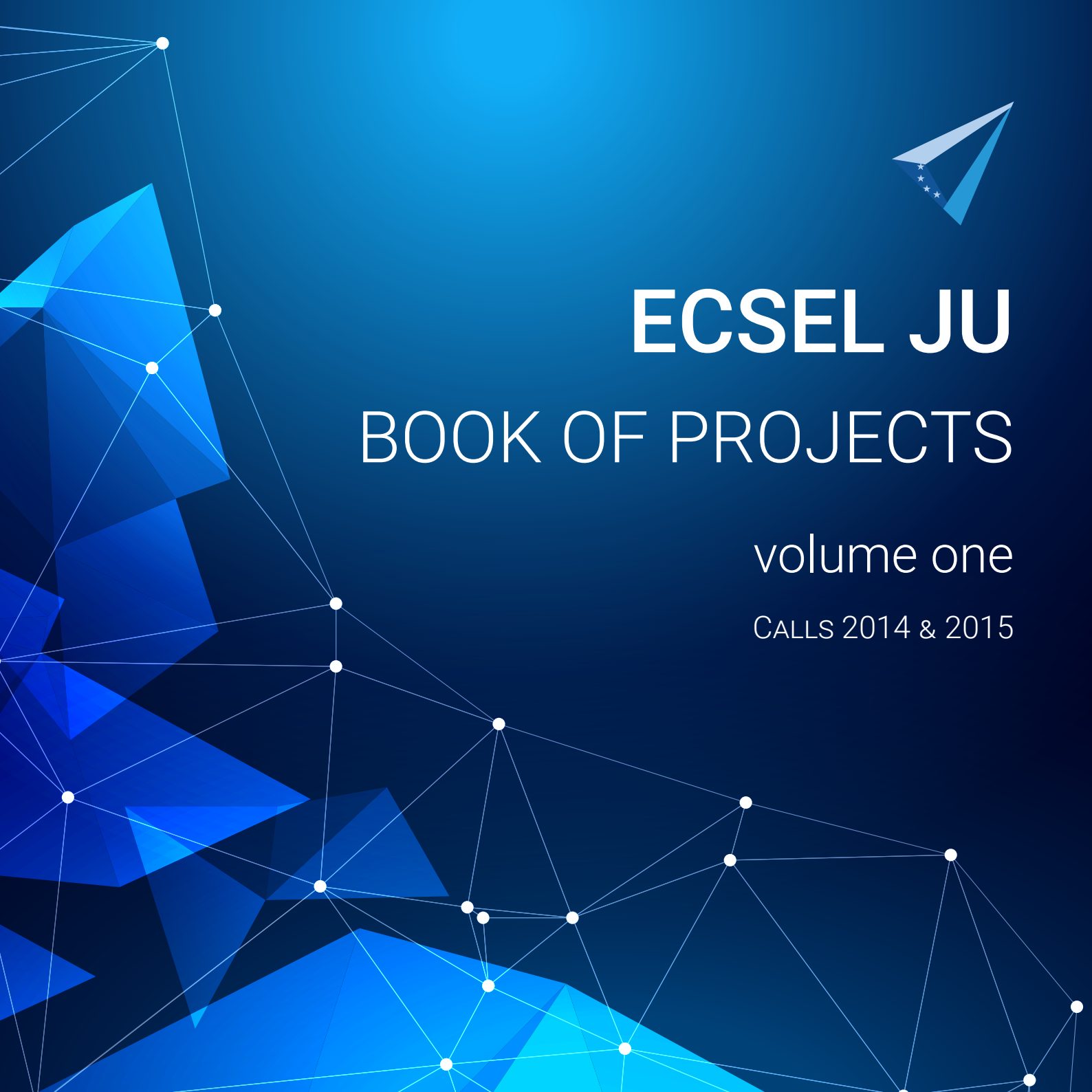

ECSEL JU

BOOK OF PROJECTS

volume one

CALLS 2014 & 2015

ECSEL JU

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CALLS 2014 & 2015

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FORE WORD

ANDREA CUOMO

Foreword

Since 2014, when the Joint Undertaking “Electronic Components and Systems for European Leadership” – ECSEL JU - was set up, a lot has been achieved. Two years on, this first "Book of Projects" is a tribute to all the hard work and dedication of everyone involved. Not only in devising and successfully having their important initiatives selected as ECSEL JU projects, but to everyone who contributed to setting up this new instrument, in managing by now two years of “Calls” for proposals, and indeed successfully launching these 25 projects.

The topic “Electronic Components and Systems” has two major characteristics of great importance to European citizens. Firstly, it is a domain where Europe enjoys high esteem in the world for its technological and application development and, as such, has a strong voice in the world-wide arena. Secondly, because of their ubiquity in daily life and key ability to drive innovation, European citizens can benefit greatly from their direct application and enjoy significant economic benefits from their positive impact on businesses in many domains.

However, Europe is being challenged by the consumerization of such systems from abroad, which presents risks for the future of Europe. For this reason, ECSEL JU was set up, to complement other existing instruments and to bring together The Commission, Member States and Industry to jointly frame and support a Wolrd-leading roadmap Electronics Components and Systems are therefore more than a specific domain of technical study – they are a pillar of social well-being, and one which all members of the ECSEL Joint Undertaking are dedicated to reinforcing.

the Chairman of the ECSEL JU Governing Board

Andrea Cuomo

INTRO

BERT
DE COLVENAER

Introduction

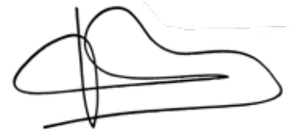
The ECSEL Joint Undertaking was set up to manage a financing scheme under Horizon 2020 LEIT (Leadership in Enabling and Industrial Leadership) chapter, bringing together the contributions from the European Commission and from Participating States: an unique and challenging model, but one which brings great benefits from financial leverage and a broad European footprint. ECSEL builds on the experience of two preceding JUs in the field – ARTEMIS and ENIAC.

But ECSEL is more than just another funding instrument. We believe strongly in the word “Joint” in “Joint Undertaking”. In bringing together both Public and Private sectors, joining forces between participating National Authorities and the European Commission, and in aligning academics and industrialists across a very wide and complex pan European supply chain, ECSEL JU presents the capability to bring science and technological development towards commercialization addressing solutions for societal challenges. Through our approach to “think together”, “work together”, “invest together”, we strongly believe we will “succeed together”.

I’m happy to present the 25 projects from the first two ECSEL years of operation: pioneers and stars, every single one of them. Pioneers, as they are the first to exercise our new instrument and stars, as they have been selected via a rigorous and competitive evaluation process. I’m sure you will enjoy discovering what they are all about!

Executive Director of ECSEL Joint Undertaking

Bert de Colvenaer



MASP & RELATION TO WP

ALUN FOSTER

An essential document that defines the ECSEL JU programme is the “Multi-Annual Strategic Plan”, or MASP. As the name implies, it lays down a longer-term vision about the technical work that needs to be done in order to secure the objectives of the programme. It is referred to by the Work Plan that describes the mechanics of the Calls for Proposals that are issued on an annual cycle. Even though Multi-Annual, it too gets updated on an annual basis – in a fast-moving collection of industries like those involved in ECSEL’s domains, it is essential that the aim of the programme is regularly recalibrated against the prevailing reality, to be sure to hit the targets set.

The MASP is a document that is collaboratively defined by the stakeholders in the ECSEL JU programme. Its primary source is the Private Members of the JU, who compile the complete description of what need to be done, and keep it up to date, in a document called the Multi-Annual Research and Innovation Agenda. Next to this is a description of which elements are the most important or urgent, to be included in the Calls for the coming year. The work is actually done by working groups from industry and academic circles, members of the Industry Associations who form the Private Members Board, with expertise relevant for the specific chapters. If you wish to influence the technical content of the programme, becoming a member of one of these organisations is a good place to start!

The staff of the JU Office, under mandate of the Executive Director, compiles the MASP on the basis of this technical input, checking it against the financial and implementation procedures of the JU, and presents it to the Governing Board for adoption. In this way, the needs of industry (which, in our world, clearly embraces the academic partners) are matched with the strategic considerations of the EU and the Participating States.

Having run this process a few times already, it’s becoming clear that this hybrid “top-down-bottom-up” approach produces a programme that has clear, strategic direction and, at the same time, offers the agility needed to produce results of immediate relevance in a fast-changing world.

CALLS 2014 & 2015

YVES GIGASE

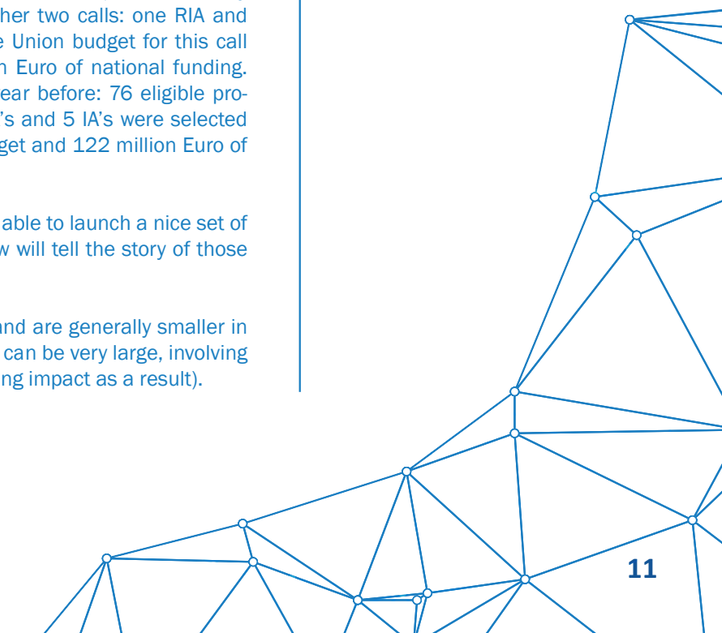
The ECSEL JU started operating on 27 June 2014, when the Council Regulation came into force. On 9 July 2014, two calls for proposals were launched with a deadline of 17 September 2014. Those calls were open for all topics in the Multi-Annual Strategic Plan (MASP). One call 2014-1 was for Research and Innovation Actions* (RIA), and one call 2014-2 was for Innovation Actions (IA). The European Union budget for both Calls was initially 135 M€, which then increased to 155M€, while the ECSEL Participating States (EPS) communicated pre-commitments of 166.76 M€ National funding, to add to that from the EU.

The response to the Calls was very strong: 48 eligible proposals were submitted for a total cost of 1830 million, and with a total requested EU funding of 715 million Euro, and 476 million Euro requested national funding. Out of those 48 proposals, 12 were selected for funding (6 RIA’s and 6 IA’s). They completely consumed the Union budget, and engaged 143 million Euro of the EPS commitments by the time the Union budget has been exhausted.

On the 17th of March 2015, ECSEL’s “Public Authorities Board” (PAB – the body responsible for all funding decisions) launched another two calls: one RIA and one IA with a deadline on September 8th 2015. The Union budget for this call was 145 million Euro, with an additional 163 million Euro of national funding. The outcome was even more spectacular than the year before: 76 eligible proposals were submitted. Out of those proposals 8 RIA’s and 5 IA’s were selected for funding. They consumed nearly the full Union budget and 122 million Euro of EPS commitments.

In all, the ECSEL JU got off to a running start and was able to launch a nice set of projects covering diverse topics. The pages that follow will tell the story of those 25 projects.

(* RIA projects are typically further from the market and are generally smaller in size, while IA projects are definitely market-facing and can be very large, involving many partners from many countries, with corresponding impact as a result).



ECSEL
PROJECTS

PROJECT CLASSIFICATION

ECSEL means Innovation in - and by means of - Electronic Components and Systems. Electronics is central to virtually all innovations in business and society, and it is constantly pushing the limits of technology. And that is hard. From nano-scale semiconductor chips with features counted in atoms to the 100-million lines of software code in a modern car, the technology stretches the limits of our knowledge and creativity, yet it must always function perfectly (think “medical instrument” or “passenger airliner” and you'll know what this means…).

MOBILITY

Electronic intelligence for the transport of goods and people; safely, efficiently and with minimal environmental impact

Electronic components and systems supporting advanced, competitive manufacturing

PRODUCTION

SOCIETY

Inclusive, sustainable and secure access to infrastructures and administrations, for citizens and local governments, through effective and user-friendly electronics systems

SMART

Medical electronics supporting active, longer life and effective diagnosis and treatment, to battle the rising cost of health-care

HEALTH

ENERGY

Sustainable energy for all citizens and businesses through intelligent generation, distribution and use

Electronics components and systems make things smart, turning technology into real, competitive added value.

To make this plethora of problems tractable, ECSEL's strategy leverages on Key Enabling Technologies as essential capabilities on the one hand, and on the other the key applications with important business and social impact. In this way, the common issues of technology development can be shared, while the specific needs of important applications are addressed. Together, these developments prepare the leap across the void between research and the creation of economic and societal added value. (In addition, each project shows its approximate total costs and the funding received at both national and EU level.)

SEMICONDUCTOR PROCESS EQUIPMENT & MATERIALS

Technologies and techniques to keep abreast of the decreasing cost of (nano-) electronics components

DESIGN TECHNOLOGIES

Assuring fast-to-market products that meet the most exacting of quality and safety demands

TECHNOLOGY

CYBER - PHYSICAL SYSTEMS

Interconnecting intelligent electronics systems with the extensive fabric of the real world

SMART SYSTEM INTEGRATION

Miniaturizing complex electronics to fit the space and performance demands of growing applications

Without the underlying transversal technologies, competitive innovations in applications are not possible.

3Ccar

Start date	**1 June 2015**
Duration	**36 months**
€M Total costs / EU / National	**54.4 / 17.6 / 13.3**
Number of participants	**47**

3Ccar addresses the ever growing complexity in mobility systems, especially in Electrified Vehicles (EV). Complexity control and reduction, translated into highly innovative semiconductors, enable improved energy efficiency, while enhanced systems integration leads to significant cost reduction, all enabling widespread EV deployment. Highly reliable electronic active safety systems contribute to Safety in Traffic ("Zero Accident Driving"), while cooperative traffic management systems will contribute towards congestion-free traffic.

With the commitment of 48 partners, including major European semiconductor suppliers and two major car manufacturers, and according to its mission "3C", 3Ccar will provide novel, Integrated Components for Complexity Control for the automotive and aviation domains.

3Ccar will demonstrate semiconductor-based powertrain, battery and fuel-cell systems for higher energy efficiency, cost effectiveness and reliability, even in harsh environments, that are ideally suited to the plugin hybrid and electric automotive mass market.

Ensuring the competitiveness of the European automotive industry and further EV growth through higher customer acceptance:

- Controlled complexity, directly reducing costs to push EV sales
- Competitiveness of the European automotive and semiconductor industries through increased robustness, functionality and cost reduction
- Next-level efficiency by higher functional integration through complexity reduction and compactness, enabling better mileage for customer acceptance
- Intellectual property and standardisation, to build European value chains
- Value chains for Manufacturing in Europe, driven by productivity and "Who can do it"
- Sustainability and lower carbon footprint, from a higher ratio of electrified cars versus ICEs (Internal Combustion Engine)

The project addresses the overall system design with a high level of partitioning while reducing complexity and related costs, simplifying maintenance and providing configurability for monitoring and updating functions. 3Ccar will ensure in-vehicle systems that monitor sensor data while performing real-time evaluation and allowing remote reprogramming. It will also bring new and scalable methods to evaluate advanced control systems in a realistic and open setting.

3Ccar will demonstrate semiconductor-based powertrain, battery and fuel-cell systems for higher energy efficiency, cost effectiveness and reliability, even in harsh environments, that are ideally suited to the plugin hybrid and electric automotive mass market.

These goals will be achieved by:

- Development of sensing and communication solutions and their integration in the next generation of automotive battery cells.
- Control of vehicle complexity by component integration and encapsulation, demonstrated with the vehicle powertrain.
- Development of complete and operating fuel-cell system, Central Computing Unit and ADAS demonstrators.
- Demonstration of interconnecting the automotive Ethernet backbone with “local network islands”.
- Delivery of embedded power modules, MEMS and sensors required by automotive powertrains, and their use and validation in project demonstrators.
- Development of model-based algorithms to determine the lifetime and operability status of EV components based on a “Design of Experiments” (DoE) approach.

3DAM

Start date	**1 April 2016**
Duration	**36 months**
€M Total costs / EU / National	**22.4 / 6.5 / 4.9**
Number of participants	**17**

Continuous downscaling of devices and development of new transistor architectures bring major challenges that cannot be met anymore by simply pushing current techniques to their physical limits. Development of a new generation of metrology, characterization tools and methodologies become more and more critical in order to advance and introduce new semiconductor technology.

Inspection and metrology systems are critical for the production of new semiconductor pilot lines and for manufacturing of reliable integrated circuit (IC) devices with high yield. These systems monitor the hundreds of processes required to manufacture a device, ensuring that they meet strict manufacturing specifications. They also help to identify and troubleshoot process issues by finding defects and detecting critical device parameter excursions, in line with the saying: if you can't find it, you can't fix it. Without inspection and metrology, it would be impossible for IC manufacturers to tackle production issues that affect fast production, to increase the number of produced devices or to address production losses quickly, and all of that in a very efficient and cost-effective way.

In order to support the European metrology equipment industry maintaining its technology leadership, 3DAM (3D Advanced Metrology and materials for advanced devices) aims at developing beyond state of the art tools for the 14-5nm technology node features with focus on 3D architectures and new materials. It will cover the main metrology and analytical gaps that still exist, such as the lack of 3D measurement capabilities at the scale of the transistor dimensions. The project plans to develop a set of new and innovative 3D metrology and characterization tools and processes, which will enable the realization of industry roadmaps in More Moore (including beyond CMOS technologies) and More than Moore. The project not only will explore innovative 3D measurement methods, but also develop novel applications based on existing techniques and combine complementary techniques into hybrid and correlative workflows that will provide more accurate, more reproducible and more relevant data and information.

The project relates to the MASP strategic area "Semiconductor Process, Equipment and Materials technology", covering particularly More Moore domain. 3DAM supports and complements several existing ECSEL pilot-line projects, such as SeNaTe and TAKE5. The consortium includes major European semiconductor equipment companies in the area of metrology and characterization, most of them world-leaders in their technology and major suppliers for all of the IC manufacturers in Europe, Asia and the USA. The project will increase the competitiveness of the strong Europe-based semiconductor Equipment industry, leading to more sales, highly skilled labour jobs and increased export to customers *world-wide.*

ADMONT

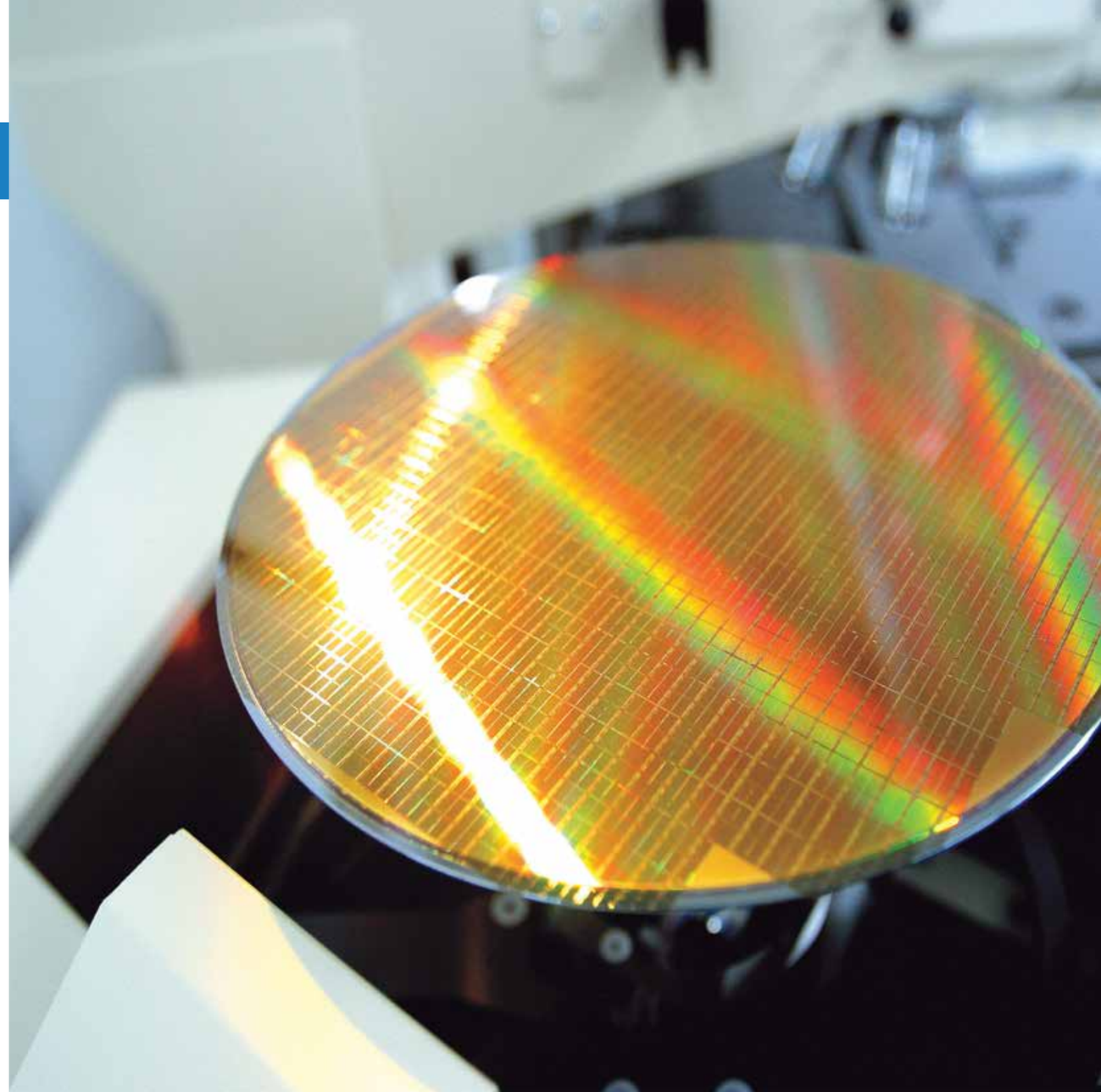
Start date	**1 May 2015**
Duration	**48 months**
€M Total costs / EU / National	**39.3 / 11.1 / 11.3**
Number of participants	**14**

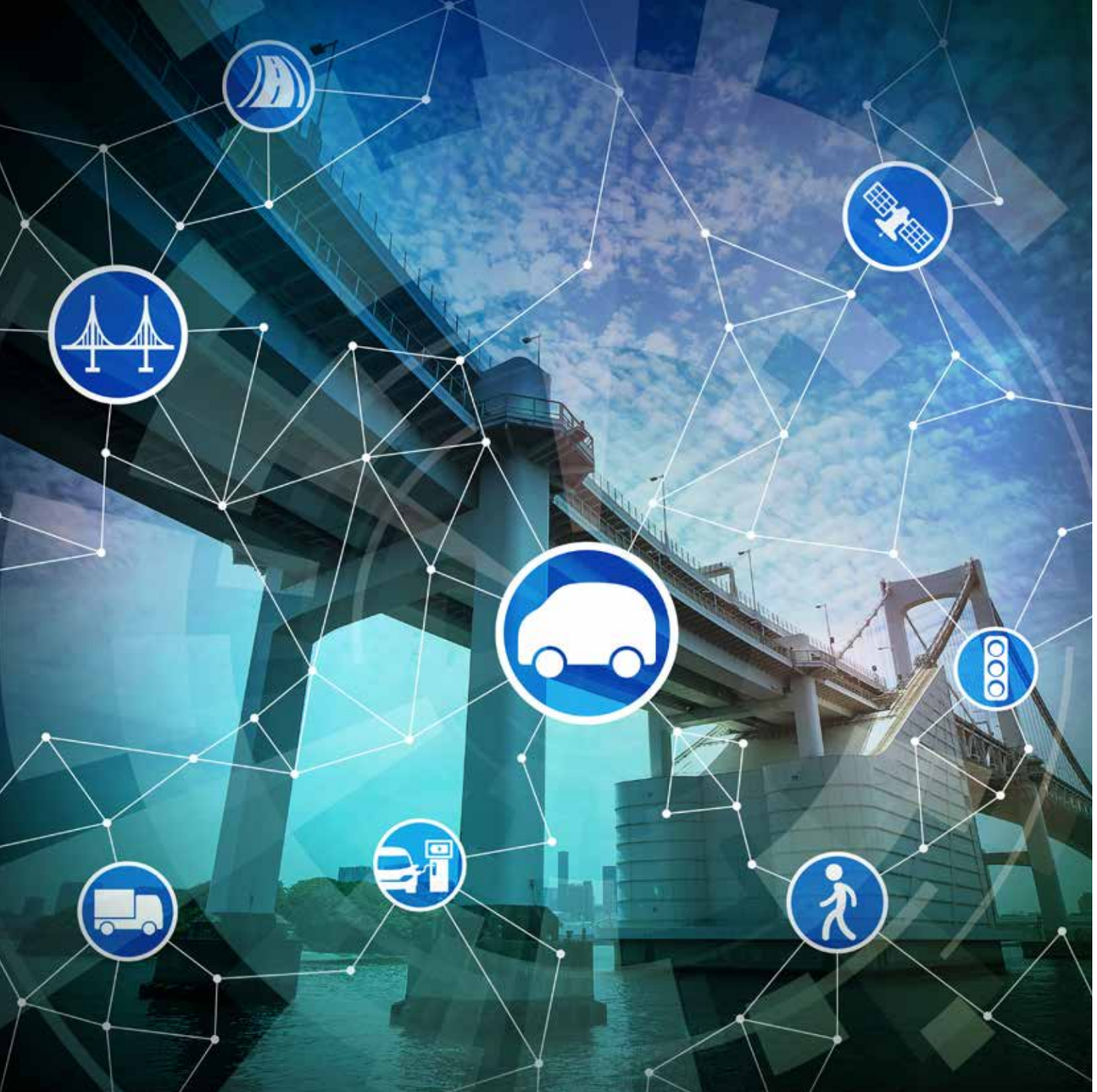
ADMONT will implement a distributed, More-than-Moore pilot line for a broad set of modules in technologies or essential capabilities not presently available within one manufacturing facility. ADMONT is going to be set up as an electronics systems and solutions incubation centre for SME innovations in Europe.

The project will:

- put in place a multi-KET ("Key Enabling Technology") pilot line contributing to the development of a vivid and competitive ecosystem and ECS industry with production in Europe
- bridge the gap between research, exploitation, industrial development and smart system integration, and so create economic and employment growth in the EU
- provide a unique, modular concept using "More than Moore"-based Key Enabling Technologies such as micro- and nanoelectronics, photonics and biomedical technology
- directly serve the key application areas of Smart Health, Smart Production, Smart Energy, and Smart Mobility
- revolutionise the innovation speed of SMEs by providing the possibility to combine process technologies and design capabilities that, before ADMONT, were isolated and out of reach
- drive miniaturisation, reducing manufacturing times of systems by more than 25% and manufacturing cost to 70% of today's electronic systems
- contribute to cost-effective and energy-efficient production of MtM (More-than-Moore) devices with robust and stable processes, technologies and product diversification using automated production techniques, demonstrated through a world-class pilot line with high yield and excellent quality.

ADMONT provides a novel approach for innovation in all sectors. It has no specific focus on particular end markets, so Automotive, Aerospace, Industrial, Food Processing, Health, Safety, ICT and various other end markets can benefit. ADMONT supplies system integrators with a modular system for combining distinct technologies at wafer level while providing a vital and necessary platform for new products. This encompasses not only process technology but also design and modelling capabilities. ADMONT aims to reduce manufacturing times for base components to 75% and reduce system costs to 70% of what can be achieved today. Electronics-based products will benefit from increased innovation speed and hence accelerated time to market. This will bring the benefits of innovation to the full value chain, both from a production perspective and from an end user perspective.





AMASS

Start date	**1 April 2016**
Duration	**36 months**
€M Total costs / EU / National	**20.5 / 6.2 / 4.1**
Number of participants	**30**

Today's world becomes more and more dependant on smart and connected applications in transport, energy, nuclear, or healthcare systems. The number of embedded systems has significantly increased over the last years, bringing in great technical complexity and sophistication toward open, interconnected networks.

The rise of the complex Cyber-Physical Systems (CPS) has intensified the problem of a lack of dependability in the presence of human, environmental and technological risks. Unlike processes in electrical and mechanical equipment engineering, CPS are not equipped with a set of standardized and harmonized practices for assurance and certification that provides safe, secure and reliable operation with typical software and hardware architectures. And because they are often constrained by different standards, the question of reusing the CPS systems from one application domain in another is also extremely complicated.

AMASS will address all these issues by establishing an open and holistic assurance and certification framework for cyber physical systems using the results of the previous successful European projects, OPENCOSS and SafeCer. These two large-scale projects dealt with assurance and certification of software-intensive critical systems using incremental and model-based approaches. OPENCOSS defined a Common Certification Language, unifying concepts from different industries in order to build a harmonized approach that can reduce time and cost overheads, via facilitating the reuse of certification assets. SafeCer developed safety-oriented process lines, a component model, contract-based verification techniques, and process- and product-based model-driven means for compositional development and certification.

The AMASS project will start by combining and evolving the OPENCOSS and SafeCer technological solutions towards end-user validated tools, and will enhance them and perform further research into new areas not covered by those projects. The ultimate goal of AMASS is lowering the costs and risks for CPS assurance and certification, which is expected to significantly help society and industry to benefit from the future use of CPS in a wide range of domains, including transport, manufacturing, healthcare, energy, defence, and communications.

ASTONISH

Start date	**1 June 2016**
Duration	**36 months**
€M Total costs / EU / National	**18.3 / 5.9 / 4.2**
Number of participants	**25**

Better, faster and cheaper diagnosis is one of the key challenges of modern European healthcare. Less invasive and more effective treatment keep the elderly out of hospital while reducing the need for expensive personal care. The ASTONISH project will develop smart optical imaging technology that will promote the use of non-invasive technology and unobtrusive health monitoring.

In previous decades, people all over the world have gained a several years of life expectancy. Europeans live longer than ever before, and this phenomenon is expected to continue due to unprecedented medical achievements. But the increased number of elderly results in a growth in chronic and acute diseases. Europe's healthcare urgently needs new technological developments if it wants to succeed in improving the quality of life.

In an attempt to revolutionize healthcare, reduce its costs and promote healthy living, ASTONISH will deliver breakthrough optical imaging and sensing technologies for low cost health monitoring, simpler diagnosis and more effective treatment, and develop smart integrated solutions that will increase the patient's quality of life within the home and hospital environment. Thanks to innovative, non-invasive navigation and localisation solutions, it will allow much more efficient and safe surgical procedures. The project will also improve the personal wearable monitoring systems that allow individuals to closely monitor changes in their health condition and immediately provide feedback.

Optical imaging is a very promising emerging technology with great potential to improve disease prevention, diagnosis and treatment and is also significantly lower in cost. It uses the properties of visible light, Near Infrared (NIR) or Hyper Spectral Imagining to allow doctors to see deeper into tissues without the damaging effects of X-rays. It also has new capabilities, allowing for visualizing of soft tissues, measuring different properties of organs at the same time, and even provides immediate diagnosis capabilities.

Smart algorithms, multimodal fusion techniques and biomedical signal processing will process the acquired data and advanced user interfaces will simplify the complex clinical tasks. These technology components will be integrated together with other conventional imaging technologies to build application-specific solutions for physiological monitoring, tumour detection, minimally invasive surgery, brain function monitoring and rehabilitation.

ASTONISH will deliver breakthrough optical imaging and sensing technologies for low cost health monitoring, simpler diagnosis and more effective treatment, and develop smart integrated solutions that will increase the patient's quality of life within the home and hospital environment.

The technology developed by ASTONISH will allow physicians to record, over a several-days period, highly relevant parameters for the early detection of cardiovascular or metabolic risk. It invests in developing portable devices that will allow for early detection of brain abnormalities, which are now only possible to measure in a hospital environment. Additionally, the project will develop the next generation of medical systems for automated detection of skin cancer using optical biopsy.

The ASTONISH partners cover the full value chain, from semiconductor manufacturing to clinical centres testing the final application. The set of proposed innovations will improve the global competitiveness of the European healthcare industry and deliver ready to market technologies making the long life of European citizens easier.

Putting the 'Smarts' into Smart Energy

Alun Foster

ECSEL JU provides funding for collaborative, pre-competitive RD&I projects, specifically on Electronic Components and Systems. But it is in fact more than simply another funding scheme: the Public-Private Partnership model has shown its ability to focus RD&I effort, leverage investments and, in the ECSEL JU case through the direct involvement of National authorities, support projects with much greater European “footprint” (on average, 6 to 7 countries in a project). These larger initiatives are important enablers for moving technological results into real deployment. They create sufficient “critical mass” to support adoption all along the supply-chain, particularly of standardised processes and tools to facilitate adoption and certification of the resulting products.

Why is this important? It goes without saying that energy, with implications across all sorts of domains, is a key concern today. And with the environmentally responsible goal of reducing energy derived from burning hydrocarbon fuels, more and more focus goes onto the use of electricity - especially from renewable sources - as the primary (though not the only) vector for energy distribution.

Because of the key role that electronic components and systems play along the whole of that energy path, the ECSEL strategic plan - the technical goals of the RD&I projects the JU funds - contains several chapters on the topic, and a whole section on Smart Energy. The latter looks specifically at the role of electronics in sustainable power generation and energy conversion, the reduction of energy consumption and the efficient management of energy within the community of users. Sections on Smart Mobility, Smart Society and Smart Manufacturing also address the integration of new, systematic ways of working with energy into their specific domains.

Electronics can contribute to two broadly defined areas for optimising our energy use. On one hand, reduce the consumption and losses by developing energy-efficient electronic controls and by providing end-users with tools to help them adopt energy-friendly behaviour. On the other, manage the distribution of electrical energy, including integration of renewable sources, as an intelligent system - a “Smart Grid”. Optimising energy at a systematic level can be highly effective and “Smart” is of course where electronics excels, as this “lighting” example demonstrates.

"With the environmentally responsible goal of reducing energy derived from burning hydrocarbon fuels, more and more focus goes onto the use of electricity - especially from renewable sources - as the primary (though not the only) vector for energy distribution."

According to the IEA, lighting accounts for 20% of global building energy consumption. Already, the move away from the incandescent lamp towards higher-efficiency lamps, especially LED lighting, is able to give a significant reduction in energy used. The project “EnLight” (awarded by ECSEL for its innovation impact) studied the deployment of LED lighting as a system. It demonstrated, in addition to the already significant improvement possible by retro-fitting LED lights, an additional 45% gain can be achieved (call it “cut by half”, though in some cases they achieved 70%!). By approaching energy as a system, and developing “smart” electronics components and systems as a way of optimising that system, significant energy savings can become reality.

The article was published in:
Parlimentary Magazine
Issue 436 | 13 June 2016

Smart Grids address the impacts of the Electrification of Transport

Delphi4LED

Start date	**1 June 2016**
Duration	**36 months**
€M Total costs / EU / National	**9.3 / 2.8 / 2.2**
Number of participants	**15**

The rise of LED technology is changing the ecosystem of the lighting industry. Delphi4LED responds to these changes by providing the EU LED Lighting industry with a set of tools and standards enabling the design and production of more reliable, cost effective and market leading LED based lighting solutions. This will boost the market for integrated, smart lighting solutions and give Europe the opportunity to outpace the global competition.

Light Emitting Diode (LED) lighting products are overtaking the market rapidly. In fact, next generation solutions foresee a complete replacement of conventional light source (e.g. light bulbs) with LED solid-state lighting. This technology presents a whole range of advantages over the traditional solutions, with greater energy efficiency being the crucial improvement. LEDs enable significant reductions in CO2 emissions and energy consumption, which is critical since 88% of lighting costs are energy related. Their improved durability and longer lifetime, increased environmental friendliness, digital controllability, smaller size, lower heat output and easier control with digital electronics presents new product innovation possibilities for system integration and application.

The European lighting industry is facing several challenges due to this technological shift. The adoption of LED by the lighting industry transfers the market and the supply chain boundaries, essentially dominated by European companies, to a perfect competition industry, where worldwide based players from other industries than LEDs (e.g. sensors & controls, ICT) are joining. In the new LED ecosystem the value chain belongs to two different industries: the semiconductor industry and the lighting industry. Those two industries are working separately, often doing double work and not deriving and exchanging design critical parameters on a common basis. This makes the process very inefficient. To regain a leading position, the European Lighting industry has to address this communication gap, together with both product price and reliability of LED-based lighting solutions.

Delphi4LED provides an answer to this market transition by combining the competitive lighting knowledge base in Europe with new paradigms and corresponding solutions to the product creation process, particularly easing the early development phase by the standardization of (yet non-existing) compact LED models for design and simulation. Combining these models together with models of other electronic and mechanical components will allow unifying the computer based design environment for integrated lighting products.

Bridging the design gaps between different players in the Solid State Lighting (SSL) chain helps speed up development and allows for an increase in the accuracy of prediction of final product performance, without the need of building physical prototypes. In return, this will result in a much lower price of the final LED solutions, and an extra room for creativity in systems and end-user products.

DENSE

Start date	**1 June 2016**
Duration	**36 months**
€M Total costs / EU / National	**14.5 / 4.2 / 3.1**
Number of participants	**16**

Severe weather conditions, such as snow, heavy rain or hail, have long been viewed as one of the last remaining technical challenges preventing self-driving cars from being brought to the market. This can only be overcome by developing a fully reliable environment perception technology.

Self-driving cars are a rapidly growing technology. They eliminate the human error which is responsible for the highest percentage of accidents. Introduction of versatile driving support systems has already resulted in a significant decrease of car accidents and improved the comfort of driving. However, there are still issues self-driving cars simply cannot yet deal with – bad weather conditions.

Current driver assistance systems offer comfort and safety in good weather, but in severe weather they often malfunction and fail. DENSE will develop an all-weather system sensor suite for traffic services, driver assistance and autonomous driving. The project identified key improvements needed to secure the driverless cars, which is to extend line of sight for sensors in restricted visibility conditions beyond the capabilities of human beings. This means reliable detection of other traffic participants and obstacles in adverse weather such as rain, fog, and snow, and in degraded light conditions. This new sensor set will combine three technologies: radar, gated short-wave infrared camera and a short-wave infrared LIDAR. None of these three sensors could deal with all sorts of weather conditions individually; they must therefore be used together in order to ensure the technology complies with the high safety requirements.

DENSE will start from analysis of the contributing factors to car accidents in severe weather. This knowledge will allow defining functional and operational requirements needed to build an innovative sensor suite capable of operating in all weather and lighting conditions yielding outline specifications and system architecture needed for the actual sensor development and integration in cars. The project will develop advanced radar with a high angular resolution operating in the 77-81 GHz automotive band, a Short Wave Infrared (SWIR) gated camera sensor with pulsed laser illuminator, and a new LIDAR for improved performance in adverse weather. The sensor suite will also allow for the assessment of road surface conditions.

DENSE will implement a high-level fusion platform integration between the sensors to maximise their efficiency. In order to speed up the market introduction, DENSE will elaborate solutions how the new sensor suite can be integrated into a vehicle, keeping minimum size and low manufacturing cost constraints while preserving the highest possible reso-

The project seeks to reshape human interaction with vehicles and the future of European automotive and transport industries. Sensor-based cars being able to operate in all weather conditions will enhance mobility and safety thanks to providing a more flexible use of vehicles.

lution. Ultimately, DENSE will put the demonstrator to the test under a controlled environment as well as in real life weather conditions.

The project seeks to reshape human interaction with vehicles and the future of European automotive and transport industries. Sensor-based cars being able to operate in all weather conditions will enhance mobility and safety thanks to providing a more flexible use of vehicles. DENSE will also strengthen Europe's leading position of automotive industry, and open new doors for exploiting infrared, laser and radar technologies. Technology developed within the DENSE research program will not be limited to automotive applications and will be useful to other applications areas. The sensor suite and its hardware and software components will certainly find their way into different sectors, such as safety and security, data communication and consumer products.

ENABLE-S3

Start date	**1 May 2016**
Duration	**36 months**
€M Total costs / EU / National	**67.9 / 16.6 / 16.0**
Number of participants	**71**

Highly automated systems will help to solve societal challenges in many domains. In transport, for instance, they can significantly increase safety by avoiding human errors, improve efficiency, and significantly reduce emissions in mobility applications. Today, proving that these systems are safe and work in all environmental conditions, is almost impossible. There are uncountable scenarios which need to be covered, and this is not feasible in practice. ENABLE-S3 is searching for methods that will enable to reduce testing effort without having a negative impact on the quality of performance.

Mobility and transport are not the only domains that will benefit from implementing more advanced automated systems. Diagnosis or treatment in the health care domain will be cheaper and allow for faster and higher quality thanks to automated medical applications. They will also help to support high quality medical diagnostics and surgery, and assist in long-term patient care. However, validation procedures of highly automated systems in transport and health industry, as well as in many other applicable domains, are extremely time-consuming and costly.

ENABLE-S3 will lead to a significant time and cost reduction for the validation process across six industrial domains: automotive, aerospace, rail and maritime, as well as the health care and farming sectors. Thanks to virtual environments testing, the project will also lead to increased functionality, safety and security of automated and autonomous systems by raising the level of dependability and minimizing the risk of design or implementation faults.

The resulting validation framework will ensure European competitiveness in the global race for automated systems, with an expected market potential of €60bn by 2025. Virtual testing, verification and coverage-oriented test selection methods will promote and extend existing standards. The project results will eventually be used to propose new standardized validation procedures for highly automated systems (ACPS).

The project is strongly industry-driven. Several representative use-cases from smart mobility and smart health will define the requirements to be addressed in the project and will assess the benefits of the technological progress achieved in the project. All validation methods and tools will be developed to fulfill the requirements of real, relevant industrial use-cases.

EnSO

Start date	**1 January 2016**
Duration	**48 months**
€M Total costs / EU / National	**76.4 / 18.7 / 17.2**
Number of participants	**35**

Internet of Things refers not only to a personal computer and smartphone connected through internet. IoT is the wireless interconnection of all of the billions of devices and “things” linked through internet or local area networks, working together to ensure the most efficient utilization of each device. The number of interconnected devices is constantly growing and is estimated to reach 50 billion by 2020. Each of these “things” needs to be powered, which is a major setback for broader adoption of IoT applications - with billions of things come billions of batteries that must be manufactured and maintained.

ECSEL project EnSO (Energy for Smart Objects) will set up a unique European ecosystem in the field of high-performance autonomous miniature energy-harvesting power sources that will enable developing new innovative microelectronic systems for IoT market in Europe. The scope of project encompasses energy solutions for powering “smart” objects in Smart Society, Smart Health and Smart Energy key applications. EnSO will develop high reliability assembly technologies of shapable and customisable micro batteries, energy harvester and power management building blocks, and set up a competitive high volume production.

The other EnSO objectives are to:

- demonstrate the competitiveness of EnSO energy solutions for powering the autonomous Smart Objects
- disseminate EnSO energy solutions with easy to use demonstration kits to foster the take-up of emerging markets
- develop high reliability assembly technologies of shapeable micro batteries, energy harvester and power conditioning building blocks for Autonomous Micro Energy Sources (AMES)
- develop and demonstrate very high capacity and very high density rechargeable micro battery product family
- develop customizable smart recharge and energy harvesting enabling technologies for AMES
- Demonstrate and evaluate the AMES design and manufacturing capability based on generic key enabling building blocks

As an ECSEL Innovation Action, EnSO’s work addresses the market replication, demonstration and technological introduction activities. ENSo ecosystem will involve all of the value chain - from key materials and tools to many demonstrators in different fields of application.

EnSO will bring innovative energy solutions to market, inducing definitive differentiation for electronic smart systems based on customizable, generic building block technologies. EnSO innovations, in terms of advanced materials, advanced equipment and multi-physics co-design of heterogeneous smart systems, will contribute to the Semiconductor Process, Equipment and Materials thrust.

EXIST

Start date	**1 May 2015**
Duration	**36 months**
€M Total costs / EU / National	**28.7 / 9.4 / 6.8**
Number of participants	**17**

EXIST will research and develop new technologies for innovative image sensors, needed in the next plus one (N+2) generation of imaging devices used in several application domains. The image sensor research will focus on enhancing and extending the capabilities of current CMOS imaging devices through new architectures and processing technologies.

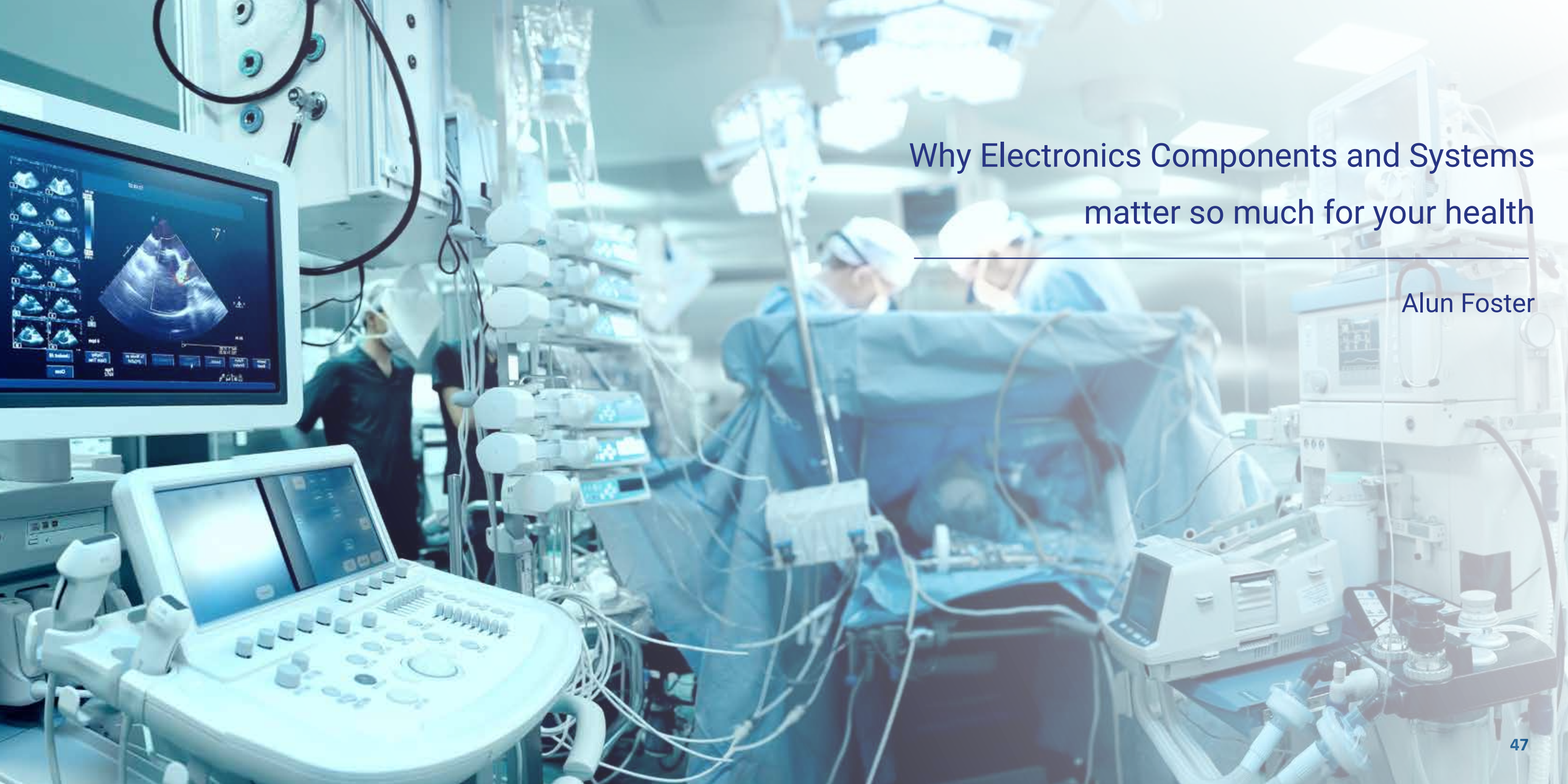
Strategically, Europe must remain at the forefront of image capture due to the diversity of applications that support many key industries. EXIST's technologies and demonstrators will enable a number of new vision systems addressing the following societal and business needs:

- broadcast cameras with unprecedented image quality and enhanced viewer experience and interaction for the second generation of Ultra High Definition Television (UHDTV)
- enhanced quality control in a smart production environment
- hyperspectral detection cameras (working beyond visible light) allowing the extraction of more detailed information, e.g., enabling smart sorting in the food industry
- improved safety through more sensitive and versatile gas detection systems for industrial applications
- improving healthcare/medical applications, for example laparoscopy
- citizens' security through Ultra High Definition surveillance systems giving better detection rate or through intelligent security systems using 3D vision

The EXIST consortium will develop innovative new technologies for image sensors:

1. New design (architectures) and process technology (e.g. 3D stacking) for:
- better pixels (lower noise, higher dynamic range, higher quantum efficiency, new functionality in the pixel)
- pixels at higher speed (higher spatial and temporal resolutions, higher bit depth)
- time-of-flight pixels (3D sensors)
- local (on-chip) processing and embedded "time delay and integration" CCD sensors in CMOS.

2. Extended sensitivity and functionality of the pixels:
- extension into infrared
- filters for hyperspectral and multispectral imaging
- better colour filters for a wider colour gamut
- colour filters using Fabry-Pérot Interference cells
- Increased optical, analog and data imaging pipelines to enable high frame rates, better memory management.



Why Electronics Components and Systems matter so much for your health

Alun Foster

Electronic instruments for healthcare are already fairly well established – we regularly see them in doctor's practices and even more so in hospitals – and they are becoming more and more sophisticated, too. We even see personal health-care devices for sale over-the counter becoming available.

Such rapid progress as we have seen in consumer electronics is not that easy in e-Health applications. Not only must the electronic device be faultlessly reliable and safe (much more than your Smartphone) and their connections into information networks guarantee superlative levels of privacy, they must also fi t in to the bigger picture of healthcare as a societal system.

Electronics components and systems offer very real solutions to the rising cost of healthcare. To keep their deployment in step with the expectations requires a lot of ingenuity, and - on the global scale of things - the playing-field is far from even. To keep e-Health under our control, we must do it fast and economically but without compromising on reliability and privacy.

In Europe, we have a strong history of collaborative R&D and many valuable developments have come from research programmes financed at Trans-National and European levels (e.g. Eureka!, Horizon-2020, …). In 2008, an additional instrument was added – the" Joint Technology Initiatives": in the eld of Electronics, implemented as the Joint Undertakings ENIAC and ARTEMIS - merged in 2014 to form the ECSEL JU (while adding smart, miniaturised integrated systems technologies from the EPoSS platform).

These Public-Private Partnerships focus RD&I e ort, leverage investments (in ARTEMIS/ENIAC, each Euro from the EU leveraged about 6 Euros of private and National investment) and, through the direct involvement of National authorities, support projects with much greater European "footprint" (on average, 6 to 7 countries in a project but often many more). These larger initiatives are important enablers for moving technological results into real deployment. They create sufficient "critical mass" to support adoption all along the supply-chain, particularly of standardised processes and tools to facilitate adoption and certifcation of the resulting products. e-Health forms one very important axis of the ECSEL "Multi-Annual Strategic Plan". More recently, another tool has been added to the ECSEL programme, in the form of "Lighthouse Initiatives". While not being projects per-se, this concept is designed to structure the impactcreating focus already observed in the JU model onto domains of major societal importance, bringing non-technological assets (standards, legislation, certi cation,…) into their remit.

"Electronics components and systems offer very real solutions to the rising cost of healthcare. To keep their deployment in step with the expectations requires a lot of ingenuity, and - on the global scale of things - the playing-field is far from even. To keep e-Health under our control, we must do it fast and economically but without compromising on reliability and privacy."

It is a big part of our vision to see such major initiatives develop and grow to become important beacons of industrial and societal consolidation and growth in Europe. e-Health in particular will become increasingly important in all our lives.

The article was published in:
Parlimentary Magazine
Issue 435 | 31 May 2016

Accessing Electronic Health Records poses strict challenges for privacy and security

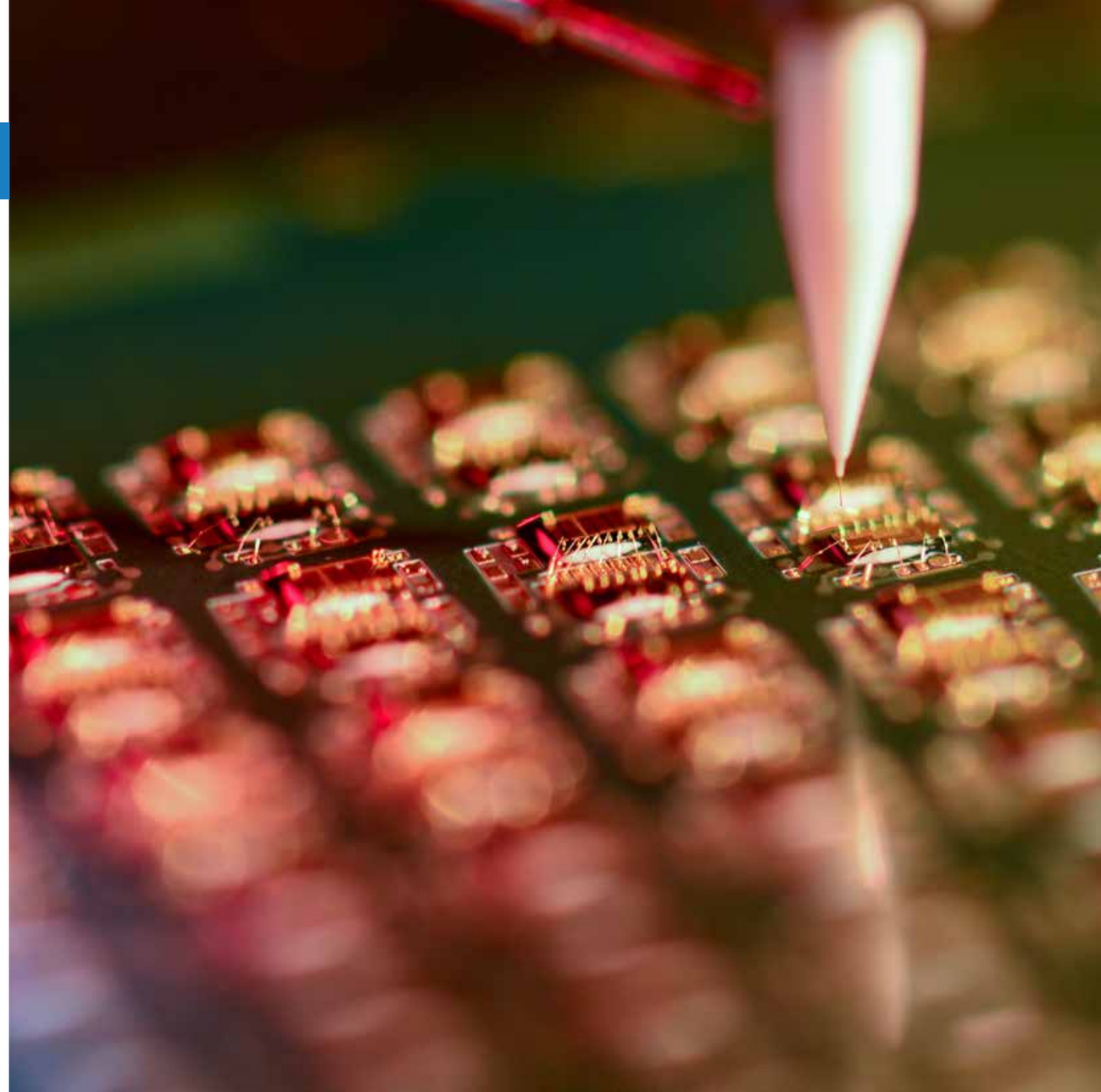
InForMed

Start date	**1 June 2015**
Duration	**36 months**
€M Total costs / EU / National	**48.1 / 11.4 / 11.1**
Number of participants	**39**

InForMed will establish a pilot line for micro-fabricated medical devices that encompasses the complete trajectory from micro-fabrication to assembly and smart catheter fabrication. The project brings together key industrial and academic players in a manufacturing ecosystem that enables optimal use of the technologies and competencies available in Europe. The pilot line will be demonstrated by a number of innovative products in the areas of hospital and home healthcare.

Micro-fabricated devices are moving increasingly towards the front-end of medical equipment, where they form the interface between human and machine. As such, these devices determine to a large extent the quality of the total system. In order to maintain and extend the premier position of the European industry as manufacturer of state-of-the-art medical equipment, it is crucial to establish a versatile and flexible infrastructure where new device concepts can be demonstrated, validated and fabricated in pilot production. Much more than standard CMOS or traditional MEMS devices, these medical devices require a broad assortment of different technologies (such as micro-fluidics), advanced assembly and moulding, and the processing of new materials such as polymers and even proteins. InForMed constitutes a flexible, distributed manufacturing network using new and existing technological infrastructures incorporating the combined expertise of the leading European industrial players.

The InForMed pilot line will be hosted by one of the largest manufacturers of medical equipment in Europe, Philips, and it will be open to third party users, including SMEs. This unique pilot line will focus especially on the production-compliant processing of polymers, which are essential components for many medical devices. At the moment, too many promising new concepts that have been developed in research and academia fail to become a success in the market because too little attention has been paid to the manufacturability and transfer of the technology to a production site. InForMed will address the efficient transfer of technology from research to pilot line, and also from pilot line to high volume production. The demonstrator products cover a wide range of devices in the medical domain and include smart catheters, implantables, detectors for diagnostic equipment, smart body patches and devices for advanced in-vitro testing.



IoSense

Start date	**1 May 2016**
Duration	**36 months**
€M Total costs / EU / National	**65.2 / 14.7 / 13.6**
Number of participants	**33**

The aim of IoSense is to boost pilot production capacity and improving time-to-market for innovative microelectronics, in order to increase the competitiveness of European ECS industries.

This is to be accomplished by establishing three, fully connected semiconductor pilot lines in Europe:

- two 200mm frontend lines (Dresden and Regensburg)
- one backend line (Regensburg) networking with existing, highly specialized manufacturing lines.

The new pilot lines will form a network with existing specialized R&D and manufacturing lines to work as a European modular solution system. The focus is on the availability of innovative, competitive and indigenously European sensors and sensor systems, for applications in Smart Mobility, Society, Energy, Health and Production.

IoSense will close the gap in time to bring ideas into high volume market and increase the manufacturing capacity of sensor/MEMS components in the involved pilot lines by a factor of 10, while reducing manufacturing cost and time by 30 percent.

IoSense is designed to enable focused development work on technological and application oriented tasks combining with market orientation. “Design to Market Needs” will be accomplished by customer involvement, embedding all required functionality besides sensors. Finally, the time for idea-to-market for new sensor systems is intended to be brought down to less than one year. Semiconductor manufacturing will get a new boost in Europe, enabling competitive solutions to the industry, securing employment and providing solutions to upcoming challenges in the IoT era.

MANTIS

Start date	**1 May 2015**
Duration	**36 months**
€M Total costs / EU / National	**30.0 / 9.8 / 9.1**
Number of participants	**49**

Maintenance can cost anything between 30% and 50% of the total manufacturing costs in industrial processes. However, it no longer needs to be a necessary evil that costs what it costs but can be an important function that creates additional value in the business process as well as new business models with a stronger service orientation. MANTIS will develop a Proactive Maintenance Service Platform Architecture based on Cyber Physical Systems that enable "Collaborative Maintenance Ecosystems".

MANTIS will contribute to improving companies' asset availability, and therefore their competitiveness, growth and sustainability by:

- Reducing the impact of maintenance on productivity and costs
- Reducing the time required for maintenance tasks
- Increasing the availability of assets
- Improving the quality of the maintenance service and therefore of products
- Improving the working conditions and maintenance performance of personnel
- Increasing sustainability by preventing material loss and reworking (e.g. due to out-of-tolerance production)

Several use-cases from four validation scenarios will form the proving-ground for the architecture and functionality of the innovative, proactive maintenance service platform and for its future exploitation in the industrial world. They have been selected as representative of those industries or domains whereby the results obtained can be confidently extrapolated to several industry areas and different fields of maintenance.

Production asset maintenance will be validated in:

- A Shaver production plant
- A Pultrusion line
- Metal pressing machine maintenance
- Sheet metal working machinery
- Compressor maintenance
- Vehicle maintenance management will be validated in:
- Trucks and construction vehicles
- Railway systems

Energy production asset management will be validated in:

- Windmills
- Photovoltaic plants
- Conventional energy production

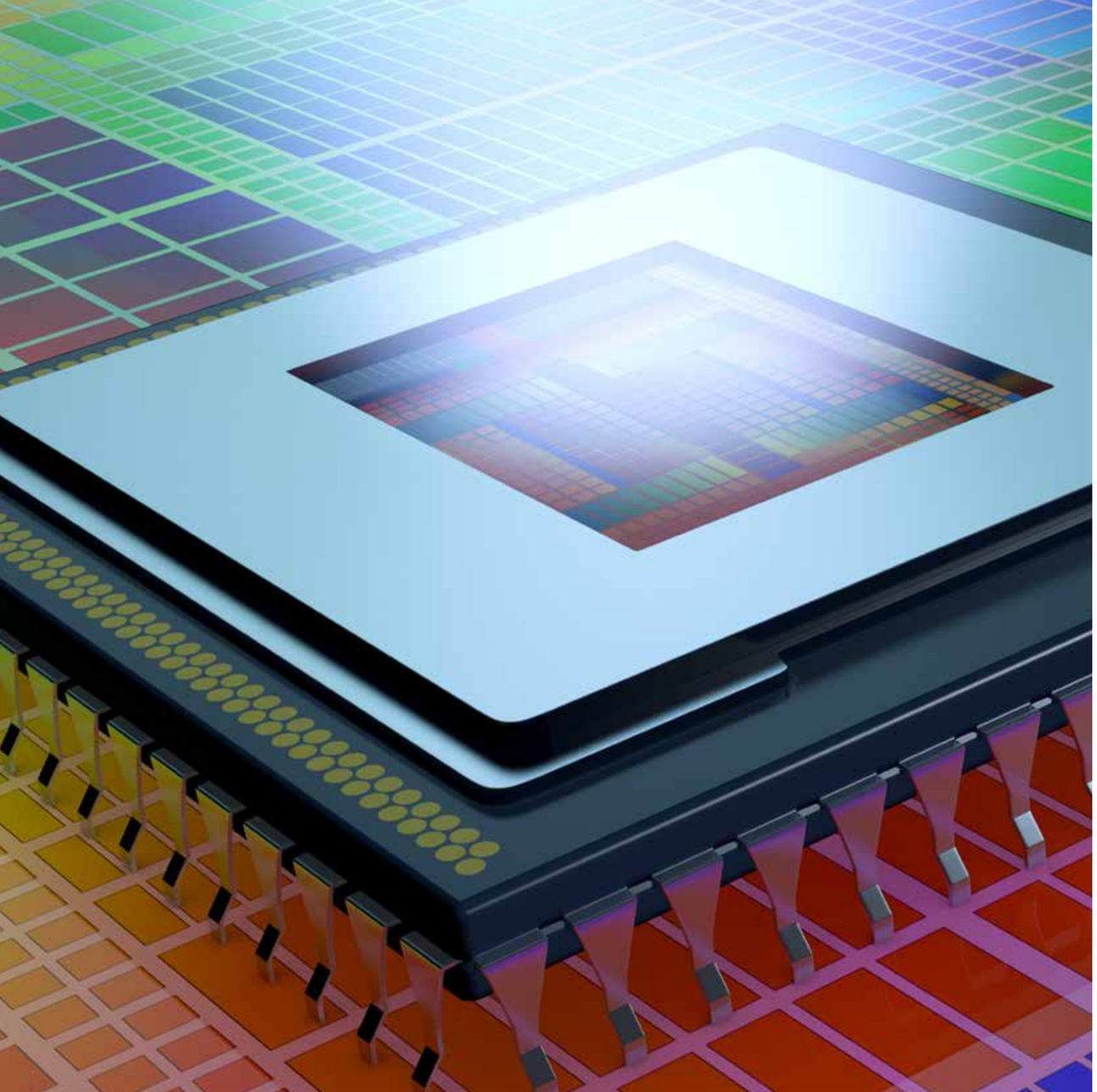
Health equipment maintenance will be validated in:

- Healthcare / medical imaging systems

MANTIS will contribute to competitiveness, growth and sustainability by improving companies' asset availability, reducing the impact of maintenance on productivity and costs as well as the time required for maintenance tasks and, at the same time, boosting the availability of assets, the quality of the maintenance service and, therefore, of products, working conditions and maintenance performance, and sustainability by preventing material loss and reworking.

MANTIS consists of distributed processing chains that efficiently transform raw data into knowledge, while minimising the need for communication bandwidth. Sophisticated, distributed sensing and decision-making functions are performed at different levels in a collaborative way, ranging from local nodes, which locally optimise performance, bandwidth and maintenance, to cloud-based platforms that integrate information from diverse systems and execute distributed processing and analytics algorithms for global decision making. This chain will include key technologies such as:

- Smart sensors, actuators and cyber physical systems capable of local pre-processing
- Robust communication systems for harsh environments
- Distributed machine learning for data validation and decision-making
- Cloud-based processing, analytics and data availability
- HMIs (Human-Machine interfaces) to provide the right information to the right people at the right time in the right format.



OSIRIS

Start date	**1 May 2015**
Duration	**36 months**
€M Total costs / EU / National	**4.5 / 1.8 / 1.5**
Number of participants	**10**

OSIRIS, an ECSEL Research and Innovation Action (RIA), proposes a large improvement of Silicon Carbide (SiC) wafers. SiC is a semiconductor material with unique electrical and thermal properties suitable for high temperature and high-power applications. OSIRIS expects to achieve a thermal conductivity increase by 30%, which signals a major breakthrough for devices that must handle high power. For next-generation transistors, these new wafers will bring significant cost savings.

Reliability and cost/performance trade-offs are still a major limiting factor for GaN (gallium nitride) and SiC (silicon carbide) electronic device applications. SiC substrates are therefore at the core of SiC power electronic device manufacturing as well as microwave GaN devices, as they are mostly grown on SiC substrates. Despite the fact that SiC material shows impressive thermal conductivities (up to 490 W/m·K, comparable to copper), today's cost of SiC substrate is magnitudes more expensive than Si (silicon), which limits its market penetration. By improving the thermal conductivity by 30%, new SiC substrates will increase the device performance (electrical, thermal, reliability) and boost interest in using SiC wafers, driving costs down. Moreover, a cost reduction by a factor 2 to 3 for microwave applications will also enable entry into these markets, with further increases in potential volumes. As this innovative substrate technology will be European-based, it will locally reinforce related industries in the semiconductor manufacturing eco-system.

OSIRIS will bring in two innovations to address both the material properties and the present cost issue. Firstly, a 30% rise in the thermal conductivity of SiC wafers has recently been demonstrated by OSIRIS partners, through the use of selected isotopes for the material constituents, which this project can make an industrial reality. Secondly, it is proposed to use the cheaper silicon carbide substrates as a "handle" for microwave Gallium Nitride (GaN) devices, growing these devices on top of a highly resistive isotopic SiC layer. Indeed, in the example of microwave devices, most of substrate material (back of the device) has to be lapped away at process completion and is lost, so using a cheaper substrate wafer brings a major overall cost saving.

These innovations will greatly contribute to improving overall device power performance, particularly by decreasing junction temperature (power efficiency, robustness, footprint) and reducing the production cost, also for (microwave) GaN devices.

PowerBase

Start date	**1 May 2015**
Duration	**36 months**
€M Total costs / EU / National	**87.6 / 19.2 / 17.7**
Number of participants	**39**

PowerBase will set up and enhance power semiconductor manufacturing pilot lines for wafer production and chip packaging, with special attention for compact power applications. Demonstrators and full-scale testing are essential building blocks in PowerBase, stepping up Europe's innovation capability by developing technologies specifically addressing energy efficient systems.

PowerBase focuses on value creation in Europe, aiming at keeping Europe at the forefront of technology development and deployment. Positioned as “Innovation Action”, exploitation of the project’s results is a primary goal, thus bridging the gap between research and exploitation.

Power Semiconductors are key drivers for the innovation capability of European industries, large and small, in turn generating economic growth and supporting meaningful jobs for citizens. At the critical interface between data processing and the harsh, real world, they support solutions for some of the difficult societal challenges addressed by European policies for 2020 and beyond. For both reasons, it is vital that investments continue to be made to ensure European collaboration, and access to the technologies, know-how and capacities which guarantee growth potential and strategic independence in the face of tough competition and increased globalisation.

The European semiconductor ecosystem employs approximately 250,000 people directly and is at the core of innovation and competitiveness in all major sectors of the economy. PowerBase will directly impact the production of semiconductors in Europe, and so is aligned with the electronics strategy of the European Commission.

Electronic components and systems (ECS) is a domain with a fast-growing worldwide market. European companies have dominant global positions in key application areas for Europe, such as the efficient use of limited energy resources, as well as in equipment and materials for worldwide semiconductor manufacturing.

The innovative power components envisioned address the highest efficiency and reliability in energy generation, transformation and usage, providing these at a reasonable price per power unit. PowerBase addresses the “silicon path” and the “wide band-gap path” enabling major advancements in the area of “More-than-Moore” (MtM) and System-in-Package (SiP). The main objectives covered by the work packages and demonstrators are:

The project PowerBase will improve the ability of the European industry to provide more efficient and more compact applications for energy generation, transformation and usage by early availability of enhanced power devices made in Europe.

- Development of advanced carrier substrate technologies for improved Gallium Nitride (GaN) material quality and reliability, for next-generation GaN-based power devices
- Establishment of a qualified, wide band-gap GaN technology pilot-line based on 200mm wafers for high performance, “normally off” GaN power transistors. This includes GaN-on-Silicon epitaxy, with advanced process control, high manufacturing stability and yield
- Expansion of the limits of today’s 300mm silicon-based substrate materials for power semiconductors in two directions: Firstly on low-ohmic substrates and then on high-ohmic substrates, by the introduction of advanced doping materials and power-device processes.
- Improvement of manufacturability in a high volume / highly automated fab, as being key for cost competitiveness, including work on advanced automation
- Enhancement of system compatibility by introducing advanced packaging solutions from a dedicated chip-packaging pilot line
- Demonstration of the results and reliability in high-profile, compact, power application domains where size matters.

"We are challenging the limits of what is physically possible"

A talk with doctor Anton Chichkov, the 2015 Calls Co-ordinator, on the backstory of how ECSEL launches a call and on the work that has to happen before a project is approved.

Can you explain the process from preparing the call and the launch to the actual funding?

Before ECSEL JU launches a call, there is a lot of work to be done in order to achieve alignment with Industry (and with this, "Industry" refers to the eco-system of large and small companies, research institutes and universities that form our Research, Development and Innovation community) and National Authorities. Our program strongly depends on the national budgets, and on our capability to show the countries the benefits of investing the money in our research. The decision to launch the call is taken by the Public Authorities Board (*PAB is made of representatives of public authorities). Industry Associations also play a big role – they define topics that will be in the call. We all together shape the call – it's a symbiosis, a common work for a mutual benefit. We profile ourselves as a service for the National Authorities and Industry, we help them to meet their targets and supply half of the budget.

Everything is done on the highest transparency level – being as transparent as possible is extremely important at each step of our work. We announce how much money we will spend and in which technology domain, we organize events to spread the word and prepare the ground to launch the calls.

The project proposals are being shaped in the meantime; consortiums are being created; and once the call is made public, we receive the first projects proposals up until the closure date.

How does ECSEL evaluate the proposals?

Once we have all the proposals, ECSEL will select a pool of experts to evaluate them. Experts can register in the H2020 expert database. They upload their CV, references and their relevant publications in a chosen area. ECSEL then picks the experts from this database with matching profiles.

ECSEL chooses four experts per proposal. They read the proposals and write reports. Then we organize meetings for experts to discuss the proposal and agree on the final score.

Does it happen often that experts don't agree?

At the beginning, yes. Experts are usually professors or directors with a lot of knowledge and experience - we let each of them to express their opinion. During the discussion they start to see the proposal from the other's perspective and usually find a common point of view.

What happens then? Some proposals are chosen by the experts. What about the rest?

The experts actually make a ranking of proposals. This ranking then goes off to the PAB and the PAB has the final word. Of course it's all done with a consensus - the countries have different priorities but they need to find a common ground.

Does this selection procedure affect the quality of the projects selected?

Every project that gets through the evaluation would be totally worth funding – the level of quality is that high at

this stage. Unfortunately we don't have enough budget to fund them all, so sadly we always have to leave a number of excellent projects on the table that can't be funded because there's not enough money.

What is the 'technology readiness level' of a project?

To rank the development of our projects we use the Technology Readiness Level scale from 1 to 9 common to all H2020 projects. The lowest scale means a project is still in the very initial stage of research, whereas 9 means a project is ready for the market.

ECSEL JU launches two types of calls – for 'innovation' and 'research and innovation' actions. The first ones have a high technology readiness level, which means they are closer to the market. The 'research and innovation' projects are ideas that need to be further elaborated, and they focus on more actual research and development. All projects require a high innovation level.

What is the role of an ECSEL Project Officer in the life of a project?

The preparation of the Grant Agreement requires quite some interactions and iterations.. The Project Officer is there for the project coordinator and partners – if they need help, they contact their PO. That's mainly administrative help, but sometimes it can be technical. Once the GA is signed and the project starts, it typically gets a little bit calmer.

But even when running, sometimes projects can encounter a difficulty, so there's a lot of POs interaction with the projects to try and help them meet their goals – administrative, technical and financial. Theoretically the Project Officer is not required to have a lot of specialized knowledge to manage the project, but in practice they have to. It's a very broad field, and while POs have some technical specializations, we make sure we all know what's going on. We do have projects with many amendments, and in order to be able to coordinate the changes you really need to understand the technical aspects.

How does ECSEL review the projects?

Usually there is one review per year. During such review everything gets checked – the whole execution of the project, all deliverables, reports, and the achieved progress. It's a research program – if the project doesn't achieve the planned result but can prove that it can't be done – it's also a result. Positive or negative, all results count.

"In every call there's at least one project that continues the work from a previous project. And it's amazing – first off, because they are successful. And secondly, because their product it is relevant for the whole world. In fact, they practically make the best possible product in the world."

It must be really difficult to make it all work when all partners are scattered around Europe, right?

It is complex and can be challenging, but it is very fulfilling to see things really work. We coordinate chains of projects – an initial project that prepares something, and then the next project steps in and makes it even better. And then the third project picks up where the others left off and improves it again. In every call there's at least one project that continues the work from a previous project. And it's amazing – first off, because they are successful. And secondly, because their product it is relevant for the whole world. In fact, they practically make the best possible product in the world. We are challenging the limits of what is physically possible. We lead the technology - every phone, every computer, every system, every electronic device actually is being made thanks to the machines, components and methods we help to develop.

Prime

Start date	**1 December 2015**
Duration	**40 months**
€M Total costs / EU / National	**38.9 / 12.2 / 10.9**
Number of participants	**18**

The goal of PRIME is to establish an open Ultra Low Power (ULP) Technology Platform, containing all necessary design and architecture blocks and components needed to support supply of products for the "Internet of Things" (IoT). This will enable the European industry to increase and strengthen their competitive eco-system and benefit from market opportunities created by the (IoT) revolution.

Over 3 years, the project will develop and demonstrate the key building blocks of IoT ULP systems, driven by the applications in the medical, agricultural, domestics and security domains. This will include:

- developing a high performance, energy efficient and cost effective technology platform
- building a flexible design ecosystem (including IP and design flow)
- bringing changes in architectural and power management to reduced energy consumption
- developing security blocks based on PUF ("Physically Unclonable Function")
- defining the System of Chip and System in Package memory banks and processing implementations for IoT sensor node systems

Developed advanced as 22nm FDSOI low power technologies with logic, analog, RF and embedded new memory components (STT RAM and RRAM) together with innovative design and system architecture solutions will be used to build macros and demonstrate functionality and power reduction advantage of the new IoT device components.

The PRIME project will realize several demonstrators of IoT system building blocks to show the proposed low power wireless solutions, functionality and performance of delivered design and technology blocks.

The project will enable an increase in Europe's innovation capability in the area of ULP Technology, design and applications, creation of a competitive European eco-system and help to identify market leadership opportunities in security, mobility, healthcare and smart, cost competitive manufacturing.

R2POWER300

Start date	**1 July 2015**
Duration	**36 months**
€M Total costs / EU / National	**7.6 / 2.1 / 1.8**
Number of participants	**10**

R2POWER300 focuses to set up all the preliminary study for a new 300mm Pilot Line located at ST-Microelectronics in Agrate Brianza – Milan, including new dedicated facilities and all the involved 300mm equipments and materials. This evolution will impact new generations of Smart Power and Discrete technologies platform, bringing to ST a greater production efficiency and a leading-edge lithography (i.e. 90nm gate length) to unleash the next generation's smart power and power discrete products.

The strategy of R2POWER300 is based on two main pillars:

1. Continuous technological innovation on Smart-Power and Discrete technology, facing with the more demanding market power applications;

2. Industrial policy focused on high quality and mass production's cost optimization, competing with the world wide power semiconductor production;

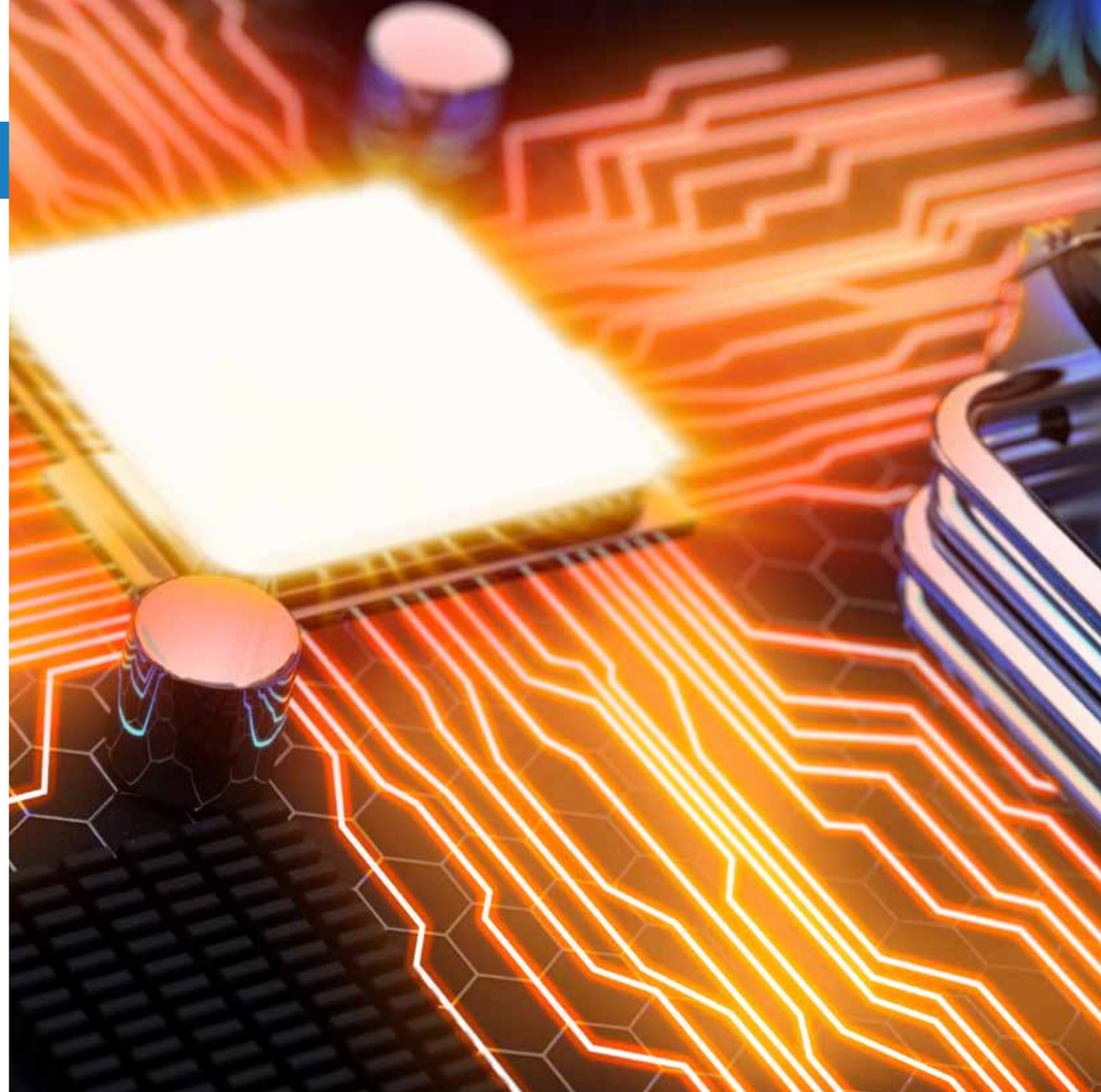
Strenght point of Smart Power technology consists on its wide application differentiation, proper of the "More than Moore" market, spanning from mid-power automotive, coping with extremely challenging operating temperature to industrial controllers, battery management systems for HEV, FEV and electric bikes, domestic and outdoor lighting based on LED drivers, computer and industrial peripherals, drivers for MEMS sensors and actuations, and so on.

The project aims to achieve the following goals:

1. set up all the fab front end stages for the future extension to 300mm, i.e. line's specification, tools' evaluation and screening, new process's optimization and characterization.

2. evaluate, characterize and optimize the process necessary to continue the BCD technological roadmap, toward the new evolutions based on lithography and integrated features differentation. BCD (i.e. Bipolar + CMOS + DMOS) is a unique smart power technology invented by ST in the mid '80s (CMOS's gate length was 4 µm at that time!). As of today BCD is one of the key technology assets of ST and the indefatigable evolution and challenging roadmap makes ST a world-class leader on smart power ICs.

3. The ongoing miniaturisation of smart power electronics faces new challenges in the packaging area. Dies and components must be able to be placed very close together, introducing different kind of challenges, starting from packaging to the thermal budget management. SiP activity will be performed, with specific reference to sintering based die-attach, thermal analysis and dedicated packaging solution.



REFERENCE

Start date	**1 December 2015**
Duration	**42 months**
€M Total costs / EU / National	**33.1 / 10.1 / 6.1**
Number of participants	**16**

Today's world is overwhelmingly digitalized. The integration of information and communication technologies in people's lives is unprecedented, and the volume of data being constantly exchanged is growing drastically. This need for instant access to web and information and for quick communications has a massive impact on the consumer electronics landscape. With the growing number of connected devices from a wide range of sectors, including automotive and aeronautic industries, there is a need for improved semiconductor performance which will help to maximize the benefits and lower the costs.

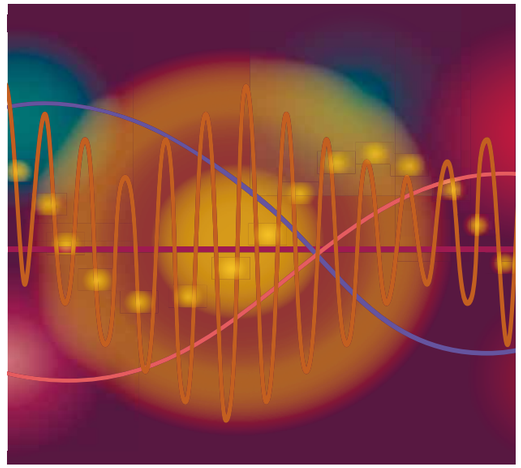
All this technology relies on semiconductor as a Key Enabling Technology - each connected object contains several semiconductor components for data reception, computing, sensing, system management, and data emission. Among these components, the Radio Frequency Front End Modules (RF FEM), which enables signal reception and transmission, are the key elements to move to 4G+ and 5G standards which will be the leading communication technology of the next decade. However, at this moment no silicon-based solution is available to meet 4G+ and 5G performance and integration requirements.

This is where REFERENCE projects steps in – to develop Radio Frequency communication applications based on RF Silicon-on-Insulator (RF-SOI), which is perceived as the most promising disruptive technology to address performance, cost and integration needs for next generations' RF FEM components.

The core objectives of REFERENCE are:

- Improving the performance to match the new standards requirements above 1Gb/s data rate, which includes linearity enhancement and significant reduction of signal losses, increased device and performance stability, and integration of RF, analogue and digital on the same silicon chip;
- Developing of innovative RF-SOI substrates for 4G+ / 5G that are compatible with standard silicon manufacturing processes, match characteristics and perform at standard yield-level for current industry technology nodes;
- Moving from 200mm diameter into 300 diameter manufacturing in order to reach the best performance. Additionally, providing an industrial solution available in 300mm diameter on the market today, will give an opportunity for Europe to take over leadership in substrate manufacturing (starting material and advanced substrates).

At this moment no silicon-based solution is available to meet 4G+ and 5G performance and integration requirements. This is where REFERENCE steps in – to develop Radio Frequency communication applications based on RF Silicon-on-Insulator (RF-SOI), which is perceived as the most promising disruptive technology to address performance, cost and integration needs for next generations' RF FEM components.



- Developing the entire RF product chain of value including substrates, RF devices fabrication, packaging of such components, system integration and Hardware/Software design and architectures.

The technology developed by REFERENCE will cover three application domains: cellular, automotive and aeronautic. The research results will progress European position in the next generation connectivity – compatible with 4G+ and 5G standards, it will be applicable in all sorts of devices. It will also contribute to next-generation, fully automated vehicles equipped with high connectivity, and improve connectivity with the in-flight and ground environments.

The program aims to prove the feasibility of low latency, secure and reliable wireless aircraft communication. Most importantly, it paves the way for improved safety and interactivity in all transportation systems.

RobustSENSE

Start date	**1 June 2015**
Duration	**36 months**
€M Total costs / EU / National	**10.3 / 3.3 / 3.4**
Number of participants	**15**

RobustSENSE defines, develops, and evaluates measures for detecting and reacting to performance degradation in driving assistance systems under adverse weather conditions – all the way from the sensor level up to strategy planning. This platform will provide enhanced sensing performance and overcome the present problem of environmental perception sys¬tems failing under weather conditions like rain, snow or sun-flare. Such an improved platform is needed to achieve the necessary reliability of automated and autonomous driving functions for uninterrupted safe operation.

European industry is leading the field of driver assistance systems, but OEMs from Japan and the USA have been catching up considerably in recent years. To maintain the lead it is important to address the existing shortcomings of as¬sistance systems: The range of driver assistance functions is limited, being useful only in close to ideal weather and light conditions. If not enough data is received by a component or a single sensor, the driver assistant function is deactivated as today's systems are realized as isolated one-sensor systems with fixed threshold.

To enable continuous and better system operation, RobustSENSE combines formerly independent subsystems to an integrated and comprehensive solution. This way, one sensor can compensate or mitigate the failure of another sensor, so that the system will become adaptive and tolerant to limited sensor functionality. The reliability assessment of each component and sensor within the system itself and the compensating reaction of the system will provide uninterrupted support for the user when support is needed most – while driving under adverse weather and light conditions.

RobustSENSE improves sensor technologies, develops advanced methods for sensor signal processing and innovative algorithms for sensor data fusion, scene understanding, behavioural planning and trajectory planning with the goal of two main innovations:

- Each component of the sensor platform is able to continuously monitor its own performance and to deliver this information to the other modules. This leads to a continuous, overall system performance assessment which is used to adapt current assistance or automated driving capabilities to the system quality that is presently available.

- Building on system redundancy, performance assessment and improved sensing performance the embedded redundancy will be used to calculate the best environ¬mental representation under given circumstances and present sensor reliability.

RobustSENSE will considerably strengthen Europe's position in the worldwide race towards autonomous vehicles.

SafeCOP

Start date	**1 April 2016**
Duration	**36 months**
€M Total costs / EU / National	**11.6 / 3.8 / 3.5**
Number of participants	**28**

Next generation Cyber-Physical Systems (CPS) are interconnected through wireless communication. They provide businesses and individuals with a wide range of highly innovative applications and services in everyday life. Because of the complex nature of these systems, it is necessary to make sure they comply with essential requirements of safety and security.

SafeCOP is an ECSEL project targeting cyber-physical systems whose safe cooperation relies on wireless communication. The Cooperative Open Cyber-Physical System (CO-CPS) is a "system-of-systems", which is characterised by multiple stakeholders, dynamic system definitions, and unpredictable operating environments. In this scenario, no single party holds the overall responsibility over the system, which means the safety-relevant functions are performed jointly while relying on the wireless communication. This means that safety and security could easily be compromised.

Such CO-CPS can successfully address several societal challenges, and can lead to new applications and new markets. For instance, cooperative vehicles, or "V2V", have been shown to reduce fuel consumption, decrease the number of traffic accidents, and result in efficiency gains and congestion savings. CO-CPS can also be successfully applied in healthcare, a domain which is characterized by dramatically increasing costs. For example, cooperative robots could be used to reduce the amount of physical labour in hospitals.

Development of CO-CPS, however, poses challenges that are not adequately addressed by existing practices. These challenges typically require design decisions to be made that trade-off safety concerns, functionality, cost, and other considerations. SafeCOP will develop a safety-assurance framework for such systems, which will facilitate their certification and market release. The project will also define a reference "Runtime Manager" architecture that detects abnormal behaviour, and triggers a safety degraded mode in case of emergency. SafeCOP will also contribute to developing new standards and regulations by providing certification authorities with scientifically legitimate solutions. The project will also equip current wireless technologies with a safety protocol to ensure secure cooperation of already existing systems.

SafeCOP brings clear benefits in implementation and certification practice of cooperating systems in four areas: healthcare, maritime, vehicle-to-vehicle and vehicle-to-infrastructure. The project will lower certification costs, increase trustworthiness of wireless communication, ensure better management of increasing complexity, reduce effort for verification and validation, lower total system costs, and shorten time to market leading to increased market share. These results will be demonstrated in five use-cases: cooperative moving of empty hospital beds, cooperative bathymetry with boat platoons, vehicle control loss warning, vehicle and roadside units' interaction and vehicle-to-infrastructure cooperation for traffic management.

SemI40

Start date	**1 May 2016**
Duration	**36 months**
€M Total costs / EU / National	**61.9 / 12.2 / 11.0**
Number of participants	**37**

Electronic components and systems (ECS) are key drivers for the innovation capability of European industries, large and small, generating economic growth and securing jobs for citizens. This is where ECSEL project SemI40 (Power Semiconductor and Electronics Manufacturing 4.0) is stepping in – it will establish smart, sustainable, and integrated semiconductor production. The project will pave the way for serving highly innovative electronic markets with products powered by microelectronics manufactured in Europe.

Future smart factories will be created by fusing production technology with novel, pervasive, and networked information and communication infrastructures. These infrastructures are capable of sensing, collecting and processing large amounts of data in real-time in order to deliver production value in terms of availability, flexibility, and controllability/traceability, and at the same time ensuring security and safety.

This interconnection of information technology and industry is referred to as the Fourth Industrial Revolution, or Industry 4.0. It is not a new technology – it's simply a move towards the level of industrial digitalization. This involves a range of advancements, such as Internet of Things and Cyber-Physical systems (i.e. sensors having the ability to collect and analyse information used by factories), developments in big data collection, and improvements in communications infrastructure secure enough to be used in an industrial context.

SemI40 focuses on smart production using cyber-physical systems, with secure data traffic playing a key role within and outside factories. One of the goals is to develop processes that ensure secure communication across the partners in the supply chain environment characterized by different features – for example, in terms of age, operating system or interfaces. This will help to drastically reduce potential impact on production thanks to early identification of risks from malware.

Another major focus of SemI40 is to develop dynamic simulations of semiconductor manufacturing processes, which is a core aspect enabling to perform fast, flexible and reliable reactions in face of changes in requirements, demands and technological solutions. This will in turn enable production to be planned efficiently and improve capacity utilization, cycle times and quality of the final product.

SemI40 aims at establishing a "learning factory" by joining machine learning models and new algorithmic approaches

Electronic components and systems are key drivers for the innovation capacity of European industries, generating economic growth and securing jobs for citizens. SemI40 aims to balance system security and production flexibility, to increase information transparency between fields and enterprise resource planning. It will also improve fab digitalization and virtualization, and enable automation systems for flexible distributed production.

for predictive analytics with more computational resources. Proposed methods will be evaluated for the application scenario of semiconductor manufacturing. This will allow for significant energy savings and more efficient use of resources.

SemI4.0 will also research the social impact on the jobs of the future - Industry 4.0 will in the long run change work functions and qualifications of employees. The requirements of future job profiles need to already be taken into account now. They increasingly entail system-oriented working and necessitate training and qualification measures that reflect the changes in production processes. As a result of these developments, SemI40 will have significant impact on smart regions - high tech jobs in the area of semiconductor technologies and micro/nano electronics in general are expressed core competences of the participating partners' regions in Austria, France, Germany, Italy, and Portugal,

INDUSTRY 4.0

SeNaTe

Start date	**1 April 2015**
Duration	**36 months**
€M Total costs / EU / National	**181.1 / 32.3 / 30.0**
Number of participants	**39**

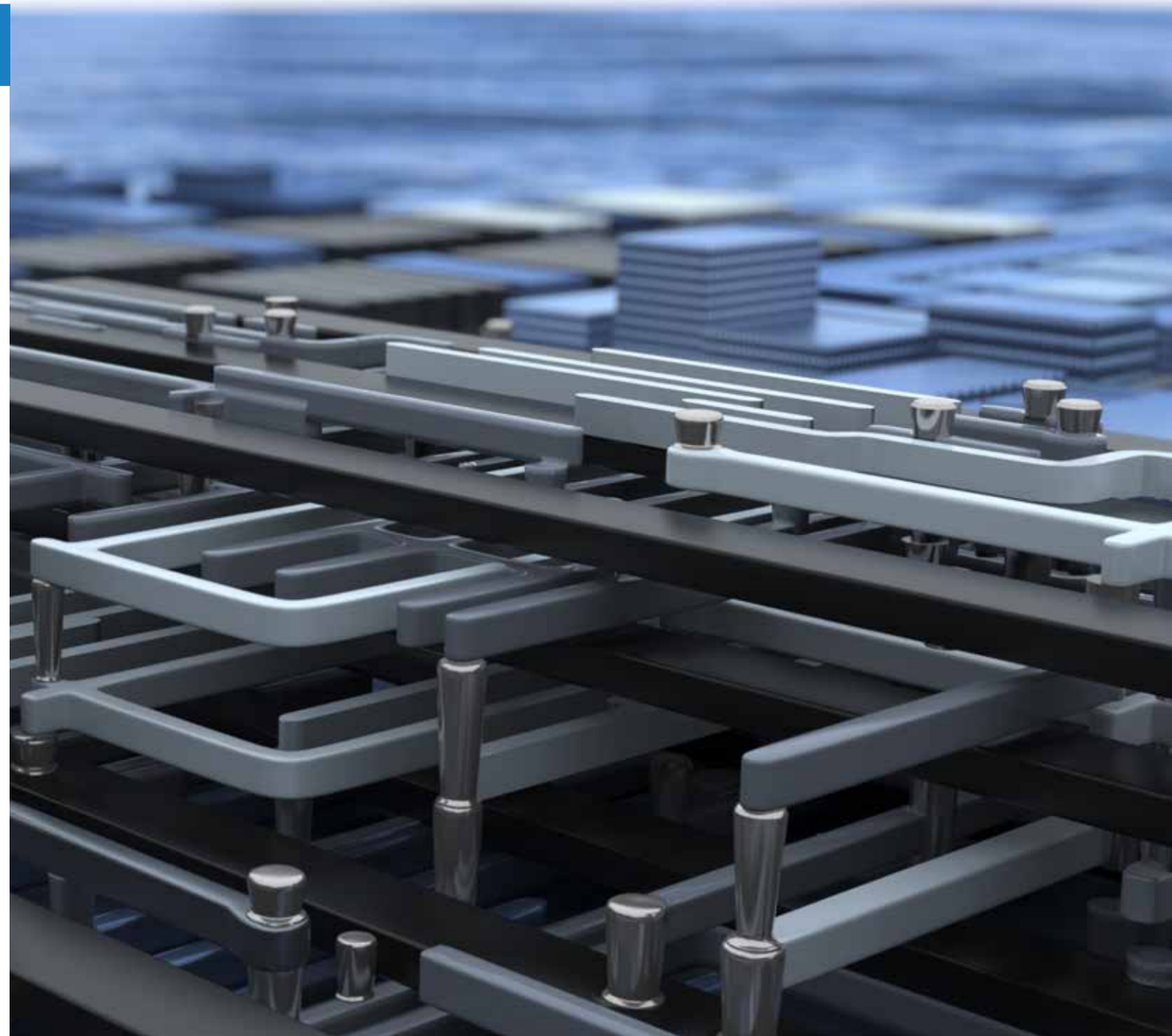
As world-class leaders in tooling for semiconductor manufacturing, European suppliers are well placed to develop tool capabilities for the next generation 7nm IC technology node (N7), keeping on the "Moore's law" projection that aims for manufacturing devices in this technology in 2018. SeNaTe will develop 7nm IC technology and demonstrate its integration using real life devices in the pilot line at the Advanced Patterning Center at imec (Belgium).

The objectives are relevant to the ECSEL JU MASP Strategic Thrusts on Semiconductor Process, Equipment and Materials. The main European actors in lithography, metrology, and process tool areas are participating in the project that will provide leading-edge results from lithography (exposing), wafer processing and electrical validation of 7nm devices in accordance with the industrial market needs and the International Technology Roadmap for Semiconductors (known throughout the world as the ITRS). The project is in line with and supports Europe's recently launched '10/100/20' industrial strategy to reinforce micro- and nanoelectronics.

The main focus of the project is to support the European equipment and materials industry in its development of tools. This industry has 20% of the worldwide market share with ASML as top supplier in the area of lithography.

The impact on the employment generated or safeguarded will be important since the results will have an impact on the production of many companies and SMEs which are involved in the project.

A lithography scanner based on Extreme Ultra-Violet (EUV) technology will be developed to achieve the 7nm module patterning specification. Metrology platforms need to be qualified for N7's 1D, 2D and 3D geometries with the appropriate precision and accuracy. For 7nm technology modules, a large number of new materials must be introduced. This brings challenges for all the respective processes and related equipment sets. Next to new deposition processes based on Atomic Layer Deposition (ALD), Chemical Vapour Deposition (CVD) and electroplating, the project will study the interaction of the materials involved with subsequent etch, passivation and planarization steps, as well as various new spin-clean processes (including group IV semiconductor-compatible critical cleans). Also, the major European EUV mask development stakeholders in the project will work together on a number of key remaining issues they face.



SWARMs

Start date	**1 July 2015**
Duration	**36 months**
€M Total costs / EU / National	**17.3 / 6.4 / 5.7**
Number of participants	**31**

The oceans are considered to host a substantial part of human and industrial resources, namely oil and gas, whose industry will move to ever deeper waters, and where renewable energy continue to be harvested from the seas in offshore wind farms, but also increasingly through tidal, currents and wave energy converters. Furthermore, minerals such as cobalt, nickel, and copper, rare earths, silver and gold will be mined from the seafloor (deep sea mining). To this end, new offshore and port infrastructure will need to be built, monitored and maintained or repaired.

Many offshore operations can be carried out by professional divers, sometimes in dangerous missions. The dependency on such kind of work represents an actual threat to the offshore industry. The extensive use of unmanned underwater vehicles (AUVs/ROVs) could solve this problem. However, such vehicles are usually customized only for performing specific tasks and are difficult to operate. This typically makes their deployment rather expensive.

SWARMs will expand the use of AUVs/ROVs (Autonomous Un-manned Vehicles and Remotely Operated Vehicles) and facilitate the creation, planning and execution of maritime and offshore operations. This will make autonomous operations a viable option for new and existing industries, reducing the operational cost, increasing the safety of tasks and help to expand the offshore sector.

SWARMs will improve the autonomy and cooperation of underwater Cyber-Physical Systems (CPS), introducing the CPS concept for sub-sea operations to boost their cost-effectiveness. This will improve the industrialisation and automation of underwater inspection, maintenance and construction operations in the harsh conditions inherent to the oceanic/maritime environment. By contributing to guaranteeing interoperability, cooperation, reuse and technological improvements, SWARMs will reduce both development and operating costs, yet contribute to increasing safety in underwater operations by reducing the risks associated with human operators.

The direct impact on cost-effectiveness in AUV/ROV production comes from increased interoperability and the reuse of current and emerging AUV/ROV technologies, as well as the provision of new standards for the AUV/ROV industry in applying a structured approach to the development of new, autonomous and safe underwater systems, thereby increasing the competitiveness of Europe in the new offshore economy. The improved automatic inspection and maintenance operations achieved using AUV/ROVs lead to shorter execution

Many offshore operations can be carried out by professional divers, sometimes in dangerous missions. The extensive use of unmanned underwater vehicles (AUVs/ROVs) could solve this problem. SWARMs will expand the use of AUVs/ROVs (Autonomous Un-manned Vehicles and Remotely Operated Vehicles) and facilitate the creation, planning and execution of maritime and offshore operations. This will make autonomous operations a viable option for new and existing industries, reducing the operational cost, increasing the safety of tasks and help to expand the offshore sector.

times, reducing operating costs and also contributing to a better understanding of the environment and resources of the oceans, on the seafloor, in the water column and on the surface. Validation and testing will be carried out on the Norwegian coast line, the Black Sea and the Atlantic Ocean.

The difficult underwater environment requires advanced technological solutions. SWARMs will develop:

- An intelligent environment-recognition and sensing system to characterise the working environment, the targets and the AUVs/ROVs involved in an underwater operation
- An innovative perception and decision-making system, for self-coordination, self-configuration, self-planning and self-synchronisation among cooperating AUVs/ROVs
- A semantic middleware for managing the interoperability, cooperation and coordination between the AUVs/ROVs and their functionalities
- An advanced decision-making assistance tool for tele-operation that allows the cooperation among AUVs/ROVs in a particular mission to be configured, managed, controlled and monitored in real-time
- An underwater communication system for managing and controlling the information exchange in a network of cooperating AUVs/ROVs
- New functions to improve the autonomy of AUVs and ease the use of ROVs
- A methodology for the design, verification and validation of safe, autonomous underwater vehicles and systems.

TAKE5

Start date	**1 April 2016**
Duration	**36 months**
€M Total costs / EU / National	**150.3 / 28.4 / 29.3**
Number of participants	**13**

TAKE5 is the next in a chain of thematically connected semiconductor "Key Enabling Technology" (KET) ENIAC-JU pilot line projects which deal with with 450mm/300mm development for the 10nm technology node, and the ECSEL JU project SeNaTe, aiming at the 7nm technology node.

The main objective is the demonstration of 5nm patterning, in line with industry needs and the "International Technology Roadmap for Semiconductors" (ITRS), in the pilot line at the Advanced Patterning Center at imec (Belgium). This is to be achieved by using innovative design and technology co-optimization, layout and device architecture exploration, demonstrating a lithographic platform for EUV ("Extreme Ultra-Violet" light) technology, and advanced process and holistic metrology platforms and new materials.

A lithography scanner will be developed, based on EUV technology to achieve the 5nm module patterning specification. Metrology platforms need to be qualified for 5nm patterning of 1D, 2D and 3D geometries with the appropriate precision and accuracy. For the 5nm technology modules, new materials will need to be introduced, bringing challenges for all involved deposition processes and the related equipment set. Next to new deposition processes, the interaction of the involved materials with subsequent steps will be studied. The project will be dedicated to find the best options for patterning.

The project relates to the ECSEL work program topic Process technologies – More Moore. It targets, as set out in the MASP, the discovery of new Semiconductor Process, Equipment and Materials solutions for advanced CMOS processes that enable the nano-structuring of electronic devices with 5nm resolution in high-volume manufacturing and fast prototyping. The project touches the core of the continuation of Moore's law (which has recently celebrated its 50th anniversary on April 19th 2015) and covers all aspects of 5nm patterning development.

WayToGo FAST

Start date	**1 May 2015**
Duration	**24 months**
€M Total costs / EU / National	**140.9 / 30.7 / 32.0**
Number of participants	**33**

The pilot-line WAYTOGO FAST will leverage Europe's leadership in Fully Depleted Silicon on Insulator technology (FDSOI[1]) so as to compete through a leading-edge technology offer at the 14nm node and beyond, as well as prepare the future nodes' transistor architecture.

The project aims to establish a distributed pilot line between 2 companies:
- SOITEC, for the fabrication of advanced engineered substrates, with and without strained silicon top film.
- STMicroelectronics, for the development and industrialisation of a state-of-the-art FDSOI technology platform at 14nm and beyond, with an industry competitive Power-Performance-Area-Cost (PPAC) trade-off.

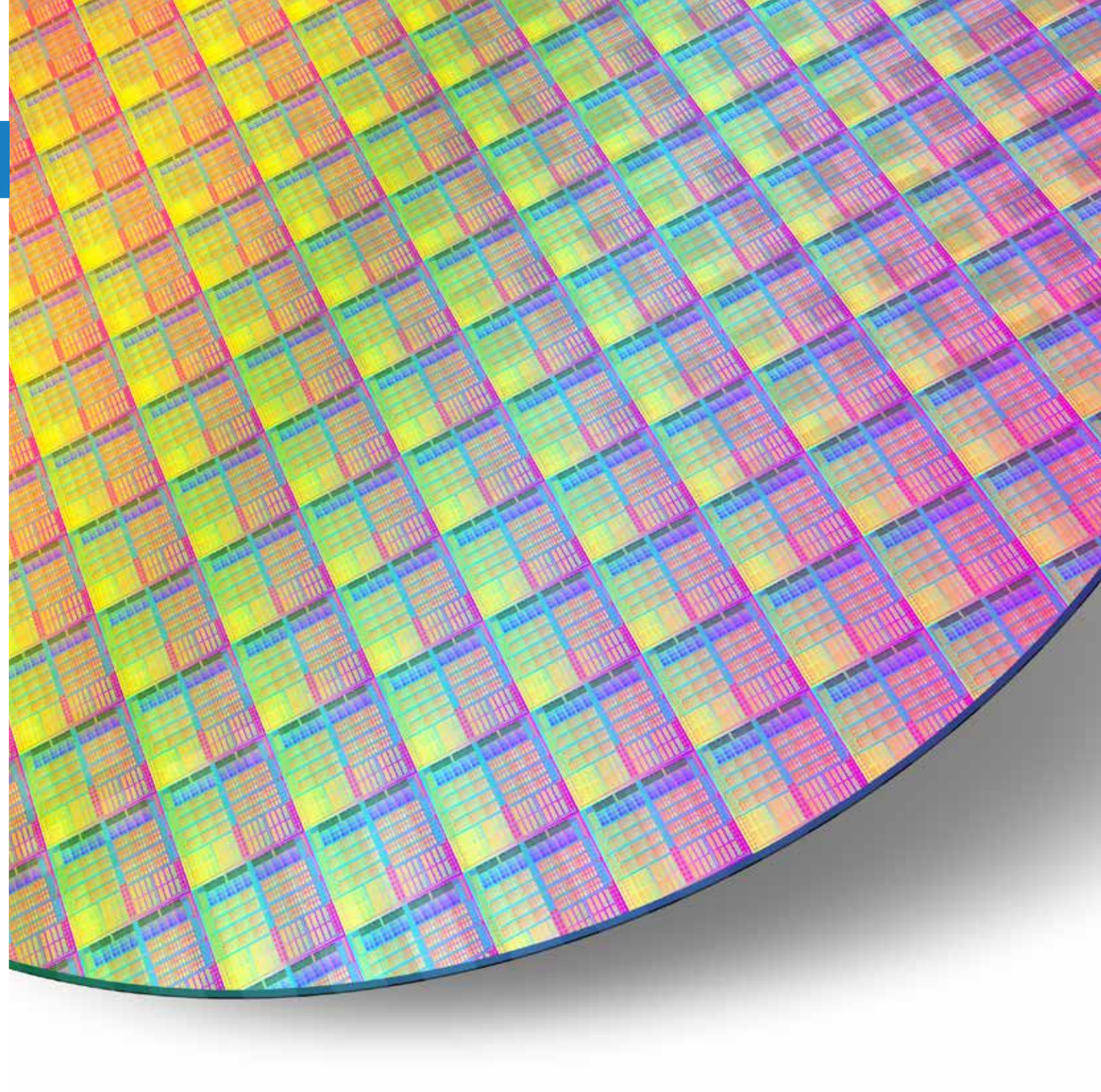
This ambitious project will leverage Europe's leadership potential through an innovative, "More Moore" Technology, contributing to the development of a strong and competitive ECS industry in the EU.

1 FDSOI is a semiconductor technology that breaks through the density-power-speed barrier of today's 'bulk' CMOS at ever smaller transistor dimensions, which is a strategic and vital capability for future ECS applications.

Firstly, WAYTOGO FAST will strengthen the supply side of ECS within Europe, with an original and complementary More Moore technology. Alongside mainstream CMOS technology, the added value of FDSOI comes from its major advantages when used for 'power conscious' applications. From this, in the medium term, it will foster the demand side by supporting the mobile convergence market and the emerging market of smart connected objects and "Internet of Things".
The direct impact of WAYTOGO FAST will be to speed up the competitiveness of FDSOI by offering a higher performance node architecture and substrate, driving its manufacturability within a short time-to-market and demonstrating its superiority in low-power applications.

WAYTOGO FAST is a distributed research infrastructure in the nanoCMOS domain. Beyond the direct impact stimulated by machine investment and material, there is an intellectual investment which will positively impact the whole value chain of digital electronics in Europe.

Using an innovative technology addressing the "More Moore" CMOS 2X nm challenges, the FDSOI transistor architecture and advanced SOI substrate represent a revolutionary step. The innovation level is very high: its target



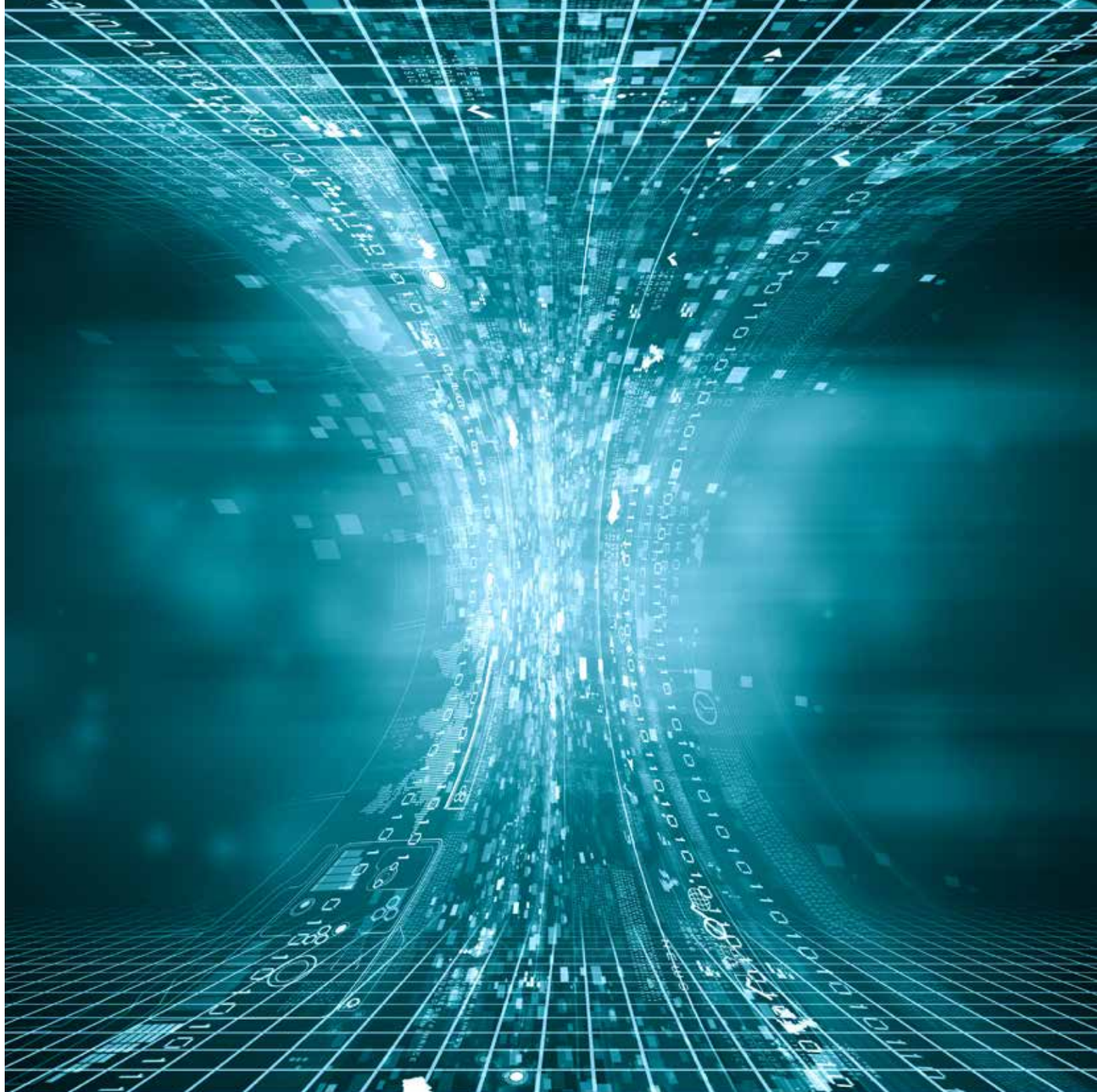
This ambitious project will leverage Europe's leadership potential through an innovative, "More Moore" Technology, contributing to the development of a strong and competitive ECS industry in the EU. Beyond the direct impact stimulated by machine investment and material, there is an intellectual investment which will positively impact the whole value chain of digital electronics in Europe.

being to install manufacturing capacity and to offer performance boosters that will speed up the deployment and volume availability of devices in the 20nm range and smaller.

Developing innovative solutions along the value chain, from material & equipment, CMOS technology, IP-blocks and design tools, and demonstrating these.

The concept of WAYTOGO FAST is the parallel pursuit of innovative developments within the FDSOI ecosystem. The developments occur simultaneously on 3 fronts, 2 of which within the distributed PILOT LINE.

- Front 1: Development of advanced engineered substrates at SOITEC's pilot line.
- Front 2: Development of enhanced performance FDSOI technology (14FD+) at ST's pilot line.
- Front 3: Development of a design ecosystem with users capable of exploiting the technology by generating new products. In addition to the pilot line and in order to extend its technical impact, ambitious demonstrators and innovative designs on FDSOI will be developed in the frame of the project.



Special thanks to the countries contributing to ECSEL projects in the 2014 & 2015 calls:

- Austria
- Belgium
- Czech Republic
- Denmark
- Finland
- France
- Germany
- Hungary
- Ireland
- Israel
- Italy
- Latvia
- Lithuania
- Netherlands
- Norway
- Poland
- Portugal
- Romania
- Slovakia
- Spain
- Sweden
- Switzerland
- Turkey
- United Kingdom

ABOUT ECSEL JU

ECSEL JU is a public-private partnership set up in 2014 between the EU (via the Commission), participating Member States and three private-member Industry Associations . It brings leading European companies - large and small - world-class European research and technology organizations and academia together around a commonly agreed technical agenda for Electronic Components and Systems (ECS) technologies. ECSEL JU draws its funding from the European Union's Horizon 2020 research scheme, as well as National - and in some cases Regional - funding authorities[1]. ECSEL JU then coordinates and allocates the resources from these parties, together with Industry's own contributions.

Why is it important? ECS are a Key Enabling Technology, impacting all industrial branches and almost all aspects of life. They provide the fabric on which the internet runs; they give life to portable phones and tablets; they drive driverless cars and trains, fly airliners, drones and satellites, make surgical robots possible... In modern times, no national economy can win in the global competition without mastering this technology. The ECSEL JU-funded projects contribute to the development of a strong and globally competitive electronics components and systems industry in the European Union.

How does it work? Industry and researcher institutes – via the Industry Associations who are members of the ECSEL Joint Undertaking, propose a technical programme, while the EU and participating countries define the budget which allows the ECSEL Office to run the calls, manage the contracts and support the participants. Together, they define a programme – and a corresponding set of projects with high impact - that best fits the needs of Industry (including academics) and National / European priorities, so offering real potential to shape the future of Europe.

1 At the time of writing, Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom participate in the ECSEL programme, though partners from other countries who are associated with the EU's Horizon 2020 programme may also be eligible to participate.

Credits

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