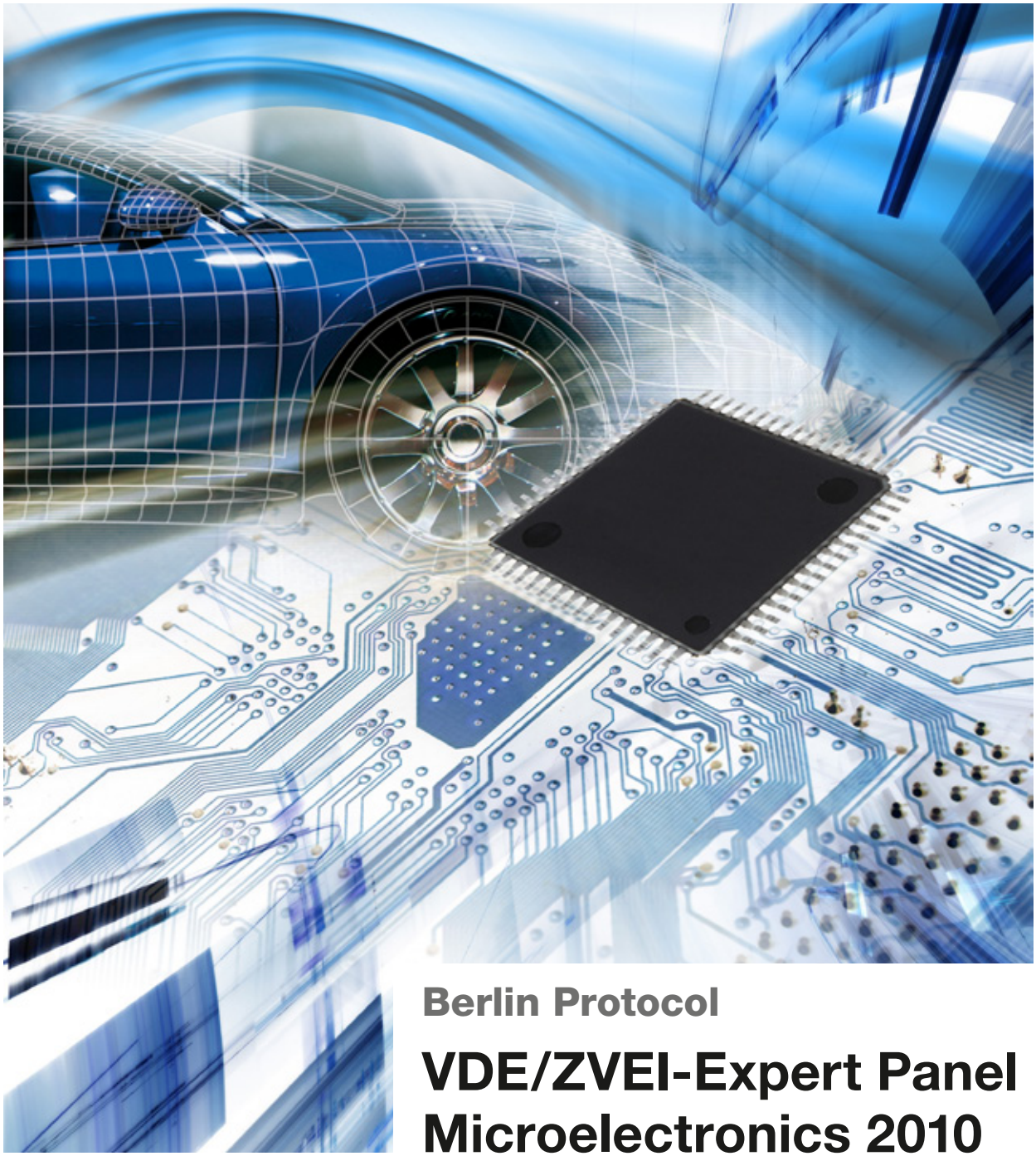

Berlin Protocol

VDE/ZVEI-Expert Panel Microelectronics 2010

ZVEI:

VDE

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Microelectronics is a key enabling technology. In its communication "Preparing for our future: Developing a common strategy for key enabling technologies in the EU," the EU Commission lists microelectronics as one such enabler, stating that "specific fields such as micro- and nanoelectronics and photonics deserve immediate policy actions given the situation of the EU industry in global competition."[1]

The Commission notes that the global market in this field is disrupted as a result of emerging economies increasingly seeing microelectronics as the key to their future development. The widely differing national and regional subsidy and currency policies are causing distortions in the global market. Although responsible international organizations like the WTO are seeking solutions to the problem, the situation in fact remains acute. In view of this major challenge, the EU Commission has concluded that it must act now on behalf of the future of industrial development in Europe. VDE and ZVEI fully support these efforts and offer the following suggestions to the High Level Expert Group:

1. **Fortify strengths**: European microelectronics is the world leader in the automobile industry as well as in the fields of energy efficiency, security and industrial electronics. Policy actions taken to secure this lead will have a direct and sustainably positive impact.

2. **Create opportunities**: In the fields of mobile communications and intelligent energy supplies, the position of Europe's microelectronics industry is quite promising. Political support for the industry's development will certainly lead to successes over the medium term.

3. **Focus on technology development**: Europe has a leading role in materials science. Both the development of new technologies as well as the advancement of existing technologies should be a primary focus of European innovation policy, since technological competence is the ultimate basis for competence in applications and manufacturing. We need to take a new approach to targeted research and development in Europe in order to translate our leadership in materials science into lead products.

1 Communication of the EU Commission: "Preparing for our future: Developing a common strategy for key enabling technologies in the EU", KOM(2009) 512, p.4.

4. **Focus on manufacturing**: Since modern factories are highly automated, labor cost disadvantages for companies operating in the EU increasingly play a subordinate role. Other competitive disadvantages vis-à-vis other regions, however, still have to be lessened or eliminated. The focus here should be on energy costs, high capital costs, excessive regulations, and the shortage of engineers. Europe is an outstanding location for developing manufacturing processes and semiconductor products. Since development work related to manufacturing requires access to factories, the EU needs a strong network of development, production and suppliers.

5. **Qualified engineers**: One key basis for European industry is the availability of highly qualified engineers. This strength has to be maintained and further reinforced to ensure the future viability of our industry.

6. **Neutral politics**: European microelectronics is highly differentiated. The business landscape ranges from patent-oriented small and mid-sized development enterprises and companies with no factories or only limited capacity, to classical factory-based major corporations and contract manufacturers. Each of these types of enterprises has its specific needs. European politics should take these needs into account and should neither show preference for nor discriminate against specific business models or company types.

7. **Equal framework conditions**: In regard to its political investments and research incentives, the European market should provide framework conditions on a par with those of the major competitors Asia, the U.S. and Japan.

8. **Ensure subsidiarity principle**: One of the strengths of European politics is its focus on the subsidiarity principle: Decisions should be made where the specialists are located. One should continue to observe this principle. Specific technologies, production platforms, wafer dimensions, etc. should not be politically prioritized.

Importance, position and potential of basic microelectronics technology

Germany currently stands at the crossroads as a viable location for the microelectronics industry. On the one hand, microelectronics will continue to be the most important basic technology for key markets of the future. It drives industrial applications in German key industries such as automobile, energy and medical engineering, it serves as a strong lever for the entire national economy and offers Germany opportunities to achieve global leadership in a changing market environment with the help of intelligent combinations of technology and products and with new business models. On the other hand, there is no cross-European strategic policy focusing on microelectronics as a motor of innovation that needs strong support for its promising industrial applications. A solid beginning has been made with the EU Commission's "Key Enabling Technology" initiative, but the issue should be energetically pursued. At present, individual national research budgets in Europe are too limited for creating and sustaining a stable and future-oriented microelectronics competency platform. Since semiconductor know-how is increasingly being integrated into the systems know-how of companies, the migration of chip manufacturing and chip design away from Germany would have a negative impact on microelectronics research and industrial applications, and increase dependency on highly subsidized locations outside of Europe. Securing the microelectronics industry in Germany therefore requires not only keeping the country's chip factories, but also continuing to build up systems know-how and strengthen the competitiveness of the entire European market. Industry experts also consider the shortage of experts, funding shortfalls, high taxes and bureaucratic hurdles to be problematic for the industry. These are the core messages presented in VDE/ZVEI-Expert Panel Microelectronics 2010, a survey of managers in microelectronics companies and research institutes.

Seeking answers to Asian challenges

The global microelectronics market is dominated today by the Asia-Pacific region. According to the World Semiconductor Trade Statistics (WSTS)[2], the East Asian region (including China, excluding Japan) accounts for a market volume of over USD 119 billion, or more than half of the total microelectronics market of USD 226 billion. With growth slipping only by 3.5 percent, East Asia also remained far more robust in the recession than Europe and Japan, where declines of over 21 percent had to be coped with. Even though the previous year's slump in European microelectronics will be more than compensated by a forecast growth rate of 27.9 percent in 2010 (global average: 28.6 percent), the gap between Europe and Japan and the Asia-Pacific region threatens to further expand in the coming years. By 2012, the East Asia share of the market is expected to grow to USD 177 billion (world market volume: roughly USD 320 billion), while Europe will have to manage with a modest USD 41.8 billion. The annual growth rate of the European semiconductor market is predicted to level off at the global average of 4.2 percent in 2012, and thus exceed growth rates in the American market. Yet Europe will remain below the rates achieved in East Asia.

The reasons for this market shift are not only to be attributed to the sheer size of the Asian markets, to the regions low labor costs and to the development of local know-how. Massive state subsidies and favorable market conditions for the settlement of new chip factories in East Asia are also important factors. In view of this highly competitive situation it is remarkable that Germany continues to be the European microelectronics champion and that the Silicon Saxony semiconductor cluster remains Europe's biggest microelectronics center.

Solid innovation position can be improved

In recent years, Germany and Europe have taken various measures to improve the competitiveness of their respective microelectronics industries. To prevail in international microelectronics competition in the future, further improvements in research and development performance are necessary. According to many experts, this can be achieved only within the framework of an overall European industry strategy. In evaluating the current situation of microelectronics research and development in Germany, East Asia and the U.S., the VDE/ZVEI-Expert Panel

2 WSTS Semiconductor Market Forecast Spring 20107

Microelectronics 2010 has designed a picture which under no circumstances should be accepted by a leading industrial nation like Germany.

In four out of five ratings categories, Germany took the last position. The state of research and development funding in Germany is considered especially problematic: Not one of the questioned experts considered it to be very good, and 54 percent rate it as poor. China is ranked world leader in R&D funding, with 63 percent giving the country very good or good ratings. Around half of the experts also rate Japan, Taiwan and the U.S. positive or very positive. This evaluation also reflects the public subsidies in the respective countries. According to the experts, Germany's research landscape and cooperation with top research partners also needs to be improved. Although nearly half of those surveyed consider it good or very good, the U.S., Taiwan and China are rated better here as well. The ratings are similar for research infrastructures and cooperation with industrial partners, although China rated lowest here.

"Chips aren't everything, but without chips everything is nothing"

The surveyed experts express growing concern as to Europe's restraint with policies for technical research and development, since microelectronics is a "key enabling technology (KET)" – a basic technology that, along with its products, drives all industries with chip-based know-how and industrial applications. In effect, "chips aren't everything, but without them everything is nothing." Chips are embedded in nearly every electrical and IT product. This is one reason why over 50 percent of Germany's total industrial production and more than 80 percent of the country's exports ultimately depend on electrical, electronic and information technologies.

The EU Commission has recognized the extreme importance of a European KET strategy and has launched an appropriate initiative. Europe's technology policy-makers must now make it a top priority to drive the development and implementation of a joint European strategy. For microelectronics to be used more effectively as an economic lever, the experts believe the entire innovation chain in Europe – from education, research and development to manufacturing – must be politically flanked and supported, and embedded in an overall industrial policy strategy.

This is especially important, since when the era of "Moore's Law"[3] ends, the microelectronics deck will be reshuffled. Highly integrated "system on chip" systems and new technologies for integrating non-digital and non-electric functions, complex power electronics and intelligent sensors are gaining in importance. Due to its existing system know-how in these areas, Germany is a leader in manufacturing highly sophisticated technical products. In many industries, interest will continue to grow for products that are smaller, lighter, more mobile and more reliable thanks to new integration technologies, and that can interact with their surroundings, a machine or with humans. In view of this trend, it makes sense to counteract the threatening migration of chip know-how from Germany, particularly since traditional key industries in Germany as well as future-oriented technologies are more dependent on local chip design and local chip production than it may first seem.

Microelectronics – Innovation motor for the global market

The lion's share of the global microelectronics market is held by integrated circuits, and accounts for roughly USD 190 billion. By 2012, this market volume is expected to grow to USD 265 billion. Integrated circuits are the basis for every type of complex electronic device or system. They enable extensive functions to be packed into tiny spaces and make it technically possible to build systems that would otherwise be too expensive, too complex, too energy-intensive, or too big. Along with integrated circuits, the market is being driven by discrete semiconductors, sensors and optoelectronics. In fact, experts expect to see double-digit growth in the field of optoelectronics in the coming years.

Integrated circuits – and in particular embedded systems that are generally invisible to the user – function in a huge variety of applications, systems and products, ranging from medical systems, washing machines, airplanes and automobiles, to refrigerators, mobile phones, and all types of home entertainment systems. Germany holds a strong technology position in the field of embedded systems and in developing autonomous embedded systems that are integrated into overall systems. With annual growth rates of around 8.5 percent, embedded systems are one of the country's technological and economic loco-

3 Moore's Law say that the complexity for minimum component costs of integrated circuits doubles nearly every two years (on average every 20 months). Performance can be increased both through smaller chip structures (More Moore) and by integrating modules with supplementary functionalities into the chip system (More Than Moore).

motives. By 2020, current annual revenue of roughly □ 17 billion is expected to climb to approximately □ 42.6 billion.[4] The reason for their growing importance in the value chain lies in the fact that embedded systems are increasingly becoming “enablers” for key German industries such as the automotive industry and machine building, and in lead markets such as energy efficiency, smart grids, electromobility, healthcare assistance systems, and smart home networking. It will become increasingly important for Germany as an industry base to have solid research positions in systems technology, in ASICs[5] and the relevant software, and be able to turn this know-how into market successes. However, it will first be necessary to strengthen Germany’s position in the field of microelectronics, intensify research efforts, and leverage expertise for industrial applications.[6]

According to the VDE/ZVEI-Expert Panel, the greatest leverage potential for microelectronics lies in applications, in particular for automotive (67 percent), energy/smart grid (49 percent) and electromobility (47 percent). In the automobile industry, around 80 percent of all innovations are the result of new developments in the fields of electrical engineering, electronics and IT. Their current share of value creation in the industry is around 30 percent. Hybrid technology for cars is especially chip-intensive. In electric cars used for personal transport, it is expected that batteries, electric drives and power electronics will account for 70 percent of the overall value creation. Industry (38 percent), medicine (36 percent), communications (24 percent) and automation (13 percent) will also profit enormously from the innovative stimulus of microelectronics. This is especially important for Germany’s economy because these are traditionally the country’s strongest industries and they would be further boosted by a robust microelectronics base. In fact, the migration of chip design, chip manufacturing and, ultimately, chip know-how would lead to new dependencies on foreign markets and substantially weaken the classic motors of the German economy. On the other hand, system know-how and application-specific embedded systems would open up new opportunities in the “More Than Moore” age.

4 A.T. Kearney Study: The IT Industry in 2020, 2009

5 Application-Specific Integrated Circuits

6 This is the conclusion reached in the VDE Position Paper “Embedded Systems” prepared by the Information Technology Society (ITG) in the VDE.

Germany's competitiveness reinforced by security, stability and infrastructure

Germany's biggest competitive advantages as an industrial location are its social and political stability, legal security and excellent infrastructure. Nine out of ten experts surveyed praise the country's political stability, legal security, logistics system and security of supplies. Four-fifths give Germany positive ratings in regard to delivery security and social stability. Roughly two-thirds praise the country's supplier structure and the quality of its business partner, research and industry network. And although the 53 percent positive or very positive ratings for currency stability are no longer a dream result in view of the financial market and debt crisis, they are still good. This also applies to the country's present energy costs.

In regard to the country's innovative strength, the ratings are less favorable in the categories of qualifications and specialists. Although nearly half the experts give positive or very positive ratings for university and college curricula in microelectronics (47 percent) as well as for access to highly qualified workers (42 percent), these ratings are lower than what can be expected for a leading center of innovation with good perspectives for the future. And they are particularly problematic when compared to the country's location advantages mentioned above. Germany is given average ratings for its labor costs and environmental regulations, which roughly half the experts consider neither especially positive nor negative.

Sandwich effects through financing bottlenecks, heavy tax burdens and bureaucracy

The flexibility of Germany's labor market is rated more negative (36 percent) than positive (17 percent). The biggest weaknesses for Germany's position as a microelectronics center, however, are revealed in the categories of financing, taxes and bureaucracy. The VDE/ZVEI-Expert Panel feels that companies have difficulty accessing venture capital in Germany. 67 percent criticize this as poor or very poor, and not one of the experts rates it positively. And more than half (53 percent) also rate access to bank capital as poor or very poor. Public funding scarcely rates higher, with a negative 45 percent. The country's "taxes and fees" framework is also rated as poor or very poor (42 percent).

Bureaucracy is second highest on the negative scale. Nearly two-thirds of the experts complain about bureaucratic hurdles. Answers to specific questions regarding possibilities for improving Germany's position in research and development reveal precisely where companies have problems with financing and bureaucracy. Above all, start-ups face problems with R&D funding, with sufficient capital, and with excessive bureaucratic hurdles. The experts urgently recommend streamlining the bureaucracy and accelerating procedures in publicly funded projects. In addition, they call for making research institutes faster, more efficient and more cooperative.

Time for an overall European industry strategy

The strengths and weaknesses of Germany's environment for the microelectronics industry are detailed in VDE/ZVEI-Expert Panel Microelectronics 2010. But the big question is: What must be done to strengthen Germany's innovative position in the No.1 global basic technology? The success of Dresden's microelectronics cluster offers one solution. In this case, public support through structural funds not only pays off, but also generates a positive leveraging effect for the entire economy.

In view of market globalization and the competitive situation, policies to make a location more attractive for business will increasingly present a general European challenge that can be solved only partially at the national level.

To master this challenge, industry experts believe a common European industry strategy should be developed in which microelectronics occupies a key position as a basic technology. Financial and fiscal measures to support research and industry should be part of this strategy, along with a far-sighted innovation and industry strategy and close cooperation between European and national levels and the relevant ministries. Basically, the experts are concerned about restoring interrupted flows in the innovation chain from qualifications to marketable products. The means to accomplish this include earmarking higher outlays for education and engineer training, strengthening research clusters in the universities, initiating long-term target and industry-oriented programs, intensifying research partnerships between industry and universities, providing tax support for R&D as is customary in many countries, and backing the development of new business models.

The experts also believe that innovative companies notable for their strong commitment to Germany should be politically supported. The German economy is not only closely intertwined with the global economy through its exports, but also ultimately profits from international ties in R&D. Improving future R&D funding could start by evaluating existing funding programs and structures. Public Private Partnerships (PPPs) on the European level are one positive example of effective cooperation between politics and industry research, and also of the high reliability of public funding programs. In these partnerships, the financial framework and decisions for project proposals lie in the hands of the politicians, while the project contents and organization of the research focal points are proposed by industry. One should also positively evaluate all approaches and facilities that consider microelectronics to be a unity of technology and product as well as a key enabling technology for Europe. European support programs with the participation of the countries are currently regarded with skepticism, since there is no cross-national consensus for R&D funding. In this context, one generally recommends EU-wide coordination in all relevant fields, from research and industry policies to social systems.

The race for pole position in “More than Moore” has begun

The biggest stimulus for innovation in the coming years is expected to come from the “More than Moore” era – in which microelectronic systems will be coupled with sensory and actuator functions (“smart systems”) through new technologies and the use of new materials such as carbon. The experts believe that Moore’s Law will apply for around another ten years. This perspective opens up enormous opportunities for Germany, which originally started out in the age of microelectronics lagging behind the leaders and later was able to reduce the gap. The experts believe the country can seize these new opportunities when backed by a long-term strategic program that bundles important future-oriented themes into overall fields, and that coordinates and supports this strategy through clusters and direct industrial funding. Close and efficient pre-competitive cooperation and an accelerated and simplified funding program will play an important role here.

The future competitiveness of Germany’s and Europe’s industrial base ultimately will depend on the course set for funding and supporting the most important basic technologies for all industrial applications. The strategic importance of microelectronics for all key industries in Germany and Europe as well as for all future lead markets, however, is still not adequately appreciated. Establishing and supporting a seamless innovation chain in microelectronics would be an important means to ensure success in future lead markets. The decisions for embarking on such a course must be made soon, be strategically oriented, and be tailored for Europe as a whole.

VDE

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