

## About the NEREID Roadmap

### Why a roadmap?

- To better coordinate academic and industrial research for equipment, semiconductors and application development.
- To provide inputs for future research programmes at European and National levels
- To coordinate efforts to overcome the main nanoelectronic challenges and put the EU at the forefront of future technological development.

### How to participate?

- The project solicits the participation of technology experts from leading European industrial and academic research organizations in General and Domain Workshops, with coverage of travel expenses.
- The Workshops allow a better definition of the technology roadmap, by matching application requirements and technology evolution.
- The interaction between technology and application experts leads to the early identification of the most promising technologies and additional R&D needs.

### Which fields are covered?

- Application sectors include Energy, Automotive, Medical/ Life science, Security, IoT/Smart connected objects, Mobile convergence and Digital Manufacturing.
- Technology sectors cover Advanced Logic and Connectivity, Functional Diversification, Beyond-CMOS, Heterogeneous Integration and System Design as well as Equipment, Materials and Manufacturing Science.



First presentation of the NEREID roadmap on December 6, 2017, at EFES 2017 in Brussels.

The first version of the NEREID roadmap has been made available on the NEREID website (<https://www.nereid-h2020.eu/roadmap>) in order to allow experts all over the world to provide feedback. The feedback has been used to create an updated (pre-final) roadmap to be presented at a NEREID Workshop during ESSDERC 2018 in Dresden.

## NEREID Project Partners

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The pre-final Version of the NEREID roadmap is available at <https://www.nereid-h2020.eu/roadmap>

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## NanoElectronics Roadmap for Europe: Identification and Dissemination

A Horizon 2020 cooperation and support action

Duration: November 15<sup>th</sup>, 2015 until December 15<sup>th</sup>, 2018

### Project pitch

NEREID ("Nano-Electronics Roadmap for Europe Identification and Dissemination") is a cooperation and support action (CSA) of Horizon 2020 research and innovation programme under grant agreement No 685559,

- Started November 2015
- Duration: 3 years

### Objectives:

- to develop a roadmap for the European nanoelectronics, starting from the applications and leveraging the strengths of the European eco-system,
- to perform an early benchmark of promising novel technologies,
- to identify the bottlenecks along the innovation (value) chain.



The NEREID project is funded by the European Commission, H2020, under contract ICT-CSA-685559).



## NEREID Objectives

The objective of this project is to elaborate a new Roadmap for Nanoelectronics, covering the R&D needs all along the innovation chain by combining

- the requirements of European semiconductor and applications to address societal challenges, and
- the advanced concepts developed by Research Centres and Universities in order to achieve an early identification of promising novel technologies.

The final result is a roadmap for European micro- and nanoelectronics, with a clear identification of medium & long term objectives.

Thus, the NEREID Roadmap is complementary to the ECSEL ECS Strategic Research Agenda (ECS SRA), which is focusing on shorter term horizons. NEREID is also complementary to the new International Roadmap for Devices and Systems (IRDS) in the Europe-led More than Moore domain (e.g. Smart Sensors, Energy, Energy Harvesting) although it has a joint collaboration with IRDS in the fields of More Moore, Beyond CMOS and computing systems,



### NEREID Roadmap Objective

## NEREID Concept

In order to focus the roadmap, NEREID started from application areas which are key for European economy like Automotive, Energy, Medical/Life science, Security, IoT/Smart connected objects, Mobile convergence or Digital Manufacturing.

With that background, NEREID has projected the evolution of the main Figures of Merit (FoMs) vs time for the most promising technologies, which are not included in the ECS SRA.

Understanding the dependencies between short/medium term (e.g. More Moore and More than Moore) and long/very long term (e.g. Beyond CMOS) activities is very important to speed-up technology transfer between academia and industry using disruptive technologies leading to possible new large future markets.

## Structure of the NEREID roadmap

The NEREID roadmap is structured by technology sectors:

- Advanced Logic (Nanoscale FETs/Memories) & Connectivity
- Functional Diversification (Smart Sensors, Smart Energy and Energy for Autonomous Systems)
- System Design and Heterogeneous Integration
- Equipment and Manufacturing Science
- Beyond-CMOS (Emerging devices & Computing Paradigms)

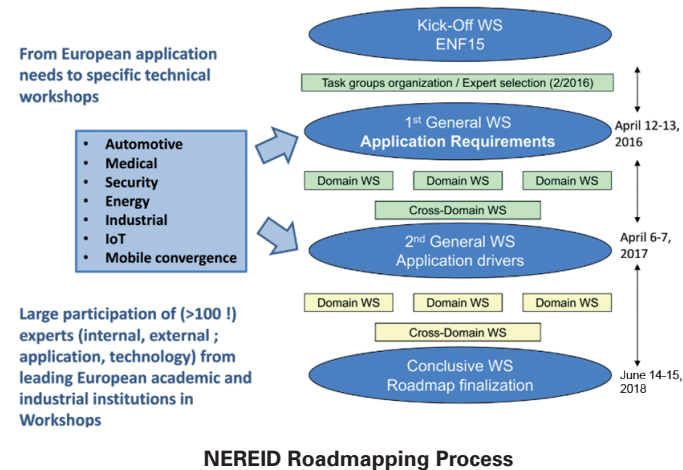
One diversifying factor of NEREID with respect to the previous ITRS activity is the strong focus towards those More than Moore and heterogeneous technologies that are of great interest for the European industry.

In the More Moore domain there is a strong interest in Europe for specific activities dealing with very low power systems, leading to possible disruptive applications for instance for future IoT systems, or for application driven performance, e.g. high temperature operation for the automotive industry.

## NEREID Roadmapping Process

The project is based on the interaction between application and technology experts, coming from leading research players in industry and academia. To achieve this, the NEREID project organized workshops, where experts presented the state-of-the-art..

Three major general Workshops with a large participation by European application experts/technology users and technological experts (more than 100 experts) have been organized followed by specific technology workshops (Domain Workshops) in order to better define the technology roadmap in terms of applications requirements and technology evolution.



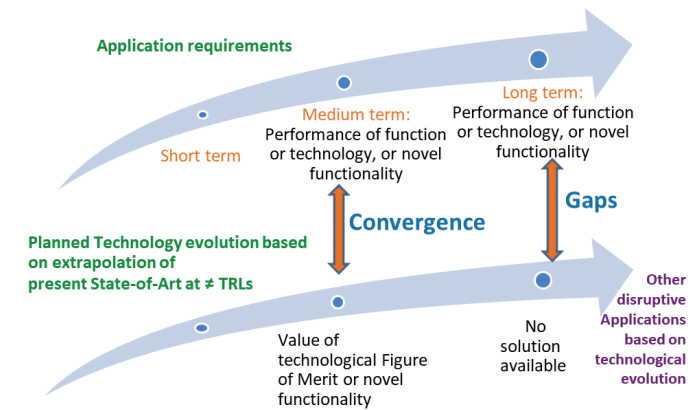
### NEREID Roadmapping Process

## NEREID Approach

Aim of all workshops is to reach a convergence between applications and technologies:

- The evolution scenarios of the products/applications should result in defining future requirements for basic functions, which could be generic enough to apply to many products.
- From the evolution of functions, technology experts can derive the development needs of the underlying technologies, that can satisfy the functionalities and performances needed for different applications.

Insights on future technology evolution and availability can also prompt new ideas for disruptive products and applications, which are discussed during the workshops.



### NEREID Roadmap Approach

This interaction between technology and application experts can lead to the early identification of the most promising technologies, on which to focus R&D for a better growth of the European economy and society.

## NEREID International Outlook

Even if focused on European technologies and applications, the NEREID project has established cooperation links with other international roadmap definition initiatives. In particular strong links have been established with IRDS, by the participation of NEREID experts to IRDS meetings, and a sharing of activities, with IRDS focusing more on Computing and Communications and NEREID on More than Moore technologies.

An International Advisory Board, including leading experts from Europe, USA, Japan and Taiwan, has been established since the beginning of NEREID, and it has provided advice in all phases of the roadmap process.