Pilot Initiative

“ESM - Efficient and Sustainable Manufacturing”

Giacomo Copani
Pilot Technical coordinator

AFIL – Lombardy Intelligent Factory Cluster

Chemnitz, 27 October 2017
What is a Vanguard Pilot Initiative?

Coordinated Initiative (strategic project)

Formally supported by multiple Regional Governments

Focused on a strategic challenge for industry

Aimed at generating and supporting inter-regional projects for the establishment of pilot plants supporting manufacturing innovation
What is a Vanguard pilot plant?

European network of open facilities where companies (including SMEs) can find:

- Innovative **technologies**
- Multi-disciplinary **competences**
  (technology, business, innovation)
- Stimulating **cultural environment**

To understand, test, set-up and uptake innovative technologies and methods

- TRL>7
- Open
- Motivated and supported by industry
- Clearly focused on applicative domains
What does a Vanguard Pilot Initiative do?

**Coaches demo-cases to:**
- Accelerate their progress
- Identify and stimulate dedicated funding opportunities
- Empower the partnership
- Communicate their progress/results
- Establish synergies with other existing initiatives

**Stimulates the identification of strategic innovation topics of joint interest and the setup of pilot projects: the demo-cases**

**Offers coordination and structured methodology for inter-regional cooperation**

**Acts as a bridge between the technical/industrial and the political level**

**Creates critical mass**
Pilot, demo–cases and use cases

- Broad strategic scope
- Interface between industry and policy
- Methodological support
  *i.e. Efficient and Sustainable Manufacturing, ...*

- Focus on defined technology areas or manufacturing goals
- Operative project level
  *i.e. circular economy, Digital&Virtual Manufacturing, ...*

- Focus on specific technologies and industry sectors
- Concrete implementation intent for the benefit of companies
  *i.e. energy efficiency in automotive manufacturing processes*
The Vanguard Pilot
ESM – Efficient and Sustainable Manufacturing

Manufacturing efficiency

• increasing throughput
• improving quality
• reducing costs

Manufacturing Sustainability

• reducing energy
• reducing materials consumption
• reducing emissions
• increasing the inclusion of humans in the factories
ESM Methodology and tools

Pilot plants (PP) Regional ideas

ESM Pilot Concept Definition

EU PP concept design

Business Planning

PP Business Plans

Pilots funding and implementation

ESM PP in-use

Methodology to collaboratively define EU pilot plants concept
Establishment of European Working Groups
Assessment of pilot concepts against the ESM vision
Suggestions to WGs to improve the concept
Guidelines for business planning
Support to WGs process governance
Assessment of business plans
Suggestions to WGs to improve business plans
Support in funds identification and raising
Support in regional cooperation

Vanguard ESM Pilot as generator, coach, facilitator and accelerator of demo-cases
The process to identify the first wave of demo-cases

- Regions propose ideas for pilot plants on ESM
- Identification of synergies and complementarities among proposals
- Design of the EMS integrated pilot plants network

September 2014 - November 2014 - December 2014
## ESM running demo-cases

<table>
<thead>
<tr>
<th>Adaptive and Intelligent Manufacturing</th>
<th>Lombardy</th>
<th>Catalonia</th>
<th>Baden Württemberg</th>
<th>Basque Country</th>
<th>Emilia Romagna</th>
<th>Flanders</th>
<th>Hauts de France</th>
<th>Northe</th>
<th>Saxony</th>
<th>Scotland</th>
<th>South Netherlands</th>
<th>Tampere</th>
<th>Indicative number of stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Energy and environmentally-efficient manufacturing processes</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Advanced sustainable surface &amp; coating manufacturing technologies on polymers</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Digital and Virtual Factory</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>De- and Re-Manufacturing</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>
ESM demo–cases progress

- ESM Pilot Concept Definition
- Business Planning
- Pilots funding and implementation

Smart and Adaptive manufacturing
Energy Efficient Manufacturing
Surface treatments and coatings
Digital and Virtual De- and Remanufacturing
Opportunities of Vanguard ESM Pilot

✓ Enter a **highly-qualified network of stakeholders** willing to implement and exploit **pilot plants** in Europe

✓ **Increase knowledge on industrial opportunities and technologies in strategic manufacturing areas**

✓ **Establish a channel to:**

  ✓ **Bring research results to the** market (for technology developers and research organizations)

  ✓ **Uptake research results** (for industrial companies)

✓ **Interregional cooperation and business internationalization**

✓ **Achieve critical mass** for the implementation of ambitious projects

✓ **Increase the impact of research and innovation projects**
Conditions

• Play in the frame of a Regional system participating to Vanguard

• Industrial motivation

• Alignment with regional specialization strategy

• Complementarity and synergy with what it is already under development

• Self-commitment and investment
Examples

✓ ESM is registered as a partnership in the S3 Platform on Industrial Modernization and participates to its Steering Committee

✓ Representatives of ESM participated to the MANUNET Consortium

✓ S34Growth Interreg EU project: definition of new funding instruments supporting inter-regional cooperation for the implementation of Vanguard pilot plants projects

✓ GREENOMED Interreg MED project: further testing of the Vanguard methodology to include new MED Regions in the activities and to increase demo-cases critical mass (in the area of green manufacturing)

✓ ESM partners got funded projects thanks to increased competitiveness

✓ INNOSUP Proposals presented as a Pilot level

✓ Participation to meetings with EU Commission and at political level

✓ ...

Mediterranean Trans-Regional Cooperation for green manufacturing innovation

0. Vanguard framework setting
1. Identification of key-topics for Pilot Plants
2. Establishment of Regional core groups
3. Motivating Ideas
4. Consolidation of Regional WGs

Design of regional node in coherence with others
Business plan
Implementation

New concept note
Invoking other Regions

www.greenomed.interreg-med.eu
Thank you for attention

giacomo.copani@afil.it
“De- and Remanufacturing” Pilot Network

Regions: Lombardy, Scotland, Saxony, Tampere, Flanders, Basque Country, Norte

Technical Coordinator: Marcello Colledani

Presenter: Marcello Colledani, Politecnico di Milano, Lombardy

AFIL: Intelligent Factory Lombardy Region Cluster

VANGUARD INITIATIVE – NEW BUSINESS OPPORTUNITIES FOR EUROPEAN INDUSTRY
October 26–27, 2017
Best Practice and Introduction to the Vanguard pilot actions
Pilot Idea: Concept

De- and Remanufacturing includes the set of technologies, tools and knowledge-based methods to recover, re-use and upgrade functions and materials from industrial waste and post-consumer high-tech products, under a new producer-centric Circular Economy perspective.

Example: Benefits of Remanufacturing in the automotive industry (Electronic Air Control unit).

[Source Kohler: D., Mechatronic Remanufacturing at Knorr-Bremse Commercial Vehicles Systems (CVS)].

EU – Towards a circular economy, a zero waste programme for Europe, COM (2014) 398 final
Economic Benefits of Circular Economy at large scale

Shifting toward a circular economy model would deliver better outcomes for the European economy and yield annual benefits of up to €1.8 trillion by 2030.

Annual total cost of producing and using primary resources, EU-27, euros trillion

Source: Europe’s circular-economy opportunity
McKinsey Center for Business and Environment September 2015
Strategy: demonstrating integrated innovative solutions and de-risking private investments in Circular Economy

G7 Summit Declaration June 2015: The G7 Alliance on Resource Efficiency promotes Circular Economy, Remanufacturing and Recycling as strategic actions.

At European level, the Commission has launched in December 2015 the strategic initiative “Closing the loop - An EU action plan for the Circular Economy”.

H2020 R&I projects under the Focus Area “Industry 2020 in the Circular Economy”, calls CIRC, Spire and FOF, at TRL 6-7.

Lack of infrastructures that can demonstrate to industry integrated circular economy solutions and business models, de-risking the private investment.

These Innovation Hubs should act as “technology gateways” that any business sector can use.
The main objective of the De-and Remanufacturing pilot network is to integrate a multidisciplinary set of advanced and innovative enabling technologies and digital innovations (TRL 7-8) and to exploit the regional Smart Specializations in synergic way to offer services to European end-users, mainly manufacturing companies, to solve specific sustainability-oriented problems related to their products.

The pilot network nodes will act as Innovation Hubs for Circular Economy, being a network of competence and technology centers and supporting future producer-driven replication at industrial scale (TRL 9).
Pilot Idea: Application Domain

The Pilot Network is seen as a **One-stop-shop** for delivering innovation services to the industrial end-users with a multi-regional approach.

<table>
<thead>
<tr>
<th>Industrial Innovation Service Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Life-cycle information</td>
</tr>
<tr>
<td>management.</td>
</tr>
<tr>
<td>Environmental sustainability assessment</td>
</tr>
<tr>
<td>and LCA.</td>
</tr>
<tr>
<td>Patent and technology IPR searches.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Market analysis and business models.</td>
</tr>
<tr>
<td>Legislation review and innovation deals.</td>
</tr>
<tr>
<td><strong>Product and process certification.</strong></td>
</tr>
<tr>
<td>Business case validation and scenario</td>
</tr>
<tr>
<td>analysis.</td>
</tr>
<tr>
<td><strong>Circular economy training.</strong></td>
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<td></td>
</tr>
</tbody>
</table>
The network will be composed of:

- New infrastructures, which will be designed, developed, and installed on purpose for this pilot network.
- Existing infrastructures, which will be upgraded towards integrated pilot plants.

**Key Issue:** integrated pilot plant solutions, needed by industry to validate high-risk investments in circular economy businesses before the industrial implementation.
Benefits of the multi-regional, value-chain oriented approach

Enabling technologies and processes (collaborative disassembly by robotics, remanufacturing, inspection, demanufacturing, re-processing, coating and recovery)

Digital Innovation (IoT, smart products, cloud-based platforms, Things Lifecycle Management, data analytics, process and system simulation)

Innovation in eco-products, processes and business models

Cross-regional Value-chain building (new service-oriented business models, open innovation, product re-design, cross-sectorial industrial symbiosis, ecosystems)

An effective transition to new circular economy businesses in Europe requires a systemic approach and cross-KETs innovations, in traditional and emerging sectors (SCREEN CIRC-3, FiberEUse CIRC-1).
SCREEN Synergic Circular Economy Across European Regions

SCREEN H2020 aims at the **definition** of a **replicable and scalable approach**, to support **European Regions** in the transition to new **Circular Economy cross-regional value-chains**. This will be done through the identification and implementation of **operative synergies** between R&I investments of H2020 program and EU structural funds.

The methodology developed within the project will be replicable in all the European Union, thus creating an **interregional framework for financing Circular Economy value chains**.
Industrial Participants and investors.

More than 60 European companies, with a cumulative turnover of 32 B€ and with some 175,000 employees, and 69 universities and RTOs distributed among the involved regions are involved.

<table>
<thead>
<tr>
<th>TECforce</th>
<th>Filartex Spa</th>
<th>Gamesa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candy</td>
<td>Gafitex</td>
<td>Xnext</td>
</tr>
<tr>
<td>RoldElectronics</td>
<td>Pass Maglia</td>
<td>Lot Quantum Design</td>
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<td>TP Vision</td>
<td>Samatex</td>
<td>MH Systems</td>
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<tr>
<td>Barco</td>
<td>PTMT PANTER</td>
<td>Holonix</td>
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<td>Worldline</td>
<td>Rivierasca</td>
<td>Idealtech</td>
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<tr>
<td>Turner Aviation</td>
<td>Brienza Plastica S.p.A.</td>
<td>Cosberg</td>
</tr>
<tr>
<td>Cargotec Finland Oy</td>
<td>Sintostamp S.r.I.</td>
<td>Giasini</td>
</tr>
<tr>
<td>Sandvik Mining and Construction Oy</td>
<td>Magniplast S.p.A.</td>
<td>AERNNOVA</td>
</tr>
<tr>
<td>Metso Minerals Oy</td>
<td>OCV Owenscorning</td>
<td>ITP</td>
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<tr>
<td>Valmet Power Oy</td>
<td>Covestro</td>
<td>Gallo</td>
</tr>
<tr>
<td>John Deere Forestry Oy</td>
<td>Campine</td>
<td>Van Gansewinkel</td>
</tr>
<tr>
<td>Bronto Skylift Oy Ab</td>
<td>Gallo Plastics</td>
<td>TKM TTT Finland Oy</td>
</tr>
<tr>
<td>Avant Tecno Oy</td>
<td>Kokkola LCC Oy</td>
<td>IRIZAR</td>
</tr>
<tr>
<td>Magneti Marelli</td>
<td>A2A Ambiente</td>
<td>Meleghy</td>
</tr>
<tr>
<td>Cannon</td>
<td>Relight</td>
<td>Automotive</td>
</tr>
<tr>
<td>Mercedes</td>
<td>Fincoat OY</td>
<td>GKN</td>
</tr>
<tr>
<td>Tenova</td>
<td>Telatek Oy</td>
<td>Enginsoft</td>
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<tr>
<td>Maier</td>
<td>Marzotto</td>
<td>MCT</td>
</tr>
<tr>
<td>Indeva</td>
<td>Batz</td>
<td>Cobat</td>
</tr>
<tr>
<td>DMG Mori</td>
<td>Ki-lab</td>
<td>ASPIRE Eng.</td>
</tr>
</tbody>
</table>
Industry-led use cases and related business cases

A detailed analysis of identified *sectorial Use Cases*, with industrial partners associated, has been performed, where more regions are involved. For each Use Case, a business case has been detailed including a *business plan* for the industrial take-up of the solutions.

<table>
<thead>
<tr>
<th>Regional/Cross-Regional Use Case</th>
<th>Involved Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite Recovery from Wind Energy System</td>
<td><strong>Basque Countries</strong>, Saxony, Lombardy, Tampere</td>
</tr>
<tr>
<td>Heavy machinery components remanufacturing</td>
<td><strong>Tampere</strong>, Basque Countries, Lombardy, Saxony</td>
</tr>
<tr>
<td>Automotive parts remanufacturing</td>
<td><strong>Scotland</strong>, Lombardy, Saxony, Norte</td>
</tr>
<tr>
<td>High-value TLC systems and Electronics Recovery</td>
<td><strong>Lombardy</strong>, Tampere</td>
</tr>
<tr>
<td>Metal components reprocessing</td>
<td><strong>Saxony</strong>, Tampere, Lombardy</td>
</tr>
<tr>
<td>Remanufacturing of e-motors</td>
<td><strong>Saxony</strong>, Lombardy, Norte</td>
</tr>
<tr>
<td>Plastics recycling from WEEE</td>
<td><strong>Flanders</strong>, Lombardy</td>
</tr>
<tr>
<td>E- mobility batteries remanufacturing for re-use</td>
<td><strong>Lombardy</strong>, Saxony</td>
</tr>
<tr>
<td>Photovoltaic panels de-manufacturing</td>
<td><strong>Flanders</strong>, Lombardy</td>
</tr>
</tbody>
</table>
Example of industrial use cases

Example 1:
Gamesa, producer of wind energy systems. By 2034, some 225000 tonnes of rotor blade materials will have to be treated annually worldwide. Wind energy market growth of 5% in EU.

Goal:
- Recover and re-use composites from blades in other industrial sectors (automotive and construction).

Impact:
- \(20\text{M€ increase in revenues per year for the company.}\)

Example 2:
Italtel, producer of products and solutions for Next-Generation Networks services (8 millions of hardware units, 24 millions of telephone lines installed worldwide).

Goal:
- Re-use components.
- Recover high-value materials.

Impact:
- \(8\text{M€ increase in revenues per year for the company.}\)
- Pay back time of the investment is 2 years.
FiberEUse Project

Large scale demonstration of new circular economy value-chains based on the reuse of end-of-life fiber reinforced composites.

Topic: Systemic, eco-innovative approaches for the circular economy: large-scale demonstration projects (CIRC-1-2016)

The FiberEUse project aims at integrating in a holistic approach different innovation actions aimed at enhancing the profitability of composite recycling and reuse in value-added products.

Duration: 48 months, starting on June 2017.

Consortium: 21 partners, from 7 EU countries.

Coordinator partner: Politecnico di Milano

EC Funding: ca. 10 mln €.
FiberEUse cross-sectorial use-cases

The FiberEUse proposal aims to develop and demonstrate at a large scale:

- The integration of **innovative remanufacturing technologies** addressed to develop profitable reuse options for mechanically or thermally recycled EoL GFRP and CFRP composites.

- The development of **an innovation strategy for mobilization and networking of stakeholders** from all the sectors related to composites.
Operational and Business Model of the Pilot Network

Regional, national, EU, projects exploitable results and competences.

Industrial users (first group from use-cases)

Private investments for industrial take-up

General Financial Structure – three layers

Layer 1
- Basic Demonstration Infrastructures - Costs related to the setting up of the infrastructures and platform
  - Regional, national and EU Subsidies

Layer 2
- Projects-related activities (within the platform; TRL 5-7/8) - Operating costs
  - Public Subsidies and private co-investments

Layer 3
- Replication – Indus. Upscale (TRL 8/9) 1
- Replication – Indus. Upscale (TRL 8/9) 2
- Replication – Indus. Upscale (TRL 8/9) 3
- Replication – Indus. Upscale (TRL 8/9) 4
- Etc.

Private investments, public (EIB-like) loans

Revenues generated from Replication/Industrial upscale and production

New Circular Economy businesses in EU. New jobs, social and environmental impact.
Business Model of the Pilot Network

This pilot network is designed to be a “generator” of new industrial plants for European circular economy solutions.

Pilot Network Revenues:
• The User will pay a daily fee for each access.
• The User will share with the pilot network a portion of the revenues obtained by selling the product/service demonstrated by the business case developed by the platform (IPR exploitation).
• The core partners of the pilot (companies, universities and RTOs) will pay a yearly fee to be part of the pilot network and to access the generated knowledge and best practices.

Pilot Network Costs:
• Each demonstration project will have a specific duration and will require a group of full-time dedicated persons (hired and paid by the pilot network).
• Maintenance and upgrade costs of the pilot network facilities will be covered yearly by the pilot.
• A cost of customization of the platform for each new project will be incurred (paid by the pilot).
Business Model of the Pilot Network

<table>
<thead>
<tr>
<th>Year after installation</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accesses to the pilot network (n°)</strong></td>
<td>18</td>
<td>23</td>
<td>30</td>
<td>33</td>
<td>36</td>
</tr>
<tr>
<td><strong>Pilot total revenues (mln €)</strong></td>
<td>2.281</td>
<td>3.414</td>
<td>4.916</td>
<td>5.963</td>
<td>7.565</td>
</tr>
<tr>
<td><strong>Total costs (mln €)</strong></td>
<td>0.88</td>
<td>2.34</td>
<td>2.69</td>
<td>2.86</td>
<td>3.03</td>
</tr>
<tr>
<td><strong>Installation &amp; Launch costs co-funding (mln €)</strong></td>
<td>12</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td><strong>Installation &amp; Launch costs funding (mln €)</strong></td>
<td>28</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td><strong>Annual margin (mln €)</strong></td>
<td>-10.6</td>
<td>1.07</td>
<td>2.23</td>
<td>3.1</td>
<td>4.53</td>
</tr>
<tr>
<td><strong>Cumulative margin (mln €)</strong></td>
<td>-10.6</td>
<td>-9.53</td>
<td>-7.3</td>
<td>-4.2</td>
<td>0.34</td>
</tr>
</tbody>
</table>

The installation and launch investments will be paid back in 5 years if 4 demonstration projects are attracted per year (on average) by each regional pilot. Considering a successful industrial replication rate of the developed solutions of 25%, about 35 new industrial installations will be originated by the pilot network in these 5 years. The cumulative revenue for the involved companies of about 215 million Euros. The 35 new installations will mobilize private resources for 535 million Euros. Leverage factor for the public investment of about 19 in five years from the pilot network installation.

(a) Users’ access profile
(b) Revenues profile
(c) Cumulative margin profile
# Implementation & Investment Plans

## Phases

1. **Concept & Business Plan**
2. **Detailed Design**
3. **Installation & Commissioning**
4. **Marketing & Launch**

## Integration of existing, new and upgraded facilities

## Schedule
- **Achieved 2015**
- M1-M9
- M6-M21
- M18-M24

## Funding

<table>
<thead>
<tr>
<th>Phase</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Funding</strong></td>
<td>0</td>
<td>3.15</td>
<td>24.5</td>
<td>0.35</td>
<td>28</td>
</tr>
<tr>
<td><strong>Co-funding</strong></td>
<td>0.5</td>
<td>0.85</td>
<td>10.5</td>
<td>0.15</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.5</td>
<td>4</td>
<td>35</td>
<td>0.5</td>
<td>40</td>
</tr>
</tbody>
</table>

**Total**

28

12

40
Highlight 1: Relight s.r.l., Hydro WEEE.

“The Vanguard De-and Remanufacturing pilot network is a new way to share innovation.”

“Relight as a member of this pilot, aims at opening new markets by establishing a sustainable cooperation within the pilot to attract new industrial users of Relight technologies and to pave the way for new recycling services.” Bibiana Ferrari, CEO of Relight s.r.l.
“Xnext developed the most advanced real time material scanner that will revolutionize the quality control testing for manufacturing and will make possible to identify and separate the materials in circular economy applications. In perspective, the 30% of Xnext sales 2020 budget will be generated by revenues from circular economy applications”.

“The De-and Remanufacturing pilot will represent a fundamental installation for show-casing the potentiality of our technology in an integrated pre-industrial environment, thus supporting Xnext in gaining market shares in many different sectors”

Bruno Garavelli, Founder of Xnext
Financial Needs, challenges and next steps

The De-and Remanufacturing demo-case is in a very advanced state. However, challenges are found:

- Financial mix for “layer 1” (Regional and European sources) still to be defined;
- Lack of a clear time-line for the investment;
- Uncertainty in the implementation mechanisms;
- In spite of the significant industrial involvement.

De-and Remanufacturing demo-case next steps:

- A Memorandum of Understanding (MoU) has been defined and share among the 7 regions involved in the pilot. It is ready to be signed.
- Some regions are ready to start building/upgrading the infrastructure.
- Seven additional regions expressed interest to be involved.
- An Expression of Interest for the DG Regio call for Thematic Partnerships to Pilot Interregional Innovation Partnerships is under preparation.
- Direct interactions with the EIB have started.
- New proposals for innovation projects will be launched in in H2020 programs (SPIRE, CE, SC5, ICT, ITN).
Thank you for attention

“De- and Remanufacturing”

Pilot Network

<table>
<thead>
<tr>
<th>Region</th>
<th>Technical contact</th>
<th>Organization</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lombardy</td>
<td>Marcello Colledani</td>
<td>Politecnico di Milano</td>
<td><a href="mailto:marcello.colledani@polimi.it">marcello.colledani@polimi.it</a></td>
</tr>
<tr>
<td>Tampere</td>
<td>Minna Lanz</td>
<td>Tampere University of Technology</td>
<td><a href="mailto:Minna.lanz@tut.fi">Minna.lanz@tut.fi</a></td>
</tr>
<tr>
<td>Norte</td>
<td>Luis Carneiro</td>
<td>INESC Porto / PRODUTECH Cluster</td>
<td><a href="mailto:luis.carneiro@inescporto.pt">luis.carneiro@inescporto.pt</a></td>
</tr>
<tr>
<td>Scotland</td>
<td>Winifred Ijomah</td>
<td>Scottish Institute for Remanufacture - Strathclyde</td>
<td><a href="mailto:w.l.ijomah@strath.ac.uk">w.l.ijomah@strath.ac.uk</a></td>
</tr>
<tr>
<td>Saxony</td>
<td>Katja Haferburg</td>
<td>Fraunhofer Institute for Machine Tools and Forming Technology</td>
<td><a href="mailto:katja.haferburg@iwu.fraunhofer.de">katja.haferburg@iwu.fraunhofer.de</a></td>
</tr>
<tr>
<td>Basque Country</td>
<td>Ane Irazustabarrena</td>
<td>Tecnalia</td>
<td><a href="mailto:ane.irazustabarrena@tecnalia.com">ane.irazustabarrena@tecnalia.com</a></td>
</tr>
<tr>
<td>Flanders</td>
<td>Joost Duflou</td>
<td>Ku Leuven</td>
<td><a href="mailto:joost.duflou@kuleuven.be">joost.duflou@kuleuven.be</a></td>
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</tbody>
</table>
Impacts: supporting re-industrialization of Europe and growth

Demonstrating new De- and Remanufacturing solutions for circular economy businesses will bring social benefits worldwide:

- **New jobs** coupled with technological and automation innovations, due to the increased competitiveness of companies through the ability of delivering products at lower cost (15000 new jobs for the considered access profile);
- **New effective technologies** to be exported also to emerging countries;
- **Environmental**, social and image advantages for global manufacturing enterprises (total savings of emissions of 60000 KTons CO2/year, of energy of 10 TWh/year and of materials, that otherwise would go to landfill, of 200 kTons/year for the considered access profile);
- **Political benefits** in terms of independency from fluctuations and turbulence in the primary material market (e.g. for rare earths).
Use case concept and objectives

**Case Description:** E-waste is the fastest growing stream in Europe (Estimated CAGR of 20.6% between 2015 and 2020) with a high variability in composition and evolution rate of products.

**State of Art:** Recycling of post-use electronic products by monolithic and rigid recycling processes.

**Market opportunity:** Post-use electronics as a source of high-value re-usable components and materials.

**Objective:** Investigate innovative de- and re-manufacturing process-chains to recover functions and materials (e.g. key metals, rare earths) from high value post-use electronics.

**Goal:**
- Re-use components.
- Recover high-value materials.

**Expected Impacts:**
- 8M€ increase in revenues per year for the company.
- Pay back time of the investment is 2 years.
Use case solution

Innovative process-chain

Technological Challenges:
- Adaptability to different post-use product conditions.
- Higher level of automation.
- In-line material characterization.
- New service-oriented business models.
- Digital innovations for process-chain simulation, data analytics and service delivery.
- Product re-design for re-use.
Vanguard De and Remanufacturing multi-regional offer

- New end-users (e.g. TLC systems, industrial equipment, etc.)
- Metal refining by plasma processes
- Smart robotic disassembly, mechanical and chemical recovery processes, in-line material inspection technologies and material re-processing and re-use processes.
- Digital innovation solutions for product-use monitoring and product data traceability, Open Industrial IoT Platform, advanced simulation and analytics, new service oriented business model development and LCA tools.

A new infrastructures will be designed and installed in Lombardy

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**Lombardy financial needs**

Lombardy infrastructure

- Integration of advanced and innovative technologies and digital innovations (TRL7-8)
- **Modular and reconfigurable** Pilot Plant for different use-case.
- High degree of *integration, automation and control.*

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<tr>
<th>Remanufacturing</th>
<th>ICT tools &amp; Simulation</th>
<th>Inspection, Materials Analysis, Certification</th>
<th>Business Model, Reverse Logistic and LCA</th>
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Partners

- **13 industrial partners**, 8 of which are SMEs
- **6 academic and research partners**
- **2 industrial associations**