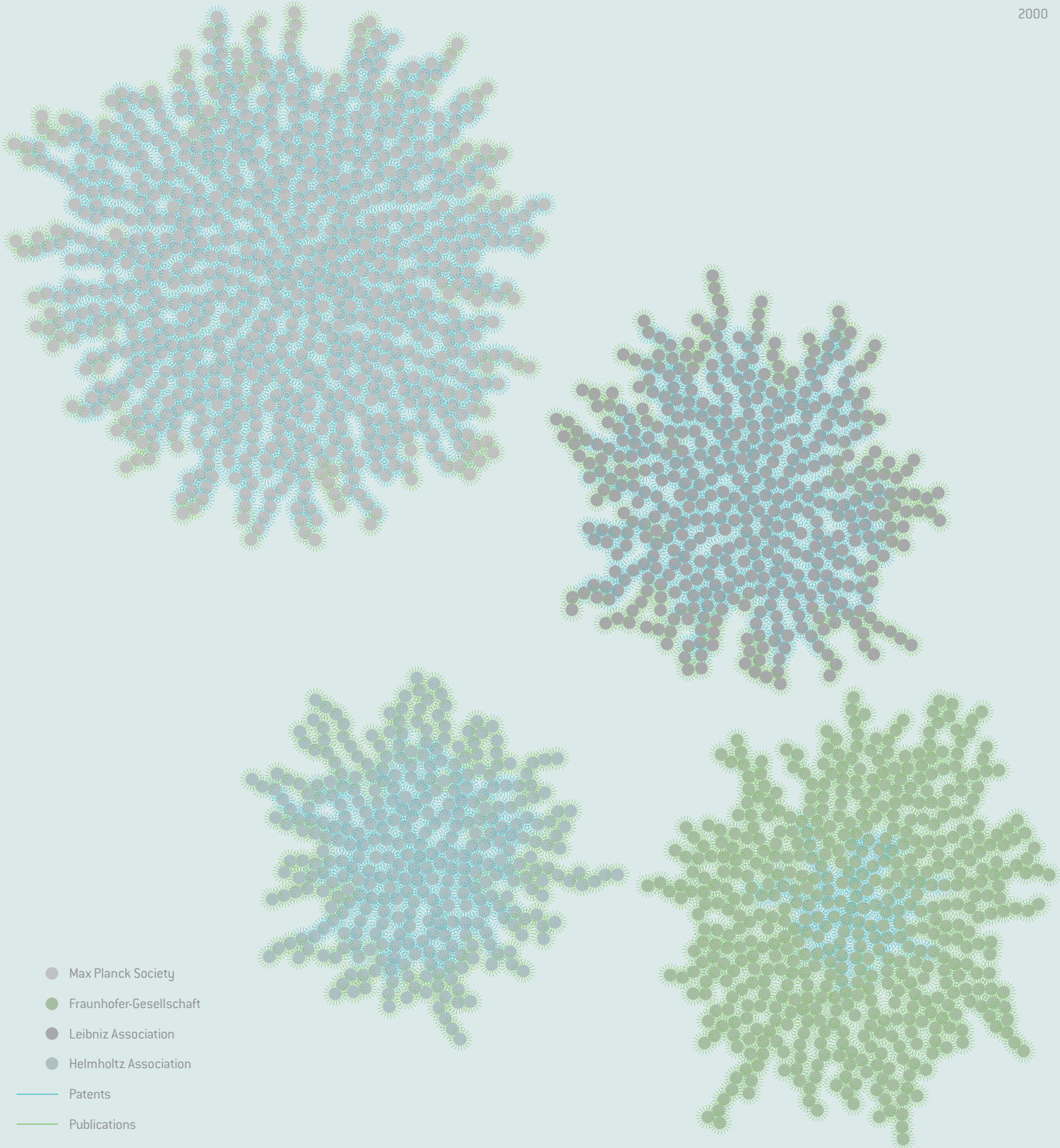
What are scenarios good for?

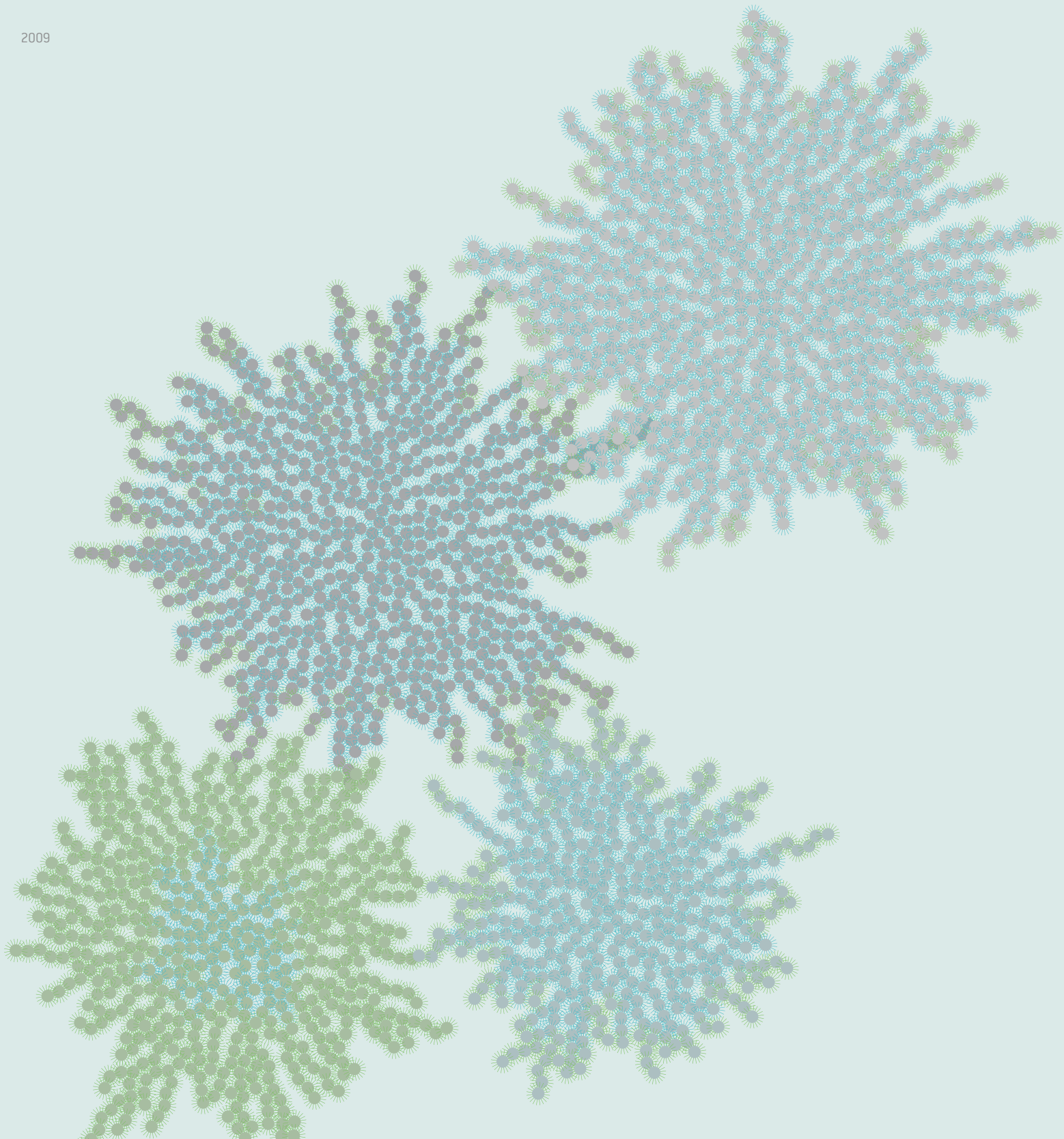
Practical measures can be drawn up against the backdrop of these created visions of the future. To get a head start on the competition, some of them often have to be tackled right away. Armed with the knowledge about future needs, the strategies applied so far can already be assessed today and new ones developed in good time.



PATENTS AND PUBLICATIONS OF GERMAN RESEARCH INSTITUTES

2000







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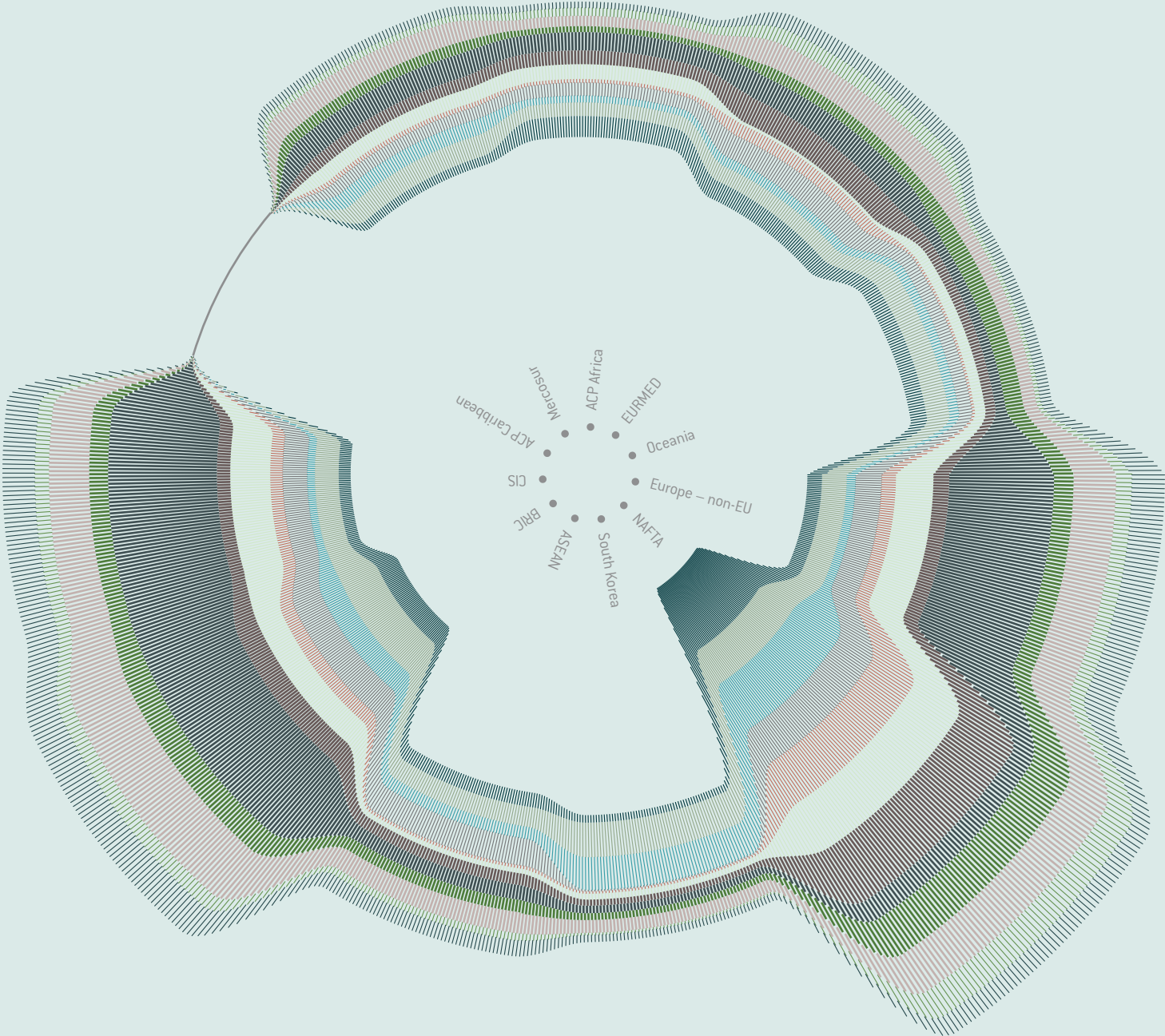
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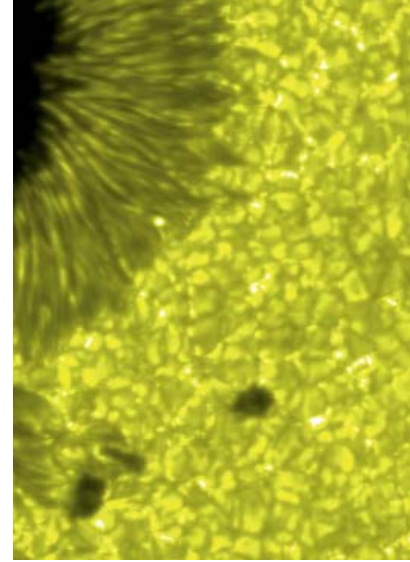
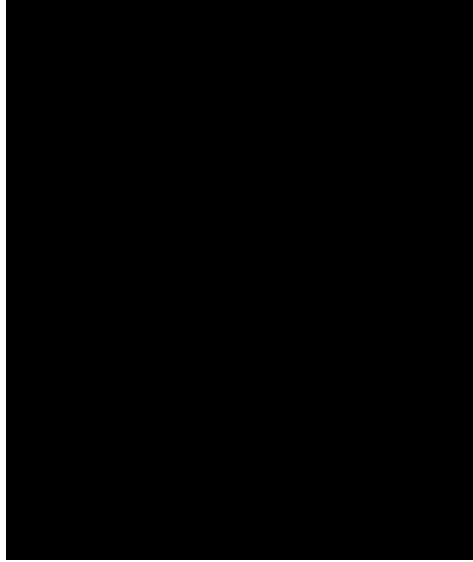
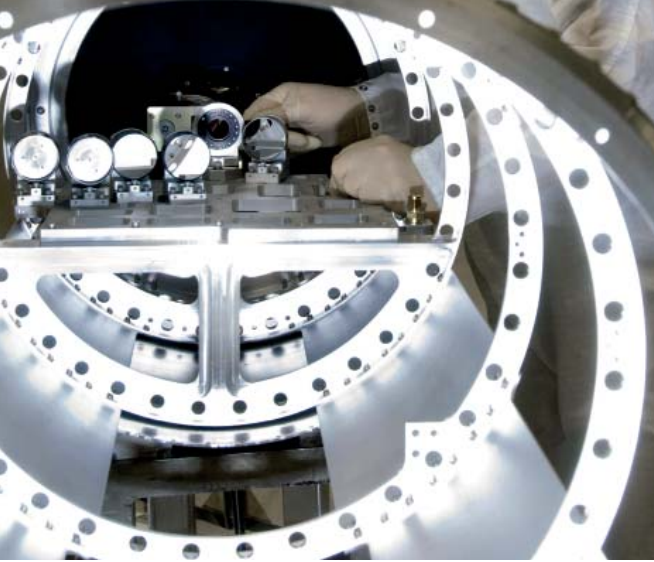
NON-TARIFF TRADE BARRIERS OF
TWELVE INNOVATIVE EU COUNTRIES WITH DIFFERENT REGIONS IN THE WORLD



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LONG-TERM PLANNING FOR EFFICIENT AND SUSTAINABLE ENERGY USE

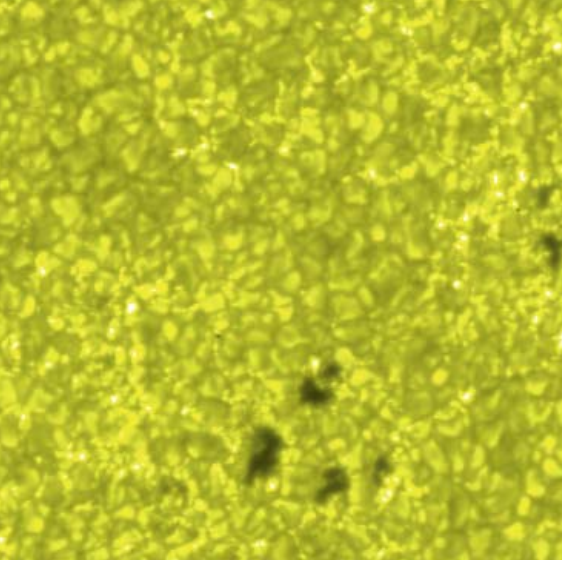
CC ENERGY POLICY AND ENERGY SYSTEMS

The Competence Center Energy Policy and Energy Systems conducts research on approaches to a sustainable energy system. It examines development paths for future technologies, makes predictions of demand and emissions, identifies the potentials of CO₂ reduction measures and analyzes markets for energy sources, energy products and technologies and energy services. The researchers develop and evaluate measures and instruments for the diffusion of sustainable technologies and examine their impacts on employment, income, economic structures and the environment. In this way, they support policymakers and companies in implementing measures which help to diffuse energy-efficient and renewable technologies and offer them advice when setting priorities for research and development. This also contributes to improving their competitive position in the energy sector.

The most recent scientific insights indicate that climate change is proceeding faster than was feared so far. The Business Unit Energy and Climate Policy develops and evaluates instruments and measures to mitigate the greenhouse effect. For the Federal Environment Agency, the researchers analyzed the ecological and economic impacts of the voluntary emission reduction commitments announced by industrialized and developing countries after the Climate Conference in Copenhagen. The study shows that the costs of these commitments amount to a maximum 0.25 percent of the world economic output if emission allowances are allowed to be traded unlimitedly across countries. Regions like the EU whose production processes are associated with relatively low emissions can even register small gains in GDP (compared to baseline development). However, these voluntary commitments as a whole are not sufficient to go down the emission pathway towards the “two degree target”.

Renewable energies make an important contribution to climate protection, the security of supply and competitiveness. The scientists in the Business Unit Renewable Energies document the costs, benefits and potentials of these energy sources, develop and evaluate policy instruments to pro-

Climate change is proceeding even faster than feared. The scientists are developing and evaluating instruments and measures to mitigate greenhouse gas effects.



mote them effectively and efficiently and offer support to decision-makers in setting priorities for research and development. As part of the experience report on the Renewable Energy Act prepared by the German government, the main reforms supporting renewable energies in the power sector were examined and design elements were proposed for their improved market and system integration. On behalf of the European Commission, the implementation of the Renewable Energy Directive was closely monitored and innovative support policies and financing instruments were put forward for this sector.

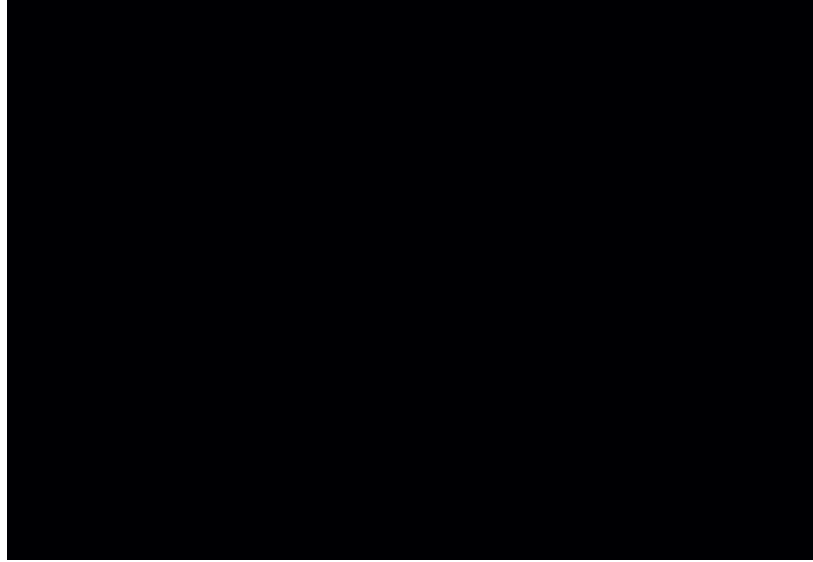
The members of the Business Unit Energy Efficiency analyze technologies and measures to improve energy efficiency and derive strategies for companies and political decision-makers. They evaluate the costs and benefits of efficiency technologies and identify indicators of efficient energy use. Among other things, they are monitoring the implementation of important EU directives to promote energy efficiency and are helping to prepare the EU's new action plan for energy efficiency. At national level, research is focusing on the energy efficiency measures of the German government's Integrated Energy and Climate Programme, its National Climate Initiative and its new energy concept.

The Business Unit Energy Economy develops scenarios and models of future energy demand and supply. For example, researchers compile electricity forecasts for the next 20 years for leading European energy suppliers. These are important to be able to adapt power stations and grids to future electricity demand in the long term. Research is also conducted on electricity storage options for balancing fluctuating renewable energy sources as well as on new energy carriers, such as hydrogen and electricity for sustainable mobility services.

As part of Fraunhofer's System Research on Electric Mobility, the Fraunhofer ISI is in charge of the research area "Focus on Technical System Integration and Social Policy Issues" and is concerned with the various aspects of electric mobility. Among other things, it examines which innovative transport concepts can be developed for both private motorized passenger transport and for inner-city delivery services. Customer acceptance is a critical factor here for the market success of electric mobility. The environmental benefits are an important driver of this new technology; these include the reduction of greenhouse gases, lowering particulates and less noise pollution. However, a global boom in electric mobility would also result in risks relating to the supply of rare metals for batteries and power electronics; here, possible bottlenecks and substitution strategies are identified. Since the transition from combustion engines to electric motors will affect the established structures in the automotive supplier and manufacturing industries, another work package investigates how the industry can prime itself for changing value chains in international competition.

Electricity forecasts are essential for energy providers, in order to adapt the power stations and grids in the long term, so that they can meet future electricity demand.

Head: Dr. Harald Bradke, phone +49 721 6809-153, harald.bradke@isi.fraunhofer.de



SUCCESSFUL INDUSTRY-SCIENCE COOPERATIONS

CC INDUSTRY AND SERVICE INNOVATIONS

The Competence Center Industry and Service Innovations identifies and evaluates innovation potentials in the areas processes, products, organization, services and service-based business models. The survey "Modernization of Production", which has been analyzing the innovation trends of manufacturing industry in these fields for more than 15 years, is vital in this context. This database and comprehensive knowledge about essential future trends in the manufacturing industry offer an ideal basis for scientifically sound and practise-oriented decision-making support in industrial innovation issues. Based on this, the scientists develop sustainable strategies for enterprises, associations and policymakers which have the potential to further safeguard attractive value added in high-wage locations like Germany or Europe.

A first example for this is the collaborative project "Systematic exploitation of service markets abroad" conducted by the Business Unit Industrial Services. The developed guidelines show firms how they can recognize and harness the economic potentials of possible services related to their products. This also includes transferring them into economic business models and strategies for market protection and development. The manual offers, for example, besides a guide to action, also appropriate instruments such as appraisal schemes with which companies can expand their knowledge of this strategic issue. This reduces the uncertainty for firms as to whether and how they should expand their service offer in markets abroad. The guideline assists enterprises in strategic decision-making; they have a greater knowledge basis at their disposal.

In collaboration with scientific institutions, industrial firms can recognize and harness the economic potentials of possible services.

The project HyWert of the Business Unit Sustainable Production Systems and Location Management points out opportunities for sustainable development based on new hybrid value-added concepts. In manufacturing, an increasing number of so-called "hybrid products" are on offer, which consist of a package containing goods and services. The advantage for the customers: favorable solutions to reduce life cycle costs. Examples for this are "availability guarantees" or "pay-on-production"



concepts. On the whole, however, only a quarter of the client firms take advantage of hybrid products today. The analysis by Fraunhofer ISI shows that firms that apply procedures to evaluate the life cycle costs of their investments utilize hybrid products three times more frequently than companies which do not make use of these methods. Due to rising costs during the utilization phase of goods, for instance, for materials and energy, it is to be expected that life cycle cost assessments will be of greater relevance in the future and, as a result, hybrid products will also be in greater demand.

A further important topic in the Business Unit Technical and Organizational Process Innovations is the "Adaptability of industrial value-added chains". The recently overcome economic crisis has clearly shown that many industrial firms are faced with ever more rapidly changing customer specifications. As a result, they have developed very high fixed-cost production structures, in order to create short-term scope for flexibility. An increase in structural "adaptability" without the additional burden of these high fixed costs could be a solution. The objective of the collaborative project DyWaMed is therefore to develop a simulation-based method to dynamically evaluate and control the adaptability of integrated value-added chains, with the innovative branch of medical technology as an example. Specific design fields are, besides "measurement methods" for flexibility and adaptability, in particular also aspects of location management and the issue of "early recognition" of drivers of change.

The growth and employment potentials of non-research-intensive industrial companies are of great significance for the value-added and employment situation in Germany. But up to now they have played a subordinate role in economic and innovation policy. There are important reasons to change this: The strong domestic orientation of non-research-intensive industrial firms offers the chance of creating more jobs with promotional measures than in research-intensive sectors. In addition, non-research-intensive firms are one of the last sectors which offer a relatively large number of attractively paid manufacturing jobs for low qualified workers. In addition to labor market policy, innovation and technology policy are also called for: In order to strengthen the competitiveness of non-research-intensive firms, it makes sense to stimulate not only research and development, but also innovation activities in general. Although many firms undertake few R&D activities, they still have specific strengths, particularly in the field of process innovations. In this case, support in planning and marketing own innovations, as well as in honing the absorptive capacity for external (technological) developments and concepts would be important.

Many enterprises have high fixed-cost production structures to create scope for more flexible production in the short term; one solution is to increase versatility.

Head: Dr. Steffen Kinkel, phone +49 721 6809-311, steffen.kinkel@isi.fraunhofer.de



FORWARD-LOOKING CONSULTING FOR POLICYMAKERS AND ENTERPRISES

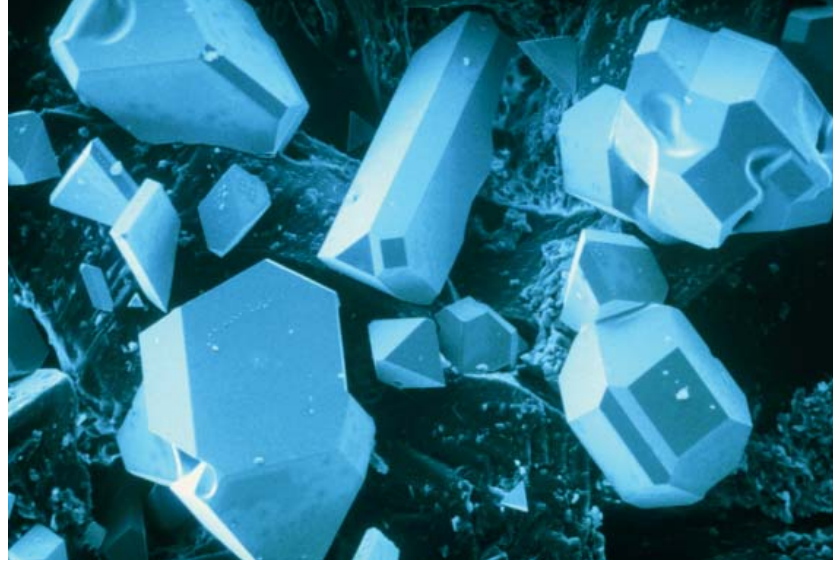
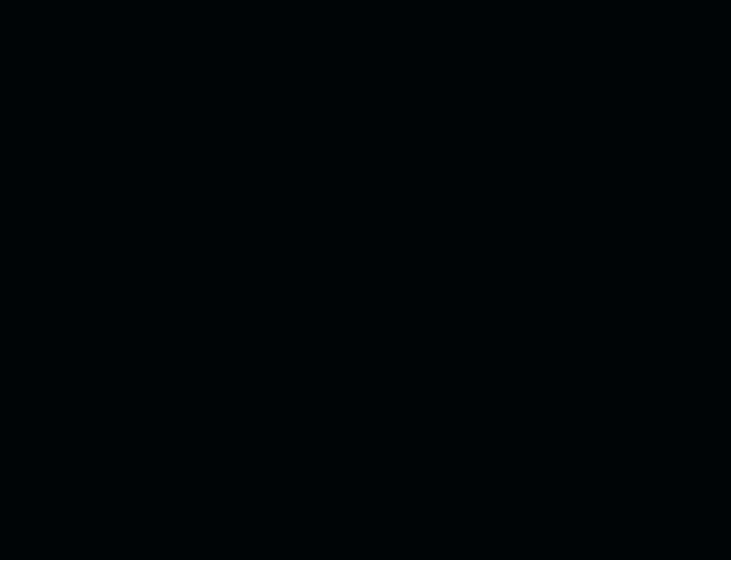
CC INNOVATION AND TECHNOLOGY MANAGEMENT AND FORESIGHT

The constant interplay of changes in society, industry and technology is accompanied by ever new challenges. The Competence Center Innovation and Technology Management and Foresight is dedicated to the development of methods that enable its clients to understand these changes and unlock the associated opportunities. The researchers develop future-oriented strategies for decision-makers in industry, policy and NGOs. To this end they deploy a sophisticated set of methods such as scenario analysis, Delphi surveys, multi-criteria assessment and technology roadmapping.

In order to develop viable strategies and make sound decisions, companies, public organizations and policymakers need to understand possible future challenges. The researchers of the Business Unit Futures Research and Foresight support their clients in exploring emerging opportunities and threats and in dealing with uncertainties and complexity. For this purpose they design tailored Foresight processes that underpin future-oriented decision-making and enhance the agility of the client's organization. As a follow-up of the successful BMBF Foresight Process, a tracking system was installed, which monitors the changes in the research and innovation landscape resulting from the Foresight process. The findings will support the embedding of the Foresight results into the Ministry's strategic processes and thereby underpin a consistent and long-term-oriented research and innovation policy.

The BMBF has installed a tracking system, which monitors the view into the future, thus supporting consistent and long-term research policy.

In the Business Unit Management of Innovations and Technologies, methods are developed with which the ever more complex and faster moving innovation system can be harnessed and utilized. In order to have success with innovations, forward thinking and technological competence are essential. For energy providers, the scientists draw up scenario-based roadmaps for the way towards a future energy supply, among others, for the system elements: smart grid, smart home, as well as storage and output management, focused on a planning horizon of the next 20 years. In



chaired workshops, possible futures in the form of scenarios as well as robust paths as roadmaps are developed and visualized, together with the employees.

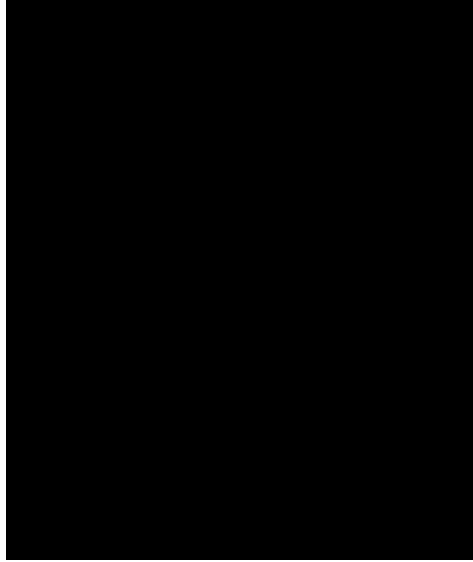
Many innovations are possible only with the appropriate materials. The scientists in the Business Unit Strategies for Material Technologies develop strategies for new possible applications for well-known materials and research innovative materials. For instance, the scientists chaired a pre-start-up consulting process of the research network “Gas chrome facades”, and on the basis of this dialog developed a product roadmap and marketing strategy for gas chrome facades. They can considerably reduce the heating and cooling requirements for buildings and can thus potentially contribute towards the ecological and economical operation of buildings.

Recognizing and analyzing future innovation patterns is an essential research task of the Competence Center Innovation and Technology Management and Foresight. In the project “Innovation Futures” (INFU), which is financed by the European Commission, the research team identified numerous signals of change in innovation patterns and further developed them into fictive future images. These images were assessed and enriched in a prospective dialog with innovation actors around the world through interviews and an image-based online survey. On the basis of the outcomes, broader scenarios of possible future innovation landscapes were generated. These scenarios are now debated and assessed in workshops with stakeholders. In a next step, recommendations for actors from policy, industry and society on how to tap into the potentials of new innovation paradigms will be elaborated. With this approach, which is open to analytical and imaginative elements, the INFU research team aims to include a wide range of diverse ideas and perspectives and to generate relevant insights about the change in innovation for all participants and target groups.

Merging fictional visions of the future with real-life conditions leads to scenarios which delineate the possible innovation landscapes of the future.

Head: Professor Marion A. Weissenberger-Eibl, phone +49 721 6809-201, weissenberger-eibl@isi.fraunhofer.de

since 01.02.2011: Dr. Anette Kübler, phone +49 721 6809-390, anette.kuebler@isi.fraunhofer.de



USING VALUABLE RESOURCES SUSTAINABLY

CC SUSTAINABILITY AND INFRASTRUCTURE SYSTEMS

Innovations are necessary at the level of technologies, policies and companies in order to conserve finite natural resources and avoid pollutant emissions. These ecofriendly developments offer economic opportunities in industrialized and developing countries as well as emerging economies. Through its research, the Competence Center Sustainability and Infrastructure Systems adds to the knowledge about the required innovation processes so that policymakers and companies are able to make decisions in terms of sustainability. To do so, the scientists examine the ecological, economic, political and social aspects of sustainable developments and devise solutions for careful and efficient resource use.

Water infrastructure systems are facing many challenges due to climate change, demographic changes and ecological requirements. Technical, organizational, legal and political measures are needed, so that they can be designed in a way which is both flexible and environmentally-friendly to a high degree. The Business Unit Water Resources Management develops and assesses new water infrastructure systems and monitors innovative approaches. The project "Adapting wastewater infrastructure to demographic change", funded by the Federal Ministry for the Environment and the Federal Environment Agency, describes the impacts of demographic changes and the subsequent associated challenges. Based on this, the scientists have developed technical and organizational adaptation measures as well as strategic considerations for implementing innovative system concepts.

Technical, organizational, legal and political measures are required to design water infrastructure systems which are highly flexible and environmentally-friendly.

Sustainable environmental protection is frequently done by integrating this into processes, products and systems and its influence on politics and industry is growing. The scientists in the Business Unit Sustainability Innovation and Policy investigate how sustainable emerging technologies disseminate as well as what impacts they have and how competitive they are. With their cross-cutting expertise, the researchers here are also responsible for assessing the scientific side of the selection procedure for the German Innovation Prize for Climate and the Environment (IKU), which was launched by



the Federal Ministry for the Environment and the Federation of German Industry. The quest here is for innovative technologies, techniques, methods and processes as well as products, services and business models which contribute to protecting the climate and the environment. The objective of the competition is to raise the visibility of Germany's pioneering role in the fields of climate, environmental and resource protection, as well as to strengthen and honor the commitment of German industry in these fields.

High-performance transport systems are indispensable for the economy and society, but the high volumes of traffic also harbor risks to the climate and the environment. In this field of potential conflict, the researchers of the Business Unit Transportation Systems are developing national and European concepts and instruments which, on the one hand, guarantee a high degree of mobility and, on the other hand, limit the risks involved. The studies offer guidance and orientation to transport sector companies. Moving in the direction of innovations to reduce greenhouse gas emissions is becoming increasingly important. The transport innovation system in Europe is being investigated as part of the project "GHG-TransPoRD" for the EU Commission. The objective is to propose realistic reduction targets for the transport sector as a whole as well as for individual transport areas up to 2020 and 2050. These targets are based on an analysis of what is economically and technically feasible and which policy measures are potentially practicable, as well as considering possible behavioral changes. The scientists want to support the EU in strategically aligning research and transport policy in a relevant way.

The Business Unit Systemic Risks is concerned with identifying systemic risks to modern society. The interlinkages of economic, technical and ecological systems mean higher risks for infrastructure systems and the supply of raw materials. The scientists are working on ways of designing these systems to make them less vulnerable to natural disasters, crises or supply shortages. One example for this is the successful "Implementation of a method to evaluate critical, non-energy resources". For this project, which was supported by the EU Raw Materials Initiative, a method was further developed to assess the economic importance of raw materials for European industries and their supply risks. Of the 41 raw materials examined, 14 were classified as critical. In order to prevent supply shortages, the scientists recommend politically pushing the research of new raw material sources, efficient recycling and substitution, among other things, as well as supporting the stability of mining regions.

Research should be promoted in the areas of new sources for raw materials, efficient recycling and substituting materials, so that no bottlenecks occur in the supply of critical raw materials.

Head: Dr. Rainer Walz, phone +49 721 6809-236, rainer.walz@isi.fraunhofer.de



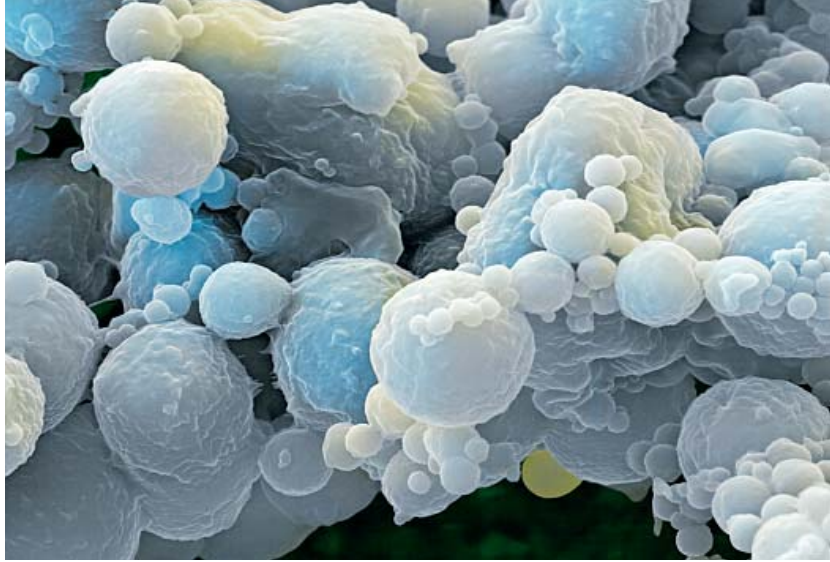
RESEARCH FOR BETTER LIVING CONDITIONS

CC EMERGING TECHNOLOGIES

Innovative technologies emerge under different conditions and spread in many different ways. In addition, many innovations influence how other technologies develop. The Competence Center Emerging Technologies investigates current and future developments in this area. The scientists analyze the scientific and economic potentials of technologies, assess their possible uses and identify which economic, ecological and social impacts they have. This also includes analyzing the societal and political framework conditions for the development and utilization of new technologies.

The researchers in the Business Unit Biotechnology and Life Sciences indicate to policymakers possibilities to exert influence in the fields of medicine, agriculture, food production, industrial production, energy conversion and environmental protection. For the Federal Ministry of Economics and Technology (BMWi), they analyzed which actions are required as a result of the Lead Market Initiative (LMI) of the EU Commission for bio-based products. Bio-based products are, for example, bio-plastics, bio-lubricants and specialty chemicals which are produced from biomass by means of (bio-) technological processes. The LMI, launched in 2007, should contribute towards promoting the potential of these products and make them more competitive. One of the most important recommendations is to supplement the already well developed support for research and development (R&D) by promoting the transfer of research results into practical application and the commercialization of bio-based products. This requires the intensive integration of small and medium-sized enterprises (SMEs). Fraunhofer ISI recommended improving the funding options by establishing a new, so-called "commercialization fund". In order to accelerate market penetration, on the one hand, the users should be more strongly integrated; on the other hand, international marketing should be promoted. Germany should strongly support the international efforts in favor of standardization, certification and labeling of bio-based products, in order to provide the mostly international actors with uniform framework conditions.

In order to make bio-based products more competitive, the transfer of research results into practical utilization and commercialization should be promoted.

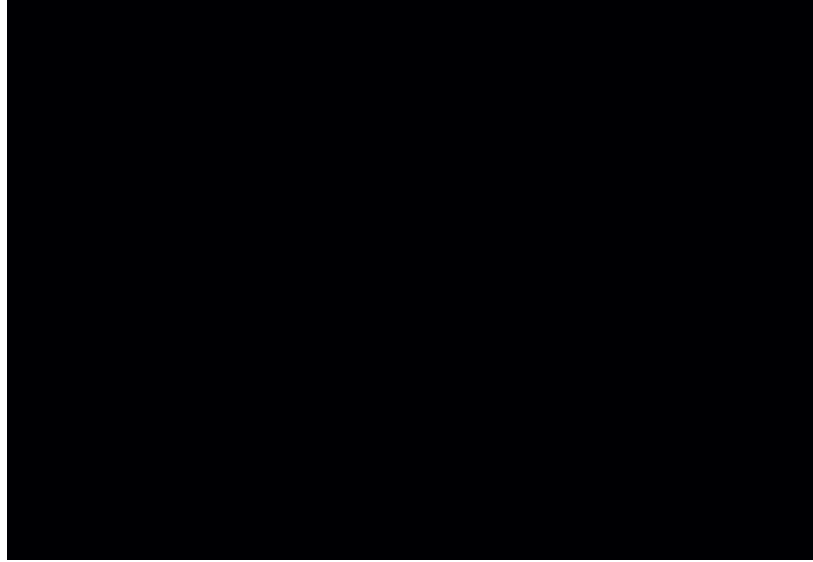


In the Business Unit Information and Communication Technologies, IT-based innovations and new media are investigated and proposals for changes in political, economic and legal conditions put forward. In the advisory project STOA E-Democracy, the researchers examine how the internet can contribute towards creating a specifically European public, on behalf of the European Parliament. Among other aspects, they show how the awareness for European politics can be raised through internet-based citizen participation, e-petitions or internet-supported political campaigns. In addition, the project investigates the possibilities of internet voting. The study “Software industry in Germany” provides an up-to-date overview of the situation of the national software and IT service branch and signals its significance for the German economy, comparing it with other branches and international competitors.

The health system is confronted with major challenges in view of demographic change, medical progress and the necessity to limit costs. In the Business Unit Innovations in the Health System, the scientists point out to politicians how the health system can be better adapted to (demographic) change, for instance, in the area of medical technology. In the report for the German Bundestag “Innovations in medical technology – Challenges for research, health care and economic policy”, the researchers analyzed whether the interaction between the ministries responsible for research, industry and health could be improved, so that the innovative and knowledge-intensive medical technology branch can continue to grow and survive in the face of stiff international competition, and so that patients should also have access to innovative, affordable medical devices. One result is that the coordination between the ministries should be further intensified, for example, through a coordinating body which improves the inter-ministerial coordination of decisions and measures. At the same time, it is important to develop the regulatory framework further and to introduce a systematic Foresight process for this purpose. It can help to identify regulatory- and standardization-related aspects in medical technology-relevant research and technology fields in good time. This will enable a more rapid adaptation of the existing set of rules, and will contribute to a situation where enterprises, the medical health care system and patients can benefit better and faster from innovations in medical technology.

In order to promote medical technology, coordination among the ministries should be intensified, for example via a coordinating authority.

Head: Dr. Thomas Reiss, phone +49 721 6809-160, thomas.reiss@isi.fraunhofer.de



STRATEGIES AND INSTRUMENTS FOR INNOVATIVE RESEARCH SYSTEMS

CC POLICY AND REGIONS

With the help of policy advice, political decision-making processes can be designed more systematically and more rationally justified. To arrive at scientifically-based policy advice, the Competence Center Policy and Regions investigates supranational, national and also regional research and innovation systems. In this context, the scientists analyze various players, instruments and strategies in industry, science and the state which produce science and technological innovations. In addition, they explore and develop existing and new promotional instruments and programs, which provide the theoretical and methodological approaches to generate strategic knowledge. Qualitative and quantitative scientific methods which are applied by the Competence Center comprise surveys, discursive procedures, document analyses, peer groups, patent and publication analyses.

The Business Unit Policy and Evaluation primarily analyzes, evaluates and develops strategies and policy measures. The scientists advise German and foreign ministries, funding organizations as well as the European Commission. For instance, in the project "INNO GRIPS", they are participating in a series of studies for the European Commission about driving and hindering forces for innovations. Here, for the first time, the correlation between innovation and the internationalization of small and medium-sized enterprises in the entire EU is being analyzed. The researchers discovered that innovative companies are more likely to export their products than non-innovative ones and that exports have positive impacts on innovation behavior. Therefore they recommend promoting internationalization and innovation with policy measures and dismantling barriers to innovation, for example by means of a uniform financing, the introduction of reliable standards and support for participating in research networks.

The researchers in the Business Unit Regions and Clusters measure, record and evaluate the structures and dynamics of regional innovation systems as well as technology clusters. On behalf of the European Commission, they systematically collated all regional innovation policy measures and

Innovative enterprises are much more likely to export their products than non-innovative ones, while export has additional, positive impacts on innovation behavior.



strategies in the EU, in the “Regional Innovation Monitor”. With the aid of a newly developed online tool, actors from politics and administration will be in a position to compare innovation policy approaches, trends and results in all European regions and take them into consideration in the sense of a knowledge management system when developing and implementing own measures.

In the study “Automotive suppliers at a dead end?” commissioned by the Chamber of Industry and Commerce of the Stuttgart region and the Economic Development Region Stuttgart GmbH, the scientists analyze perspectives and strategies for the future development of automobile suppliers in Baden-Württemberg, against the background of the diffusion of new drive technologies. The basis for the analysis of their technological performance and the upcoming activities is the assessment of patent applications at the European Patent Office.

In the Business Unit Innovation Indicators, quantitative economic and social-science methods are developed and applied. These are utilized to describe and analyze innovation systems as well as assess their competitiveness and enable the innovation potentials, technological performance and future technological development to be estimated. The Deutsche Telekom Stiftung and the Confederation of German Industry have commissioned Fraunhofer ISI, the Centre for European Economic Research and the Maastricht Economic and Social Research and Training Centre on Innovation and Technology to prepare the annually appearing innovation indicator. This examines Germany's innovative capability compared with worldwide leading industrialized nations by means of a country ranking. In the study, many different indicators are combined for an overall evaluation, one focus is education as a crucial pre-condition for the innovative capacity of national economies.

Education is the key requirement for the innovative capacity of national economies.

In the project “Regional network participation and its impacts on the internal governance structures of universities”, current political discussions about the role of universities in the national and regional innovation system are taken up on behalf of the BMBF. The objective is to examine the effects of the increasingly regional networking and integration on the internal strategic coordination and strategy-building processes, taking German universities and universities of applied science as examples. To this end, the regional cooperation behavior of HEIs and the impacts of regional commitment on internal coordination processes is determined and the findings consolidated by means of case studies.

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

WORLDWIDE PATENT SHARE OF NANO-FIELDS

COUNTRIES: RUS, FRA, GBR, ITA, ESP, NLD, SWE, BEL, CHE, USA, JPN, KOR, CHN, IND, CAN, AUS, SGP



ACADEMIC TEACHING

ACADEMIC TEACHING

Sabine Biege

Lecture
Innovationsmanagement und Service Engineering
Duale Hochschule Baden-Württemberg Mannheim

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

Lecture
Methoden der Zukunftsforschung: Delphi
Freie Universität Berlin

Seminar
Methoden der Zukunftsforschung
Freie Universität Berlin

Ewa Dönitz

Seminar
Innovationsmanagement
Femtec Berlin

Seminar
Projektmanagement
Femtec Berlin

Rainer Frietsch

IPM-ISI joint Summer School
The Value of Patents
IPM Beijing, China

IPM-ISI joint Summer School
Internationalisation of S&T policy
IPM Beijing, China

Series of lectures
Patente als Innovationsindikator
University of Kassel

Ralf Isenmann

Lecture and Seminar
Sustainable Development and Industrial Ecology
Universidad "Marta Abreu"
Las Villas, Santa Clara, Cuba

Lecture and Seminar
Roadmapping, Innovation, Strategie und Struktur
University of Kassel

Fachwissenschaftliche Vertiefung Systementwicklung und Innovationsmanagement
Vertiefendes Projektmanagement
University of Bremen

Seminar
Technologie-Roadmapping-Management
University of Bremen

Eberhard Jochem

Lecture
Environmental impacts of energy conversion and use
ETH Zurich, Switzerland

Lecture
Technological solutions against climate change
ETH Zurich, Switzerland

Steffen Kinkel

Lecture and Seminar
Offshoring und Innovation
Universität Hohenheim

Daniel Jeffrey Koch

Lecture
Dezentrales Wissensmanagement (DZWM)
University of Kassel

Seminar
Unternehmensnetzwerke
University of Kassel

Knut Koschatzky

Seminar Angewandte Wirtschaftsgeographie
Innovationssysteme und deren politische Gestaltung im interregionalen und internationalen Vergleich
Universität Hannover

Seminar Angewandte Wirtschaftsgeographie
Wissens- und Technologietransfer zwischen globalen Herausforderungen und regionalen Perspektiven
Universität Hannover

Seminar Angewandte Wirtschaftsgeographie
Neue ökonomische Geographie im globalen Kontext
Universität Hannover

Ralf Lindner

Workshop
Politikberatung in der Forschungs-, Technologie- und Innovationspolitik
Geschwister-Scholl-Institut, LMU Munich

Carolyn Michels

Tutorial Wissensmanagement
Karlsruhe Institute of Technology

Seminar
AI for Decision Making and Game Playing Computers
Karlsruhe Institute of Technology

Peter Neuhäusler

Tutorial Management neuer Technologien
Technikbewertung mit Patentanalysen
Karlsruhe Institute of Technology

Katrin Ostertag

Socio-economic aspects of development planning
Karlsruhe Institute of Technology

Mario Ragwitz

Seminar
Erneuerbare Energien in Europa
University of Freiburg

Thomas Reiss

Lecture
Management neuer Technologien
Karlsruhe Institute of Technology

Clemens Rohde

Lectureship
Modul "Planung, Bau und Betrieb von Abfallbehandlungsanlagen"
Technische Universität Darmstadt

Joachim Schleich

Associate Adjunct Professor
Energiemanagement
Virginia Polytechnic Institute
Blacksburg University, USA

Open University course
Internationale Klimapolitik
University of Koblenz-Landau

Open University course
Planspiel Emissionshandel
University of Koblenz-Landau

Ulrich Schmoch

Lecture
Soziale Strukturen in der Wissenschaft
Karlsruhe Institute of Technology

Lecture in the series "Probleme und Ergebnisse der Wissenschaftsorganisation und des Wissenschaftsmanagements"
Hochschulforschung und Industrieforschung in Deutschland,
German University of Administrative Sciences Speyer

Torben Schubert

Lecture
Innovation Economics
Technische Universität Berlin

Rainer Walz

Lecture
Umwelt- und Ressourcenpolitik
Karlsruhe Institute of Technology

Lecture
Umweltökonomik und Nachhaltigkeit
Karlsruhe Institute of Technology

Marion Weissenberger-Eibl

Lecture
Unternehmensnetzwerke im Spannungsfeld von Hierarchie und Markt
University of Kassel

Seminar
Unternehmensnetzwerke und Innovation
University of Kassel

Lecture
Innovationsmanagement: Konzeption und Methoden
University of Kassel

Seminar
Innovationsmanagement – Erfolgsfaktor in Wissenschaft und Unternehmenspraxis
University of Kassel

Case study seminar
Fallstudien des Innovationsmanagement
University of Kassel

ACADEMIC TEACHING | DISSERTATIONS | PRESENTATIONS

Lecture
Wissensmanagement im Unternehmen – Strategie, Konzepte und Methoden
University of Kassel

Seminar
Wissens- und Innovationsmanagement – Erfolgsfaktor in Wissenschaft und Unternehmenspraxis
University of Kassel

Martin Wietschel
Lecture
Stoff- und Energiepolitik
Karlsruhe Institute of Technology

Seminar
Themenfelder Energie und Umwelt
Karlsruhe Institute of Technology

Lecture
Technologischer Wandel in der Energiewirtschaft
Karlsruhe Institute of Technology

Lecture
Quantitative Modelle zum Abbilden des technologischen Wandels am Beispiel Energieanwendungen
ETH Zurich, Switzerland

Peter Zoche
Soziologische Theorie
Goffmans Beitrag zur Analyse der Interaktion in Gruppen
University of Freiburg

DISSERTATIONS

Elisabeth Dütschke
Organisation im Paradox der Externalisierung – wie wirkt flexible Beschäftigung auf das Extra-Rollenverhalten?
Sabine Boerner / Werner Nienhüser
Universities of Konstanz / Duisburg-Essen

Anne Held
Modellierung des zukünftigen Ausbaus erneuerbarer Energien in Europa auf Basis eines agentenbasierten Modells
Wolf Fichtner
Karlsruhe Institute of Technology

Nicki Helfrich
Economic growth effects of innovations induced by climate protection policies
Werner Rothengatter
Karlsruhe Institute of Technology

Arne Lüllmann
Einfluss dezentraler Erzeugung und erneuerbarer Energien auf die Vulnerabilität des Stromübertragungsnetzes
Wolfgang Kröger
ETH Zurich, Switzerland

Julia Oberschmidt
Multidimensionale Bewertung von Technologien zur Erzeugung von Strom und Wärme
Jutta Geldermann / Otto Rentz
University of Göttingen / Karlsruhe Institute of Technology

Karoline Rogge
The innovation impact of the EU Emission Trading System: An empirical analysis of the power sector
Volker Hoffmann
ETH Zurich, Switzerland

Christoph Zanker
Planung und Steuerung von Produktionssystemen im Kontext der strategischen Unternehmensplanung
Martin K. Welge
TU Dortmund University, Department of Business Management

PRESENTATIONS EXAMPLES

Elisabeth Baier and Knut Koschatzky
The impact of regional institutional characteristics on the location of MNEs – a European perspective
Conference on Innovation and Institutional Embeddedness of Multinational Companies, Oldenburg

MNEs in regional innovation systems: How to achieve durable relationships. Results from a German case study

Joint Russian-German Summer School: Perspectives for Technological Development in Russia and Germany, Karlsruhe

Knowledge Angels – Seeking Creative People in KIBs
Workshop Managing Decisions in the Era of Creativity, Karlsruhe

Nadine Bethke and Peter Neuhausler
Experience and Use of Legal Status Information in Combination with PATSTAT
EPO Patent Statistics for Decision-Makers – Pre-Conference Workshop, Vienna, Austria

Sabine Biege
Product design for industrial services and product-service systems
RESER, 20th Anniversary Conference. The Resilience of the Global Service Economy, Gothenburg, Sweden

Early stage assessment of service-based business concepts
CIRP-IP2 Conference, Linköping, Sweden

Antje Bierwisch
Kooperative strategische Frühaufklärung auf Fachverbandsebene – Charakteristika, Chancen und Herausforderungen
6. Symposium für Vorausschau und Technologieplanung, Berlin

Antje Bierwisch and Benjamin Teufel
The Method of Roadmapping as a Futures Studies Method in the Field of Security – Application and Challenges
Security in Futures – Security in Change, Turku, Finland

Inga Boie
Renewable energy technologies in emerging countries – Chances for mitigation of CO₂ emissions & potential economic benefits
NCRE, 5th International Conference on Renewable Energy Investments, Santiago, Chile

Roadmap and action plan to develop a CSP local industry in MENA countries
Workshop on Concentrated Solar Power (CSP) Local Manufacturing in the Middle East and North Africa Region (MENA), Cairo, Egypt

Harald Bradke
Energieeffizienz in Industrie und Gewerbe vor dem Hintergrund langfristiger steigender Energiekosten
VDI-Fachtagung, Baden-Baden

Kostensenkung durch effizienten Energieeinsatz.
CxO Dialog Industrial Excellence, Berlin

Kostensenkung durch effizienten Energieeinsatz in der Produktion
Energieeffizienz in der Produktion
marcus evans, Düsseldorf

Barbara Breitschopf
Kosten- und Nutzenwirkungen des EE-Ausbaus
BMU – Fachressort-Tagung, Berlin

Kosten und Nutzenwirkungen des EE-Ausbaus
BASF Ludwigshafen: Diskussionsforum Erneuerbare Energien, Ludwigshafen

Susanne Bühler
Gender Chancen:
Im Team zum Erfolg
GSaME (Uni Stuttgart) "Gender Mainstreaming – Notwendigkeit und Chance für Wissenschaft und Wirtschaft", Stuttgart

Wir und die anderen – von der Bedeutung funktionierender Teams für Motivation und Leistung herausragender ForscherInnen
Statustagung "Fit in die Zukunft – Frauenkarrieren in Unternehmen" des BMBF-Förderprogramms "Frauen an die Spitze", Berlin

Daniela Buschak
Service-based business concepts: Diffusion and effects on customer companies in the German manufacturing industry
EUROMA Conference, Porto, Portugal

Assessment of the sustainability effects of product-service systems
CIRP-IP2 Conference, Linköping, Sweden

Theoretical deduction of value potentials of service-based business models
RESER Conference, Gothenburg, Sweden

Kerstin Cuhls
Der BMBF-Foresight-Prozess
Rat für Technologie Rheinland-Pfalz, Mainz

Was ist Foresight/ Vorausschau – Zukunftsforschung?
Citizens' conference Karlsruhe, Karlsruhe

Kerstin Cuhls and Amina Beyer-Kutzner
Trends in Wissenschaft & Technik: Ergebnisse aus dem BMBF-Foresight-Prozess

Jahrestagung Kompetenznetze,
BMWl, Berlin

Stephanie Daimer

Die Internationalisierung von
Forschung und Innovation
Workshop Herausforderungen und
Chancen der Innovationspolitik,
Berlin

Koalitionsbildung nach der
EU-Erweiterung: Eine Item-
Response-Modellierung der
EU-Dienstleistungsrichtlinie
Frühjahrstagung des AK Methoden
der DVPW, Hamburg

**Stephanie Daimer and
Thomas Stehnen**

Barriers to Internationalisation
INNO GRIPS Workshop Barriers to
growth and internationalisation
of EU's innovative companies,
Brussels, Belgium

David Dallinger et al.

Transportation policy and research
in Europe
Plug-In, San José, USA

Variable tariffs for demand re-
sponse with grid-connected electric
vehicles and their contribution to
integrate intermittent renewable
generation
2nd European Conference Smart
Grids and E-Mobility, Brussels,
Belgium

Tarif-basierte Steuerung von netz-
gekoppelten Elektrofahrzeugen zur
besseren Integration Erneuerbarer
Energien
Interessengemeinschaft Vehicle to
Grid, Bern, Switzerland

**Claus Doll, Elisabeth Dütschke
and Anja Peters**

Consumer and user preferences
towards electric mobility
12th World Conference of Trans-
port Research, Lisbon, Portugal

Elektromobilität: Marktbarrieren
und erfolgsversprechende Konzepte
mit Blick auf den Konsumenten
47. Kongress der Deutschen Gesell-
schaft für Psychologie, Bremen

Friedrich Dornbusch

Proposal for a PhD thesis on
Knowledge Transfers from
Universities to Industry
DIMETIC-Session – Regional and
Policy Dimensions of Innovation
and Grow, Pécs, Hungary

Beteiligungen an Ausgründungen
als Option innerhalb der Verwer-
tungsstrategien von Hochschulen
G-Forum Jahreskonferenz, Cologne

Elisabeth Dütschke

What drives local public accep-
tance – comparing two cases from
Germany.
GHGT-10, Amsterdam, Netherlands

Consumer Acceptance of Electric
Mobility
Clean Mobility Insights, Berlin

Zur Akzeptanz von Kohlendioxid-
Speichern in Deutschland – eine
vergleichende Fallstudie
Kongress der Deutschen Gesell-
schaft für Psychologie, Bremen

Tobias Fleiter

Electricity demand in the Euro-
pean service sector: A detailed
bottom-up estimate by sector and
by end-use
IEECB, Frankfurt a. M.

Michael Friedewald

Intelligent Transportation Systems
and Smart Vehicles
3rd International Conference on
Computers, Privacy and Data
Protection CDPD2010, Brussels,
Belgium

Privacy, Data Protection and Emer-
ging Sciences and Technologies:
Towards a Common Framework
IADIS International Conference ICT,
Society and Human Beings, Freiburg

Rainer Frietsch

The EPO paradox: increasing work
financed by a decreasing output
Conference, Vienna, Austria

Life Sciences – Indicator Based
Reporting on the Chinese Innova-
tion System 2010
Workshop German Chamber of
Commerce Beijing, Shanghai,
Guangzhou, China

Indicator based reporting on the
Chinese Innovation System 2010 –
Life Sciences in China
BMBF Workshop, Berlin

Carsten Gandenberger

Soziale Verantwortung in globalen
Wertschöpfungsketten – Fiktion
oder Wirklichkeit?
Forum Angewandte Wirtschafts-
sprachen der Bremen University of
Applied Sciences, Bremen

What can corporate strategists
learn from ecological economics?
International Society of Ecological
Economics Conference Olden-
burg & Bremen, Oldenburg

**Carsten Gandenberger and
Ralf Isenmann**

Von der Industrial Ecology Science
zum Industrial Ecology Manage-
ment – ein theoriegeleiteter Ansatz
Tagung der Kommission Nachhal-
tigkeitsmanagement des Verbandes
der Hochschullehrer für Betriebs-
wirtschaft, Kassel

Rolf Gausepohl

Identifikation und Analyse von
Innovationstreibern
Triebkräfte für Innovationen in der
Holzwirtschaft, Zukunftsforum-
Holz, Alpbach, Austria

Identifizierung von High-Risk-High-
Return Forschungsprojekten
Materials Science and Engineering,
Darmstadt

BMBF-Foresight-Prozess, Chancen
für technische Textilien
Innovationssymposium der Indus-
trievereinigung Chemiefaser e. V.
(IVC), Frankfurt a. M.

**Bruno Gransche and
Philine Warnke**

Zukunftsfähige Mensch-Maschine-
Teams – fehlt da noch was? Begrif-
fe, Diskurse und Disziplinen zu
"dichteren" Kooperationsformen
zwischen Mensch und Technik
ITAFORUM, Berlin

Die Forschungsperspektive Mensch-
Technik-Kooperation – Chance für
die Science and Technology Studies
(STS) in der deutschen Förderpolitik?
STS-Auftaktveranstaltung Reflexive
Praktiken – Was ist das Potential der
Science and Technology Studies?,
Frankfurt a. M.

Harald Hiessl

Urbane Wasserinfrastruktursys-
teme: Handlungsdrücke und
Beispiele innovativer Ansätze zum
Umgang mit Wasser.
Fachkommission Wasserwirtschaft
des Deutschen Städtetages, Mainz

Umgang mit Wasser in Industrie
und Gewerbe: Ansatzpunkte für
zukunftsfähige urbane Wasserinfra-
strukturkonzepte?
Hansgrohe Wasser Symposium,
Schiltach

Wirtschaftliche Möglichkeiten im
Spannungsfeld von zentraler und
dezentraler Abwasserbeseitigung,
DWA-Hauptausschuss Wirtschaft,
Berlin

Thomas Hillenbrand

Umsetzung des DEUS 21-Konzeptes
in Knittlingen: Rechtliche Aspekte
und Akzeptanz
DWA-Tagung: NASS-Tage –
Neuartige Sanitärsysteme – Neue
Wege zum Umgang mit Abwasser,
Weimar

Wassertarifgestaltung aus ökonomischer,
ökologischer und sozialer
Sicht
Konferenz Kommunales Infrastruk-
tur-Management, Berlin

Neuartige Sanitärsysteme – NASS
Jahresveranstaltung Cluster
Umwelttechnologien, NRW, Essen

Bärbel Hüsing

Individualisierte Medizin – was
kommt auf uns zu?
9. Cadenabbia-Gespräch Medizin –
Ethik – Recht der Konrad-Adenauer-
Stiftung "Medizin nach Maß:
Individualisierte Medizin – Wunsch
und Wirklichkeit", Cadenabbia,
Italy

Engaging the public in an early
debate: Stem cells, nano-medicine
and direct-to consumers genetic
testing
OECD workshop on Better health
through bio-medicine innovative
governance, Berlin

Technikentwicklung als zentrales
Zukunftsthema – Beispiele und
politische Perspektiven
Expertenworkshop der Bundes-
zentrale für politische Bildung: Die
Zukunft gestalten – Partizipative
Technikbewertung: eine Aufgabe
der politischen Bildung?, Bensberg

Ralf Isenmann

Modeling environmental informa-
tion relevant for industry in the
European information space
EnvirolInfo: Integration of environ-
mental information in Europe, Bonn

**Ralf Isenmann, Axel Thielmann
and Martin Wietschel**

Technologie-Roadmapping zur
Entwicklung von Lithium-Ionen-
Batterien
Fraunhofer-Forum Elektromobilität
e. V., Berlin

PRESENTATIONS

Eberhard Jochem

Die Bedeutung der Energieeffizienz in der Industrie

Symposium CO₂-Neutralität in industriellen Prozessen, Kassel

An analysis on the medium- to long-term policies needed to achieve the sustainability targets in industry
Efonet Workshop – Increasing energy efficiency in industrial processes, Berlin

Chancen der LEEN-Energieeffizienz-Netzwerke – Energiekosten beschleunigt reduzieren
BDI-Projektkreis Betriebliches Energiemanagement, Berlin

Steffen Kinkel

Outsourcing – ein Hebel zur Produktivität?
60 Jahre REFA Amberg, Amberg

Stärken der Produktion am Standort Deutschland – Lernen aus erfolgreichen und gescheiterten Verlagerungsentscheidungen
Business dialog Berlin, Berlin

Produktion kommt zurück! – Strategische Erfolgsfaktoren für Standortentscheidungen
Wertschöpfungstage, Munich

Oliver Kleine

Exploring anti counterfeiting strategies: Making the case for quantitative strategy evaluation and system dynamics
24th European Conference on Operations Research EURO, Lisbon, Portugal

Exploring anti counterfeiting strategies: A preliminary system dynamics framework for a quantitative counterstrategy evaluation
International Conference Operations Research "Mastering Complexity", Munich

Fabian Kley et al.

What is a Right-Sized PHEV?
Considering Users' Driving Profiles
2nd European Conference Smart Grids and E-Mobility, Brussels, Belgium

Assessment of Future EV Charging Infrastructure
International Advanced Mobility Forum, Geneva, Switzerland

E-Mobility in Germany – Current Activities and Future Businesses

Advanced Automotive Battery Conference, Mainz

Marian Klobasa

Market Potential of Demand Response Options for Wind Integration in Germany
9th International Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Power Plants, Québec, Canada

Integration of wind generation in future electricity markets
EU Commission, Workshop on Integrating wind in integrated markets, Brussels, Belgium

Perspektiven für den Strom- und Wärmemarkt 2030/2050
Workshop Verbraucherzentrale NRW: Planung und Einsatz von Mini-Blockheizkraftwerken im Wohnungsbau, Düsseldorf

Stefan Klug

Infrastructure costs and urban sprawl
12th World Conference of Transport Research (WCTR), Lisbon, Portugal

Future research perspectives in mobility and sustainable living spaces – Results of the German Foresight process
12th World Conference of Transport Research (WCTR), Lisbon, Portugal

Land use pattern and transport for a post carbon society
JSPS-Symposium Transport and Mobility – Challenges for the Future, Tokyo, Japan

Jonathan Köhler

Emissions Trading in Aviation
SWAFEA workshop, Munich

A TIS analysis of the automobile industry
ERSCP-EMSU2010 Conference, Delft, Netherlands

Comparing transition theory and Kondratiev waves
EASST Conference, Trento, Italy

Knut Koschatzky

Knowledge and technology transfer in innovation systems – experiences from Germany

Joint IPM-ISI Summer School, Beijing, China

The changing role of universities in the German research system: engagement in regional networks, clusters and beyond
VIII. Triple Helix Conference, Madrid, Spain

Grundlagen für Innovation – Möglichkeiten der Politik
Politischer Club Gießen der Friedrich-Ebert-Stiftung, Giessen

Michael Krail

The potential of alternative fuel cars for achieving CO₂ reduction targets in EU27
12th World Conference on Transport Research (WCTR), Lisbon, Portugal

System-based analysis of diffusion of alternative drive and fuels for trucks
12th World Conference on Transport Research (WCTR), Lisbon, Portugal

Technologies and incentives to reduce CO₂ emissions from passenger cars
Berlin Seminar in Energy and Climate (BSEC), Berlin

Henning Kroll

The global economic crisis as leverage for emerging regional growth paths in China: a comparison of the Pearl River Delta and the Yangtze River Delta
Global Economic Recovery: The Role of China and Other Emerging Economies: Chinese Economic Association, Oxford, Great Britain

International Experiences with Innovation Policy Governance
Joint Workshop on Research Report about the Bohai Bay Regional Innovation System, BJASt & Fraunhofer ISI, Beijing, China

Marianne Kulicke

Evaluierung des Programmstarts und der Durchführung des Zentralen Innovationsprogramms Mittelstand (ZIM)
9. ZIM-NEMO-Jahrestagung, Berlin

Thesen zu einer effizienten öffentlichen Innovationsfinanzierungslandschaft
EFRE-Forum "Innovationsfinanzie-

rung" Wagnis- und Beteiligungskapital, Dresden

Evaluationstypen und Evaluationsmethoden – ein Überblick
DeGEVAL Jahrestagung, Luxembourg, Luxembourg

Timo Leimbach

Assessing national policies in support of software
EuroCPR, Brussels, Belgium

Entwicklung des internationalen Software- und IT-Dienstleistungsmarktes
Wiener Gespräche, Vienna, Austria

Christian Lerch

Servitization in German manufacturing industries
BestServ Forum, Espoo, Finland

Dynamics of business models
International Conference System Dynamics Society, Seoul, South Korea

Ralf Lindner

Broadening Participation through E-Petitions?
Internet, Politics, Policy 2010: An Impact Assessment, Oxford, Great Britain

Social Networking Tools Supporting Constructive Involvement throughout the Policy-Cycle
EDEM – Conference on Electronic Democracy, Krems a. d. Donau, Austria

Frank Marscheider-Weidemann

Ressourcen und Verfügbarkeit von TCO-Materialien
Transparent leitfähige Schichten (TCO), Ulm

Rohstoffe für Zukunftstechnologien
DGK-Jahrestagung und Symposium Hochleistungskeramik, Hermsdorf

Metallische Rohstoffe für Elektromobilität
f-cell, Stuttgart

Ursula Mielicke

30 Pilot-Netzwerke zur Energieeffizienz und zum Klimaschutz in Deutschland
Förderschwerpunkt Wirtschaft
Nationale Klimaschutzinitiative des BMU, Berlin

Evaluation der Pilot-Netzwerke – Ziele, erforderliche Informationen, Durchführung
Conference 30 Pilot-Netzwerke, Berlin

Emmanuel Muller

Culture d'innovation, créativité et territoire: Cas de l'Alsace et du Rhin Supérieur
Congress Management du Futur, Strasbourg, France

Emmanuel Muller, Andrea Zenker and Jonathan Schueller

Creativity and Transborder Integration of Regional Innovation Systems: The Upper Rhine Experience
Russian-German Summer School, Karlsruhe

Peter Neuhäusler

Patents and the Competitive Advantage of Firms – An Analysis based on Stock Market Data
STI Conference, Leiden, Netherlands

Patent Indicators for Macroeconomic Growth – The Value of Patents estimated by Export Volume
3rd ISI-IPM Summer School, Beijing, China

Jutta Niederste-Hollenberg

Demografischer Wandel als Herausforderung für die Sicherung und Entwicklung einer kosten- und ressourceneffizienten Abwasserinfrastruktur
22. Norddeutsche Tagung für Abwasserwirtschaft und Gewässerentwicklung, Lübeck

Katrin Ostertag

Innovationsdynamik in rohstoffintensiven Produktionsprozessen
Symposium Rohstoffeffizienz und Rohstoffinnovationen, Ettlingen

Flächenausweisungszertifikate als Instrument für weniger Flächenverbrauch
Flächenkonkurrenz & Flächenverbrauch, Mannheim

Governance variety in the energy service contracting market
The Changing Governance of Network Industries, Naples, Italy

Anja Peters

Elektroautos – psychologisch gesehen
Powertage, Fachveranstaltung "e-mobility" der EKZ, Zurich, Switzerland

Mario Ragwitz

Effective and efficient long-term oriented RE support policies
IEA Renewable Energy Working Party
Workshop Renewables, from Cinderella options to mainstream energy solution, Paris, France

Implementing the 2020 RES-Directive – challenges for the future design of national renewable energy policies
7th Conference on the European Energy Market, Madrid, Spain

Costs and benefits of RES deployment in Germany
DIREC, Delhi, India

Thomas Reiss

Strategic Approach to Future Collaboration Between the EU and Russia in Nanotechnology
Industrial Technologies, Brussels, Belgium

Convergence in enabling technologies for green growth
OECD Workshop on Green Technology and Innovation Policy, Paris, France

Dynamics of Innovation Processes in Biotechnology – Implications for SME
EUROBIOTECH, Krakow, Poland

Christian Sartorius

Anpassung an den Klimawandel – die zeitliche Perspektive
DAS Projekttreffen des Umweltbundesamtes, Berlin

Dezentrale Abwasserinfrastruktur – ein Paradigmenwechsel?
Tagung des Evolutionsökonomischen Ausschusses des Vereins für Socialpolitik, Linz, Austria

Anforderungen an die wasserwirtschaftliche Forschung von morgen – Erkenntnisse aus dem Projekt Wasser 2050
7. BMBF-Forum für Nachhaltigkeit, Berlin

Wolfgang Schade

The challenge of economic instruments: Reducing emissions through taxation and ETS
BMU – GTZ Expert meeting on Sustainable Development in the Transport Sector Worldwide, Berlin,

Technologien und Strategien für einen Green New Deal
DGB Workshop Ein neues Bündnis für Arbeit und Umwelt, Berlin

Electric vehicles' differing contextual requirements in developed and developing countries
WCTRS Conference on Green Urban Transport and Sino-French Conference on Sustainable Urban Transport, Shanghai, China

Hans-Dieter Schat

Auswirkung des demografischen Wandels in produzierenden Betrieben (Deutschlands)
Demografischer Wandel – Chancen, Potentiale, Risiken und Herausforderungen, Tokyo, Japan

Innovation mit älteren Belegschaften
Erfahrung-Gruppe Ideenmanagement im OWL Maschinenbau, Bielefeld

Lebensformen in Krisenzeiten – Wie ändern sich die Personalkonzepte in Betrieben?
Workshop des Bundesinstituts für Bevölkerungsforschung, Mainz

Elna Schirrmeister

Integrating patent & publication analyses in strategic foresight for manufacturing firms
XXI International Society for Professional Innovation Management ISPIM Conference – The Dynamics of Innovation, Bilbao, Spain

Strategic Environmental Scanning as a Management Tool for Innovation
European Research on Innovation Management ERIMA, Wiesbaden

Concepts and use of technology foresight
Research Evaluation and Technology Valuation – Concepts and Experiences, Hanoi, Vietnam

Elna Schirrmeister and Philine Warnke

Transformative RTI Policy – A Difficult Transition. The Case of ProductionConsumption 2.0
Practicing Science and Technology, Performing the Social. European Association of Science and Technology Studies EASST Conference, Trento, Italy

Joachim Schleich

Environmental and economic effects of the Copenhagen pledges

and more ambitious emission reduction targets
33rd Annual Meeting of International Association of Energy Economics, Rio de Janeiro, Brazil

How low can you go? Exploring Threshold Levels for Residential Water Demand in Germany
Workshop on Water Economics and Technology, Berlin

Volkswirtschaftliche und ökologische Wirkungen freiwilliger Klimaschutzzusagen in einem Post-Kyoto-Szenario
Viadrina, Frankfurt (Oder)

Michael Schleinkofer

Die Rolle von wissenschaftlichen Mentoren in der Pre-Seed-Phase akademischer Spin-offs
G-Forum, Cologne

Gründungsprozess von akademischen Spin-offs: Einflussfaktoren in der Vorgründungsphase
Forschungskolloquium im Rahmen des G-Forums, Cologne

Barbara Schlomann

Effizienzansätze bei Geräten und Systemen
ICTM Forum, Cologne

Regular survey on energy consumption in the tertiary sector in Germany
IEECB Focus Conference, Frankfurt a. M.

Ungenutzte Potenziale in der deutschen Energieeffizienzpolitik
Fachworkshop Ausblick auf die deutsche Energiepolitik – welche Effizienzstrategie braucht Deutschland, Berlin

Ulrich Schmoch

Struktur des Wissenschaftssystems in Deutschland: Typologie, Akteure, Zuständigkeiten, Finanzierung
Workshop Die Wissenschafts- und Forschungssysteme in Deutschland, Frankreich und der Schweiz, Kehl

Ulrich Schmoch and Nicole Schulze

The search for "hidden" university patents
STI Conference, Leiden, Netherlands

Matching of authors and inventors – a new approach
ESF-APE-INV 2nd "Name Game" workshop, Madrid, Spain

PRESENTATIONS | PROJECTS

Marcus Schröter

Energieeffizienz in der Produktion: Wunsch oder Wirklichkeit?
11. Symposium Energieinnovation, Graz, Austria

Energieeffizienz in der Produktion: Wunsch oder Wirklichkeit?
Technikforum Ressourceneffizienz in der Produktion: Energieeffiziente Antriebe und Fertigungstechnologien, Nördlingen

“Going Green” for innovation?: Energy efficient technologies and the innovative behaviour of manufacturing firms.
3rd International Conference on Quantified Eco-Efficiency Analysis for Sustainability, Egmond aan Zee, Netherlands

Torben Schubert

Bibliometric Productivity: The Role of University-Effects on the Research Group Level
STI Conference, Leiden, Netherlands

The Interplay of Innovation and Market Structure in the German Chemical Industry
Annual Conference of the Verein für Socialpolitik, Kiel

Testing Restrictions in Production Analysis: An Empirical Application
Invited Speaker DIW, Berlin

Nicole Schulze

Knowledge Transfer beyond Patents and Scientific Articles
ISA World Congress of Sociology, Gothenburg, Sweden

Systemverständnis Grüner Gentechnik durch Szenario-Workshops
NTA 4 (4. Konferenz des Netzwerks TA), Berlin

Ralph Seitz

Innovation, Technologietransfer und Gesellschaft
Materials Science and Engineering, Darmstadt

Oliver Som

Innovation patterns of non-R&D performing firms in the German manufacturing industry – an evolutionary approach to heterogeneity in firms’ innovation strategies
13th International Conference of the Schumpeter Society, Aalborg, Denmark

Kooperation und Wissenstransfer in zwischenbetrieblichen Netzwerken.
Empirische Befunde aus dem deutschen Verarbeitenden Gewerbe.
Guest lecture at the Technische Universität Dortmund, Department of Economic and Industrial Sociology, Dortmund

Integrating patent and publication analyses in strategic foresight for manufacturing firms
ISPIM Conference, Bilbao, Spain

Thomas Stahlecker

Recent Experience with German Cluster Policy
Workshop Boosting Innovation: a cluster approach, Piacenza, Italy

Cohesion Policy in the light of place-based Innovation Support
European Network on Industrial Policy International Conference – EUNIP, Reus, Spain

Stärkung wissensintensiver Dienstleistungen durch Cluster
Clusterkonferenz des BMBF, Berlin

Thomas Stehnen

Brasilien – ein neuer global player?
Guest lecture at the University of Würzburg, Würzburg

The German Innovation System at a glance: Governance and Strategies
Workshop between Inmetro, ABDI and FhG: “Innovation and Opportunities for Cooperative Projects Brazil – Germany”, Rio de Janeiro, Brazil

Innovation strategies, structures and Governance in Germany
Brazil-Germany Workshop on Innovation Promotion & Technological Systems, Rio de Janeiro, Brazil

Luis Tercero Espinoza

Rohstoffe und die Wissensgesellschaft
Expertentagung Sicherheitspolitik im Zeichen zunehmender Rohstoffknappheit, Wildbad Kreuth

Challenges related to non-energy mineral raw materials
EPP group hearing on new EU strategy on raw materials, Brussels, Belgium

Benjamin Teufel

Immer die neueste Technik? Von radikalen Innovationen und stetigen Entwicklungen
Spectaris Herbsttagung “Marketing”, Lübeck

Axel Thielmann

Stand und Trends der Lithium-Ionen-Batterieentwicklung und alternativer Energiespeicher im Kontext der Elektromobilität
XI European Automotive Congress, Madrid, Spain

Lithium-Ionen-Batterie und Materialforschung für die Elektromobilität-Forschung, Entwicklung und Zukunftsmärkte
MSE: Materials Science and Engineering, Darmstadt

Fraunhofer-Systemforschung Elektromobilität – Systemintegration und gesellschaftspolitische Fragen
Bund-Länder-Ausschuss Forschung und Technologie, Aachen

Philine Warnke

Foresight as Tentative Governance Instrument – Evidence from the BMBF Foresight Process
Tentative Governance In Emerging Science and Technology.
Actor Constellations, Institutional Arrangements & Strategies, Twente, Netherlands

Perspectives and Challenges of Systemic Foresight – The Case of Human-Technology-Cooperation
NTA4 – Vierte Konferenz des Netzwerks TA “Der Systemblick auf Innovation – Technikfolgenabschätzung in der Technikgestaltung”, Berlin

Marion Weissenberger-Eibl

Innovation und Mittelstand, Braunschweig

Kreativität – Rohstoff für nachhaltige Innovationen, Taufkirchen

Innovationsentwicklung durch Cluster – Instrumente und Erfolgsfaktoren, Potsdam

Ute Weißfloth

Identifizierung aussichtsreicher Geschäftsmodelle für die Druckluftversorgung
Workshop der GOR-Arbeitsgruppen “Entscheidungstheorie und -praxis”, “OR im Umweltschutz”

und “Simulation und Optimierung komplexer Systeme”, Erlangen

Multi-criteria evaluation of service-based new business concepts to increase energy efficiency in compressed air systems
Innovation for sustainable production, Bruges, Belgium

Martin Wietschel et al.

Das E-Mobil auf dem Weg zum Volkswagen?
18. Bad Kreuznacher Verkehrssymposium, Bad Kreuznach

FSEM-Schwerpunkt Untersuchung von Gesamtkonzepten und Gestaltungsoptionen
Congress Neue Mobilitätskonzepte, Berlin

Chancen und Herausforderungen der Elektromobilität
Baden-Baden Spezial – Elektrisches Fahren machbar machen, 4. VDI-Tagung mit Fachausstellung, Baden-Baden

Andrea Zenker

Innovationssystem und Innovationsfähigkeit Deutschlands.
Ausgewählte Charakteristika des deutschen Innovationssystems
Jahreskonferenz des Studienkomitee für Deutsch-Französische Beziehungen (Cerfa) im Ifri in Zusammenarbeit mit dem Centre d’information et de recherche sur l’Allemagne contemporaine (CIRAC) und der Konrad-Adenauer-Stiftung (KAS), Paris, France

Sebastian Ziegass

Wohin mit dem Jetzt? Von den Medialen Historiographien zur angewandten Forschung
Tagung “Was heißt und zu welchem Ende treiben wir Mediale Historiographie?”, Dubrovnik, Croatia

Peter Zoche

Akzeptanz von Technologien in der zivilen Sicherheit am Beispiel RFID
BITKOM “Sicherheitslösungen”, Frankfurt a. M.

Sicherheit und Gesellschaft
Giesecke & Devrient, Munich

Ubiquitäres Computing
Bundestagsausschuss Neue Medien, Berlin

ENERGY POLICY AND ENERGY SYSTEMS

PROJECTS AND CONTACT PERSONS

30 Pilot-Netzwerke: Lernende Energieeffizienz- und Klimaschutz-Netzwerke: 30 Pilot-Netzwerke und Entwicklung von Investitionsberechnungshilfen
Harald Bradke

EMPLOY_RES D: Kurz- und langfristige Auswirkungen des Ausbaus der erneuerbaren Energien auf den deutschen Arbeitsmarkt
Barbara Breitschopf

MAP 135: Einzel- und gesamtwirtschaftliche Analyse von Kosten- und Nutzenwirkungen des Ausbaus der erneuerbaren Energien im Strom- und Wärmemarkt
Barbara Breitschopf

EEWärmeG: Vorbereitung und Begleitung bei der Erstellung eines Erfahrungsberichtes gemäß § 18 Erneuerbare-Energien-Wärmegesetz
Barbara Breitschopf

EID-EMPLOY: Economic and Industrial Development
Barbara Breitschopf

Klimaregime 2012 – IV: Ausgestaltung des neuen Klimaschutzabkommens: Analyse der und Vorschläge für Verpflichtungen der Industriestaaten
Vicki Duscha

NEARCO₂: New participation and communication strategies for neighbours of CO₂ capture and storage operations.
Elisabeth Dütschke

Modellregionen: Sozialwissenschaftliche Begleitung der Modellregionen
Elisabeth Dütschke

DG CLIMA: Climate change mitigation by changing behaviour and consumption patterns
Elisabeth Dütschke

EuPlastVoltage: Plastics Converting Industry Long-Term Agreement on Energy Efficiency
Wolfgang Eichhammer

IEKP Monitoring: Ermittlung der Klimaschutzwirkung des Integrierten Energie- und Klimaschutzprogramms der Bundesregierung (IEKP) und Vorschlag für ein Konzept zur kontinuierlichen Überprüfung der Klimaschutzwirkung des IEKP
Wolfgang Eichhammer

Energieeffizienz Luxemburg: Unterstützung bei der Umsetzung der EU-Richtlinie zur Energieeffizienz in Luxemburg
Wolfgang Eichhammer

CA-ESD Luxemburg: Unterstützung bei der Concerted Action Energy Service Directive
Wolfgang Eichhammer

ODYSSEE MURE 2010: Monitoring of EU and national energy efficiency targets
Wolfgang Eichhammer

Projektionsbericht 2011: Verbesserung der methodischen Grundlagen und Erstellung eines Treibhausgasemissionsszenarios als Grundlage für den Projektionsbericht 2011 im Rahmen des EU-Treibhausgasmonitorings
Wolfgang Eichhammer

ETS_Benchmarking_Add_On: Additional Services to a Study Contract on Competitiveness Issues and Allocation Systems in the ETS post 2012
Wolfgang Eichhammer

ETS_BM_Guidance: Competitiveness issues and allocation system in the ETS post 2012
Wolfgang Eichhammer

EC ECCP ESD: Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further community-wide measures Reference
Wolfgang Eichhammer

Energy efficiency in Chile: Analysis of the Action Plan for Energy efficiency in Chile
Wolfgang Eichhammer

ECF EU Mandatory EE Targets
Wolfgang Eichhammer

BMU EU Energy Roadmap: Wissenschaftliche Unterstützung bei der Erarbeitung von Vorschlägen für eine EU-Energy-Roadmap, (Erreichung der Klimaszutzziele der EU bis 2050 durch Strukturwandel, Energieeinsparungen und Effizienztechnologien)
Wolfgang Eichhammer

BMU-Energiekonzept: Wissenschaftliche Unterstützungsleistungen bei der weiteren Ausgestaltung und Umsetzung des Energiekonzepts der Bundesregierung
Wolfgang Eichhammer

NEEAP 2 Luxemburg: Erstellung des 2. Nationalen Energieeffizienzplans für Luxemburg im Rahmen der Umsetzung der Richtlinie 2006/32/EG über Endenergieeffizienz und Energiedienstleistungen
Wolfgang Eichhammer

EnBW-Speicherkosten: Vergleichbarkeit von Kosten großer Stromspeicher
Fabio Genoese

E4: Energy Efficient Elevators and Escalators
Simon Hirzel

SUSPLAN: Integration of Renewables into Infrastructures
Marian Klobasa

Intelliekon: Nachhaltiger Energiekonsum von Tarifkunden durch intelligente Zähler-, Kommunikations- und Tarifsysteme
Marian Klobasa

Marktpotenziale Lastmanagement: Kurz- bis mittelfristig realisierbare Marktpotenziale für die Anwendung von Demand Response im gewerblichen Sektor
Marian Klobasa

KWK-NRW: Studie zur Potenzialerhebung von Kraft-Wärme-Kopplung in Nordrhein-Westfalen
Marian Klobasa

Gutachten CO₂-Minderung: Gutachten zur CO₂-Minderung im Stromsektor durch den Einsatz erneuerbarer Energien – Update für 2008 und 2009
Marian Klobasa

MAVO Energiespeicher: Advanced Energy Storage, Entwicklung von

skalierbaren, stationären Stromspeichern zur Netzentlastung bei der Integration fluktuierender erneuerbarer Energien
Julia Oberschmidt

WINDBARRIERS: Barriers for wind energy development in EU Member States
Benjamin Pfluger

RES-H Policy: Policy development for improving RES-H/RES-C penetration in European Member States
Mario Ragwitz

SECURE: Security of Energy Concerning its Uncertainty, Risk and Economic Implications
Mario Ragwitz

Feed-in Coop II: Wissenschaftliche Begleitung der International Feed-In-Cooperation in Deutschland
Mario Ragwitz

Analysen Wärmegesetz II: Ergänzende Untersuchungen und vertiefende Analysen zu möglichen Ausgestaltungsvarianten eines Wärmegesetzes
Mario Ragwitz

REPAP2020: Renewable Energy Policy Action Paving the Way towards 2020
Mario Ragwitz

RE-SHAPING: Shaping an effective and efficient European renewable energy market
Mario Ragwitz

RES-Financing: Financing renewable energy in the European energy market
Mario Ragwitz

Flex-Mech-BMU: Wissenschaftliche Begleitung und Unterstützung der Umsetzung der flexiblen Mechanismen der Zielerreichung im Rahmen der EU-Richtlinie für erneuerbare Energien
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Karoline Rogge

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Karoline Rogge

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Joachim Schleich

RESPONSES: European responses to climate change: deep emissions reductions and mainstreaming of mitigation and adaptation

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Joachim Schleich

ETSUpstream: Ausweitung des Emissionshandels auf neue Sektoren und Kleinemittenten (z. B. Gebäudebereich) – Potenziale, Ausgestaltung, Verbindung mit dem internationalen Klimaregime

Joachim Schleich

SUSCONE: Soziale, ökologische und ökonomische Dimensionen eines nachhaltigen Energiekonsums in Wohngebäuden

Joachim Schleich

Smart Metering: Technik und Potentiale von intelligenten Zähl-, Mess- und Kommunikationssystemen zur Energieeinsparung und Effizienzsteigerung

Barbara Schlomann

SELINA: Standby and Off-Mode Energy Losses in New Appliances Measured in Shops

Barbara Schlomann

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Barbara Schlomann

Endenergieverbrauch 2008: Entwicklung einer detaillierten Datenbasis für den Endenergieverbrauch 2008 zur Bewertung von Energieeinsparung

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Mülheim zählt: Begleitforschung für das Projekt Mülheim zählt

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Branchentechnologien Industrie: Möglichkeiten, Potenziale, Hemmnisse und Instrumente zur Senkung des Energieverbrauchs und der CO₂-Emissionen von industriellen Branchentechnologien durch Prozessoptimierung und Einführung neuer Verfahrenstechniken

Barbara Schlomann

GHD-Erhebung 2007–2010: Energieverbrauch des Sektors Gewerbe, Handel, Dienstleistungen (GHD) in Deutschland für die Jahre 2007–2010

Barbara Schlomann

Energieeffizienzberatung: Evaluation des Förderprogramms Energieeffizienzberatung als eine Komponente des Sonderfonds Energieeffizienz in kleinen und mittleren Unternehmen

Barbara Schlomann

NEEAP 2 Deutschland: Berechnung von Endenergieeinsparungen in Deutschland zur Vorbereitung des zweiten nationalen Energieeffizienz-Aktionsplans

Barbara Schlomann

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Barbara Schlomann

Kosten-Nutzen-Analyse: Kosten-Nutzen-Analyse der Einführung einer Energieeinsparquote bzw. ähnlicher Instrumente zur Realisierung von Endenergieeinsparungen in Deutschland

Barbara Schlomann

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Barbara Schlomann

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Frank Sensfuß

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Frank Sensfuß

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Frank Sensfuß

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Frank Sensfuß

PowerACE-KWK: Kombinierte Modellierung der Strom- und Wärmerversorgung

Frank Sensfuß

EE-Wärme-Quote: Fachliche und juristische Unterstützungsleistungen zur Prüfung eines neuen Instruments für erneuerbare Wärme in Umsetzung des Energiekonzepts vom 28.09.2010

Jan Steinbach

Elektromobilität: Integration erneuerbarer Energien durch Elektromobilität

Martin Wietschel

FSEM-SP4: Technische Systemintegration, gesellschaftliche Fragestellungen und Projektmanagement

Martin Wietschel

SP2A: FSEM-SP2 Energieerzeugung, -verteilung und umsetzung

Martin Wietschel

MeRegioMobil Teilvorhaben: Geschäftsmodelle und Evaluation von Steuerungsoptionen

Martin Wietschel

Vergleich H2 – Strom: Vergleich von Strom und Wasserstoff als CO₂-freier Endenergieträger

Martin Wietschel

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Martin Wietschel

TREMOT: Überleitung der Ergebnisse aus GermanHy in das Emissionsrechenmodell TREMOT

Martin Wietschel

Energienachfrageprognose: Weiterentwicklung der Energienachfrageprognose für die EU27+Norwegen, Schweiz, Türkei und Balkan

Martin Wietschel

Alpiq Stromnachfrage: Modellgestützte Stromnachfrage-Perspektiven in Europa

Martin Wietschel

EnBW Elektromobilität: Wir machen Baden-Württemberg E-mobil

Martin Wietschel

INDUSTRIAL AND SERVICE INNOVATIONS

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Sabine Biege

CR 2011: Convergence of knowledge intensive sectors and the EU's external competitiveness

Sabine Biege

DEMAT: Dematerialised Manufacturing Systems: A new way to design, build, use and sell European Machine Tools
Sabine Biege

Clean Sky: Teilvorhaben: Sozio-Ökonomische Anforderungen an die Flugzeugrumpffentwicklung
Esther Bollhöfer

DyWaMed: Entwicklung eines simulationsgestützten Werkzeugs zur dynamischen Steuerung der Wandlungsfähigkeit integrierter Werkschöpfungsketten in der Medizintechnik
Steffen Kinkel

MFRT: Konzeption eines Tools zur Selbstreflexion der Kompetenzen und Bedarfe auf dem Weg zu einem systematischen Manufacturing Footprint Design
Steffen Kinkel

6 CP: Six Countries Programme – The International Innovation Network
Steffen Kinkel

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Steffen Kinkel

VITNESS: Veränderungsbereitschaft und interne sowie externe Flexibilität mit nachhaltigen "EFQMplus"-Konzepten stabilisieren und strategisch in den Geschäftsprozessen implementieren
Steffen Kinkel

VDI-Automatisierungskongress: Analyse der Verbreitung und Einsatzziele von Automatisierungslösungen am Standort Deutschland
Steffen Kinkel

WILO: WILO Workshop – Prozess Standortentwicklung
Steffen Kinkel

TAB Traditionelle Industrien: Zukunftspotenziale und Strategien von traditionellen Industrien in Deutschland – Auswirkungen auf Wettbewerbsfähigkeit und Beschäftigung
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Transfer DL Forschung: Durchführung einer Erhebung zum Transfer aus der Dienstleistungsforschung in 13 europäischen Ländern
Oliver Kleine

PiratPro2: Gestaltung von piraterie-robusten Produkten und Prozessen
Oliver Kleine

WAROB: Wirtschaftlichkeitsanalysen neuartiger Robotik-Anwendungen und ihre Bedeutung für die Robotik-Entwicklung
Oliver Kleine

Balanced GPS: Ganzheitliche Produktionssysteme mit stabil-flexiblen Standards und konsequenter Mitarbeiterorientierung
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SIMPRO-KMU: Entwicklung eines simulations-basierten Konzepts zur systematischen und vorausschauenden Prozessmodernisierung in KMU
Gunter Lay

Transfer Mechatronik: Entwicklung von Transfermechanismen für die effiziente und nachhaltige Verbreitung von Forschungsergebnissen in die industrielle Praxis am Beispiel Mechatronik
Gunter Lay

Polysius: Durchführung einer Feasibility-Studie "Dienstleistungs-basierte Geschäftsmodelle"
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KrIDe: Kreativität und Innovationsfähigkeit im Demografischen Wandel
Hans-Dieter Schat

ZuPneu: Zukunftsfähigkeit der Pneumatik
Marcus Schröter

EnEffAH: Energieeffizienz in der Produktion im Bereich Antriebs- und Handhabungstechnik
Marcus Schröter

HyWert: Chancen für die Nachhaltige Entwicklung durch neue hybride Wertschöpfungskonzepte
Marcus Schröter

Ressourceneffizienz Produktion: Verbundprojekt: Innovationsplattform "Ressourceneffizienz in der Produktion", Teilprojekt: Zielgruppenspezifische Aufbereitung und Bündelung der Projektergebnisse sowie Umfeldbeobachtung
Marcus Schröter

INNO-GRIPS-Lot2: Economic and market intelligence on Innovation
Oliver Som

Meadow: Measuring the Dynamics of Organisations and Work
Oliver Som

Low2High: Innovationsmanagement für Lowtech-Hightech-Kooperationen, Teilvorhaben: Kooperationsmuster zwischen Lowtech- und Hightech-Unternehmen: Analyse und Gestaltung
Oliver Som

INPROWID: Entwicklung und Erprobung eines innovationsorientierten Produktivitätsmesskonzepts für wissensintensive Dienstleister
Christoph Zanker

INNOVATION AND TECHNOLOGY MANAGEMENT AND FORESIGHT

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Antje Bierwisch

SimSecur: Simulationsplattform für ein virtuelles Sicherheitsportal in kritischer Infrastruktur
Antje Bierwisch and Peter Zoche

Foresight-Verlaufssystem: Konzeptionelle Entwicklung und Implementierung eines Verlaufssystems zum Foresight-Prozess des BMBF
Kerstin Cuhls

Roadmap-Coaching: Innovationswettbewerb Zukunftsfähig mit IT
Kerstin Cuhls

BMBF-Foresight-Workshops: Konzeptionelle Weiterentwicklung und Umsetzung eines Foresight-Prozesses des Bundesministeriums für Bildung und Forschung
Kerstin Cuhls

For-MOSTAF: services of international expert group for developing a methodology, delivering training and consultancy aimed at prognostic evaluation (foresight) of Lithuanian research and higher education system
Kerstin Cuhls

FhG – Märkte für Übermorgen
Kerstin Cuhls

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Kerstin Cuhls

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Kerstin Cuhls

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Kerstin Cuhls

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Kerstin Cuhls

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Kerstin Cuhls

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Ewa Dönitz

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Rolf Gausepohl

ICT-ENSURE: European ICT Environmental Sustainability Research
Ralf Isenmann

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Ralf Isenmann

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Ralf Isenmann

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Ralf Isenmann

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Daniel Jeffrey Koch

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InnoTALK: Innovación y Tecnología
en América Latina y el Caribe
Daniel Jeffrey Koch

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Erprobung einer Methodik zur Ge-
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Philine Warnke

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Interaktive Technikgestaltung –
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Assesment of impacts on Transport
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Wirtschaftliche Aspekte nichttech-
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UBA Ext. Kosten: Schätzung exter-
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CER LHVs 2010: Study on the ef-
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single wagon load rail freight traffic
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inWasif: Zukunftfähiges integriertes
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Grauwasser WRG: Entwicklung und
Erprobung eines Anlagenkonzeptes
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Kläranlagen in Baden-Württem-
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Schwermetall-Eintrag Main: Model-
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Transitions
Jonathan Köhler

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Sustainable Development
Jonathan Köhler

CS-TE-WP2: Clean Sky
Jonathan Köhler

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COHIBA-Prio III: Mitarbeit im
ELCOM-Cohiba Projekt, Bearbei-
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MAVO-Lignocell: ProLignocel
– Neue nachhaltige Prozesse
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Frank Marscheider-Weidemann

CapChemRU 2: Dialogue among
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Guizhou: Innovatives Abwasser-
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Modernisierungsstrategie für die
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Wasserdienstleistungen
Jutta Niederste-Hollenberg

Geothermie Köbogen: Energetische
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Düsseldorf
Jutta Niederste-Hollenberg

PRYM-Park II: Prympark Düren –
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Jutta Niederste-Hollenberg

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Aktualisierung der Beschäftigungs-
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Cleantech CH: Optimierung der
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REBOUND: Die soziale Dimension des Rebound-Effekts, Teilvorhaben
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Phosphor-Kreislauf: Phosphorrecycling – Ökologische und wirtschaftliche Bewertung verschiedener Verfahren und Entwicklung eines strategischen Verwertungskonzeptes für Deutschland
Christian Sartorius

GLOWA III: Wirkungen des globalen Wandels auf den Wasserkreislauf im Elbegebiet – Ergebnisse und Konsequenzen
Christian Sartorius

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Christian Sartorius

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Christian Sartorius

KNA-Klimaanpassung: Kosten und Nutzen von Anpassungsmaßnahmen an den Klimawandel
Christian Sartorius

GHG-TransPoRD: Techno-economic analysis per mode and combined to meet GHG emission reduction targets at time horizon 2020 and beyond
Wolfgang Schade

Market-UP Support: Transport Research Market Uptake
Wolfgang Schade

Zukunft-AI: Zukunft Automobilindustrie
Wolfgang Schade

ASTRA-Renewability: Weiterentwicklung des Analyseinstruments Renewability
Wolfgang Schade

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the criticality of non-energy raw materials
Luis Tercero Espinoza

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Luis Tercero Espinoza

Kalkschlammverwertung: Marktanalyse zu Alternativen der Kalkschlammverwertung
Luis Tercero Espinoza

Schutz-TW: Schutz der Trinkwasserversorgung vor Anschlägen mit CBRN-Stoffen – Technik und Strategieentwicklung, Teilvorhaben 5: Sozioökonomische Ansätze zur Bewertung und Kommunikation von Maßnahmen zur Verbesserung der Sicherheit der Wasserversorgung
Felix Tettenborn

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Rainer Walz

ISI-CUP: Verbundvorhaben: Integration von Sustainability Innovationen in Catching-up-Prozesse; Teilvorhaben: Anforderungen, sektorale Innovationsbedingungen und Maßnahmen
Rainer Walz

Leadmärkte Umwelt: Verbundvorhaben: Lead Market-Strategien: First Mover, early Follower und late Follower, Teilvorhaben: Lead Market Strategien und Systemdynamik
Rainer Walz

Arbeitsplatzeffekte CH: Volkswirtschaftliche Bedeutung erneuerbarer Energien in der Schweiz
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Bernd Beckert

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Bernd Beckert

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Bernd Beckert

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Bernd Beckert

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Bernd Beckert

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Tanja Bratan and Thomas Reiss

Comprehensive evaluation of innovative healthcare technologies
Bernhard Bührlen

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Bernhard Bührlen and Thomas Reiss

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Michael Friedewald

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Michael Friedewald

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Michael Friedewald

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Bärbel Hüsing

Reproduktionsmedizin: Fortpflanzungsmedizin – Wissenschaftlich-technische Entwicklungen, Folgen und Rahmenbedingungen
Bärbel Hüsing

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Ersatzmethoden zum Tierversuch: Evaluation der Förderaktivität Ersatzmethoden zum Tierversuch
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Zellfreie Bioproduktion
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TAB Weiße Biotechnologie
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STOA MPL: Making Perfect Life
Bärbel Hüsing

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Simone Kimpeler

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Simone Kimpeler

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Timo Leimbach

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Timo Leimbach

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Timo Leimbach

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Timo Leimbach

TAB ePetitionen 2009: Elektronische Petitionen und Modernisierung des Petitionswesens in Europa
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SF-Policy-Instrumente: Strategie-
fondsprojekt Forschungsklausur
Policy-Analyse am Fraunhofer ISI
Ralf Lindner

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Action: Hub Websites for Youth
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Electronic Voting and other Internet
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Ralf Lindner

TAB MedTech: Medizintechnische
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ERACEP: Emerging Research Areas
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Thomas Reiss

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technology innovation system of
RUssia for preparing future Coope-
rations between the EU and Russia
Thomas Reiss

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Thomas Reiss

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Thomas Reiss

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Thomas Reiss

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petitiveness of European industry
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Thomas Reiss

EU-RU-NET: Linking R&D Strategies,
Foresights and Stimulation of EU-
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Strategie-Roundtable NMP
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(Innovationsallianz Lithium-Ionen-
Batterien, BMBF)
Axel Thielmann

Strategiefondsprojekt Nanotech-
nologie
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VISITING RESEARCHERS

Paul Kamudoni

Cardiff University, Wales
January to July 2010

Minna Kansola

VTI, Tampere, Finland
October to November 2010

Jenny Caroline Muñoz Saenz

Los Andes Peruvian University
Huancayo, Peru
October 2010 to February 2011

Julieta Schallenberg-Rodriguez

Universidad de Las Palmas de Gran Canaria, Spain
August 2010

Zhou Shenglv

Chinese Academy of Sciences,
Beijing, China
October 2010 to September 2011

Liyang Su

Chinese Academy of Sciences,
Beijing, China
from October 2010

Lifeng Yang

Chinese Academy of Sciences,
Beijing, China
October 2010 to September 2011

Xiuping Zou

Chinese Academy of Sciences,
Beijing, China
from October 2010

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Staff

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Competence Center

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

Phone: +49 721 6809-0

Fax: +49 721 689152

E-Mail: info@isi.fraunhofer.de

Internet: www.isi.fraunhofer.de

Editors

Head

Dr. Kathrin Schwabe

Ulrike Aschoff

Katharina Brömel

Sabrina Bulk

Dr. Dennis Stockinger

Dr. Sebastian Ziegus

Title and chapter graphics

Thomas Lichtenstein

Stefanie Miller

Layout, typesetting and illustration

Jeanette Braun

Renata Sas

Translations

Gillian Bowman-Köhler

Christine Mahler-Johnstone

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