

# INNOVATION AWARDS 2019



European Association  
of Research and Technology Organisations

[www.earto.eu](http://www.earto.eu)





## **EARTO – European Association of Research and Technology Organisations**

Founded in 1999, EARTO promotes Research and Technology Organisations and represents their interest in Europe. EARTO network counts over 350 RTOs in more than 20 countries. EARTO members represent 150,000 highly-skilled researchers and engineers managing a wide range of innovation infrastructures.

**CONTRIBUTE**  
**EU RD&I PROGRAMMES**  
**GLOBAL CHALLENGES**  
**EUROPE'S**  
**INDUSTRIAL COMPETITIVENESS**  
**INNOVATION UNION**  
**EUROPEAN RESEARCH AREA**

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## ► FOREWORD

### **Paving the way towards a brighter future through research, technology and innovation**

Being in the middle of negotiations for the next Multiannual Financial Framework means a momentum for transformation. Even though we are witnessing complexity and confusion, we are also witnessing a forward-looking dialogue. Our society is facing so many burning challenges that there is no other option than joining forces, pooling resources and taking a direction towards sustainability. Sustainability of the European social model largely depends on investment in research and innovation.

There is also a momentum for opportunities. Therefore, Europe is on the way towards a new industrial policy, with the ultimate goal to benefit society. As recently stated by the EC High-Level Group Industry 2030, *‘Europe will build its competitive advantage on cutting-edge and breakthrough technologies, respect for our environment and biodiversity, investment in our people and smart European and global alliances’*.

Industry, together with Research and Technology organisations (RTOs), have a key role in the European innovation ecosystem with focus moving to evolutionary and complex systems in an open innovation environment. RTOs, operating open-to-all-stakeholders technology infrastructures, are collaborating within cross-sectorial Public-Private Partnerships. RTOs often play the role of orchestrators in European innovation hubs, for example they largely contributed in setting up the Knowledge and Innovation Communities of the European Institute of Technology (EIT). When developing new, sometimes game-changing technologies, RTOs adopt a market-oriented approach early on. What we see today increasing is the interest among investors in the deep-tech start-ups launched by RTOs.



To address major societal challenges, Horizon Europe, the next EU framework programme for research and innovation, will embark on something new, namely Missions. Parallel evolutionary steps are also taken to promote a competitive Europe. The work on Strategic Value Chains (SVCs) has been a new and transformative process at EU level, facilitating cooperation between EU, Member States and industrial stakeholders. Action Plans are underway between industry and Member States. Moreover, targeted investments in microelectronics and battery value chains are under preparation as Important Projects of Common European Interest (IPCEI). Who says there is no action?

The EARTO Innovation Awards 2019 introduce you practical examples of how RTOs address today's challenges and create impact through their work. From real innovators and their success stories, we will learn first-hand about the challenges they had to face and what support they enjoyed reaching their goals.

We wish you an inspiring reading!



**Antti Vasara**  
President & CEO, VTT Technical Research Centre of Finland

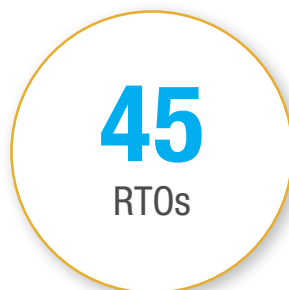


# EARTO INNOVATION AWARDS 2019

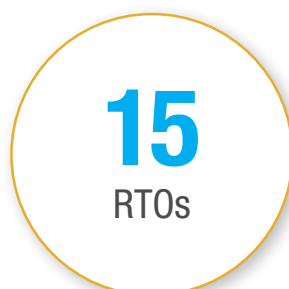
From the lab to your everyday life. RTOs innovate to improve your health and well-being, your safety and security, your mobility and connectivity. Their technologies cover all scientific fields. RTOs are non-profit organisations with public missions to support society. To do so, they closely cooperate with industries, large and small, as well as a wide array of public actors. The innovations presented in this brochure give a flavour of their work. They include real life examples which illustrate RTOs' focus on solving real-world problems and addressing today's challenges! The EARTO Innovation Awards celebrate this year its eleventh edition.

## 11 Years – EARTO Innovation Awards

### NUMBER OF APPLICATIONS SO FAR



### NUMBER OF WINNERS SO FAR



## IMPACT DELIVERED

For this category, the rewarded innovations (product or services) have social and/or economic relevance, innovative originality, are today on the market and have proven their impact.

## IMPACT EXPECTED

For this category, the rewarded innovations (product or services) have social and/or economic relevance, innovative originality, are not yet on the market as a final product/service but promise to have a great impact.

**The award competition is adjudicated  
by an independent jury**



**Peter Dröll**

Director,  
DG Research & Innovation,  
European Commission



**Simon Edmonds**

Director,  
Manufacturing,  
Materials & Mobility,  
Innovate UK



**Christian Ehler**

Member of the  
European Parliament



**Jana Kolar**

Member of the Governing Board,  
EIT



**Ernst Kristiansen**

Vice-President Research,  
SINTEF



**Juan Antonio Tébar**

Director,  
CDTI

# IMPACT DELIVERED

Discover  
innovations  
from RTOs





**1 IMPACT  
DELIVERED  
FIRST PRIZE**

## TARGETING BETTER CANCER CARE FRAUNHOFER



ABOUT  
**50 %**  
OF ALL CANCER PATIENTS  
COULD BENEFIT  
FROM FRAUNHOFER'S  
NEW RADIOTHERAPY  
PLANNING TOOL



THE NEW TOOL  
REDUCES TREATMENT  
PLANNING TIME  
BY UP TO  
**80 %**  
AND INCREASES  
PLAN QUALITY BY UP TO  
**30 %**



RADIOTHERAPY PLANNING  
IS CARRIED OUT  
ON AN ESTIMATED  
**36,000**  
PLANNING DEVICES  
WORLDWIDE



TO DATE,  
FRAUNHOFER HAS RECEIVED  
REVENUE OF MORE THAN  
**€8.5 M**  
FROM WORLDWIDE SALES  
OF THE TOOL

The Fraunhofer-Gesellschaft is a leading research and technology organisation  
with 72 institutes and research units throughout Europe.

It employs a staff of around 26,600 who work with an annual research budget  
totalling €2.2 B, 70 % of which is generated through collaborative research  
with industry and publicly-funded projects.

The Fraunhofer Institute for Industrial Mathematics ITWM specialises  
in modelling, simulation and optimisation.



[www.fraunhofer.de](http://www.fraunhofer.de) / [www.iws.fraunhofer.de](http://www.iws.fraunhofer.de)

## ► IMPROVING CANCER TREATMENT PLANS FOR CLINICIANS AND QUALITY OF LIFE FOR PATIENTS

Radiotherapy is one of the most important treatments for cancer but the high dose of radiation used to destroy cancer cells can also damage adjacent healthy cells. As a result, classic treatment planning is a lengthy, repetitive process as clinicians and planners strive to identify the best option for each patient, balancing the need for maximum tumour coverage (for curative or palliative intent) and minimum risk to other organs and side-effects. The Fraunhofer Institute for

Industrial Mathematics ITWM has developed a real-time decision support tool that evaluates the optimal compromise between these clinical trade-offs. Its interactive Multi-Criteria Optimisation (MCO) software for radiotherapy planning enables clinicians to create high-quality plans for even the most complex cases in a fraction of the time. For patients, the new approach leads to improved long-term survival rates, fewer side effects and better quality of life.



Fraunhofer's interactive Multi-Criteria Optimisation tool for radiotherapy planning generates a variety of plans in advance, enabling real-time searches for the most suitable plan for each patient.

### Getting the right balance

To optimise radiotherapy treatment plans, clinicians have traditionally specified the desired compromise of the various planning goals. Those are used to manually create a few plans. The clinician then assesses these plans. The process can be repeated again and again. Not only does this 'human iteration loop' take a great deal of time; it frequently ends with the unsatisfactory option to deliver the last generated plan. Even if the loop ends with an acceptable plan, it is completely unknown if this plan fully exploits the curative potential for the patient.

### Simulating optimised options

EARTO member Fraunhofer ITWM developed a software tool based on application-specific optimisation methods to support a process that overcomes these drawbacks. This enables the fast computation of a variety of therapy plans that meet the planning goals specified by the clinician, each featuring a different clinical compromise. These are prepared in advance so that when the clinician is ready to explore a case-specific option they can visually evaluate the optimised plans and trade-offs in real time using slider bars to vary parameters. The need for back and forth between planner and clinician is thus eliminated – and the chance to quickly identify the best plan is increased.

### Reaching patients worldwide

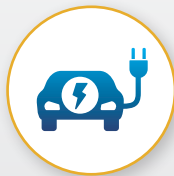
Fraunhofer's invention has caused a paradigm shift in clinical routine and the efficacy and safety of radiotherapy treatment. Users report a 30% reduction in radiation dose to organs at risk and improved tumour coverage. Fraunhofer's industrial collaborator, Varian Medical Systems, is taking the MCO-enhanced version of its Eclipse treatment planning system to customers worldwide and aims to establish interactive MCO as the gold standard in radiotherapy planning. ITWM and Varian are also exploring how the tool can be used to adapt Eclipse treatment plans in clinic with the patient, giving them confidence they will benefit from the best possible plan.

# 2 IMPACT DELIVERED SECOND PRIZE

## THE NEW ION AGE TNO



TNO'S  
**100%**  
SILICON ANODES FOR LITHIUM  
ION BATTERIES STORE  
**10 TIMES MORE**  
ENERGY PER GRAM THAN  
TRADITIONAL GRAPHITE ANODES



THE NEW ANODES  
INCREASE BATTERY  
ENERGY DENSITY BY  
**50%**  
ENABLING  
THE DRIVING RANGE  
OF ELECTRIC VEHICLES  
TO INCREASE BY  
**50%**



IT'S PREDICTED  
THAT BY 2030  
**50%**  
OF VEHICLES SOLD  
WORLDWIDE  
WILL BE ELECTRIC



THE GLOBAL BATTERY  
PRODUCTION MARKET  
IS ESTIMATED  
TO BE WORTH AROUND  
**€250 B**  
A YEAR

TNO, an independent RTO from the Netherlands, has over 3,200 professionals working to create smart solutions for complex issues. These innovations help to sustainably strengthen industrial competitiveness and social wellbeing. TNO focuses on five domains: healthy living, defence, safety and security, industry, energy and urbanisation.

ECN, part of TNO, works to accelerate the energy transition together with knowledge institutions, companies and the government.

**TNO** innovation  
for life

[www.tno.nl](http://www.tno.nl) / <https://www.tno.nl/en/focus-areas/ecn-part-of-tno/>



## ► OVERCOMING THE BATTERY BOTTLENECK TO POWER A GREENER FUTURE

The world is looking to lithium ion batteries as a strategic enabler of high performance electric vehicles, ever-smarter consumer electronics and reliable renewable energies. To realise their full potential, however, energy storage capacity must rise while size, weight and cost must fall. TNO has made a major breakthrough that addresses all these challenges including, crucially, unblocking the energy density bottleneck caused by graphite anodes. Based on a serendipitous result from

research on solar cell materials, TNO's innovation is a pure silicon anode that 'traps' up to 10 times more lithium ions, making batteries 50% denser in energy. As well as enabling batteries to be 20-30% smaller, and correspondingly cheaper, the new technology can be used without modifying manufacturing processes. TNO spin-out Leyden-Jar Technologies has established a demonstration plant and aims to partner with industry to accelerate battery energy density – and generate revenues of €10M.



TNO's innovation is an anode made of pure silicon and produced in a single process step that increases the energy density of lithium ion batteries by 50 % without compromising on cost, safety and battery lifetime.

### Unlocking the potential of lithium-ion batteries

Batteries have a big role to play in helping industries to innovate and economies to decarbonise – and the race is on to capitalise on this burgeoning industry. Europe is aiming to gain a piece of the action – and to rely as much as possible on locally-sourced materials. There are ethical as well as economic reasons behind this ambition. The battery industry currently relies completely on slurry-based processes in which graphite is suspended in solvent and coated onto copper foil. These processes are multi-stepped and energy-intensive. Until now, a cleaner, simpler silicon-only solution has not been possible, because silicon swells when charging, causing it to crumble and break.

### Making silicon mechanically stable

When the Energy Research Centre of the Netherlands (ECN), part of TNO, was working on new production technologies for thin-film solar cells, it invented a roll-to-roll process based on plasma enhanced chemical vapour deposition (PECVD). It turned out that silicon produced in this way is meso-porous and self-organised at the nanometer scale, which means it can absorb expansion during battery charging and cope with the stresses generated in charge-discharge cycles. Neither energy – nor capital – intensive, the single step process grows a silicon layer directly on copper foil to create anodes which maximise the storage capacity of silicon and retain its mechanical stability.

### Driving demand through demonstrators

A battery cell with increased density from silicon anodes will enable the automotive industry to increase the range of its products, either by reducing the weight and volume of the battery pack or by allowing longer battery time. These power options also open up opportunities across the industrial spectrum, notably for electronics, residential energy storage, electric aviation and specialty applications. Leyden-Jar Technologies has already produced a series of demonstration batteries – and sold two to European original equipment manufacturers. The firm plans to develop a demonstration plant and a licensing model for battery manufacturers and scale-up production to the capacity required for the automotive industry.



# 3 IMPACT DELIVERED THIRD PRIZE

## END OF THE TUNNEL FOR FIREFIGHTING SYSTEM RISE



THE T-REX SYSTEM  
REDUCES INSTALLATION AND  
MAINTENANCE COSTS BY  
**40-70%**  
COMPARED TO TRADITIONAL  
WATER-BASED SYSTEMS



WATER FLOW  
IS REDUCED BY  
**30 %**  
DESPITE THE SYSTEM'S  
HIGHER PERFORMANCE



THE SOCIO-ECONOMIC VALUE  
OF THE CONTRIBUTION  
MADE BY RISE  
IS ESTIMATED TO BE  
**49 TIMES  
GREATER**  
THAN THE PROJECT'S  
DEVELOPMENT COSTS



INSTALLATION IN STOCKHOLM'S  
NORTHERN LINK TUNNEL  
COST  
**€7 M**  
A CONVENTIONAL SOLUTION  
WOULD HAVE COST  
**€14 M**

RISE Research Institutes of Sweden is an independent state research institute and innovation partner focused on solving society's problems and increasing the pace of innovation. In international collaboration with companies, academia and the public sector, RISE develops services, products, technologies, processes and materials that contribute to a competitive business community and a sustainable future.



[www.ri.se](http://www.ri.se)

## ► BLAZING A TRAIL WITH INNOVATIVE SYSTEM FOR FIGHTING FIRES IN ROAD TUNNELS

Safety systems for vehicle fires in road tunnels have traditionally centred on parallel escape tunnels and emergency service response. The many catastrophic fires of the last two decades have, however, led to sprinkler systems attracting increasing attention. Existing designs were not, though, considered robust or cost-effective enough for tunnels. When Stockholm initiated its large, complex Northern Link Tunnel (NLT) project, the Swedish Transport Administration (STA) decreed that a new 'outside the box' solution was critical. A collaboration

between RISE, STA, Brandskyddslaget AB and industry leaders rose to the challenge, developing a low-cost, fixed fire-fighting system (FFFS) whose simplicity belies its capability. The innovative nozzles (working name T-REX) spray water horizontally to deluge the entire tunnel, the system greatly reduces fire spread, explosion risk and tunnel damage and is set to become a part of new international standards. Today T-REX is marketed as Tunnel Nozzle (TN) as a part of a complete FFFS system by Johnson Control (former TYCO).



The T-REX (TN) system consists of a single ceiling water pipe attached to horizontal nozzles every five metres which spray large droplets in a sideways direction, covering the entire tunnel cross section.

### Challenging operating conditions

The STA re-evaluated its advocacy of the escape tunnel concept when safety plans for Stockholm's NLT and a proposed 52 km city bypass tunnel were questioned. It was argued that this concept, which relies on free-flowing traffic ahead of a fire to ensure people aren't exposed to smoke and heat, was already leading to tunnels being shut due to potentially dangerous traffic queues. Switching to FFFS was not straightforward – they had long been discounted as unsuitable for Sweden's tough road and weather conditions. It was also believed that continental water mist systems, with their tightly perforated nozzles, were too difficult and expensive to operate and maintain in tunnels.

### Achieving peerless performance

STA's decision was a bold one: to develop an FFFS that would, for the first time, fulfil the requirements of cost-effectiveness, robustness and necessary water supply and pressure for road tunnels. The project collaborators, who included Brandskyddslaget AB and Johnson Controls, achieved all these goals plus outstanding performance. The T-REX system features one central ceiling pipe connected to horizontal nozzles positioned back to back which spray water, with optimised large-droplet size, trajectory and throwing length, to fill the entire tunnel cross section. A specially-developed coating for the steel pipes and pipe fittings ensures they can withstand the tough tunnel conditions.

### Saving time, lives and costs

Tests conducted by RISE proved the T-REX system limits the size of a fire, reducing the production of toxic gases and heat, and protects drivers throughout the tunnel even where there are traffic queues. As the operational process is automatically triggered by fire-monitoring cameras or linear detectors, T-REX speeds the fire-fighting response, which also contributes to reducing heat development and damage to vehicles and the tunnel. The system has successfully controlled four fires in the NTL and been installed in Italy and Finland and elsewhere in Sweden, where it has gained wide acceptance. Applicable in many other contexts, the technology has already been installed in industrial premises and Stockholm's Royal Opera.



## ► Innovative video analytics system to prevent drone attacks

The proliferation of commercially available and affordable drones is becoming a risk, either due to negligence or deliberate misuse. Indeed, attacks involving drones have been identified as a possible threat to the safety of critical infrastructures, such as airports. Conventional radar systems currently available in the market do not yet meet the high demands required in this type of scenarios.

**Innovation:** Gradiant, EARTO Member through ATIGA, has developed a system for detection, tracking and automatic identification of drones based on the use of intelligent videoanalytics. This cost-effective and reliable tool takes the form of a software module that can be integrated into different hardware platforms and cameras. As an alternative, the technology can also be provided as a ready-to-use system, with the software directly integrated on a hardware platform alongside a camera.

**Impact Delivered:** This innovation has been developed via several EU projects by Gradiant, which has run over 10 demos for both private and public stakeholders, receiving very positive reviews. The size of the global anti-drone market is anticipated to reach \$1.85B by 2024. The estimated profit to be obtained for 2019 is from €50k to €75k for 2019, with that number doubling for 2020.



## ► 3D audio system adds music to your ears

3D audio content through headphones has rapidly gained popularity in recent years for providing truly spatial audio experiences. Existing tools are currently reaching commercial success in the cinema and video games industry. However, this technology was not exploited in other industries, such as music.

**Innovation:** EARTO Member Eurecat developed a set of easy-to-use, flexible and cost-efficient integrated software and hardware solution to facilitate the production, post-production and distribution of binaural or 3D audio content outside professional studios. Such innovation includes a set of plugins for 3D and binaural audio production, a binaural player and a head-tracking device for headphones.

**Impact Delivered:** This innovation has been developed via an H2020 project with a consortium of five partners from four European countries, coordinated by Eurecat. It has been brought to market under Eurecat's brand name Sfêar, with prospective sales of more than €200k in the first 3 years. In addition, Eurecat deployed this solution for the creation of the first 3D audio professional music studio in Ibiza.

**AtiGA** | INTERSECTORAL  
TECHNOLOGICAL  
ALLIANCE  
OF GALICIA

**gradiant**

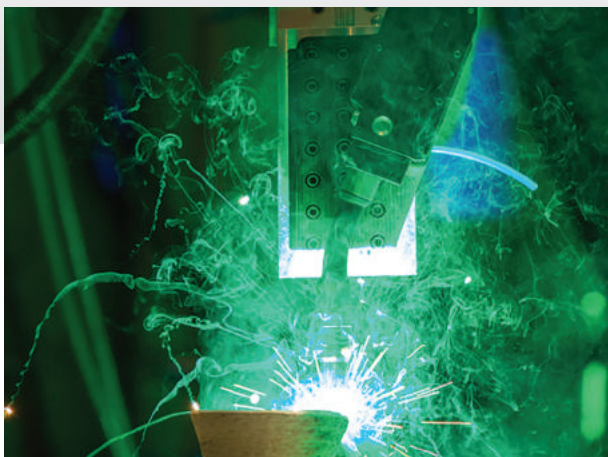
ATIGA is an alliance of six technological centres in Galicia whose main mission is to generate and to transfer scientific and technological knowledge.

[www.atiga.es](http://www.atiga.es)

**eurecat**

Eurecat is the main Technology Centre in Catalonia, Spain. Its multidisciplinary and multinational team of 600 professionals work in more than 170 projects of applied R&D.

[www.eurecat.org](http://www.eurecat.org)



## ► A hybrid robot revolutionises the manufacturing industry

Traditionally, the manufacturing of large parts requires the use of expensive equipment, thus limiting their production to specific manufacturing sites. Such sites are generally not located close to the customers. This increases the transportation costs and reduces the overall efficiency of the process.

**Innovation:** Aitiip Technology Centre, EARTO Member through Fedit, developed the “Kraken”, a disruptive hybrid robotic manufacturing concept. This affordable all-in-one machine can be used by SMEs and large industries for the customised design, production/repair and quality control of functional parts. These parts can be made in aluminium, thermoset or a combination of both materials, enabling both subtractive and novel additive technologies. It can also be used for the manufacturing of large parts of up to 20 m long, with high accuracy and quality.

**Impact Delivered:** This innovation is being developed via an H2020 project with a consortium of 15 partners from 8 EU countries, coordinated by the Aitiip Technology Centre. This project aims at offering an affordable solution into the market for the manufacturing of final parts. The Kraken decreases production time by 40% and cost by 30%, increasing productivity by at least 25%. It also reduces floor space requirements by 90%.



## ► New teeth are made of glass ceramics

About 90% of human beings suffer from caries and the consequential teeth damages at least once in their lifetime. This requires expensive dental restoration action, using biocompatible synthetic teeth that mimic both the aesthetic and the mechanical performance of natural teeth. This cost almost € 160 M in Europe every year, at a time when the cost pressure on our healthcare systems is quite high.

**Innovation:** The new dental glass ceramics of EARTO member Fraunhofer-Gesellschaft enter a new dimension of mechanical, chemical and optical properties. The high-quality synthetic dental crowns made in such material are 40% stronger than competitors’ products on the market, and have long-term stability and reliability. They mimic the natural teeth optics and are adjustable to the patient’s individual dental colour. The dental restoration can be manufactured “chair-side” in a single session during the treatment, considerably reducing time and cost.

**Impact Delivered:** These glass ceramics based dental crowns and bridges are a very efficient innovation in dental treatment, commercially available since 2013. Fraunhofer holds the global patent rights, which are exclusively licensed to DeguDent GmbH and VITA Zahnfabrik GmbH & Co.KG. For the first years, the companies expect global annual sales of € 15 M, increasing in the medium term to € 40 M annually.



FEDIT is a Spanish association of RTOs whose main mission is to boost and encourage innovation, technological development and private research.

[www.fedit.com](http://www.fedit.com)



The Fraunhofer- Gesellschaft is a German RTO, which has a clearly defined mission of application-oriented research, focusing on key technologies of relevance to the future.

[www.fraunhofer.de](http://www.fraunhofer.de)





## ► 3D-printed shoes that will fit your feet perfectly

Nowadays, personalised products are in high demand. This is also the case in the shoe market industry, especially for insoles. To increase user-friendliness and comfort, some customised insoles, using different processes (special materials, heat treatments, etc.), have been brought to the market but their price is over €50.

**Innovation:** Footwear Technology Center of la Rioja (CTCR), EARTO Member through Fedit, developed a system to create personalised 3D printed insoles that offer maximum comfort to the user as well as improve the utilities and features of the conventional solid or porous-structure insoles. This innovation enables to integrate data from different devices involved in the development of the custom insole such as a foot scanner, baropodometric platform, computer system, footwear database and 3D printer.

**Impact Delivered:** This cutting-edge project enables to customise footwear and ensure an improvement in competitiveness and differentiation from companies that produce low-quality footwear. The cost per pair of insoles is placed in a middle market band of about €25. Thanks to the innovation, the company Calzados Hergar S.A. can increase its annual turnover by 5%. This innovation can also lead to the reduction of the number of injuries caused by the interaction between footwear and foot.



## ► New solar tower technology is offering 24/7 sunshine

Industry is directly responsible for about 21 % of global CO<sub>2</sub> emissions and industrial energy demand for process heat is projected to grow another 40 % by 2050. Only biomass was available as sustainable energy source until now, but it has limited availability. Renewable fuels like hydrogen or methanol based on renewable electricity are also under development but are still very costly.

**Innovation:** DLR, EARTO Member through Helmholtz Association, developed a new receiver concept for solar tower power plants which uses black ceramic particles to absorb, transfer and store heat exceeding 1000° C. Air is heated by flowing through the particles in a direct contact heat exchanger. This hot air then provides the energy to the industrial process. The integrated storage can provide a 24/7 energy and from 5 k to 7 k full load hours can be achieved, depending on the annual solar radiation at the location.

**Impact Delivered:** This technological development offers a new solution for 18 % of the global CO<sub>2</sub> emissions. It was demonstrated on the solar tower Jülich and performed at the DLR Institute of Solar Research with about €5 M invested until now. About €17 M are secured for further ongoing or starting projects with partners.



FEDIT is a Spanish association of RTOs whose main mission is to boost and encourage innovation, technological development and private research.

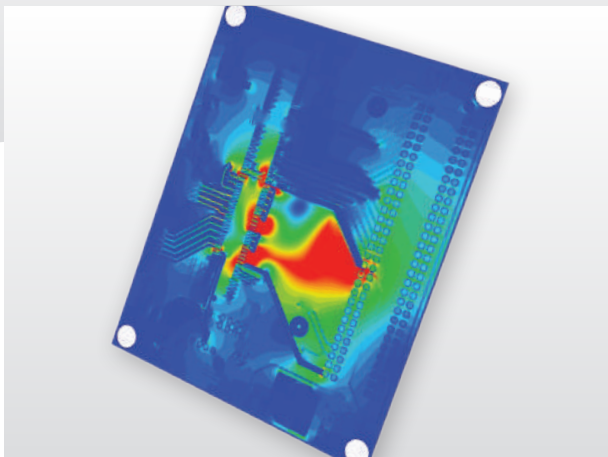
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Helmholtz Association is Germany's largest scientific organization. It represents 40,000 employees working in 19 research centres across Germany.

[www.helmholtz.de](http://www.helmholtz.de)





## ► Opening up new horizons in the electronics' world

Printed circuit boards (PCBs) are the backbone of every electronic device, whose integrity and reliability are critical for any electronics-based system. They are complex multi-material, multi-layer build-ups and their demands are continuously increasing. Recent trends, such as miniaturisation and function integration, are a driver for thinner and smaller boards, making them vulnerable for failure.

**Innovation:** Polymer Competence Center Leoben GmbH (PCCL), EARTO member through UAR, developed a virtual printed circuit boards builder, which reaches new levels of an electro-hygro-thermomechanical modelisation. This tool enables to overcome reliability issues and allows for a fast review of potential product designs, by using a homogenisation method and a submodelling approach.

**Impact Delivered:** PCCL's new development offers high accuracy, while keeping the simulation expense low. This innovation could reduce the risk of product failure and the development costs by 30 % in the global printed circuit boards market, which is expected to reach \$80.1 B by 2023. The job demand in the simulations' market is expected to grow within the next 3 years.



## ► The wood-cutting industry is moving to the digital age

The European wood product industry, including wood-cutting in sawmills, represents 1.2 % of the European economy. Sweden produces approximately 18 Mm<sup>3</sup> sawn wood annually, of which 70 % is exported. Today the sawmill industry uses local data measured via several sensors. However, such data is not connected to previous or following measurements or processes. Not all available information is kept and transferred forward or backward in the chain of processes, which results in a loss of information.

**Innovation:** EARTO Member RISE Research Institutes of Sweden developed an innovative project which collects all data in "the cloud", enabling to correlate data from the whole sawmill process, from all measurements and also from other industries (e.g. suppliers and customers). The tracing of items is made by a cutting-edge patent pending method, using a new way of presenting measurement of objects in a production line and values on the screen.

**Impact Delivered:** This innovation could increase the process efficiency by 15 %, increase the product value by 10 % and reduce energy consumption by 10 %. The participating sawmill is continuing the work to have the system fully running within 1-2 years. By then, the total annual savings can reach more than €3 M, leading to €50 M annually, once it is implemented in all of Sweden's sawmills.



UAR (Upper Austrian Research GmbH), together with its associated RTO companies, is promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

[www.uar.at](http://www.uar.at)



RISE Research Institutes of Sweden AB, is an independent state research institute and innovation partner. In international collaboration with companies, academia and the public sector, RISE contributes to a competitive business community and a sustainable society.

[www.ri.se](http://www.ri.se)



## ► Artificial Intelligence puts an end to traffic incidents

Despite the many safety precautions in place, serious road accidents still lead to many casualties. Victims of accidents are often people who find themselves outside the safe zones for pedestrians, either due to their own negligence, the actions of others, or technical shortcomings. So far, drivers have not had sufficient tools to recognise dangerous situations in time and react to them quickly enough to prevent dramatic outcomes.

**Innovation:** Software Competence Center Hagenberg GmbH (SCCH), EARTO member through UAR, developed in cooperation with AVI Systems GmbH the embedded Artificial Intelligence Algorithms for the AiRVS system, a high-tech camera monitor solution, integrated into any road vehicles. This provides the driver with a powerful tool for detecting persons and objects in real-time (e.g. pushchairs), predicting their possible trajectories. It enables better and earlier warning signals for dangerous situations, helping the driver to react faster.

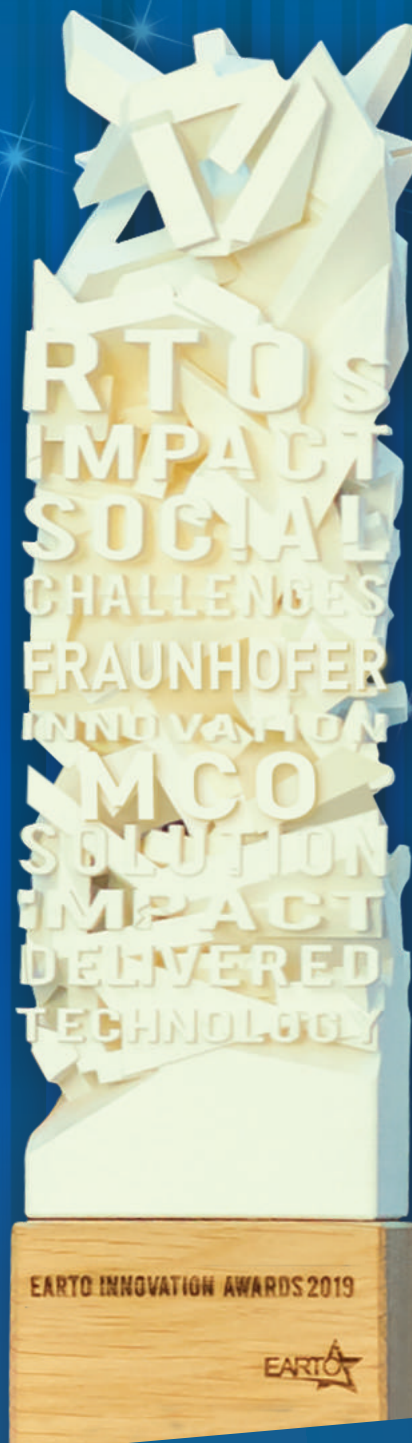
**Impact Delivered:** This innovation could improve the overall traffic safety and reduce any kind of accident related costs. The project is now in a pilot phase but has shown a high reliability of up to 99 % sensitivity in the fair context. It has open opportunities of €1 M in the automotive industry. A 30 % turnover increase is expected once the project is sold.



UAR (Upper Austrian Research GmbH), together with its associated RTO companies, is promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

[www.uar.at](http://www.uar.at)

**IMPACT  
DELIVERED**



# IMPACT EXPECTED

Discover  
innovations  
from RTOs







# 1 IMPACT EXPECTED FIRST PRIZE

## ENERGY TRANSITION ON THE MOVE CEA



THE SMART ENERGY HUB  
MAKES IT POSSIBLE TO GET  
**100%**  
OF A BUILDING'S ENERGY  
DIRECT FROM LOCAL  
AND SUSTAINABLE  
ENERGY PRODUCTION



THE HUB ENABLES A  
**65 %**  
DECREASE OF PRIMARY  
ENERGY CONSUMPTION  
IN BUILDINGS



IN TESTS,  
CO<sub>2</sub> EMISSIONS  
WERE REDUCED BY  
**26 %**  
FOR AN OFFICE BUILDING  
IN FRANCE AND  
**70 %**  
FOR RESIDENTIAL BUILDINGS  
IN GERMANY



THE GLOBAL MARKET  
FOR THE NEW SYSTEM  
IS ESTIMATED TO BE  
**€ 10 B**  
BY 2020

The CEA – Alternative Energies and Atomic Energy Commission –  
is a partially state-funded French RTO and a prominent player in the ERA.

The CEA is active in four main areas: low-carbon energies, defence & security,  
information technologies and health technologies. The CEA maintains a cross-disciplinary  
culture of engineers and researchers, building on the synergies between fundamental  
and technological research.



[www.cea.fr](http://www.cea.fr)

## ► ENABLING THE ENERGY TRANSITION WITH FIRST LOCAL CLEAN ENERGY STORAGE SYSTEM

Even though the production of clean, local energy is now easy and affordable, there remains one last missing link in moving the energy transition forward. Until now, there has been no way of guaranteeing continuous access to locally produced intermittent renewable energies. CEA and French firm Sylfen have solved this security of supply problem with a breakthrough that balances the surplus and deficit generated by unpredictable solar and wind sources. The innovation at the

heart of the Smart Energy Hub they developed is the reversibility of its energy processor. This means it can operate either in electrolysis mode to store renewable energy in the form of hydrogen or in fuel cell mode to produce electricity and heat from hydrogen previously produced or methane. The hub has a highly promising future, fuelling the spread of renewable energies in buildings and communities and the strengthening of Europe's competitiveness in the clean energy race.



The Smart Energy Hub is a hybrid energy storage and cogeneration system which means buildings can use their own supply of energy 365 days a year for the first time.

### Making local renewables reliable

Buildings represent 40% of Europe's CO<sub>2</sub> emissions and are the focus of efforts to reduce pollution and emissions by realising the potential of local clean energy production. With the development of electric mobility, they are also becoming nodal points on local grids. This is adding pressure to produce more energy locally and to manage these larger energy supplies in traceable, short circuits. Given the unpredictability of renewables, this means finding a way to store surplus energy locally rather than sending it to the grid and to release energy for re-use as required. Harnessing hydrogen, which can store more energy than batteries, looks promising but has so far proved hardly possible.

### Optimising energy efficiency

A disruptive innovation developed by EARTO member CEA has made it possible. CEA deployed its reversible solid oxide fuel cell (rSOC) technology to help develop a large capacity, hybrid energy storage and cogeneration system. The Smart Energy Hub combines batteries, for their fast switching capabilities, with rSOC reversible fuel cells which store energy in the form of hydrogen and render it when needed in the form of electricity and heat. The rSOC technology ensures the best performance of the three integrated energy systems – electrolyser, hydrogen fuel cell and combined heat and power from biogas or natural gas locally available – delivering both high energy efficiency and optimum cost.

### Creating a new energy industry

CEA's rSOC technology is protected by 22 patents, for which Sylfen has negotiated an exclusive worldwide licence for its field of application. A proof-of-concept prototype has been delivered in 2018 and is in operation and demonstrator systems will be delivered to Torino, Paris and Sorrento by 2020. For the first fully commercial units, to be produced from 2021, Sylfen will target the building sector as well as cities and districts. The company predicts an annual turnover of €100M in 2024. In the longer term, it is aiming to achieve €1B annual turnover, create more than 2,500 direct and indirect jobs – and become one of the industrial cornerstones of the new energy industry in Europe.

# 2 IMPACT EXPECTED SECOND PRIZE

## ONE STEP AHEAD FEDIT



THE NEW PICEO  
MANUFACTURING PROCESS  
REDUCES COSTS AND ENERGY  
CONSUMPTION BY  
**50 %**



THE OLD  
MANUFACTURING PROCESS  
USED TO TAKE  
**4-5 HOURS**  
NOW IT'S JUST  
**30 SECONDS**



THE PHOTONIC  
INTEGRATED CIRCUITS MARKET  
IS FORECAST TO GROW FROM  
**€ 267 B**  
TO MORE THAN  
**€ 1,300 B**  
BY 2022



BY 2024,  
THE PROJECT'S RETURN  
ON INVESTMENT  
IS EXPECTED TO BE  
**€ 5.8**  
FOR EACH EURO INVESTED

Fedit is a Spanish association of research and technology organisations  
whose main mission is to boost and encourage innovation,  
technological development and private research.

The UPC Technology Center (CIT UPC) is a non-profit entity, attached to the  
Universitat Politècnica de Catalunya (UPC) and focussed on applying university research  
capabilities to innovation in business. CD6 is a research group within CIT UPC.

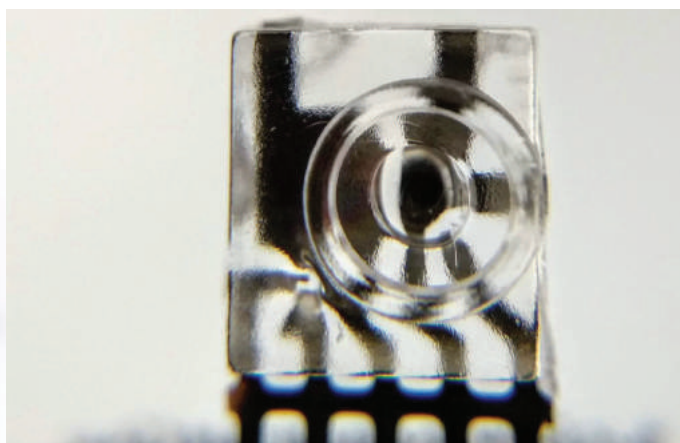


[www.fedit.com](http://www.fedit.com) / [www.cit.upc.edu](http://www.cit.upc.edu)

## ► SHINING A LIGHT ON THE BRIGHT FUTURE OF PHOTONIC INTEGRATED CIRCUITS

Photonic integrated circuits (PIC) accommodating multiple optical functions are already all around us in lighting, communication, health, industry and transport applications. These light-based chips have even greater potential – and could even topple electronics – if current manufacturing time, component positioning errors and associated costs could be reduced. CIT UPC/CD6 has developed a new methodology, PICEO, for manufacturing PICs which overcomes all these drawbacks by using optical quality micro-injection techniques with

thermoplastic materials. This new technology for encapsulating the active optical elements in PIC devices and to embed the optical elements of the PIC to provide optical functionality opens up innovative design possibilities for enhanced functionality and longevity and in so doing redefines the optical design and manufacturing landscape. An advanced PICEO manufacturing facility will open in 2020 to capitalise on this disruptive innovation by producing high added-value products for mass market applications across the industrial spectrum.



PICEO is a new manufacturing methodology for photonic integrated circuits which uses optical quality micro-injection techniques with thermoplastic materials to encapsulate multiple optical components.

### Limiting circuit performance

Encapsulation is one of the most important elements of the PIC manufacturing process, protecting optical parts, enabling connectivity and facilitating operation and installation procedures. It is also one of the most costly, accounting for 60 % of production costs. Currently, encapsulation uses mould injection of thermosetting plastics, which has several limitations. These include a four-to-five hour curing stage which causes production bottlenecks and extra energy consumption, time and cost. This method also limits the geometries of optical parts, which affects functionality, and takes several steps to align components, which can result in suboptimal precision and poor final performance.

### Redefining the production process

The UPC Technology Center – CIT UPC, EARTO member through Fedit, aimed to find a way to automate component positioning, enable in-line validation of component behaviour and reduce the cost of the curing process. The result is PICEO, a micro-injection machine for PIC encapsulation based on moulding with thermoplastics that allows to embed the secondary optical elements at the same moment of the encapsulation. PICEO simplifies the production process, enabling multiple optical elements to be manufactured and assembled in one step for the first time. It also fulfils an unmet market need for lower production volume and allows the use of free-form optical surfaces, which improves performance and efficiency by 8-10%. This in turn reduces energy demand for the same output of light and increases product lifetime.

### Competing in the global market

When this technology reaches the market in 2020 it will initially be focused on key markets including LED lighting, information and communication technology, sensors and photovoltaics, which account for almost 70 % of total market income – around € 139M. The plan is to generate revenue through three streams: the sale of manufacturing equipment, maintenance services and component royalties. As the only low-cost, high-quality process of its kind in the world, PICEO will help Europe compete in the global market, even in regions where labour prices are lower, and significantly contribute to maintaining the current double-digit growth rate of the PIC industry.



**3** IMPACT  
EXPECTED  
THIRD PRIZE

## THE SEED OF A GOOD IDEA

# TECNALIA



TECNALIA'S NEW CONCRETE  
HARDENING ACCELERATOR  
REDUCES SETTING TIME  
BY UP TO  
**35%**



NANOSEED  
WILL COST  
**40%**  
LESS THAN THE  
CURRENT BEST SELLER



CONCRETE STRENGTH  
GAINS OF UP TO  
**400%**  
AFTER EIGHT HOURS  
HAVE BEEN REPORTED  
FOR AN ADDITION OF  
**5%**  
OF NANOSEED



NANOSEED  
IS EXPECTED  
TO ACHIEVE SALES OF  
**€1.8M**  
OVER THE NEXT FIVE YEARS

Tecnalia is a Spanish RTO aiming to transform knowledge into GDP by creating business opportunities for companies through multidisciplinary and applied research, improving people's quality of life. Experts of more than 27 nationalities, in 22 headquarters all over the world, visualise, identify and develop comprehensive technological solutions with creativity and imagination for more than 4,000 clients.



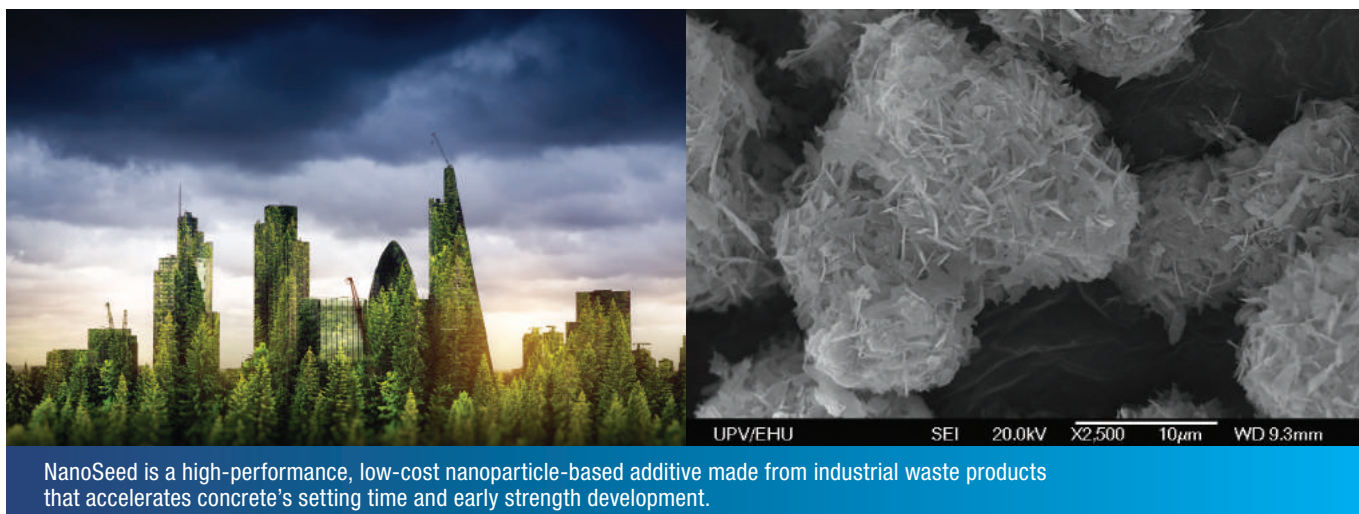
[www.tecnalia.com](http://www.tecnalia.com)



## ► BUILDING SUSTAINABILITY INTO THE CEMENT INDUSTRY WITH NANOPARTICLE-BASED HARDENING ACCELERATOR

Cement composites, like mortar and concrete, are the most widely used materials in the world. They are also responsible for 5 % of CO<sub>2</sub> emissions. Significant effort has been made to optimise their synthesis process and reduce their carbon footprint, but a step-change solution has not been forthcoming. Tecnia turned to nanotechnology to make the required multi-purpose breakthrough. It developed a production process for a concrete hardener, NanoSeed, which uses nanoengineered particles made from industrial waste to act as

accelerators of the cement-setting process. Not only has NanoSeed achieved the industry's holy grail, doubling the speed of hardening at almost half the cost and without reducing final strength, its benefits will also enable its wider use, so less CO<sub>2</sub> emitting cement has to be used. In solving key technology challenges without increasing concrete's environmental impact, NanoSeed has ensured sustainable competitive advantage in a growing global industry.



NanoSeed is a high-performance, low-cost nanoparticle-based additive made from industrial waste products that accelerates concrete's setting time and early strength development.

### Reformulating the cement mix

Half of cement's CO<sub>2</sub> emissions come from decarbonation of the limestone inherent to the synthesis process. In the absence of new, greener cements containing less calcium, the only solution has been to reduce the use of cement clinker with supplementary cementitious materials (SCMs). Most SCMs, however, slow down hydration reactions and strength development, which is further accentuated by cold weather. Hardening accelerators therefore have an important role to play in the cement mix, reducing the time required to cure concrete so that it quickly develops enough strength to remove the formworks and continues building on top of it. This prevents the construction industry from unnecessary downtime.

### Improving productivity and cost

EARTO member Tecnia identified calcium silicate hydrate (CSH) particles, known to be effective agents for promoting cement setting, as the key to unlocking benefits for the whole value chain. Unlike existing CSH production methods, which are expensive and difficult to scale up, the simple water-based process behind NanoSeed obtains reactive seeds of CSH through the hydrothermal treatment of environmentally friendly raw materials. These seeds have the same properties as high-performance commercial nanoparticles but are 20% cheaper to produce. They will easily double production for precast concrete manufacturers and speed up on site construction.

### Reaching a growing global market

NanoSeed has already been produced at industrial scale and tested by an end user in the precast industry and a leading cement chemical company. The plan is for a new company, ConSeed, to bring the product to market in 2019 and have a production plant built and working at full capacity by 2021. Before then, income will come from direct sales of the product produced by third parties. To expand the business beyond Europe as quickly as possible, the intention is to license the technology to the global construction chemical industry. In its first five years, ConSeed aims to sell over 1,000 tons of NanoSeed, sign four license agreements and bring in revenue of €1.8 M.

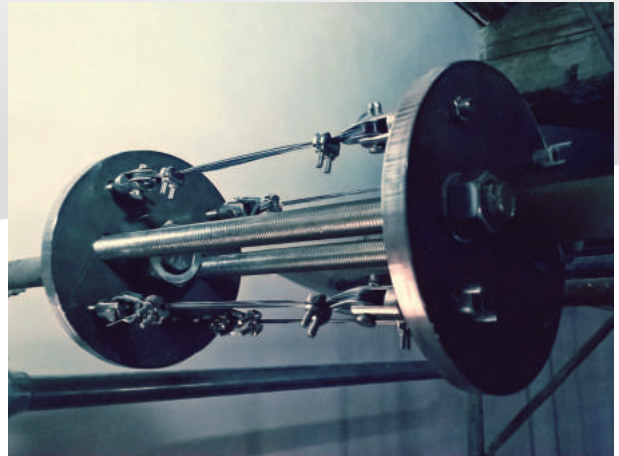


## ► The flying radar that saves lives

Natural disasters, such as earthquakes and other types of disasters, can result in people trapped under debris. Once one of these disasters occur, search and rescue missions are launched. The urban search equipment has been growing fast. For instance, the market for drones, with application to public safety missions, should be worth of \$1.15B in 2022.

**Innovation:** Gradiant, EARTO Member through ATIGA, developed the “Alivator”, a light-weight radar of 1 Kg, conceived as a hanging box for commercial drones. It is made up of a radar module, several radiofrequency components, a processing board and a communication's link to send results to the controller. Its high mobility and detection capabilities allow to detect survivors safely through 6m of layers of air and quickly, as it covers an area of 100 m<sup>2</sup> in 30 minutes.

**Impact Expected:** This innovation has been completely developed by Gradiant since 2013. The survival probability for people trapped under debris is reduced by 50 % in the first 24 hours. Alivator can increase the search speed and allow first responders to search for survivors, while being less exposed to dangers.



## ► The new ANTISEISMIC device based on Shape Memory Alloy (SMA)

Frequent and catastrophic seismic events can result in damaging existing buildings and historical architectural assets. The demand for structural upgrading of buildings is, therefore, increasingly growing. The use of metal tie rods in thrusting structures (i.e. archs and vaults) is a widespread practice, but it can be seriously dangerous in case of an earthquake.

**Innovation:** EARTO Member CETMA – European Research Center for Technologies Design and Materials developed an innovative anti-seismic device named ANTISEISMA and dedicated to all thrusting structures of both industrial and cultural heritage buildings. This device, composed of Shape Memory Alloy (SMA) elements, is able to recover initial shapes even after having been deformed. It exploits the pseudoelasticity property of SMA wires and it is capable to dissipate large amounts of energy during the seismic event, thanks to a reversible phase transformation in the solid state.

**Impact Expected:** This innovation can lead to the reduction of reconstruction and repair cost of buildings, caused by an earthquake and can also increase the turnover of companies involved in seismic upgrading. This project is expected to reach the market within 2 years. Its target market is mainly Europe and especially Mediterranean countries which face high seismic risk.

**AtiGA**

INTERSECTORAL  
TECHNOLOGICAL  
ALLIANCE  
OF GALICIA

**gradiant**

ATIGA is an alliance of six technological centres in Galicia whose main mission is to generate and to transfer scientific and technological knowledge.

[www.atiga.es](http://www.atiga.es)

**CETMA**  
EUROPEAN RESEARCH CENTER FOR TECHNOLOGIES DESIGN AND MATERIALS

CETMA, European Research Center for Technologies Design and Materials, is a Research and Technology Organisation (RTO) which carries out applied research, experimental development and technology transfer.

[www.cetma.it](http://www.cetma.it)



## ► Damaged skin? Not anymore

The cosmetic industry is constantly looking for new innovations to better address the needs of consumers, especially at a time when medicine needs to be more and more personalised. Innovation in cosmetic ingredients and products' formulation is needed to keep up with market needs and provide personalised skin service.

**Innovation:** EARTO Member CIDETEC developed a ready-to-use smart nanoencapsulation technology that interprets skin needs to deliver natural active ingredient where actually required. The nanocapsules are based on specially designed polypeptide. They offer a fast and modulated action: releasing the ingredient on the damaged area of the skin, with a more restrained release on the healthy part. The innovation increases the bio-availability of the active ingredient by more than 50 % on the damaged skin area, improving its effectiveness by up to 4 times and its stability by more than 80 %.

**Impact Expected:** This innovation has been developed under H2020 project PeptiCaps (grant agreement 686141), under the coordination of CIDETEC. The newly created start-up company EMISSARY Cosmetics will commercialise the nanocapsules as cosmetic ingredients, expecting to reach 20 % of the smart encapsulation cosmetic market within 5 years. The total revenue in 2024 is expected to be €9.3M.



CIDETEC is an organisation for applied research that integrates three international reference institutes in the fields of energy storage, surface engineering and nanomedicine.

[www.cidetec.es](http://www.cidetec.es)



## ► Innovative combustion diagnosis based on flame images

Combustion process is a chemical reaction in which a large amount of heat is produced. Monitoring and control of the industrial combustion systems can lead to a higher energy efficiency and reduction of pollutants emissions.

**Innovation:** EARTO Member CIRCE – Research Center for Energy Resources and Consumption developed an advanced flame visualisation tool which enables to diagnose and optimise combustion process in the petrochemical industry. This tool allows detecting burner malfunctions based on the digital image processing. It also generates warnings in order to support the operator and improve the management of the combustion system.

**Impact Expected:** This innovation has been developed under the H2020 project DISIRE allowing a reduction of fuel consumption, minimising its environmental impact and a cost reduction of natural gas consumption per year of 0.67 %. Besides, it offers higher maintenance, safety and huge digitalisation of the combustion system. Other optimisation strategies based on Computational Fluid Dynamics have been explored and could lead to fuel savings of 2 to 3 % per year and to 40 % lower NO<sub>x</sub> emission levels.



CIRCE is a technological center founded in 1993 and seeks to provide innovative solutions for sustainable development.

[www.fcirce.es](http://www.fcirce.es)





## ► Personalised e-diet at the tip of your mouth

Adopting a healthy lifestyle is a growing demand from society, with increasing expectations around personalised diets. This is a key to prevent the onset of diet-related diseases, such as obesity, hypertension or other cardiovascular diseases. People are in need of solutions to sustain healthier habits and guarantee an optimal health and physical conditions while ageing.

**Innovation:** EARTO Member Eurecat developed digital tools for being able to deliver actionable personalised plans to improve people's health, based on their phenotype, genotype, behaviour, lifestyle and food preferences. The innovation applies omics sciences, especially metabolomics, to know the state of metabolic health and induce a change in nutrition and lifestyle habits. The ICT tools cover the three levels of food value chain: recommending products at the point of sales, personalised delivery food service and professional dietary advice.

**Impact Expected:** This innovation will have a significant impact on citizens' health and on health care system costs. It could also increase user satisfaction and confidence in personalised nutrition. The solution can be exploited as a all-in-one platform, offering nutrition advice, data and analytics services, or as individual business cases (e.g. new nutritional products).



## ► Creating dynamic 3D models of real persons for virtual worlds

With the extremely rapid development of the Virtual Reality (VR) and Augmented Reality (AR) markets, creating a convincing 3D representation of persons will bring the field of media production to the next level. New technology developments with volumetric video enable to simultaneously capture real persons with multiple cameras and create naturally moving dynamic 3D models.

**Innovation:** EARTO Member Fraunhofer-Gesellschaft developed an entire 3D Human Body reconstruction (3DHBR) studio with novel and unique capture and processing technology. High-quality video cameras with 20 MPixel resolution each enable the video-based processing of 3D information without the need for any additional active depth sensors.

**Impact Expected:** This technology will further enrich the applications for the 3D representation of persons, embedding realistic movements with high authenticity and realism. Complex modelling and animation can therefore be avoided. The first 360-degree video test production started in 2017. The technology has been transferred to a commercial studio in 2018, supported by € 1.5 M public and private investments. The Volucap GmbH has been founded to start commercial production with Fraunhofer technology.



Eurecat is the main Technology Centre in Catalonia, Spain. Its multidisciplinary and multinational team of 600 professionals work in more than 170 projects of applied R&D.

[www.eurecat.org](http://www.eurecat.org)



The Fraunhofer- Gesellschaft is a German RTO, which has a clearly defined mission of application-oriented research, with a focus on key technologies of relevance to the future.

[www.fraunhofer.de](http://www.fraunhofer.de)





## ► Enjoy a ride at the right temperature in electric vehicles

The interest into the Battery Electric Vehicles' (BEV) market has increased in the last years. However, air conditioning and heating system in electric vehicles are still an issue because of the negative impact on the vehicle distance range. The Joule heating technology is in pilot phase. Practical applications, regarding the Peltier cooling technology, exist but a new approach is required for the BEV market.

**Innovation:** AIMPLAS, EARTO member through REDIT Innovation Network, developed the JOSPEL project, a new concept of Joule heating. This innovative system consists of thermoplastic heating panels which can be placed in different parts of the car, creating a radiant heating in the vehicle cabin combined with fresh air in order to improve passengers' thermal comfort sensation. Polymer properties are modified to increase their electrical conductivity and they can act as a resistance when an electric current is applied.

**Impact Expected:** JOSPEL project can reduce the energy consumption compared to conventional heating systems by 30% and the energy related to passenger comfort systems by 50%. It is expected to be industrialised and commercialised within maximum 2 years. AIMPLAS already licenced the system to an industrial partner.



## ► The mining industry is getting cleaner

The mining industry is constantly striving to improve the environmental performance and sustainability of their operations. In Sweden, the mining industry uses 38 Mm<sup>3</sup> of process water annually. Existing technologies for sulfate removal from water require high energy inputs, use large volumes of reagents and generate large quantity of waste products.

**Innovation:** EARTO Member RISE Research Institutes of Sweden developed an energy and resource efficient biological process to reduce water footprint from the Swedish mining industry. This novel process enables efficient reduction of sulfate emissions in cold climate when temperatures are below 10°C, which was previously considered not feasible. RISE's innovation enables recirculation of water without generating waste products.

**Impact Expected:** This innovation allows production of clean water with up to 95% sulfate reduction. It also allows increase of resource efficiency for the mining industry, having the potential to save 19 Mm<sup>3</sup> of water per year in Sweden. RISE's innovation could reduce generation of solid waste by 100 kton per year, compared to current technologies. The project has a €3,000M estimated target market annually, with an industrial consortium committed to facilitate its implementation. In the future it could be exported to other mining and metal industries in Europe and worldwide.

**REDIT**  
INNOVATION NETWORK



**AIMPLAS**  
PLASTICS TECHNOLOGY  
CENTRE

The Network of Technological Centres  
of the Valencian Community (REDIT)  
is a private non-profit association that integrates and  
represents the 11 technological centres of the region.

[www.redit.es](http://www.redit.es)

**RI  
SE**

RISE Research Institutes of Sweden AB, is an independent state  
research institute and innovation partner. In international collaboration  
with companies, academia and the public sector, RISE contributes  
to a competitive business community and a sustainable society.

[www.ri.se](http://www.ri.se)



## ► Unbreakable and curved X-ray systems

Today's X-ray detectors for medical diagnostic applications are made on glass, making them heavy, difficult to transport and prone to breakages. A cost-effective X-ray imaging equipment is needed to improve diagnosis of diseases, enhance patient access to healthcare and create more capacity through process efficiencies.

**Innovation:** EARTO Member TNO developed a curved X-ray detector with organic materials that would be less vulnerable than current glass-based designs, and significantly meet emerging clinical needs. TNO created organic photosensor arrays on plastic. These arrays are thinner, lighter-weight, unbreakable, very appealing for (light) detection applications, paving the way for more compact 3D X-ray imagers with better image quality.

**Impact Expected:** The new photosensor materials ensure medical-grade performance while significantly simplifying fabrication, reducing cost by ca. 40%. On top of such cost-reduction, the printed detector allow the volume of 3D X-ray detectors to shrink by 50% and images can be produced using less radiation. The global X-Ray detector market is expected to reach \$3.6B by 2024 (from \$2.3B in 2016).



## ► Brand new biobased materials made of lignin

Lignin, the second most frequently occurring polymer in nature, can be a valuable substitute to approximately 50M tonnes of various products based on crude oil. It acts as a radical scavenger when added to a mixture removing or de-activating impurities. However, while it has many advantages over other techniques, lignin depolymerisation leads to the formation of coke.

**Innovation:** Kompetenzzentrum Holz GmbH (Wood K plus), EARTO member through UAR, developed a new technique to avoid coke generation during lignin depolymerisation: hydrotalcites will be applied as heterogeneous base catalysts in aqueous systems. This will make lignin accessible as stabilizer for polyolefins. The lignin stabilisers can be applied to form biobased resins, aerogels and carbogels, having similar performance with common stabilisers, in order to overcome the limitations of typical polyolefin stabilisers.

**Impact Expected:** This innovation has been conducted through the project BioRest, within the Programme line EFRE. Industrial partners, as well as aerogel and wood panel manufacturers, are involved in the process development and will act as lead applicants in the next few years. The project will reach the market within 3 years.

**TNO** innovation  
for life

TNO, an independent Dutch RTO, has some 3,200 professionals who put their knowledge and experience to work in creating smart solutions to complex issues.

[www.tno.nl](http://www.tno.nl)

**UAR**  
Upper Austrian Research GmbH

**WOOD**  
KPLUS

UAR (Upper Austrian Research GmbH), together with its associated RTO companies, is promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

[www.uar.at](http://www.uar.at)

**IMPACT  
EXPECTED**



EARTO INNOVATION AWARDS 2019





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