Introduction

- The political context
- The answer of the Commission
- Why a European (Research) Policy Micro - and Nano-electronics?
- The Nanoelectronics landscape
- How to implement ?
- European Initiatives
- Conclusion
The renewed ‘Lisbon’ strategy for growth and jobs: new cycle 2008-2010

Lisbon Strategy
(growth & jobs)
2000

Gothenburg Sustainable Development
(quality of life)
2001

4 priorities
- Investment in human capital & labour market innovation (Employment & skills)
- Investment in knowledge & innovation
- Exploitation of the potential of companies incl. SME’s
- Energy and climate change

Objective Barcelona: 3% of GDP

The Lisbon strategy 2008-2010

Shaping the future society:
A knowledge & networked society by:
- Pervasive computing
- Ambient intelligence
- Internet of things, Future internet

Managing the grand challenges of the future
- Climate change & sustainable environment
- Clean and sustainable energy
- Sustainable transport
- Sustainable production & consumption
- Public health threats
- Social inclusion, demography & migration,
- Fighting global poverty
- Security and safety

Managing economic and social progress:
- Globalisation
- Aging population
- Adapt social security and labour markets
- Scarce resources

Most are global threats, global challenges and offer global opportunities
What does the European Commission?

- **policy**
- **funding**

Staff papers, Communications, Regulations,….

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**The European policy framework**

- **“Lisbon”**
  - Strategy
  - Growth & Jobs

- **“Gothenburg”**
  - Sustainable Development Strategy
  - Quality Life & Well Being

- **Triangle of knowledge**
  - Research
  - Produce
  - Education
  - Diffuse
  - Innovation
  - Apply

ERA

Inside
All elements have to work together to make it happen

- Research & Development & Innovation & “Industrial” Policy
- Legislation
- Lead Markets & Innovative Public Procurement
- Research + Education + Innovation funding
- Regional Policy & structural funds

R&D in a holistic and global context

Increased international cooperation on RTD, impact and risk assessments, common initiatives for sustainable growth (reduce CO2), Green IT, autonomous driving, safety, ....

Nanotechnology & Nanoelectronics: enabling and pervasive!
WHY a innovation & nanoelectronics policy? Levers to Increase Profitability & Growth *)

- **Enhance Innovation Ability** - 86 %
- **Focus on Core Competencies** - 80 %
- **Cost Cutting** - 78 %
- **Organic Growth** - 74 %
- **Capital Efficiency** - 74 %

Companies believe Innovative Ability is the most important lever!

*) Across all regions and industries

Source: Arthur D. Little, 2005

Europe need to increase its innovation potential

High Tech Areas, high growth areas are very R&D Intensive

R&D Intensity in HighTech Areas

- Investments are growing exponentially with shrinking size
- Nanoelectronics evolution requires massive investments in R&D & production capability

Source: Technology Review
Nanoelectronics: Challenges for Europe

- Nanoelectronics - pervasive and motor for innovation in many areas
- Nanoelectronics - a growing market but fierce global competition and Europe is a net importer
- Technological and research challenges are manifold
  - nano domain is multi-disciplinary, product performance and functionality integration are growing, complexity increasing, costs are huge, expensive research infrastructure
- Europe’s public research investments are fragmented

By 2010, electronics & software in cars will account for up to 40% of its value

Applied intelligence example: safety cocoon

- Bluetooth or WLAN connects with GSM, issues status updates, emergency warning
- 77 GHz Radar Long range ≤ 150 m
- Infrared Night Vision ≤ 150 m
- Video Mid range ≤ 60 m
- Ultra sonic Short range ≤ 3 m
- Video Rear zone

Cornerstone of high-tech economy

2005 worldwide market figures – source Future Horizons IFS2006

Semiconductors $ 265B

Services > $ 6,000B

Products $ 1,340B

Consumer, Medical, Transport, Security, Space

Telecom, Internet, Broadcast

Materials and equipment $ 75B

World GDP $ 46,000 B

Cornerstone of high-tech economy

77 GHz Radar

Infrared

Video

Ultra sonic

Video

Networked Cars

2005 worldwide market figures – source Future Horizons IFS2006
Applied intelligence example: all in the pocket

- Personal Health Monitor
  - Heart activity
  - Blood pressure
  - Glucose level

- Personal Map
  - Compass
  - GPS
  - Altitude

- Personal Weather Station
  - Humidity
  - Pressure
  - Ozone
  - UV exposure

- Decibel Meter

- Identification

- Mouse

- Gaming

- Personal Map
  - Compass
  - GPS
  - Altitude

Many invisible distributed devices throughout the environment, that know about their situational state that can be tailored towards your needs and can recognize you, that can change in response to you and your environment that anticipate your desires without conscious mediation.

Nanoelectronics has many Societal Impacts

- Artificial vision
- Identification
- Insulin dispenser
- Stimulation

Intelligence and Communication in Everything
“Semiconductors are for the Information Society what grain was for the agrarian, and iron and steel for the industrial society”

Shanghai Museum of Urban Development

“As money is for the business, semiconductors are the motor for innovation in all industrial sectors, the fuel for the ‘real’ economical engine”

Characteristics of Nanoelectronics industry

- **Enabling or value adding** (innovation driver, productivity & efficiency driver, general purpose,....)

- **It has Systemic relevance** (networking, IPR, multidisciplinary,....)

- **High Tec** (innovation cycles, R&D intensive, science and know-how intensive, high skill ratio, IPR)

- **Capital intensive** (production, R&D, investment equipment & / employee)

- **Global**

- **Economic and social relevance** (market growth including new markets, employment,....)
Nanoelectronics challenges
An Industry in Movement

Increasing cost for advanced mega fabs & for R&D for next technology node & private equity involvement trigger major changes:

- Globalisation of Semiconductor R&D and Manufacturing
- Changing Business Models and Consolidation (digital economy)
- Changing R&D Models
- 4 Generations to Go? - What is Next?

How to remain competitive?
How to compete globally?
How to assure RTD is not following production?
RTD is big business!!
What about the post crises??

The opportunity: Building on European strengths

- Europe has a history of open collaboration between equipment and materials suppliers, chip makers, system integration and final application designers
- Europe has a strong fabric of large multinationals, innovative SMEs, and renowned academic institutions with a broad expertise and excellent brains
  - Industry sectors: e.g. semiconductors, lithography, SOI
  - R&D institutions: e.g. IMEC, CEA-LETI, FhG, Tyndal
- Europe has regional ecosystems as main competence centers, some major foreign investments and a stable social situation (Leuven/Eindhoven, Dresden, Grenoble, Dublin, Catania).
A healthy European semiconductor industry?  
a European Answer is Needed

Europe and MS need to help European companies to become or maintain global leadership in key lead markets (system houses as well as semiconductor companies and companies in the whole foodchain to create innovative products competitive at world level)

- concentration on R & D and transfer in innovation
- focussing on lead markets, single markets
- stimulate pre-competitive procurement
- assure fair competition and access to finances

Europe and MS need to make sure European soil is fertile ground to attract new investments (European and external) in the nanoelectronics and electronics industry.

- best researchers and best educated and trained multidisciplinary engineers
- access to best manufacturing & research infrastructure
- fight fragmentation and explore / focus on regional clusters of competence
- provide (financial or equivalent) incentives to attract semiconductor industry and fight the distortion of the competition from other regions in the world
- mobility and a social attractive working environment

Nanoelectronics: a European Answer is Needed

Europe needs a coordinated R&D and Innovation Policy and more efforts in Nanoelectronics

- critical mass in entire value chain - materials, equipments, design, integration and manufacturing
- building on lead markets - technology + market driven R&D
- better linked industry and academia
- increased multi-disciplinarity and system approach

High impact of non-R&D factors!!!!

- trained multidisciplinary engineers
- access to manufacturing, foundries & research infrastructure - for SMEs and academice
- state aid policy complementary to “industrial” and research policy,
- new investments and IPR protection

Excellence and competence  
be at the top - concentration on most value added
What does the European Commission?

(policy)

When and Why Public Investment in R&D?

Market failure criterion:
Pervasive technology - Spill over effects
Broader public interest - Investment in ‘public goods’
High risk & uncertainty factor - Critical mass problem
Incomplete technology chain - Strategic cooperation

To be complemented/topped up by industry investments:

More, earlier, focused and coordinated

Nanoelectronics R&D: Key for Europe’s Competitiveness
Nanoelectronics: research and innovation

ICT in FP7
- 9.1 B€ 2007-2013- increase of 30% -2010 - wrt to FP6

ICT in Competivity Innovation Program (3.6 B€)
- 730 M€ on areas of public interest eHealth, eGovernment

Nanoelectronics in FP7
- ICT (nanoelectronics and FET: 50 M€ funding - 100M€ cost / year)
- RTD (NMP, materials)
- ENIAC JTI (3 B€ program (2008-2013): 450 M€ + 850 M€ from MS, rest from industry)
- ERC and EIT (infrastructure)

Nanoelectronics in Eureka
- CATRENE (2 B€ (2008-2011))

Nanoelectronics and Structural Funds

Nanoelectronics

Internationalisation
- GAMS, INC

State Aid
- Major programs in France, Netherlands, Germany, Portugal, Ireland

Nanoelectronics as part of Nanotechnology
- Largest market
- Communication and Action plan: Several policies involved & Public awareness

Nano-electronics as part of recovery package
- Electric Car, Energy Efficient Buildings, Manufacturing

Public procurement, coordination with National Programs, with regions of knowledge, Quick Start Program, European Investment Bank.

........................ and many more ......
Conclusion Nanoelectronics Industry

- **“Strategic - Systemic - Enabling”:**
  - Need to keep R&D & I and access to manufacturing in Europe.

- **“Capital - Science - Knowledge Intensive” - Multidisciplinary**
  - Need R&D & I policy and cooperation at EU level, with and between MS for research, education, infrastructure, manufacturing (knowledge ecosystems) - networking
  - Need to stimulate investments, access to finance, tax incentives

- **“Globalisation”**
  - Need to cooperate and compete (cooptition) at world level (no fortress EU)
  - Need larger entities (supply - demand, lead markets, pre-commercial procurement)
  - Harmonise internal market

Conclusion Nanoelectronics 2

- **“Stimulate ‘sustainable’ growth”:**
  - Need to combine social needs with market / economic vision
  - Lead markets - procurement - fair competition/trade barriers - tax policy
  - Explore Recovery package: Survive to become stronger!

All forces need to work together

- EU and MS
- Public authorities, policy makers, industry, research and academics
- Research, innovation stimulation, regulatory, infrastructure, regional and other policies.
Conclusion

Investing in innovation is investing in wealth and social progress, investing in nanoelectronics and semiconductors today is investing in future innovation.

All major developed States in the world are investing heavily in nano-tech research.

Europe and its Member States must assure access to nanoelectronics manufacturing and competence as one of their main strategic assets to safeguard their long term innovation potential to create wealth and well being.

Policy actions and Research Initiatives (7th framework, JTI ENIAC) are contributing to this high level objective.

European Research Policy in Nanoelectronics:
There is light in the dark

Thank you for your attention.
European Strategy for RTD and Innovation in nanoelectronics

The implementation mechanisms

European Research Area - New Perspectives - “Internal market in research, restructure of research fabric, research policy”

Lead markets, Open Innovation, Technology Platforms, Joint European Technology Initiatives, Joint Programming as a gateway to Strategic Research Agendas and to the transfer of research into the market. Regulatory aspects. “Towards a European Strategy for Initiatives Nanotechnology” and “Action Plan” to implement an integrated, safe and responsible approach. “Communications on energy, future internet,...” and “i2010 initiative” « the Recovery plan »

Framework Programme for RTD to master and shape cooperative RTD Competitivity and Innovation Programme to ensure uptake and best use”

National Programs, Regional Policies, (Regions of knowledge ” Poles de Competitivité”, ‘Quick Start’ EIB, structural funds, ...) EUREKA

European competitive position:
Some facts and figures

• EU share in global hi-tech value added products declining due to US dominance and fast rise of Korea, China
• Total ICT R&D spending per capita in EU less than 1/3 compared to US and Japan; investment in ICT in EU < 6.5%, US & Japan close to 8% of GDP
• Pre-commercial public procurement US spend 50 B€ / y ; EU less than 2 Billion € - Public sector is 45% of GDP
• Public investment in ICT R&D in EU 5.5 B€/y in US 14 B€/y
• EU is world largest ICT market (32%) but growing only 4%/y compared to 7% world wide, fragmented making it difficult for new small companies to grow, the supply is only 20%, shrinking and investments are low
ICT: underpinning EU growth, innovation and sustainable development

• Companies believe Innovative Ability is the most important lever to increase profitability & growth - Arthur D. Little - 2005
• High Tech Areas, high growth areas are very R&D Intensive

The ICT landscape
• ICT is 6% of EU GDP, responsible for 50% of productivity gain, employs 6.5 Million people, is instrumental to address societal challenges and underpins innovation and science progress
• Systematic outsourcing / off shoring of production
• Global competition attracts investment in manufacturing, R&D and skills outside Europe
• Difficulty for SMEs to access finance and grow, low Return on Investments

Some key messages
• Industrial progress but not at any price (ecological footprint - energy, environment-, social progress,...)
• Globalisation: Europe concentrates on value added jobs and on reform to the knowledge and networked society
• Research and innovation and progress in nanotechnology / nanoelectronics in particular are key to realise the renewed Lisbon strategy and to maintain competitiveness.
• Europe invests in an integrated, safe and responsible approach towards RTD in nanotechnology and in an integrated and coordinated approach to increase nanoelectronics competence in Europe, to collaborate and compete globally.
Some key messages (2)

- While mega-fabs may be locating in Asia, smaller, more flexible fabs will continue to prosper in Europe and European technology will play a key role in solving several world’s environmental, energy or social needs (lead markets).

- High technology material and equipment companies, innovative system integrators, continued contributions from research consortia such as IMEC, LETI, Fhg and Tyndall and universities, contribution from innovation regions (poles de compétitivité) and initiatives like ENIAC, CATRENE and the Framework will keep Europe in the centre of innovation in nanoelectronics.

Some key messages (3)

- A fast paste is essential. Many European policies and visions critically depend on nanoelectronics progress. The European program is prepared to support European participation in strategic alliances globally to maintain this progress (16nm, 450mm).

- R&D&E and related policies must subscribe to the “ecological and social European objectives”. The recovery package underlines this importance by stimulating on top of restructuring activities such as ‘energy efficiency’, ‘green car’, ‘manufacturing’ Europe is prepared to support any cooperation in these fields.

- The European program support any activity for better education, training for researchers and engineers, and for more multi-disciplinarity in the curricula.

- Europe supports increased cooperation between the different ecosystems (incl. Leuven area, Grenoble, Dresden, ), and with the ENIAC JU incl.any cooperative activities in manufacturing. Europe stimulates European presence in international conferences (INC). roadmapping and benchmarking initiatives