# "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

Workshop on Investment Platforms
November 20, 2017
Berlaymont, 200 rue de la Loi, Brussels

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.
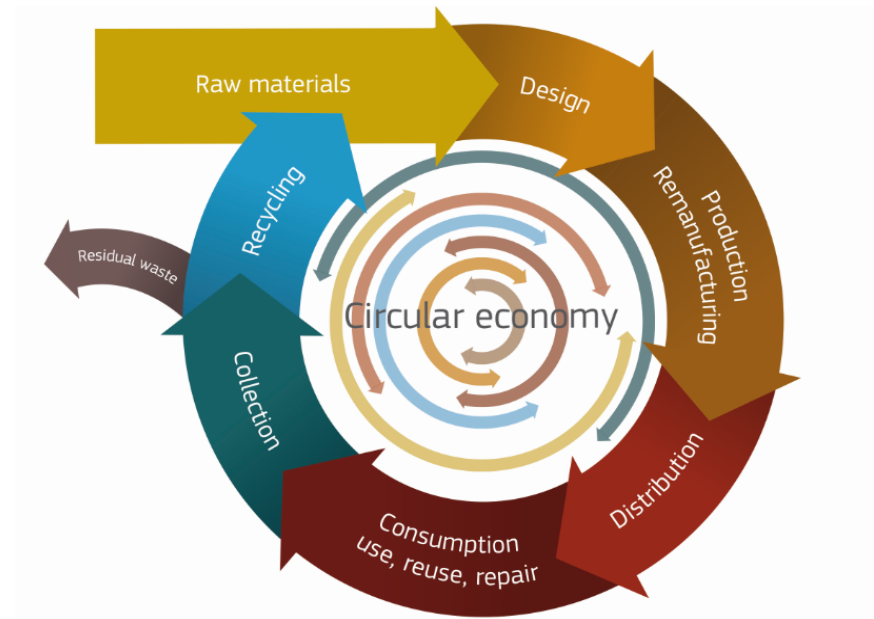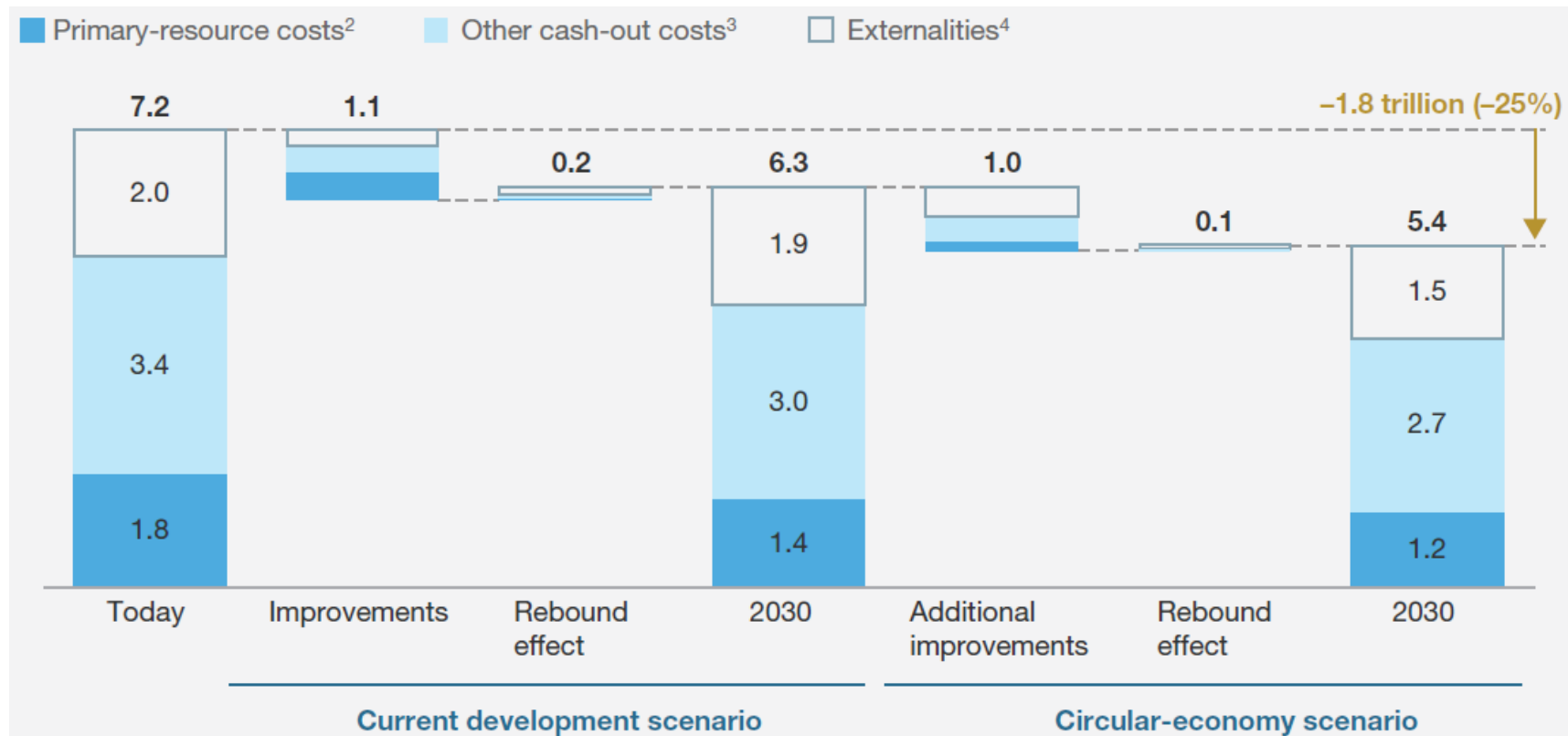

EU – Towards a circular economy, a zero waste programme for Europe, COM (2014) 398 final

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

De- and Remanufacturing Pilot Network

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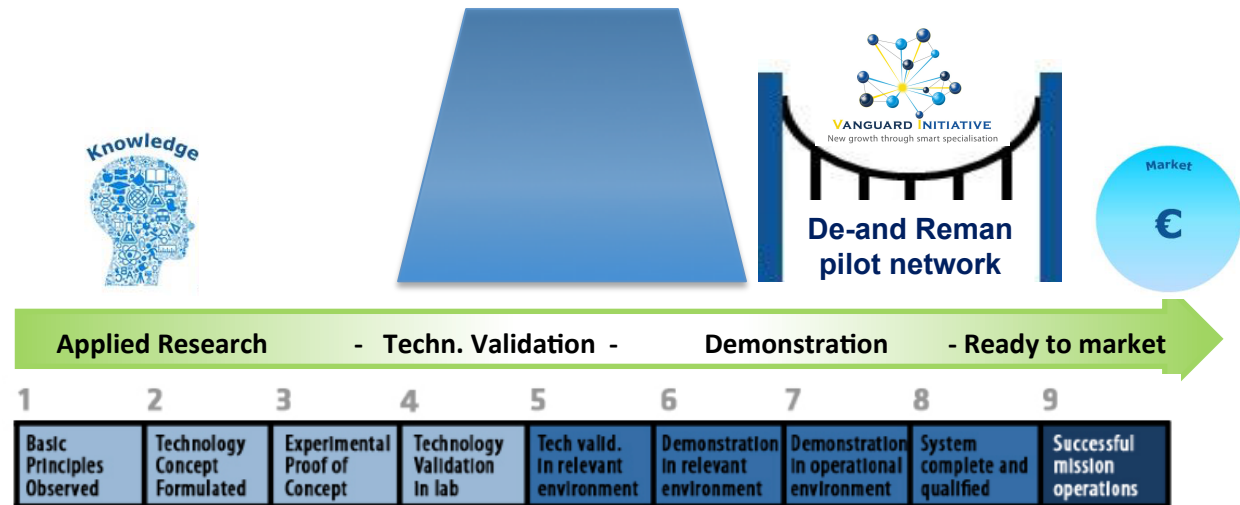
At European level, the Commission has launched in December 2015 the strategic initiative **"Closing the loop - An EU action plan for the Circular Economy"**.

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.

Applied Research - Techn. Validation - Demonstration - Ready to market

1	2	3	4	5	6	7	8	9
Basic Principles Observed	Technology Concept Formulated	Experimental Proof of Concept	Technology Validation In lab	Tech valid. In relevant environment	Demonstration In relevant environment	Demonstration in operational environment	System complete and qualified	Successful mission operations

De- and Remanufacturing Pilot Network

Pilot Idea: Application Domain

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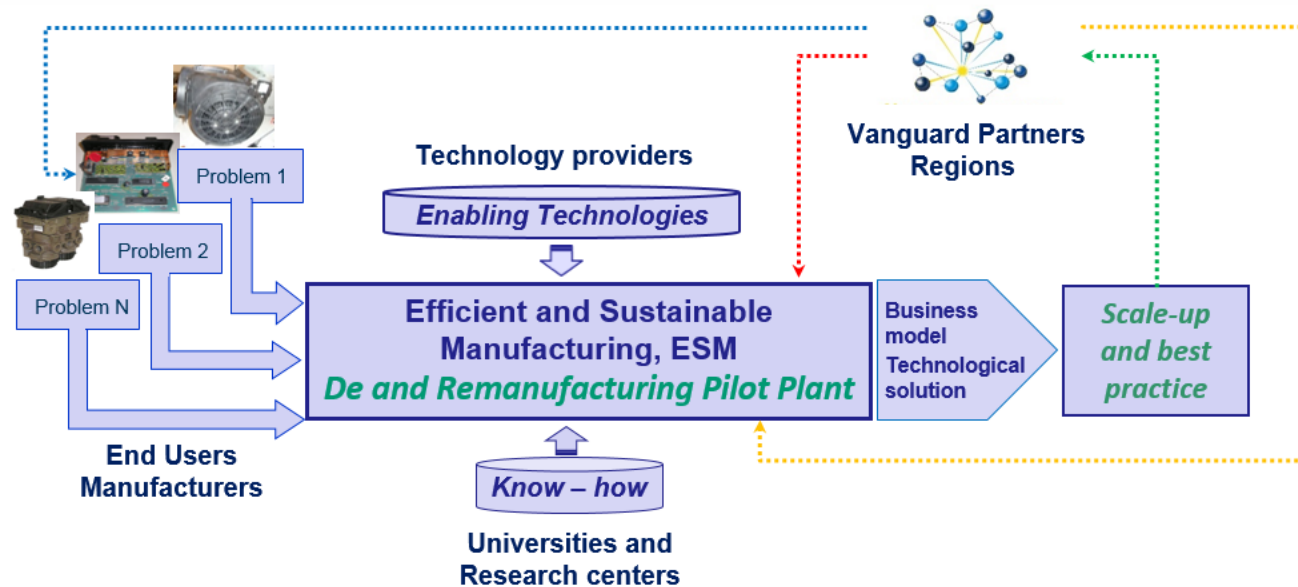
The pilot network nodes will act as *Innovation Hubs for Circular Economy*, being a network of competence and technology centers and supporting future producer-driven replication at industrial scale (TRL 9).

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.

Industrial Innovation Service Portfolio	
Reverse logistics optimization.	Technical feasibility assessment.
Product Life-cycle information management.	**De-and Remanufacturing Process-chain design and demonstration.**
Environmental sustainability assessment and LCA.	System integration and control.
Patent and technology IPR searches.	Product design/re-design for circular economy.
Market analysis and business models.	Prototyping and product testing.
Legislation review and innovation deals.	Production of pre-series.
Product and process certification.	Process chain optimization, simulation, and analytics.
Business case validation and scenario analysis.	Value-chain integration.
Circular economy training.	Support to Environmental Technology Verification (ETV) applications.

De- and Remanufacturing Pilot Network

Pilot Geographic Configuration and Regional Specialization

Mechanical remanufacturing and **in-use product monitoring** in the automotive industry.

Pre-treatment technologies for remanufacturing of photovoltaic panels **and end treatment techniques** for thermoplastics

Re-use of composites by **thermal processes** from aeronautic sector and wind energy system. **Recovery** and re-use of **metal scrap** by **plasma process**.

Robotics handling systems supporting disassembly and reassembly operations in the automotive industry

Laser-based remanufacturing of the mechanical parts in large machinery

Re-production of steel sheet by Hydroforming and CNC-bulk metal forming

Sustainable Demanufacturing processes including **human-robot cooperation for disassembly, electronics remanufacturing, key-metals and composite recovery and reuse by mechanical processes,** for the automotive and electronics industry

Tampere

Scotland

Flanders

Saxony

Basque Country

Lombardy

Norte

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.

De- and Remanufacturing Pilot Network

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).

De- and Remanufacturing Pilot Network

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.
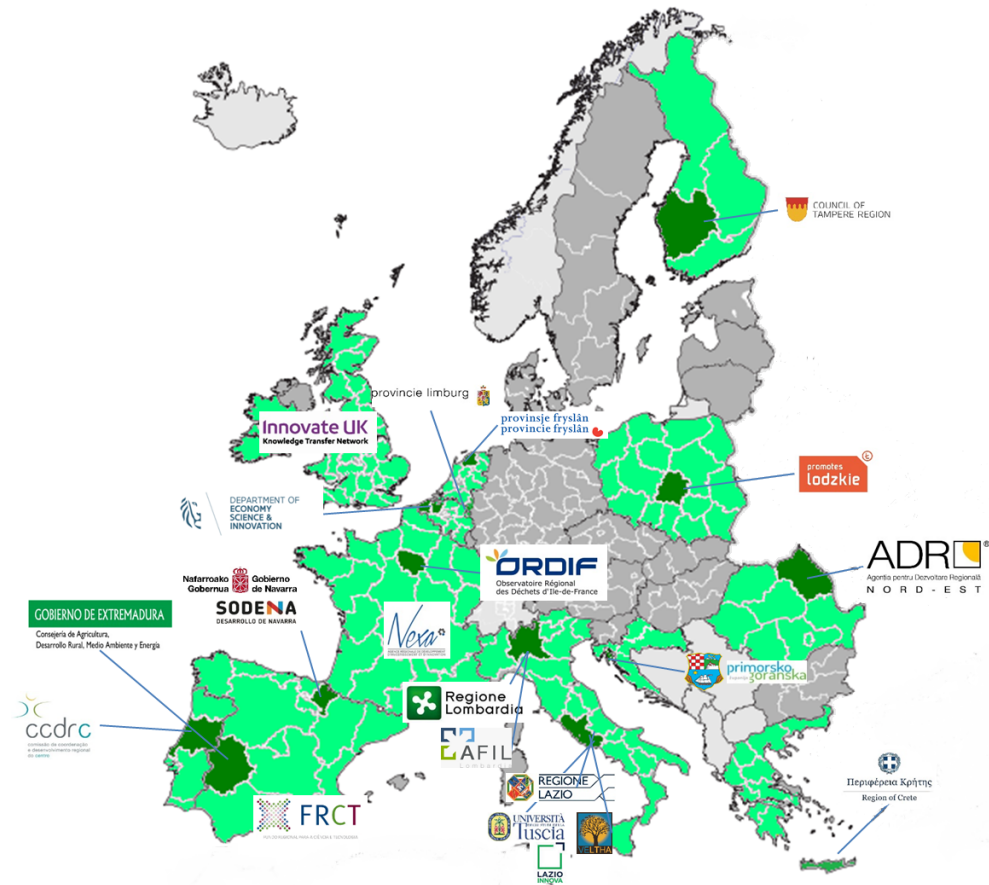
Industrial Participants and investors.

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.

The stakeholders have signed **Letters of Intent** to participate to the definition of this Pilot Network and, in the case of future end-users, to access the pilot network and to carry on industrial take-up, in case of positive evaluation of the developed solution.

De- and Remanufacturing Pilot Network

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.

Regional/Cross-Regional Use Case	Involved Regions
Composite Recovery from Wind Energy System	**Basque Countries**, Saxony, Lombardy, Tampere
Heavy machinery components remanufacturing	**Tampere**, Basque Countries, Lombardy, Saxony
Automotive parts remanufacturing	**Scotland**, Lombardy, Saxony, Norte
High-value TLC systems and Electronics Recovery	**Lombardy**, Tampere
Metal components reprocessing	**Saxony**, Tampere, Lombardy
Remanufacturing of e-motors	**Saxony**, Lombardy, Norte
Plastics recycling from WEEE	**Flanders**, Lombardy
E- mobilty batteries remanufacturing for re-use	**Lombardy,** Saxony
Photovoltaic panels de-manufacturing	**Flanders,** Lombardy

De- and Remanufacturing Pilot Network

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 €.

De- and Remanufacturing Pilot Network
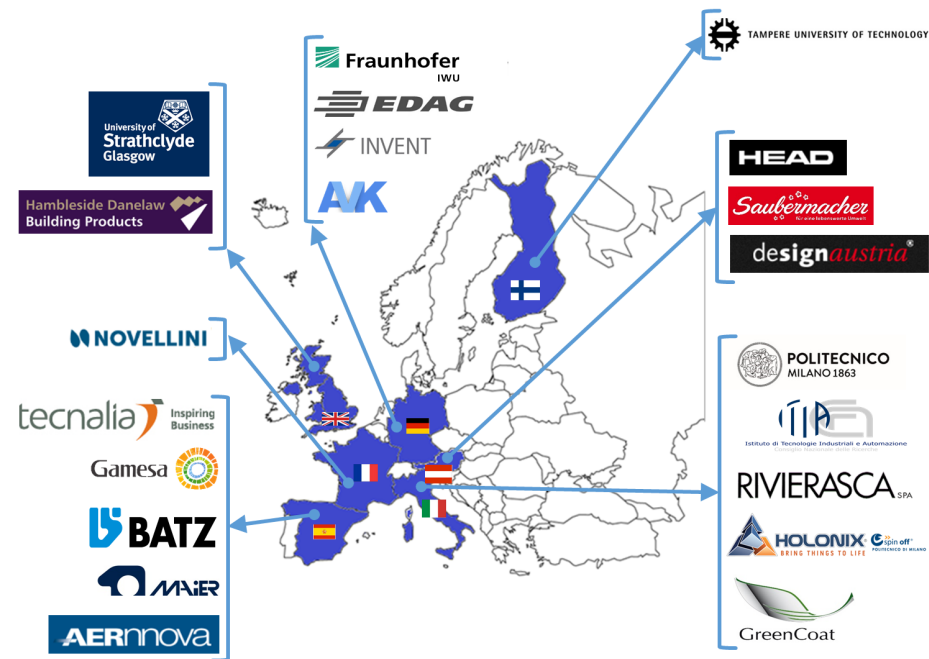
FiberEUse cross-sectorial use-cases

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.

De- and Remanufacturing Pilot Network
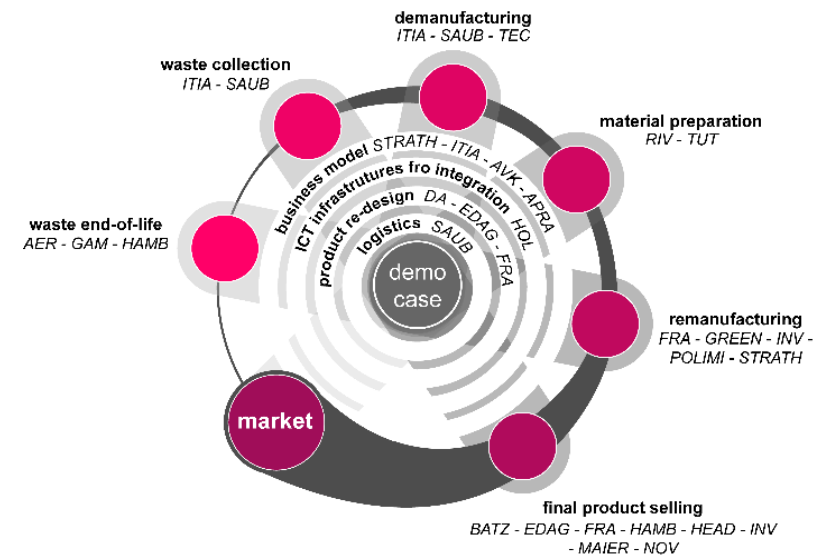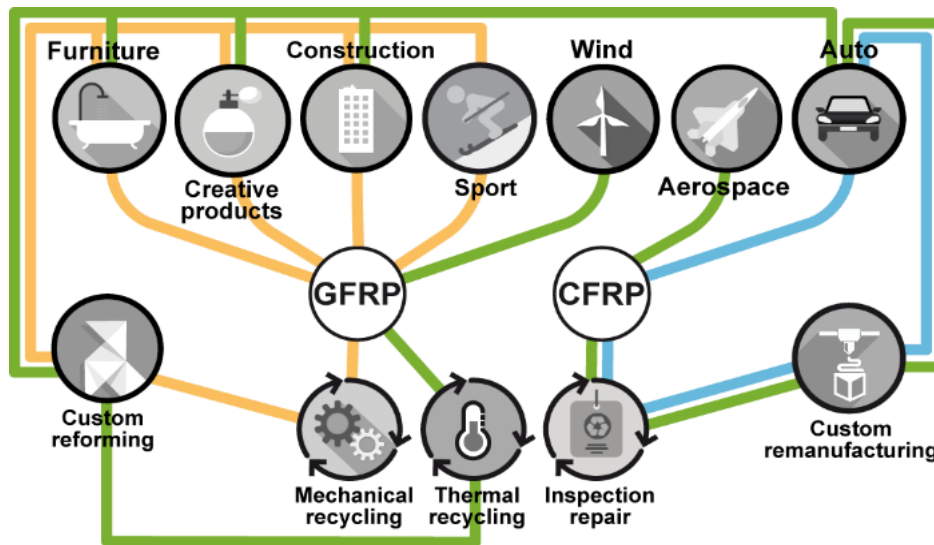
Vanguard De and Remanufacturing multi-regional offer

New end-users (e.g. TLC systems, industrial equipment, etc.)

Metal refining by plasma processes

Tampere

Lombardy
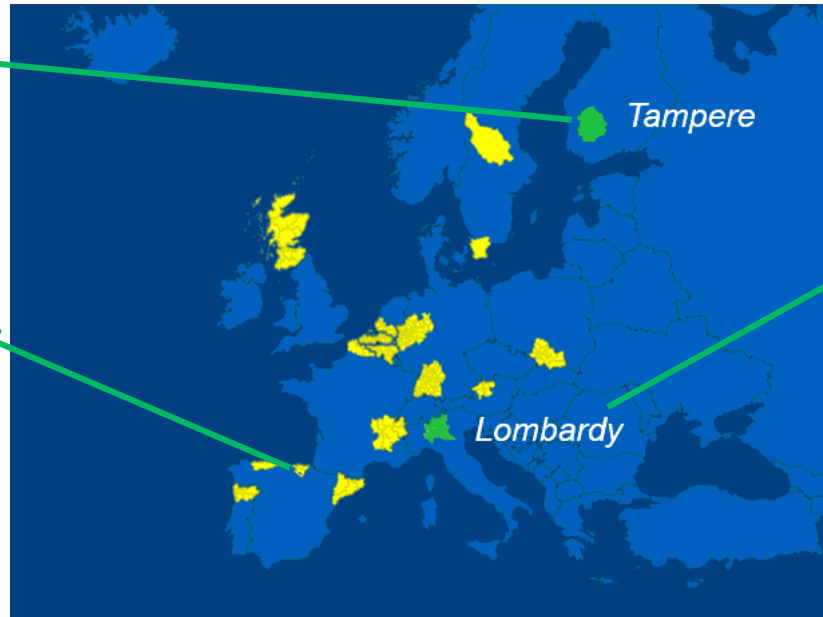
Smart robotic disassembly, mechanical and chemical recovery processes, in-line material inspection technologies and material re-processing and re-use processes.

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

		Phase	1. Concept & Business Plan	2. Detailed Design	3. Installation & Commissioning	4. Marketing & Ramp-up	Total
		Funding	0	1,26	9,8	0,14	11,2
		Co-funding	0,2	0,34	4,2	0,06	4,8
		Total	0,2	1,6	14	0,2	16
Lombardy financial needs		Planning	Achieved 2015	M1-M9 (end of 2017)	M6-M21 (2017-2018)	M18-M24 (2019)	

De- and Remanufacturing Pilot Network

From Use Cases to the Business Model of the Pilot Network

Procedure for Business Model development

De- and Remanufacturing Pilot Network
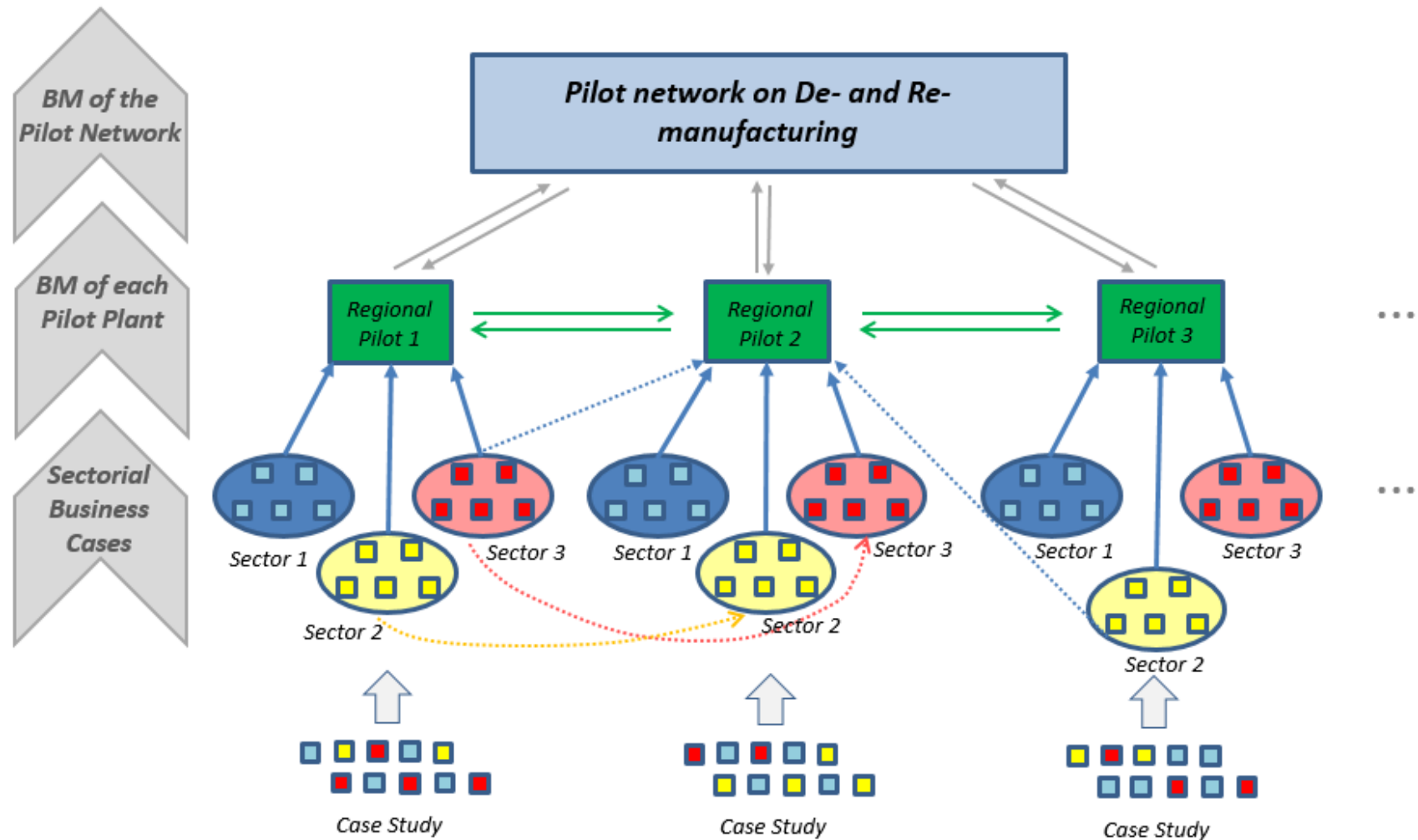
Operational and Business Model of the Pilot Network

General Financial Structure – three layers

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

Layer 1

Basic Demonstration Infrastructures - Costs related to the setting up of the infrastructures and platform

Regional, national and EU Subsidies

Industrial users (first group from use-cases)

Layer 2

Projects-related activities (within the platform; TRL 5-7/8) - Operating costs

Public Subsidies and private co-investments

Private investments for industrial take-up

Layer 3

Replication – Indus. Upscale (TRL8/9) 1

Replication – Indus. Upscale (TRL 8/9) 2

Replication – Indus. Upscale (TRL 8/9) 3

Replication – Indus. Upscale (TRL 8/9) 4

Etc.

ROI based on industrial upscale

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.**

De- and Remanufacturing Pilot Network

Business Model of the Pilot Network

This pilot network is designed to be a "*generator" of new industrial plants* for European circular economy solutions.
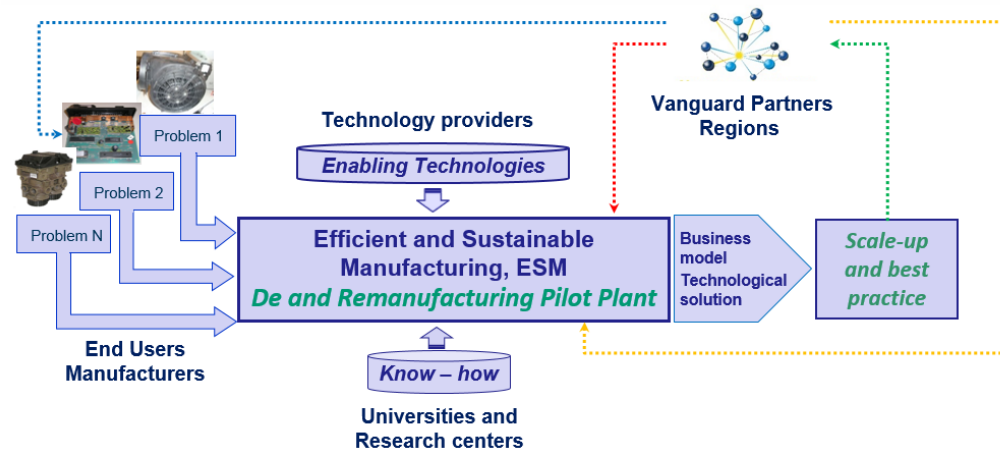
Pilot Network Revenues:
- The User will pay a *daily fee* for each access.
- The User will share with the pilot network *a portion* of the *revenues* obtained by *selling the product/service* demonstrated by the business case developed by the platform (IPR exploitation).
- The core partners of the pilot (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 requires 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).

De- and Remanufacturing Pilot Network

Business Model of the Pilot Network

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

(a) Users' access profile

(c) Revenue profile

De- and Remanufacturing Pilot Network

Business Model of the Pilot Network

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- 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.

Implementation & Investment Plans
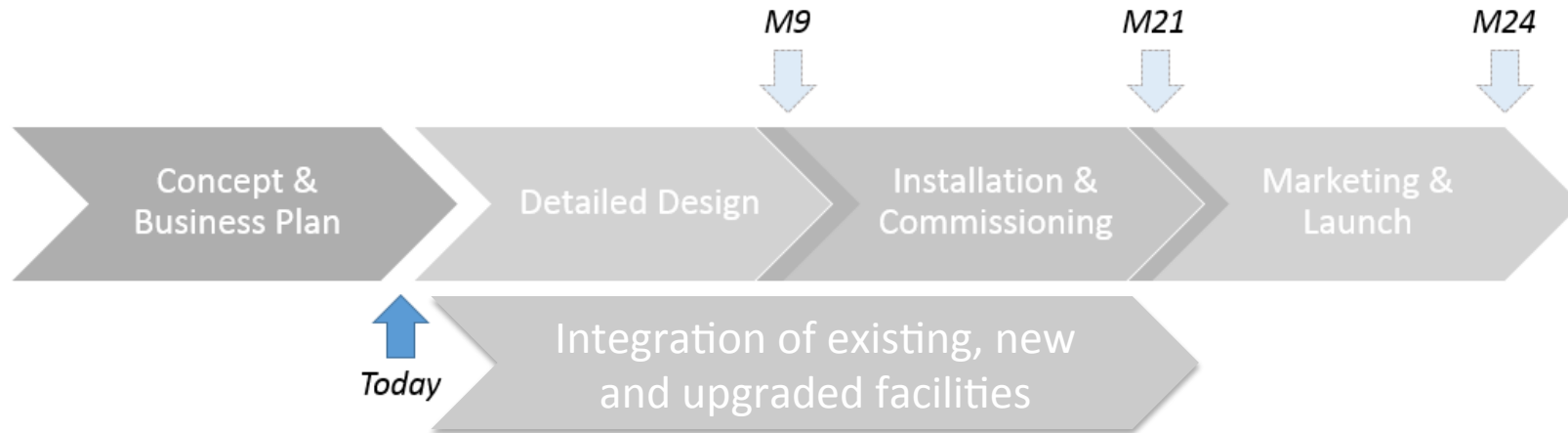
M9   M21   M24

Concept & Business Plan → Detailed Design → Installation & Commissioning → Marketing & Launch

Today → Integration of existing, new and upgraded facilities

Phase	1 Concept & Business Plan	2 Detailed Design	3 Installation & Commissioning	4 Marketing & Launch	Total
Funding	0	3.15	24.5	0.35	28
Co-funding	0.5	0.85	10.5	0.15	12
Total	0.5	4	35	0.5	40
Schedule	Achieved 2015	M1-M9	M6-M21	M18-M24	

De- and Remanufacturing Pilot Network

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

Spent Lamps

Fluorescent lamps powder

Rare earth oxalates

"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.

Highlight 2: Xnext.

XSPECTRA® DETECTOR

WATER

WATER + AMMONIA
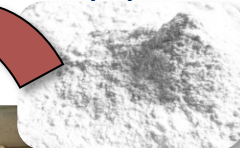
"*Xnext developed the most advanced real time material scanner that will revolutionize the quality control testing for manufacturing and will make possible to identify and separate the materials in circular economy applications. In perspective, the 30% of Xnext sales 2020 budget will be generated by 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
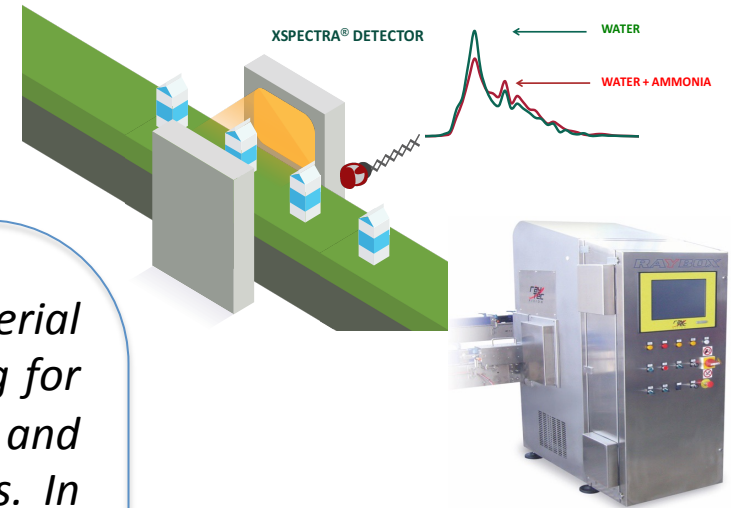
XNEXT
ADVANCED INSPECTION TECHNOLOGY

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).

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.
- 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 has been submitted.
- 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
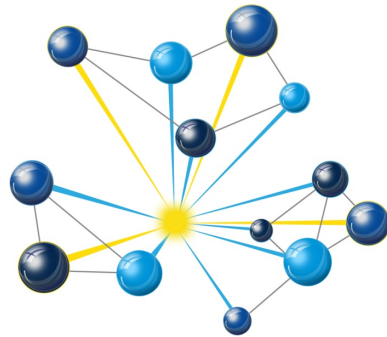
Vanguard Initiative
New growth through smart specialisation

Business Model doc

Pilot Initiative
"ESM – Efficient and Sustainable Manufacturing"
Coordinating Regions: Catalonia and Lombardy

BUSINESS PLAN FOR THE PILOT NETWORK
"De- and Remanufacturing"

17/02/2016

Prepared by:
Working Group Coordinator: Marcello Colledani
Involved regions: Lombardy, Scotland, Saxony, Tampere, Norte and Basque Country

63 pages

Pilot Summary

4 pages

Investment Plan

Pilot Initiative
"ESM – Efficient and Sustainable Manufacturing"
Coordinating Regions: Catalonia and Lombardy

INVESTMENT PLAN FOR THE PILOT IDEA
"De- and Remanufacturing"

15/02/2016

Prepared by:
Working Group Coordinators: Marcello Colledani
Involved regions: Lombardy, Scotland, Saxony, Tampere, Norte and Basque Country

34 pages

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

IPR Management
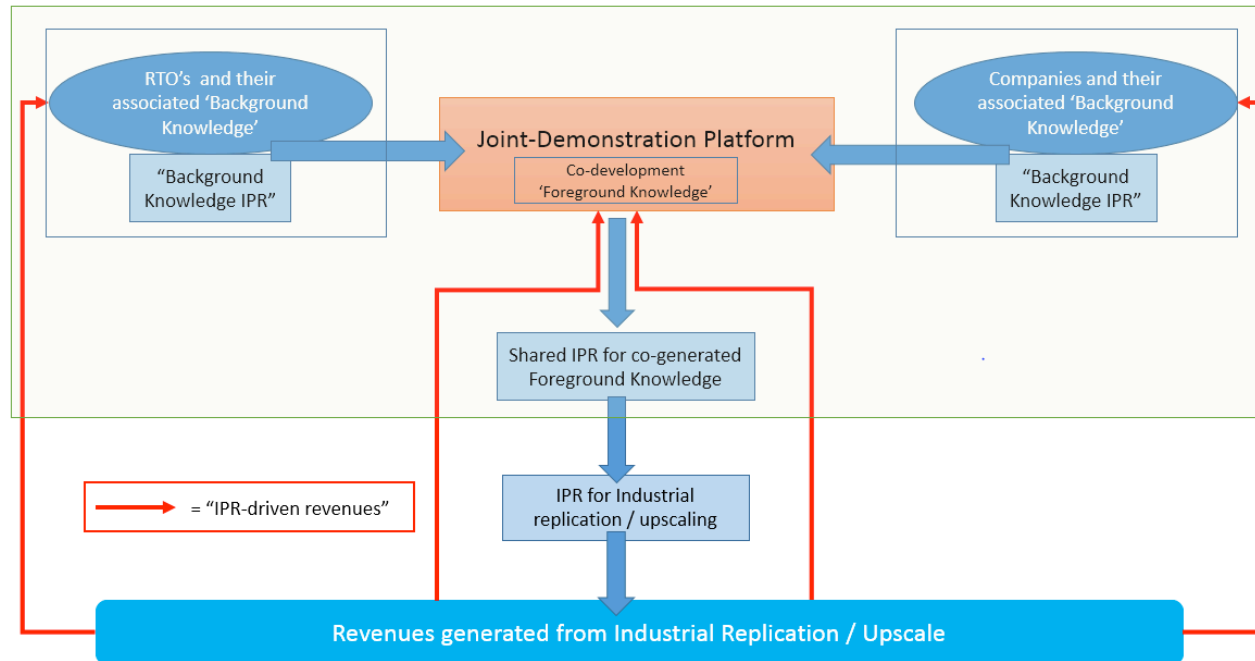
IPR claim is justified when the activities made possible by the platform have led to de-risking private investment in industrial upscale and new market access.

Guidelines for management of IPR:

- The signature of a IPR Agreement between the user and the node of the network delivering the service is required **before starting** each project delivery.
- If a user intends to keep the full rights on the foreground knowledge, a **specific fee** shall be negotiated (function of the revenues).
- If the pilot keeps the IPR on the foreground knowledge, it will constitute the **"best practices"** knowledge base, at disposal of the whole network.
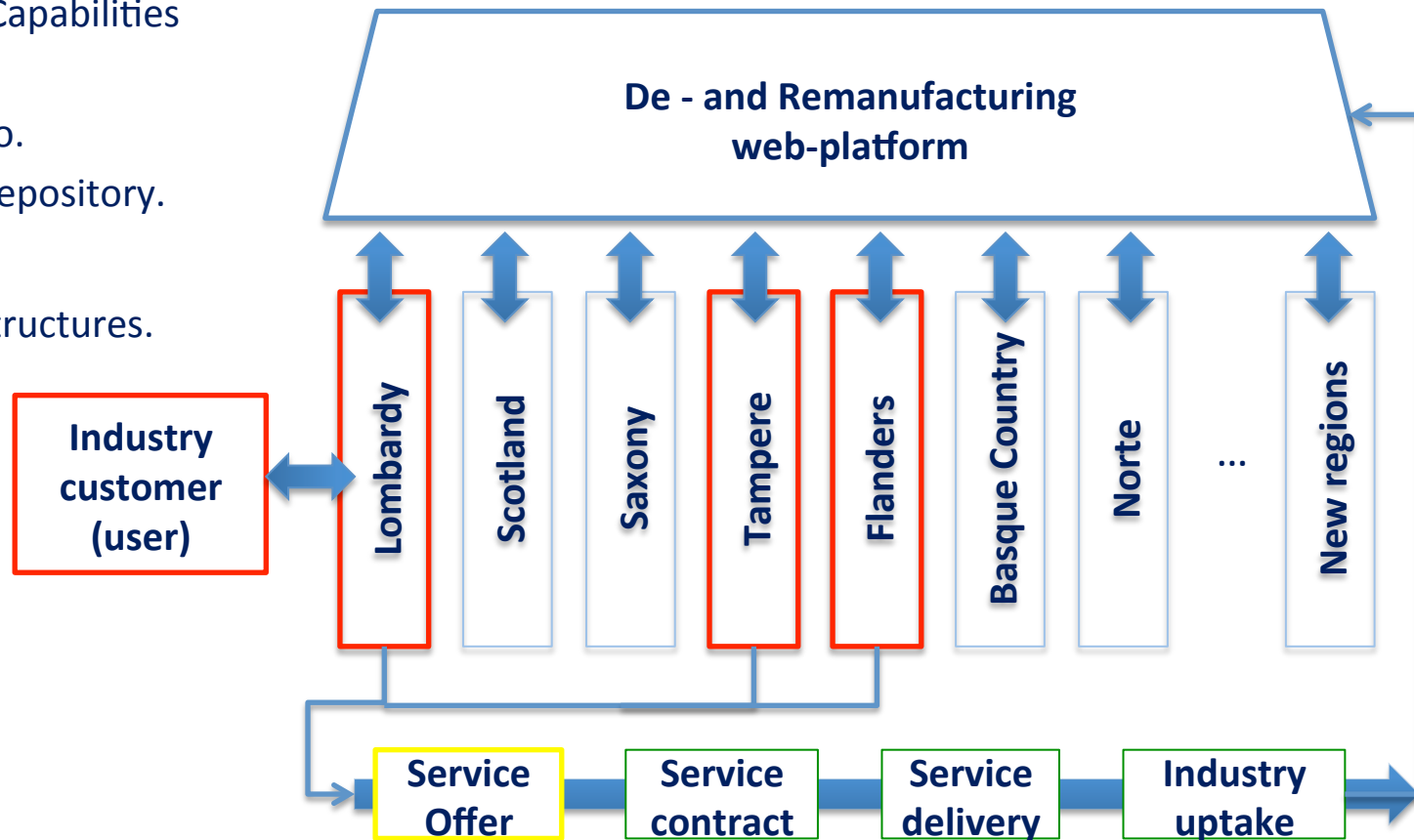
Pilot Network operational framework

De- and Remanufacturing Pilot Network

Pilot Network operational framework
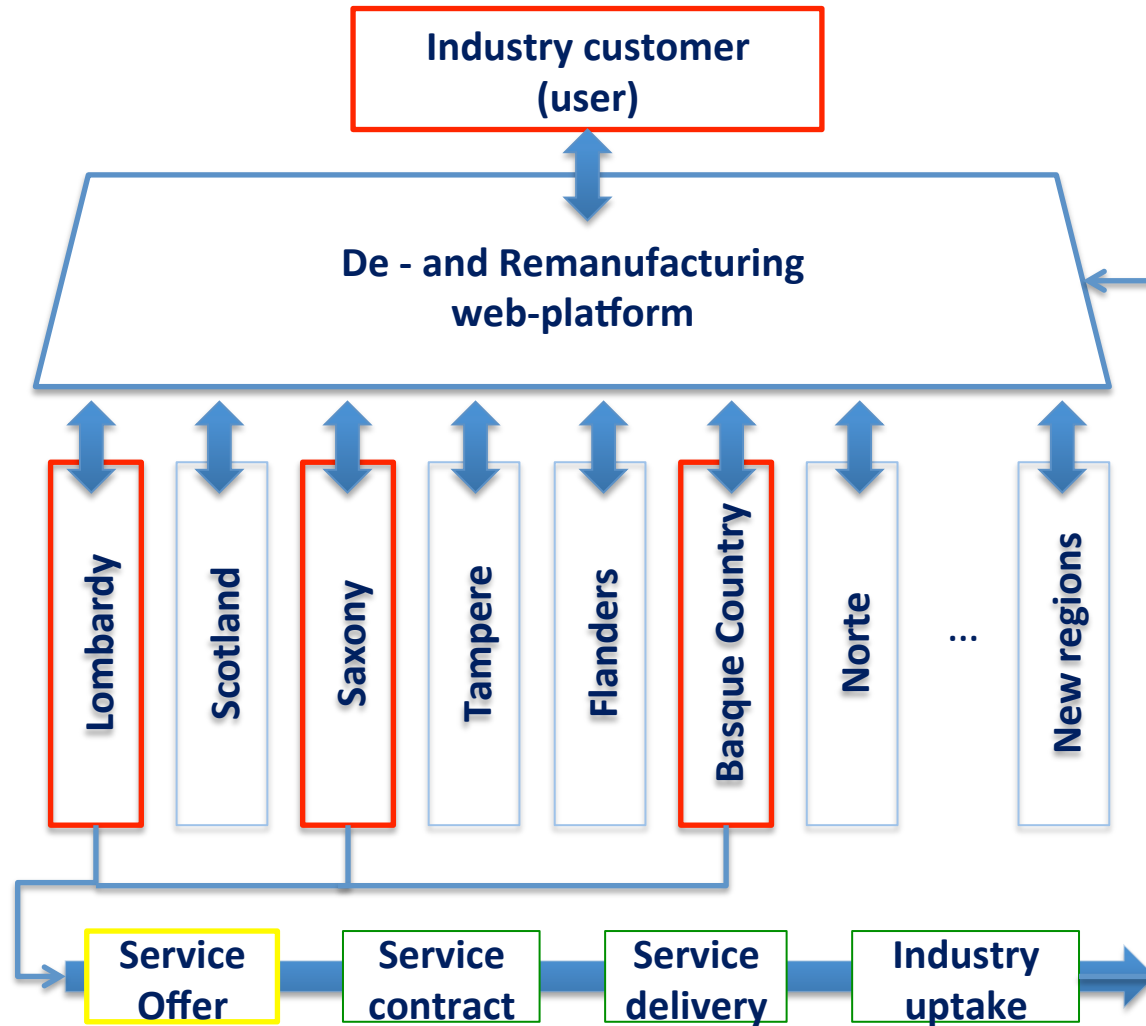
- Technological Capabilities inventory.
- Service portfolio.
- Best practices repository.

- Regional Infrastructures.

De - and Remanufacturing web-platform

Industry customer (user)

Lombardy | Scotland | Saxony | Tampere | Flanders | Basque Country | Norte | ... | New regions

Service Offer → Service contract → Service delivery → Industry uptake

Governance: Two-level Structure

Proposed Business Entity: Association (EU-level), Clusters or RTOs (Regional level).

Two-level governance:

- **European Pilot Network Board.**

Main Role: to coordinate the interregional cooperation activities with decision-making power at operational, monitoring and strategic levels.

- To monitor the pilot network operations and the coherence of the projects with the pilot network mission;
- To monitor the industrial accesses to the infrastructure;
- To evaluate and approve any change in the pilot network architecture;
- To provide standard IPR agreement forms to the Regional Boards for industrial accesses;
- To market and promote the Pilot Network;
- To exploit the best practices generated within the network at European level.

- **Regional Pilot Board, lead by the Regional Pilot Coordinator (RPC).**

Main Role: to effectively deliver the services to customers.

- Effectively delivers of the services to the users in line with the Pilot network quality standards;
- Attracts new local customers;
- Reports the technical developments and best practices.

Governance Structure – Local Regional level

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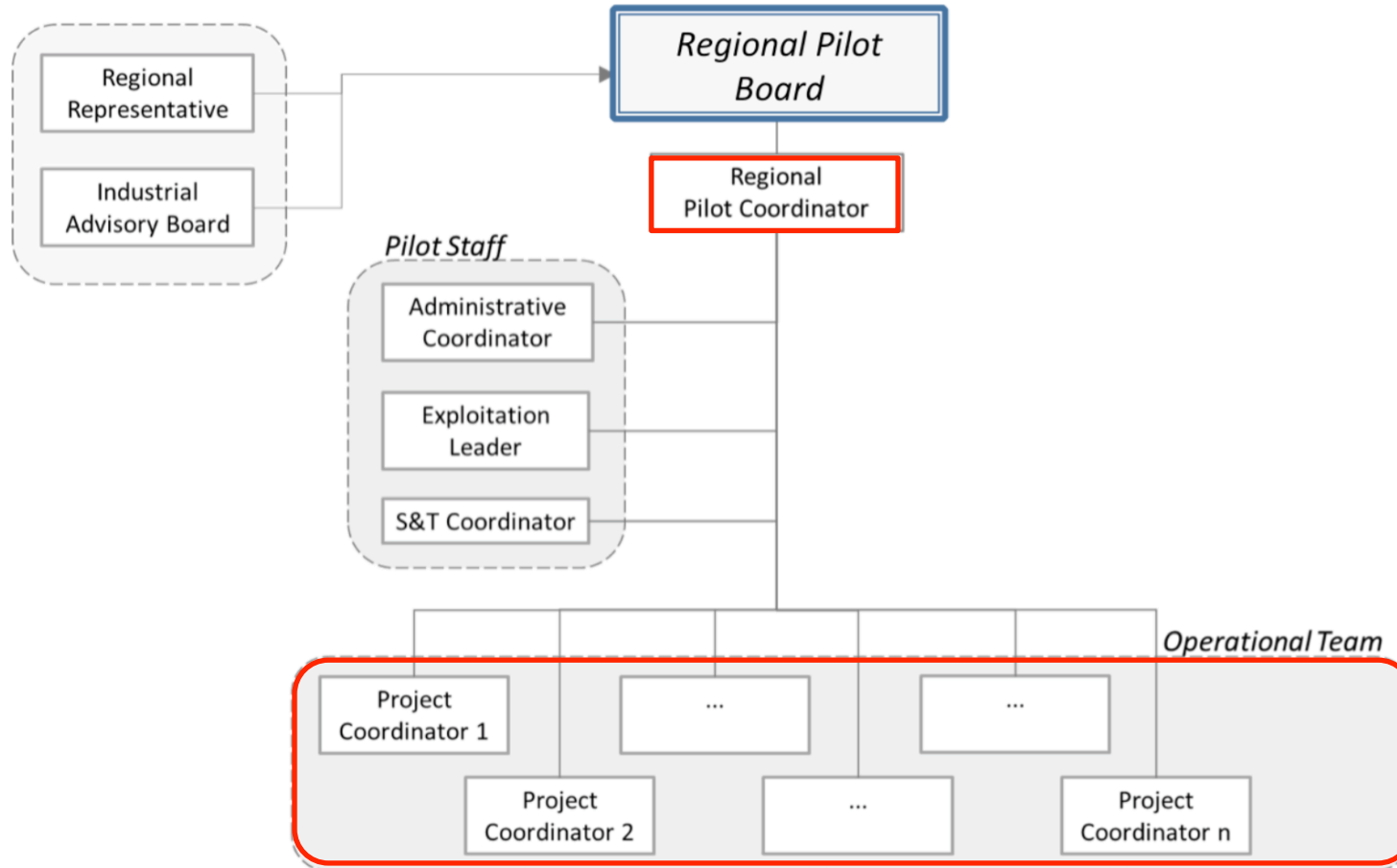
Governance Structure – European level