Microelectronics and systems: A Key Enabling Technology for Europe

WHY SHOULD REGIONS INVEST STRUCTURAL FUNDS IN MICROELECTRONICS?

The European Commission defined microelectronics as one of the six Key Enabling Technologies (KETs) of Europe[1]. Microelectronics are the lifeblood of 40% of all innovations. Components and Integrated systems are found in virtually all electronic products; from computers and telephones to cars and buildings. Micro and nano-electronics underpin a significant part of the worldwide economy. Their role will continue to grow as future products and services become more digital and connected. The global turnover of the sector alone was around €230 billion in 2012. Despite the current economic climate, the worldwide market for micro and nano-electronics has grown by 5% per year since 2000. Further growth of at least the same magnitude is predicted for the remaining part of the current decade. In Europe, more than 240.000 people are directly employed in micro and nano-electronics.

In the coming years the market for the internet of things will further develop unlocking new economic growth and employment for the regions of Europe. The connected car and smart buildings are only two examples representing 730 Billion Euro of revenue.

Although the market share of European manufacturers of just under 10% including Equipment manufacturing and smart miniaturised systems is modest, as compared to the global completion in the United States and Asia, the European micro electronics sector is still competitive. Although Europe still has a good presence in the IDM market Europe, it is also becoming very active in chip manufacturing through fables design companies and foundries. Finally it has a strong and undisputed leadership in the manufacturing of equipment and systems for the automotive sector.

Keeping a manufacturing base in Europe and being able to produce state of the art chips and systems is key for many industrial sectors in Europe like automotive. European regions should follow the example of Silicon Europe that has been able to create 4 true ecosystems of innovation and technology. These regions are instrumental for the competitiveness of (surrounding) European technology based (manufacturing) sectors and is an example of smart specialisation in Europe.

The cluster partners from Germany, Belgium, France and the Netherlands are linked by a common goal: They aim to secure and expand Europe's position as the world's leading center for energy efficient micro- and nanoelectronics and information and communications technology (ICT). In order to reach this goal, Silicon Saxony (Dresden/Germany), DSP Valley (Belgium), Minalogic (Grenoble/France) and Point One (Eindhoven/Netherlands) are cooperating in research, development and business expertise. Together they represent about 800 research institutes and companies, which account for more than 150,000 jobs; among the companies are global market leaders such as Philips, NXP, Globalfoundries, Infineon, STMicroelectronics, Schneider Electric und Thales. This makes Silicon Europe one of the largest technology clusters of the world. Last year only, through the ENIAC Joint Undertaking 5 Pilot Lines for microelectronics were established in Europe (not only in the regions mentioned above) reinforcing technological en entrepreneurial activity in the field of microelectronics

BARRIERS AND CHALLENGES

Through the operational plans regions will be able to plan their activity in the field of microelectronics and to announce their investment plans within their region. To be able to use EU

[1] COM(2009) 512: KETs are knowledge-intensive and associated with high R&D intensity, rapid innovation cycles, high capital expenditure and highly-skilled employment. They enable process, goods and service innovation throughout the economy and are of systemic relevance. They are multidisciplinary, cutting across many technology areas with a trend towards convergence and integration.

Regional funds such as ERBD the regions will have to assess how microelectronics can contribute to the creation of growth and jobs. Regional operational plans will have to be in line with the interests of local industry and the regional knowledge base. Like in other regions with strong clusters in microelectronics, regions should aim at a perfect match between all actors in order to contribute to and benefit from the value chain in micro- and nanoelectronics.

The European Commission has launched a communication for a European Strategy for micro- and nano-electronic components and systems announcing the new Public Private Partnership (PPP) in microelectronics under the EU's new Research and Innovation (R&I) framework programme for 2014-2020 (Horizon 2020). This new JTI called ECSEL aims to establish a long-term commitment between 8the Commission and the microelectronic stakeholders to invest in market oriented research, demonstration, and pilot line activities and will contribute to possible projects in the region. http://ec.europa.eu/digital-agenda/en/news/communication-european-strategy-micro-and-nanoelectronic-components-and-systems

This communication is a very useful reference documents for regions having plans to invest in microelectronics. It helps to define technologies and innovation opportunities to develop RIS3 operational plans.

HOW TO ACT?

The following elements are useful to consider for regions wishing to develop regional strengths in microelectronics and systems in preparation of their operational plan:

1. Analysis

Identify the main fast growing microelectronics and systems industrial sectors and the main stakeholders in your region (industry, incl. SMEs and end-users, universities, research institutes, competence centres, etc.); make a SWOT analysis of their capabilities and skills as well as of their competitive advantages; in particular, assess the opportunity in affecting the innovation potential of user industries excelling in application areas and industrial sectors present in your region;

Engage with the stakeholders: set strategic R&I priorities (expressed in your RIS3 operational programmes); develop roadmaps to reach the set goals, and define implementation actions for the main actors to work together and spur forms of innovation or specialisation. Examples of potential lines of action are provided below;

identify / link with other similar activities at EU level to help your stakeholders find opportunities for cooperation and growth outside your region / country;

develop a *planning and monitoring framework* based on a number of key performance indicators to measure progress against the objectives and assess the expected impact; Relevant Key performance indicators for KETs in general and microelectronics and systems in particular are provided both in the KETs High-Level group report.

2. Governance/Stakeholder Involvement

Regional governments, development agencies, private investors and banks together with local industry should commit to contribute to the execution of the operational plan. All actors play a key role in promoting R&I investments in the region. Their cooperation means synergy in terms of knowledge, networking and funds. Therefore, it is important for the regions to coordinate their operational plans in the framework of Smart Specialisation among all stakeholders in the cluster and if necessary even with relevant stakeholders outside their regions. Excellent clusters are a must to develop and implement effective regional RIS[3].

In Europe, the 3 largest clusters in the field of Micro and Nanotechnology; one in Dresden, one in Eindhoven/Leuven and one in Grenoble. Further there are important production facilities in Ireland

Leixlip were INTEL has established its European manufacturing base. Apart from the big 4 clusters there are a dozen small clusters focussed on the development and manufacturing of microelectronics throughout Europe. Commission's approach is to help these clusters reinforce their excellence and their attractiveness to investors and to young talents. Through supporting their networking, it helps them bring together regional ecosystems and develop sustainable business partnerships all along the value chain. The new PPP ECSEL JTI is one of the major instruments to support new installations, demonstrators and pilot lines also for the benefit of all stakeholders including SMEs. Also other European Instruments like Horizon 2020 are viable instruments alongside the Structural funds to make a contribution to the development of those clusters.

3. Priority setting:

Within clusters, SMEs are also playing an important role in the development and manufacturing of microelectronics and systems. Regions should support SMEs by stimulating their access to testing, prototyping and manufacturing capabilities for microelectronics and systems through open innovation models along the value chain, promoting the collaboration between large industry and SMEs. Supporting the development of open-access pilot lines and foundry services (see below) enable SME to access to microelectronics and systems manufacturing capabilities.

EPPL (Enhanced Power Pilot Line) is an EU ENIAC Pilot Line Project focussed on the production of leading edge power semiconductors for advanced, energy efficient industrial, medical and mobility applications. In the project large companies, research institutions and SMEs are participating and co-operating together.

Regions should explore the opportunity to stimulate industrial clusters in microelectronics. Creating such clusters requires a balanced policy to match actors and activity. Attracting large industrial players together with research institutions are a powerful incubation strategy usually leading to new industrial activity of new fast growing start-up companies. The success of these young start up companies depend on open access pilot lines and manufacturing facilities at regional centres of excellence. Pilot facilities enable cost-effective deployment of microelectronics and systems technology in numerous applications, and ultimately lead to high volume production. Supporting the creation of pilot production facilities, in which industry and research institutes can jointly develop innovative microelectronics and systems production processes, targeting applications relevant to societal challenges and economic growth.

4 Policy Mix:

KETs and microelectronics and systems will take up a prominent role in Horizon 2020. One of the main new issues is that Regions will be able to more easily combine different EU instruments in order to support their local economic ecosystems. In the future, several EU funding tools can be combined for the financing of one operation (for example the creation of a pilot production line), given that the expenditure is not double-financed and general state aid principles are followed. In addition, the Commission will cooperate with the European Investment Bank in order to provide loan guarantees to productive investments. Overall, a coherent financial framework will be put in place in order to support development and innovation stages of KET- and microelectronics and systems related processes.

Regions could invest in large scale demonstration actions and public procurement schemes that promote innovation for an effective field testing and deployment of innovative microelectronics and

systems technologies in application fields where public authorities can act as first users. Illustrative examples include the 5 pilot lines that were commissioned by the ENIAC JTI in 2012i. In the future regions could participate and co-fund such pilot lines contributing to the strength and added value of microelectronic clusters in their regions.

5. Evaluation and Monitoring:

The European Commission calls upon the Member States and the regions to monitor closely the progress made in regional development, specifically when it concerns micro-electronics and systems integration. Coming Europe and the regions should follow the developments to see if the regions are able to develop new clusters in microelectronics to benefit from evolving/emerging markets like the connected car and smart buildings. It will be key to create the right framework conditions for involved industries to capture these markets through RIS3.

FURTHER READING & FORTHCOMING EVENTS

Useful websites

[1] *http://ec.europa.eu/regional_policy/sources/docoffic/official/communic/smart_growth/comm2010_553_en.pdfhttp://ec.europa.eu/enterprise/sectors/ict/key_technologies/index_en.htm*

[2] *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0341:FIN:EN:PDF*

[3] *http://www.europe-innova.eu/c/document_library/get_file?folderId=148901&name=DLFE-9308.pdf*

[4] *http://www.epic-assoc.com/*

[5] *http://s3platform.jrc.ec.europa.eu/c/document_library/get_file?uuid=a39fd20b-9fbc-402b-be8cb51d03450946&*

[6] *http://www.rim-europa.eu/*

[7] *http://ec.europa.eu/competition/consultations/2012_stateaid_rdi/index_en.htmlTowards 2020*

[8] http://www.microelectronics and systems21.org/download/Brochures/Microelectronics and systems_Roadmap_final_lowres.pdf

[9] http://cordis.europa.eu/fp7/ict/microelectronics and systems/digitalagenda-and-ssl_en.html

[10] http://www.microelectronics and systems21.org/download/Leverage_Internetversion.pdf

[11] http://www.microelectronics and systems21.org/download/Brochures/Microelectronics and systems21-Internet.pdf

[12] http://cordis.europa.eu/fp7/ict/microelectronics and systems/clusters_en.html

[13] http://www.qren.pt/np4/np4/?newsId=1334&fileName=guide_research.pdf