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Accompanying document to the

Proposal for a
COUNCIL REGULATION

Setting up the "ENIAC Joint Undertaking"

Executive summary of the
IMPACT ASSESSMENT

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1. INTRODUCTION

A Joint Technology Initiative (JTI), a public-private partnership between industry, Member States and the Commission is planned for nanoelectronics, with as major objectives:

- to increase and coordinate in a single programme the resources needed for industrially-driven cooperative R&D in Europe and to transfer results in major application sectors;

- to increase the level of strategic partnerships and initiatives among European partners and to provide European industry with the critical mass in terms of resources and competencies to play a significant role at global level;

- to experiment a new way of executing industrial R&D in order to efficiently anticipate the changing business and research models, more adapted to industrial needs in particular for SMEs, combining for the first time national, EU and private funding.

This document focuses on the impact analysis of such a JTI, based on the results of extensive consultations of the Commission with stakeholders in the nanoelectronics domain.

2. PROBLEMS AND CHALLENGES

Nanoelectronics is pervasive and the motor for innovation in many areas today including mobile communications, transport, computing, consumer products, and manufacturing automation. This gives it a large economic impact or a high socio-economic relevance as for security, healthcare, aging, energy saving, and environmental monitoring. Europe must safeguard its capability to design and produce its products following its own standards of high quality, sustainability and environmental friendliness.

Nanoelectronics is a global market ($265bn in 2005) directly stimulating a larger electronics industry ($1340bn) but Europe is not gaining market share. Europe is a net importer of nanoelectronics: 12% of the worldwide semiconductor production capacity is located in Europe, while 20% of the worldwide semiconductor products are consumed in Europe. The global competition is fierce, especially by countries like Taiwan, Korea, China and the USA.

Business models are changing. Nanoelectronics becomes a global activity. Integrated Design and Manufacturing (IDM) companies are increasingly relying on foundries (third-party fabs) and go fab-lite for their added-value operations or even fab-less, cooperating in ecosystems of knowledge for their R&D and in strategic alliances for their access to the most advanced technologies. This is the result of the growing capital investments (e.g. 5.5 B€ for a typical mega fab) required to research and manufacture the new generations of components. This goes above what individual companies can afford (except Intel) in terms of return on investment and rate (18%) of research. Consequently, generic nanoelectronics technology research is executed in a few major alliances, while manufacturing of advanced commodity products is done in a few mega fabs. Europe must assure that its companies can play a strategic role in these global alliances and can keep added-value operations including advanced manufacturing in Europe, accessible to European partners (including SME's active in equipment, support, systems integration and design). One of the main competitive risks is a 'technological lockout'. European suppliers might fall so far behind their competitors that they are unable to catch up.

Research models are changing. Europe must further assure that the research can be executed on European soil in order to maintain high added-value jobs in Europe. This requires a shift from the linear model where research results are transferred from universities to institutes and further to industry, into a model where research is done in cooperation, deeply embedded in the industrial web supporting the knowledge ecosystems. Moreover the research must produce sufficient critical mass and allow for sharing access to expensive state-of-the-art infrastructures, supporting the European industry and its researchers in acting globally.

Delocalisation of nanoelectronics manufacturing holds a real risk of migrating also added-value activities to other parts of the world. Some countries have developed special incentives to attract and retain foreign semiconductor investment, whereas the EU lacks a dedicated sectoral approach to support this key industry. Europe must react with comparable measures.

Product performance and functionality is growing. Advances in miniaturisation allow ICT to be embedded everywhere, providing enhanced functionality, more intelligence and more personalised products and services. These added-value operations are key elements for product diversification and a strong European competence. They form the basis for a European Strategic Research Agenda combining miniaturisation with other system integration elements aimed at key European lead markets. This holds a huge economic potential in the knowledge-based society. Europe can just not afford to miss this future and become dependent for its social progress and well-being on progress in other regions of the world. The semiconductor industry will also have to face the challenge of combining the shortening of the product life cycles with the increasing complexity of those products. In fact, only a significant investment in advanced R&D allows keeping up the pace of innovation in this sector.

Technological challenges are manifold. As technologies shrink in the nano domain, research is becoming increasingly multi-disciplinary. Bringing European competencies together is essential for future progress. The rising complexity to overcome the technological roadblocks requires increased human effort and an expensive infrastructure. Mobilisation of all resources and worldwide cooperation is required to realise the milestones. It is also expected that traditional miniaturisation will reach its limits in 10-15 years. Activities have to be started to prepare for beyond the traditional scaling of devices. Part of the R&D will have to focus on improving the efficiency of production. The capabilities to design new products are lagging behind the technological progress. The European research fabric will need to redirect itself to take better account of the technological opportunities and will need to invest more in applied research. This requires a fundamental shift from single science, technology thinking into multi-disciplinary system thinking.

Europe's public research investments in nanoelectronics are fragmented: Eureka, the Framework Programme (FP), national/regional initiatives (including various 'pôles de compétitivité'). Consequently, Europe's research landscape is in the need of a convincing, efficient coordinated approach in the area of nanoelectronics.

Market failures justify a public intervention in the nanoelectronics domain. Basic knowledge, developments of new equipment, materials and design tools are cross-cutting many applications, are difficult to protect, create many knowledge spillovers and are to be considered as "public good". Research is speculative and exploitation of the results uncertain with fierce global competition which creates imperfect and asymmetric information. SMEs engaged in high-tech innovative projects may find it difficult to reach critical mass to compete at worldwide level. The pervasiveness of nanoelectronics across a wide range of industries, public sector tasks and new societal applications makes it impossible for R&D actors to reap the full return of their efforts. This creates major R&D spillovers and positive externalities. Coordination and networking problems among market actors, public sector, and cross-sectoral application domains also justify public intervention in pre-competitive R&D.

3. POLICY

Stakeholders have recognised the critical nature of the problems and have gathered in the ENIAC European Technology Platform (ETP), in which all possible players work together to reinforce the EU's leading position in the design, integration and supply of nanoelectronics. The platform has published a European Strategic Research Agenda (SRA) outlining the evolution of the field from a medium- to long-term perspective and identifying a number of important technological and regulatory challenges for Europe.

The proposed ENIAC JTI will be one of the pillars for implementing the **technological and economic objectives** of the ENIAC ETP. The JTI is to contribute to sharing the escalating costs of the R&D activities and infrastructures; take or maintain leadership in diversifying applications of semiconductor technologies; manage breakthroughs in technology and in design in order to fill the ever-widening gap between technologically achievable and economically feasible; provide SMEs with effective tools to support them in their innovation process and to act at global level.

Several options to implement the JTI were evaluated and discarded. These vary from doing nothing (business as usual) to participation in joint actions by Member States (with various legal models). Only a new action at Community level can develop an approach that combines the benefits of European integration with fast alignment of goals and industrial policies and with flexibility in participation and national commitment by Member States.

The analysis of the potential implementation options for the ENIAC JTI concluded that **a 'Joint Undertaking' model** on basis of Article 171 of the Treaty **is the only option that satisfies the constraints and requirements to achieve the objectives.** It's a structure durable over time with legal personality that (a) provides a legal framework for the collaboration of all public and private stakeholders, (b) is capable of receiving funding from different sources, and (c) is capable of launching major initiatives of longer duration.

It is further expected that the JTI will create **additionality** in terms of extra R&D expenditure thanks to the foreseen EC investment of €450m leveraging a €3bn programme with additional national support and greater industry funding (1 euro of the EC contribution to leverage an expected 6 to 7 euros of R&D effort). More importantly the JTI will create **'behaviour additionality'** in terms of European collaborative projects launched, acceleration of R&D results, expanded scale, scope and complexity of the projects.

4. STRUCTURE AND GOVERNANCE

The founding members of the ENIAC Joint Undertaking (JU) would be Member States, the European Community and R&D performers. Other members can join the JU at a later stage. The R&D performers, i.e. industry and research organisations, are represented in the JU via an association called AENEAS. The statutes of this association have to follow the general principles of fairness, transparency and openness for accession.

The Governance Structure of the Joint Undertaking is made of a Governing Board, an Industry and Research Committee, a Public Authorities Board (PAB) and an Executive Director with a Secretariat.

The JU will elaborate a multi-annual work programme based on the SRA, under which R&D activities will be implemented through open calls for proposals. Participation to these calls will be open to all organisations and not only to the members of the association. State members of the JU will annually commit resources that will be mainly spent to fund their respective national participants. The EC will also commit a budget (contributed by the FP). Industry will cover more than 50% of its R&D cost for the JU through in-kind contributions. In addition, industry will cover approximately two thirds of the operational and non-R&D costs of the JU through cash contributions.

5. ECONOMIC IMPACT

European public funds act as a magnet for further private and national investments. Many national policies are being aligned with the European ones. Several new strategic initiatives are launched by Member States to support these technologies.

The total nanoelectronics value chain is concerned by this initiative. It is therefore of vital importance to build anchors for European top companies to stay here. Such anchors will be made of pools of competence and will be created through the fostering of networking between companies and research institutes. Furthermore, strategic alliances between nanoelectronics component suppliers and system designers will provide more incentives to keep knowledge in Europe and to create diversified products with a European flavour.

The impact of achieving the JTI technical objectives will bring Europe at par with other players worldwide for being considered a strategically important partner in global alliances in view of the diversification and integration of complex systems.

The JTI will remove uncertainty by creating the stability for investing in a long lasting initiative. Especially for SMEs, the new arrangements will offer a more attractive regime. A further benefit of the JTI compared to the current co-existence of various schemes is the increased efficiency of EU-level disbursements, the savings expected from avoiding preparation of proposals in different languages, the streamlined project reporting procedures and an increased success rate due to guaranteed harmonised funding procedures.

6. SOCIAL AND ENVIRONMENTAL IMPACT

The JTI will contribute to maintain and create more and better quality jobs, in line with the re-launched Lisbon strategy. Mainly the greater use of nanoelectronics-based products and services will lead to the creation of several thousands of jobs in Europe.

The JTI is oriented towards the vision of 'ambient intelligence': environments that are aware of our presence and responsive to our needs. The JTI targets such environments with six application domains: healthcare, energy, mobility & transport, security & safety, communication and education & environment. All have a high social relevance and contribute to improving the quality of life and well being in our society. Unless the public sector intervenes with adequate support, it is clear that individual firms cannot expect sufficient returns to justify the level of R&D investments that would be socially optimal. For instance, this applies to environmental monitoring and management which is a key application area for the JTI.

All electronic systems use electricity and are part of a general trend towards the 'electrification' of society. However, use of electronic systems also allows better management and control of energy efficiency. For example, nanoelectronics will be essential in the intelligent portable systems needed to reduce energy consumptions in the house, in the plants and in the transport systems that will be a key factor for the protection of the environment. In many applications this is their primary purpose. Moreover, reduced power consumption for electronic devices is an important and ongoing technical objective.

Nanoelectronics must be developed in a safe and responsible manner, in line with the European Commission's safe, integrated and responsible strategy for nanosciences and nanotechnologies for Europe in its Communications "Towards a European Strategy for Nanotechnology" COM(2004) 338 and "Nanosciences and nanotechnologies: An action plan for Europe 2005-2009" (COM(2005) 243). The strategy confirms that nanotechnology and nanoparticle developments should address any potential public health, safety, environmental and consumer risks upfront by generating the data needed for risk assessment, integrating risk assessment into every step of the life cycle of nanotechnology-based products, and adapting existing methodologies and, as necessary, developing novel ones. The establishment of the Nanoelectronics Joint Undertaking will bring all stakeholders together to discuss these important issues, to agree on common ways to address any potential risks and more specifically to call on common measures to support environmentally sound management of nanoelectronics life-cycle.

7. BENEFITS AND RISKS

The overall financial support from the EC in the area of nanoelectronics will increase during FP7.

The risks for the FP are very low. The EC contribution is conditional on the contributions of the Member States and will be made in annual commitments/disbursements depending on the progress of the JTI.

It is expected that part of the activities in the area of nanoelectronics currently supported within the Eureka clusters will be progressively integrated in the ENIAC JTI.

What if no action? Europe may run the risk that the competence to integrate new functionalities into smart systems will follow the off-shoring trend of commodity manufacturing, weakening in the long run the capability to produce in Europe added-value in electronic systems. This would result in a dramatic decrease in competitiveness in general, particularly as nanoelectronics is at the bottom of a wide food-chain forming the basis of the knowledge society and a motor for the future economy at large. This would also have major consequences for the number of high quality jobs, not only in the hardware sector but for all other activities dependent on hardware innovation. In order to avoid such a doom scenario, there is a political will to safeguard more European competence on European soil while encouraging strategic alliances to form knowledge-based ecosystems as well as to strengthen European presence in global alliances.

8. MONITORING

The JTI will be concurrent with FP7 and will be subject to similar procedures of monitoring and evaluation. The ENIAC SRA provides the baseline for assessments, of which the criteria could include increase in investment, efficiency in procedures, technological progress, non-technological activities and involvement of SMEs and new players. Two monitoring assessments are foreseen: one at the mid-term and one at the end of the life of the Joint Undertaking.

9. CONCLUSION

A JTI on nanoelectronics is proposed to help safeguard European competitiveness in nanoelectronics. An integrated European initiative of longer duration designed to link the different required competences together will deepen the strategic alliances between European partners providing for sufficient critical mass in terms of resources, access to infrastructure and competences to compete or cooperate at worldwide level.