Universidade Vigo

CYPRUS 2016

Grupo CIMA

LIVEWASTE

CYPRUS 2016

Thursday, 23 June 2016

ROOM 3

SESSION III

Design and development of a pilot plant for WEEE-computers reusing

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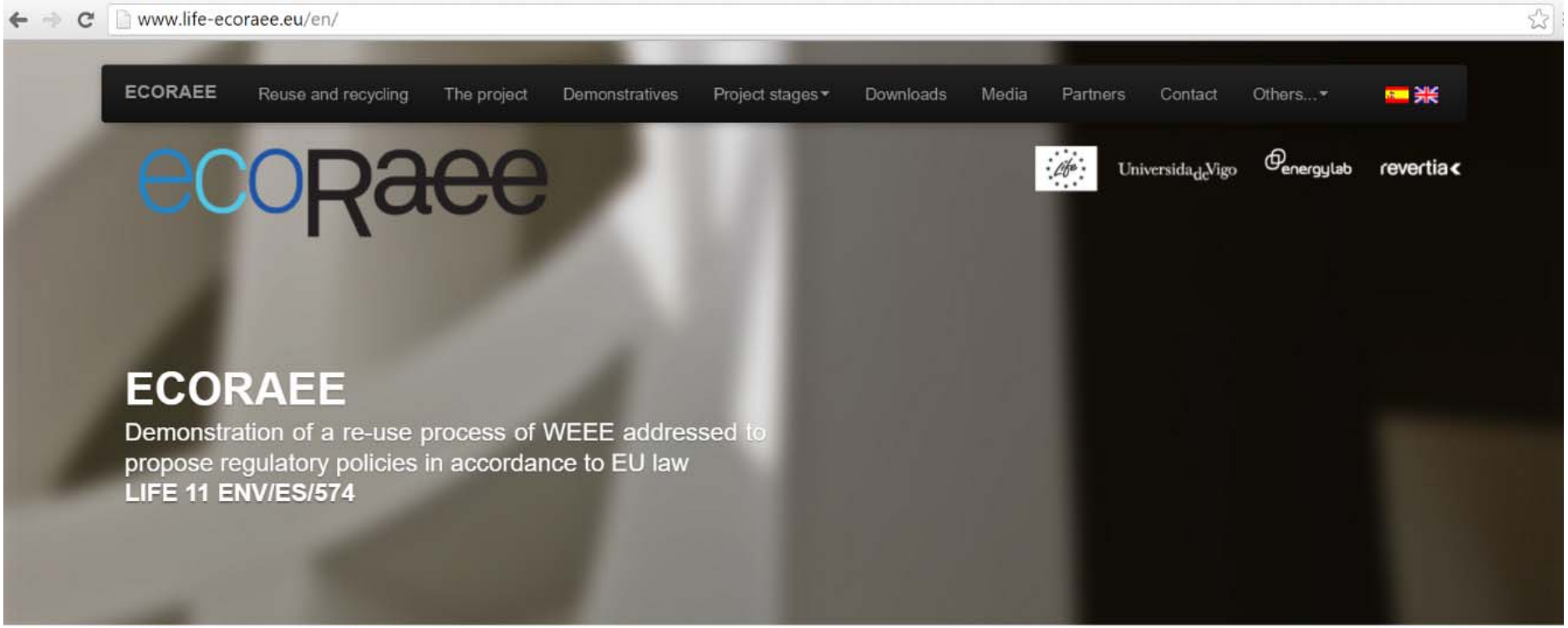
LIFE-ECORAEE project http://www.life-ecoraee.eu/en/



LIFE-ECORAEE project http://www.life-ecoraee.eu/en/

ecoRaee – *Demonstration of a re-use process of WEEE addressed to propose regulatory policies in accordance to EU law*

What is ecoRaee?

- 6th of 35 projects (2011) EU LIFE+ Environmental & governance sub-program.

- **Team**:
  - Coordinate by **Universidade de Vigo**,
  - Partners: **revertia** and **EnergyLab**

- 3 year transfer project (2012-2015)
- Total budget of 1,269,155 euros,
- European Union providing: 622,038 euros (50% of the total budget)

LIFE-ECORAEE project http://www.life-ecoraee.eu/en/

ecoRaee – *Demonstration of a re-use process of WEEE addressed to propose regulatory policies in accordance to EU law*

Who is in the project team?

- **University of Vigo** *(*Coordinator)*
- **Revertia:** start-up company founded in December 2009
  - waste electric-electronic equipment (WEEE) management operator
- **EnergyLab:** founded in 2008,
  - specializing in energy efficiency and sustainability

Universidade de Vigo
http://uvigo.es

Revertia. Recogida, restauración y reutilización de aparatos electrónicos
http://revertia.com/

EnergyLab eficiencia energetica y sostenibilidad energetica
http://www.energylab.es

LIFE-ECORAEE project http://www.life-ecoraee.eu/en/

ecoRaee – *Demonstration of a re-use process of WEEE addressed to propose regulatory policies in accordance to EU law*

Who is in the project team? *(*Coordinator)*

- **Universidade de Vigo**
  - institutional project comprising **departments** and/or **research groups**
    - **Department of Mechanical Engineering (Grupo CIMA)**
    - Department of **Electrical Engineering**
    - Department of **Computer Engineering**,
    - Department of **Applied Economic**
    - Department of **Environmental Law**
  - other **University services** such as:
    - the **Environmental Office**,
    - the **European Project Section** of the Research and Development Support Service,
    - and the **Rector's Office**, responsible for institutional communication

Grupo CIMA (Centro de Ingeniería Mecánica y Autmoción)

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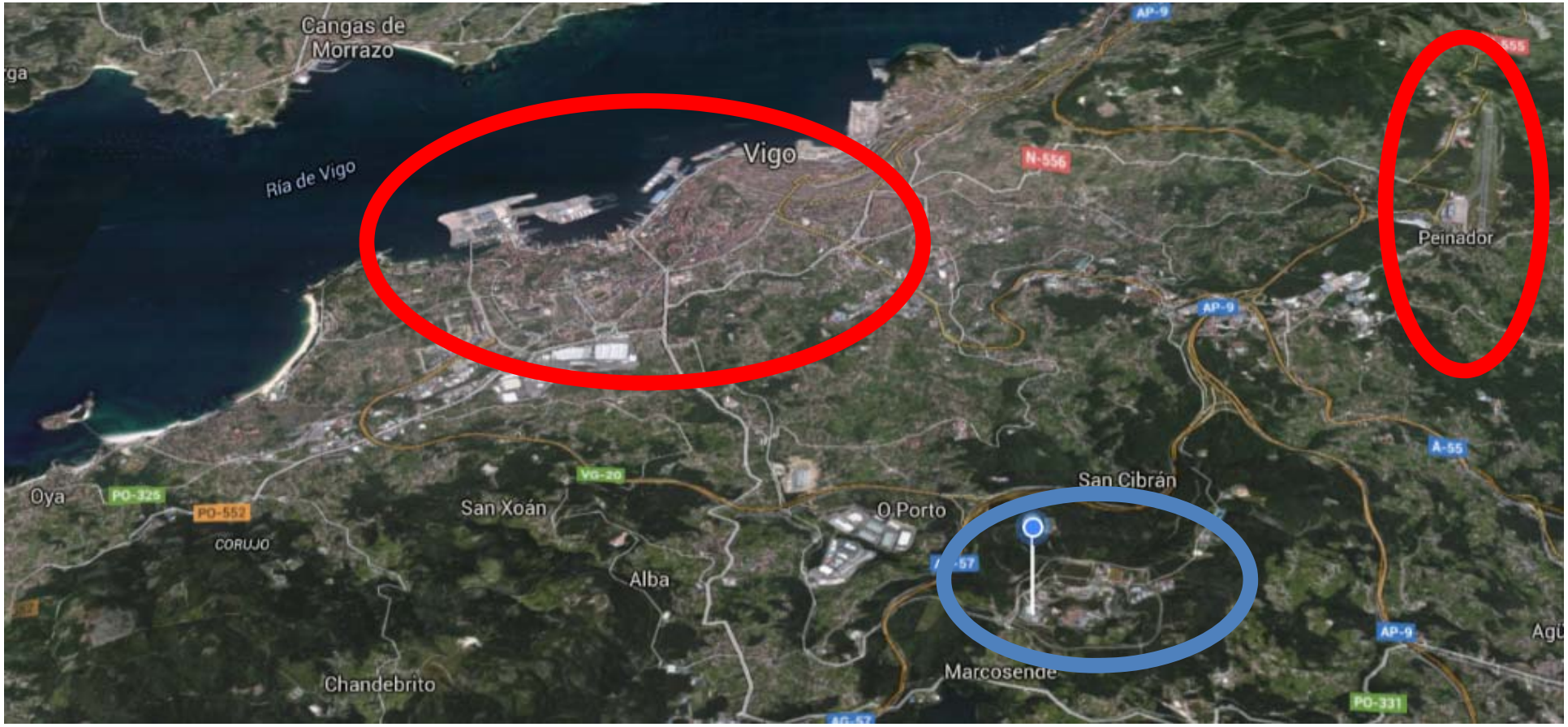

Grupo CIMA (Centro de Ingeniería Mecánica y Autmoción)

LIFE-ECORAEE project http://www.life-ecoraee.eu/en/

ecoRaee – *Demonstration of a re-use process of WEEE addressed to propose regulatory policies in accordance to EU law*

What are the project's objectives?

LIFE-ECORAEE project http://www.life-ecoraee.eu/en/

ecoRaee – *Demonstration of a re-use process of WEEE addressed to propose regulatory policies in accordance to EU law*

What are the project's objectives?

- ✓ Characterizing and **demonstrating** an industrial preparation process for **reusing** electric and electronic equipment (EEE)
- ✓ Promoting standards that guarantee the correct implementation of European law
- ✓ Contributing to a high level of separation of WEEE

LIFE-ECORAEE project http://www.life-ecoraee.eu/en/

ecoRaee – *Demonstration of a re-use process of WEEE addressed to propose regulatory policies in accordance to EU law*

What actions are to be implemented?

Focus on this paper:

Design and development of a pilot plant for WEEE-computers reusing

Action implemented by Grupo CIMA **at** Universidad de Vigo

Layout of the pilot plant to the industrial preparation process for WEEE reuse (PC-computers)

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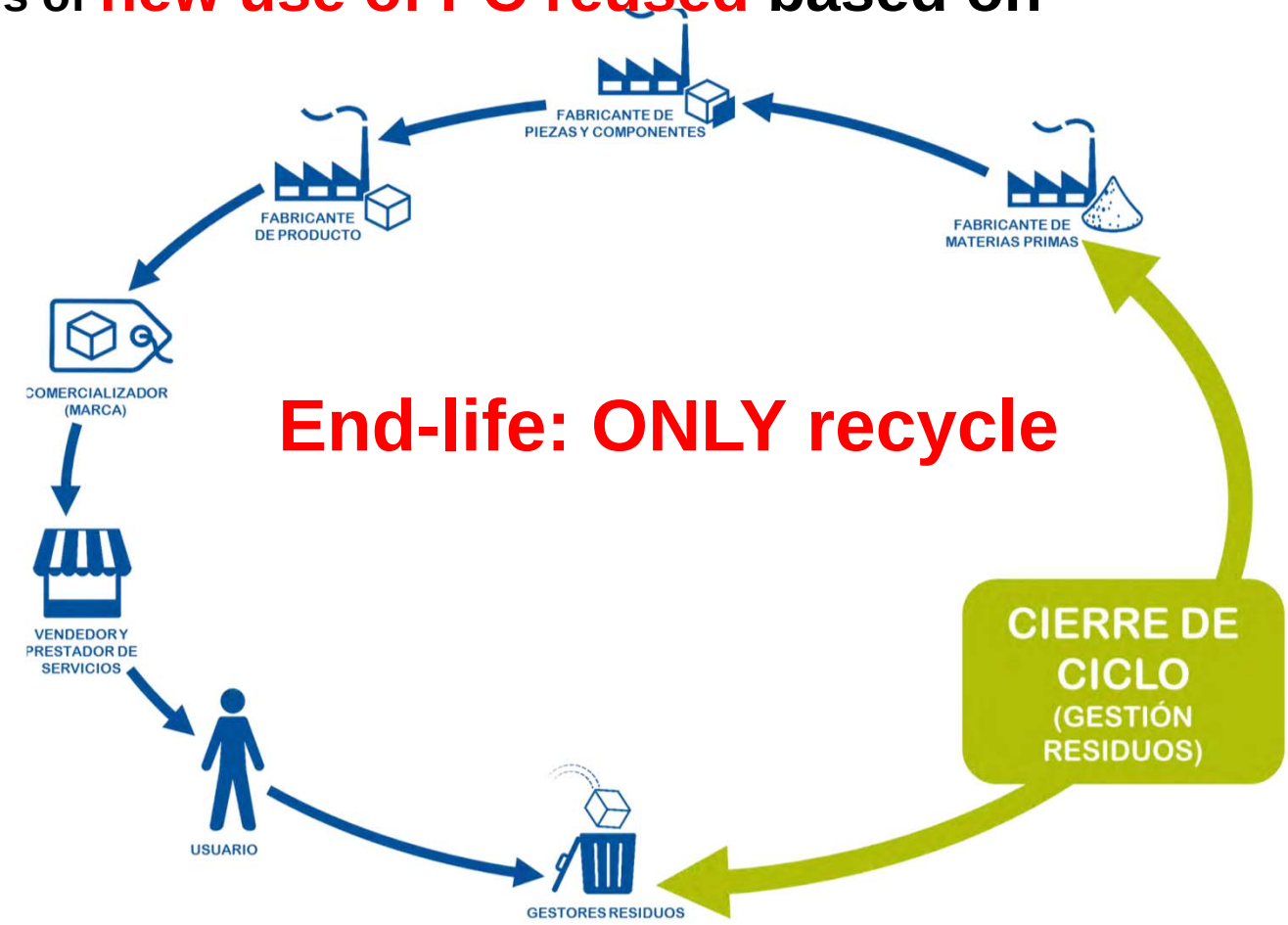
Demonstrations of new use of PC reused based on

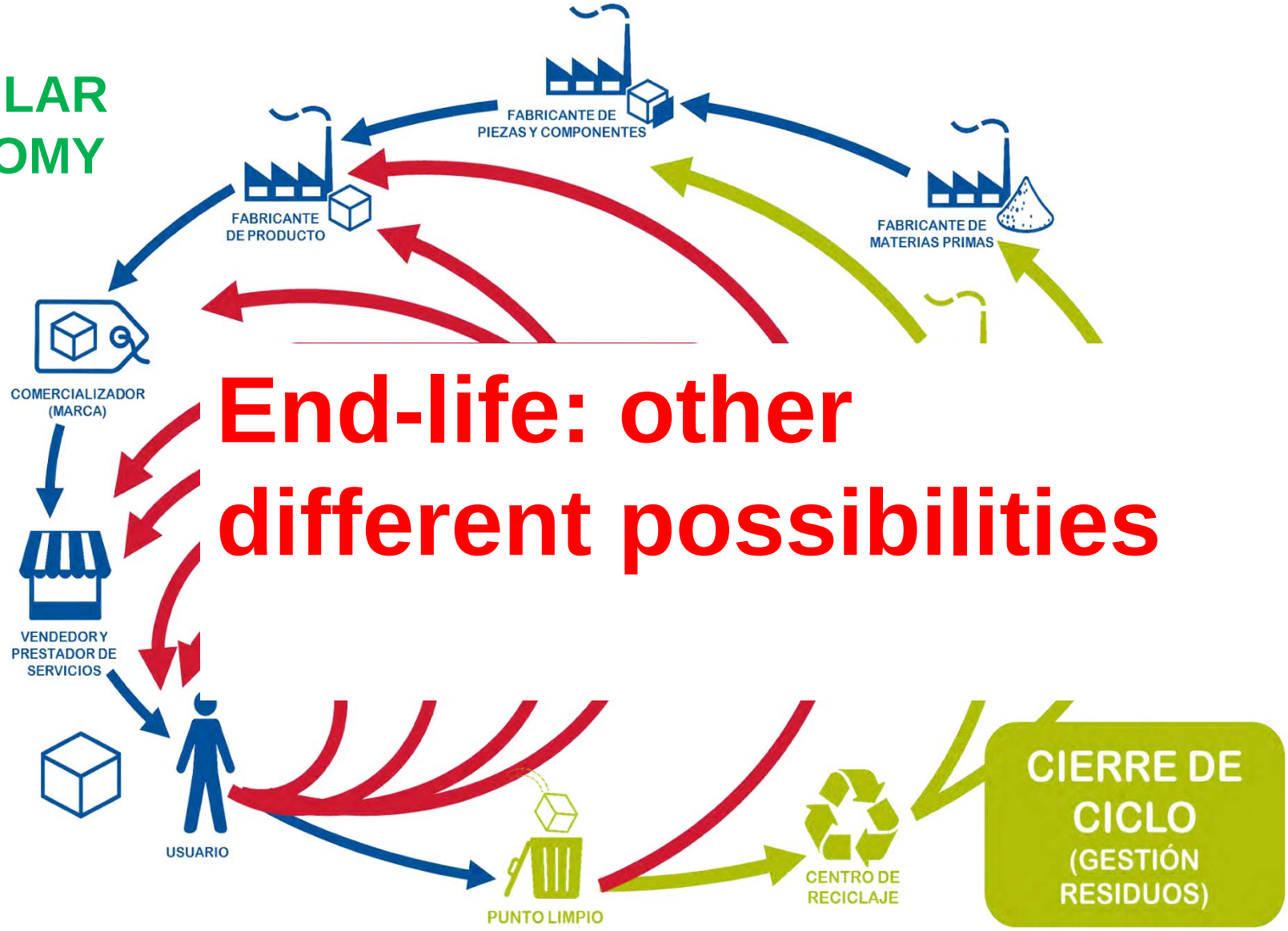
CIRCULAR ECONOMY



End-life: ONLY recycle

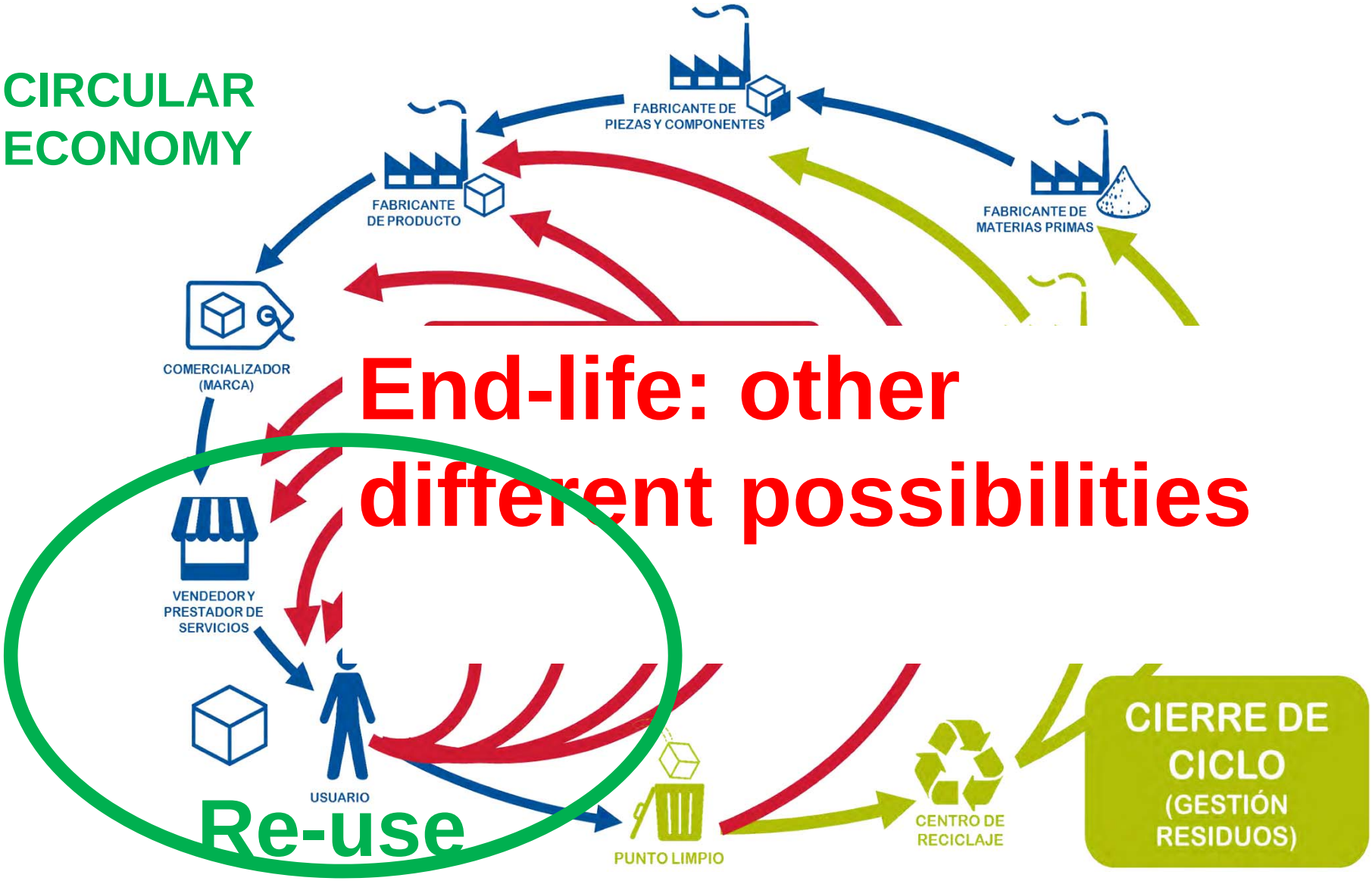
Demonstrations of new use of PC reused based on

CIRCULAR ECONOMY



End-life: other different possibilities

Demonstrations of new use of PC reused based on



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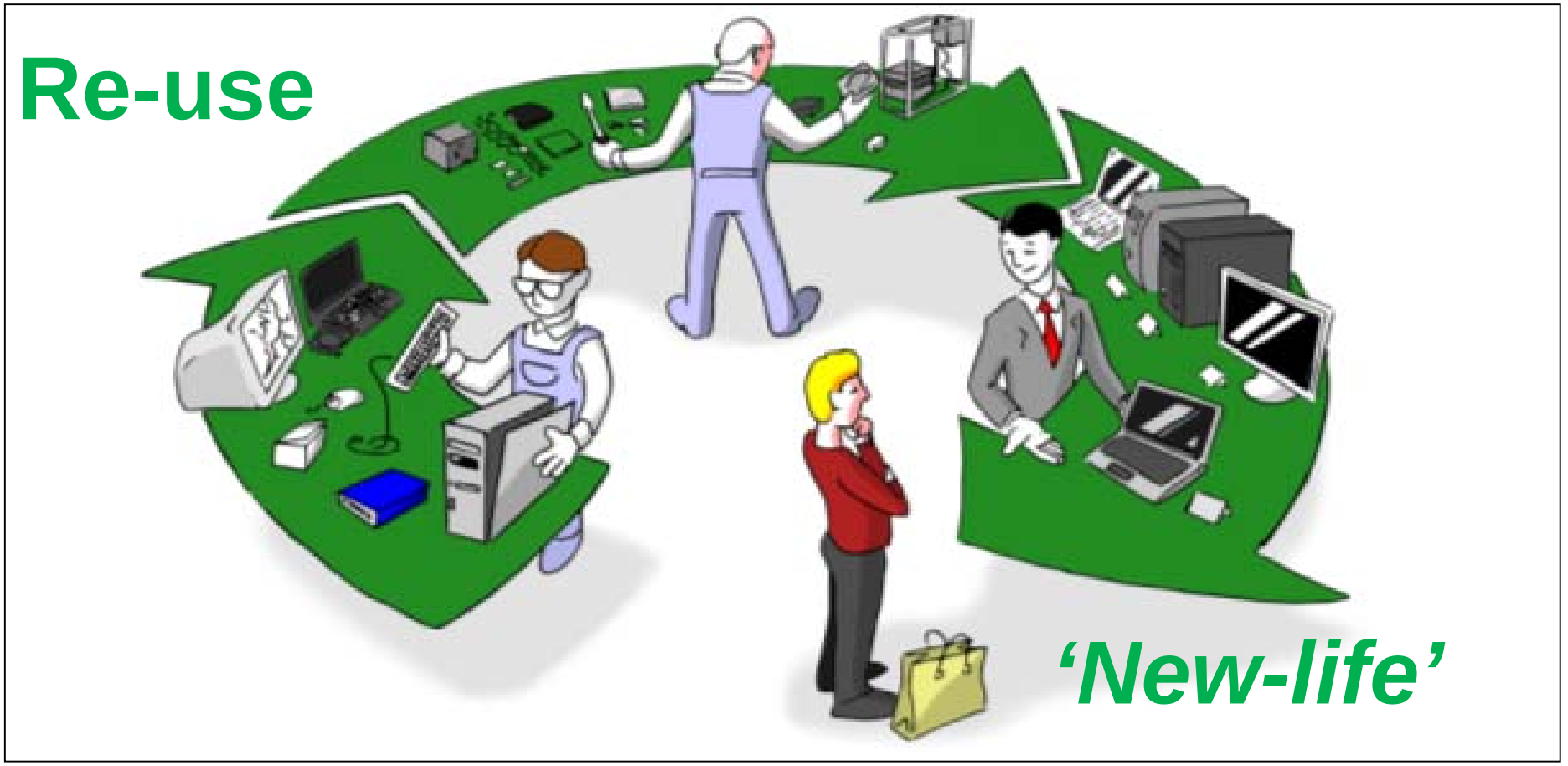
'New-life'

Demonstrations of new use of PC reused



Demonstrations of new use of PC reused (all demos: D1-D2-D3-D4)

New-life: 4 different applications

Universidad de Vigo

DEMO-1: Control system air conditioning and lighting

DEMO-2: Cluster of computers for grid processing

DEMO-3: Perimeter security devices intranet

revertia

DEMO-4: Generic purpose computers

Offimatic and *internet* use

Demonstrations of new use of PC reused (all demos: D1-D2-D3-D4)

New life: D4 – D3 and D2

Universidad de Vigo

DEMO-1: Control system air conditioning and lighting

DEMO-2: Cluster of computers for grid processing

DEMO-3: Perimeter security devices intranet

revertia

DEMO-4: Generic purpose computers

Offimatic and *internet* use

Quick view

Demonstrations of new use of PC reused (all demos: D1-D2-D3-D4)

New life: D4 – D3 and D2

DEMO-2: Cluster of computers for grid processing *(calculation)*

DEMO-3: Perimeter security devices intranet *(internet defender)*

DEMO-4: Generic purpose computers *(Offimatic* and *internet* use)

Demonstrations of new use of PC reused (all demos: D1-D2-D3-D4)

New life: focus on DEMO-1

DEMO-1: Control system air conditioning and lighting

DEMO-2: Cluster of computers for grid processing

DEMO-3: Perimeter security devices intranet

DEMO-4: Generic purpose computers

Offimatic and *internet* use

Demonstrations of new use of PC reused (all demos: D1-D2-D3-D4)

New life: focus on DEMO-1

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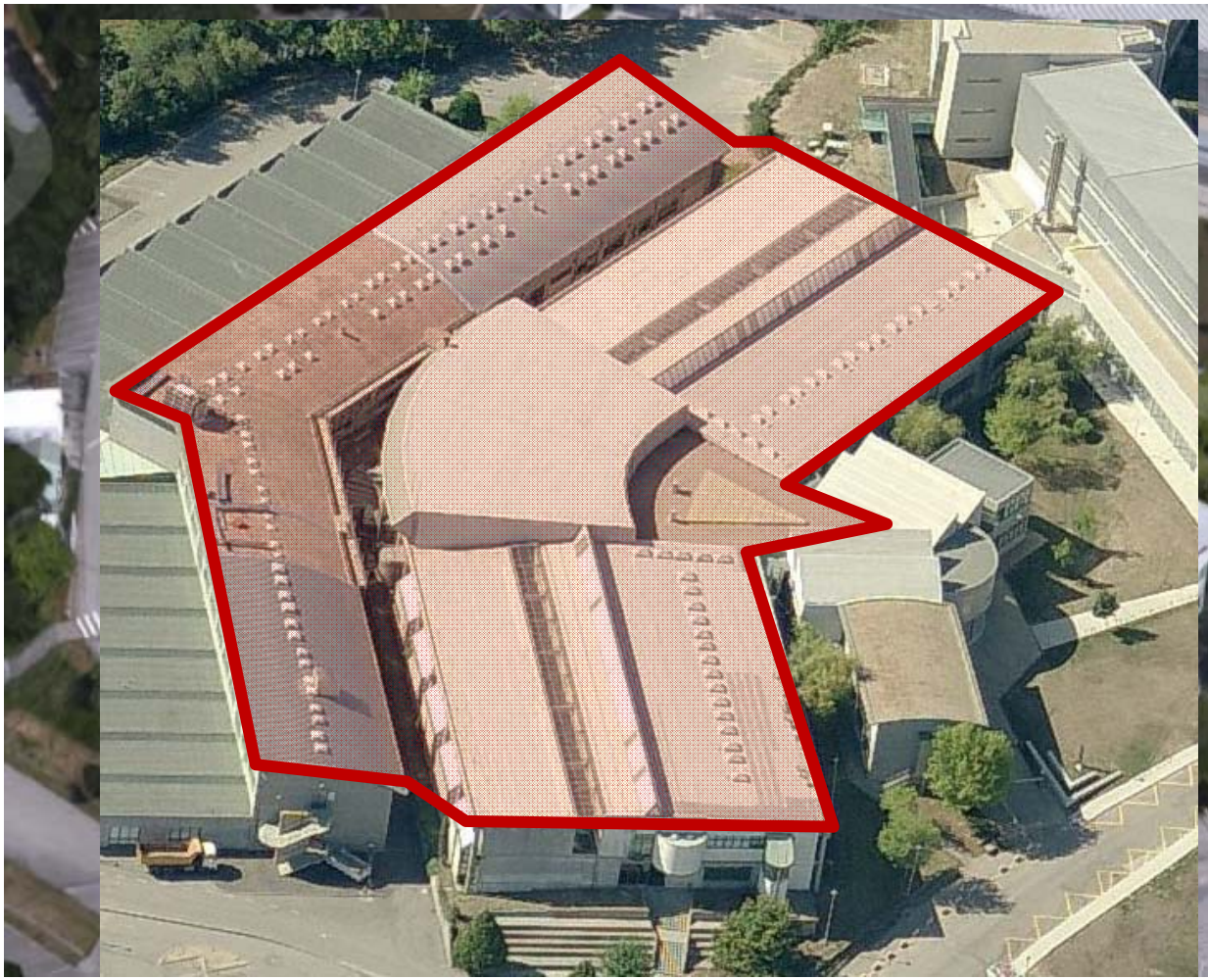
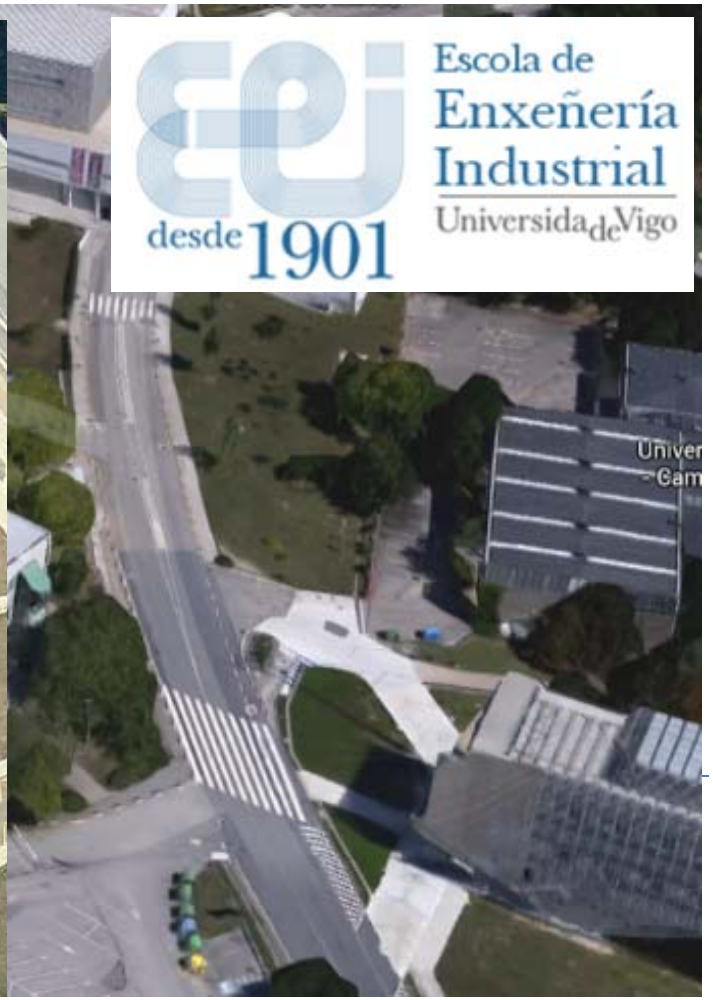
New life: focus on DEMO-1

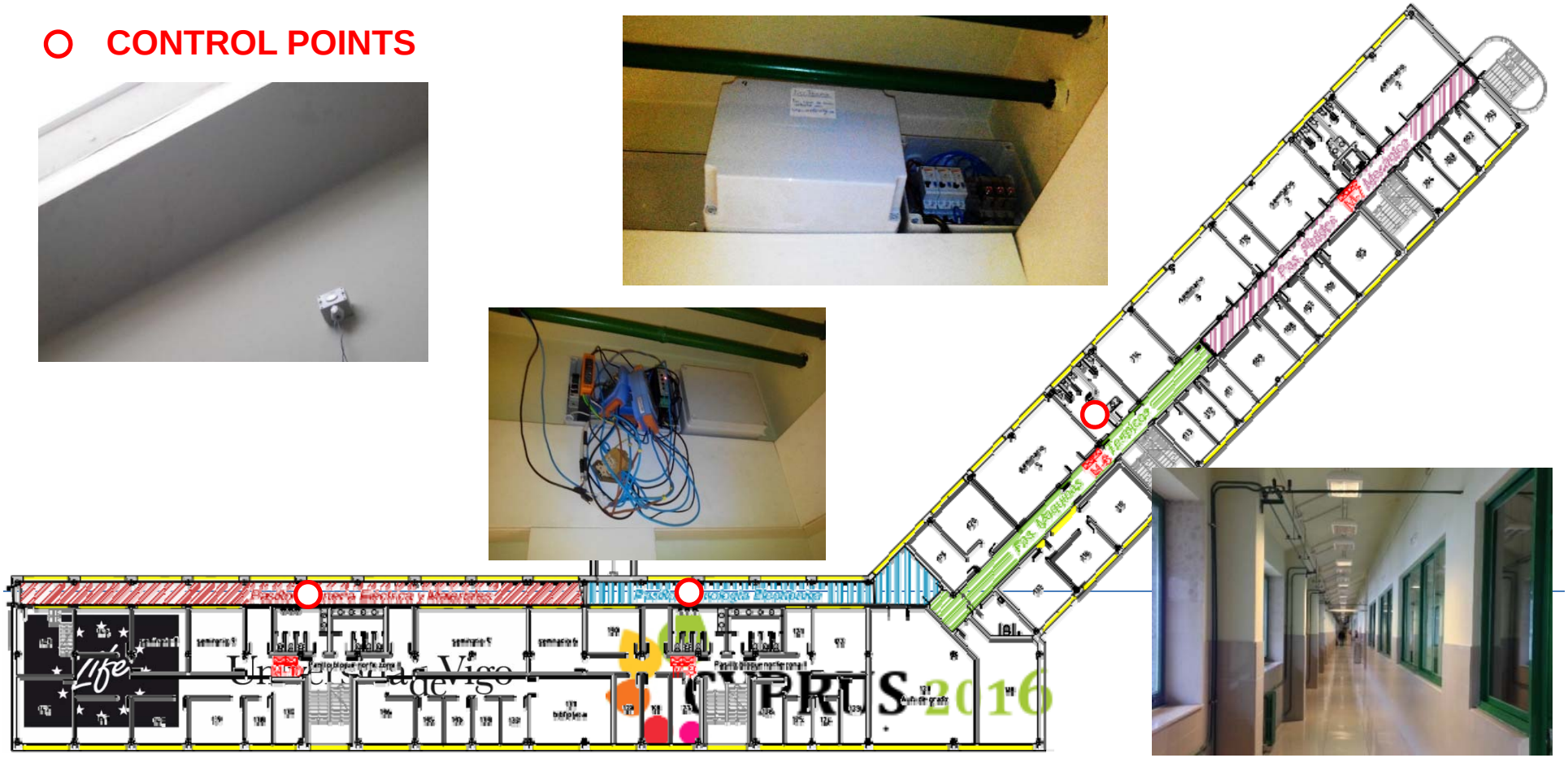




Demonstrations of new use of PC reused (all demos: D1-D2-D3-D4)

New life: focus on DEMO-1

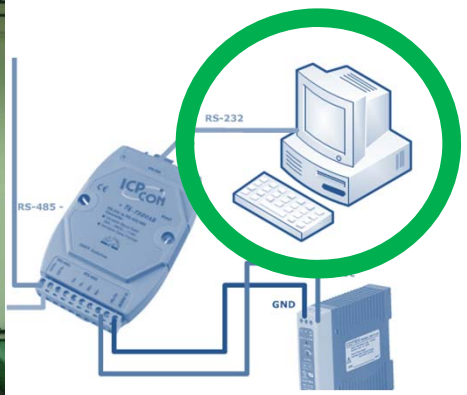
- **CONTROL POINTS**



Demonstrations of new use of PC reused (all demos: D1-D2-D3-D4)

New life: focus on DEMO-1

Re-used PC



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What actions are to be implemented?

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Action implemented by Grupo CIMA **at** Universidad de Vigo

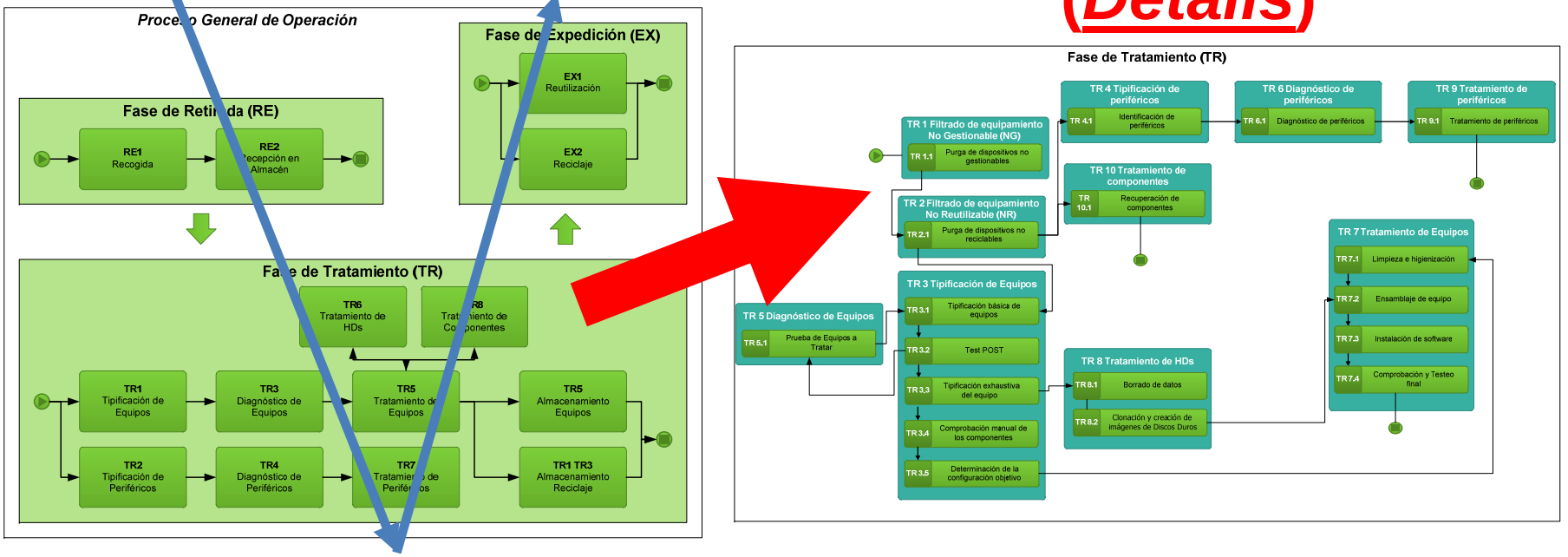
Layout of the pilot plant to the **industrial preparation process** for **WEEE reuse** (PC-computers)

Operations needed: Design and development of **PILOT PLANT**

1-Recollection

3-Expedition

2-Treatment or processing (*Details*)



2-Treatment or processing

Operations needed: Design and development of **PILOT PLANT**

Treatment or processing (*details* for D1-D2-D3)

DEMO 1	DEMO 2	DEMO 3
TR 1 - 2: Filtering equipment TR 10: Treatment components. TR 3.1: Classification of basic equipment. TR 3.2: Test POST. TR 3.3: Comprehensive Classification of teams. TR 3.4: Manually checking components. TR 3.5: Determination of the target configuration. TR 8.1: Erasing disc. TR 7.1: Cleaning and sanitization. TR 7.2: Assembly of equipment. TR 7.3: Installing software. TR 7.4: Checking communications. TR 7.5: Performance testing. TR 5: Diagnosis.	TRI 1 - 2: Filtering equipment TRI 10.1: Recovery cabling. TRI 10.2: Classification of wiring. 3.1 TRI: Basic Criminalization of equipment. TRI 3.2: Test POST. TRI 3.3: Comprehensive Classification of teams. TRI 8.1: Erasing disc. TRI 7.1: Removing equipment. TRI 7.2: Classification of components. TRI 5: Diagnosis.	TR 1 - 2: Filtering equipment TR 10: Recovering components. TR 3.1: Classification of basic equipment. TR 3.2: Test POST. TR 3.3: Comprehensive Classification of teams. TR 3.4: Manually checking components. TR 3.5: Determination of the target configuration. TR 8.1: Erasing disc. TR 7.1: Cleaning and sanitization. TR 7.2: Assembly of equipment. TR 7.3: Setting client. TR 7.4: Checking and final testing. TR 5: Diagnosis.

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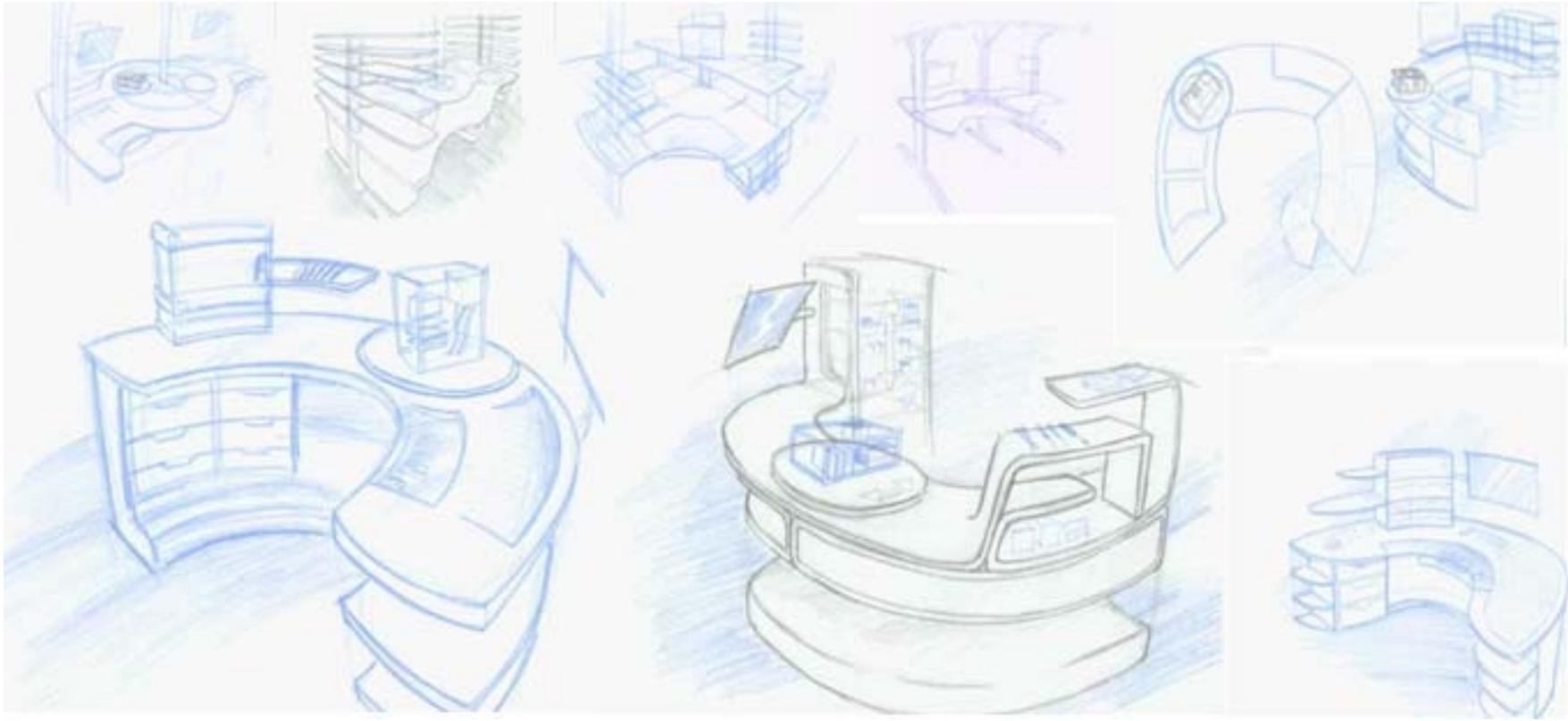
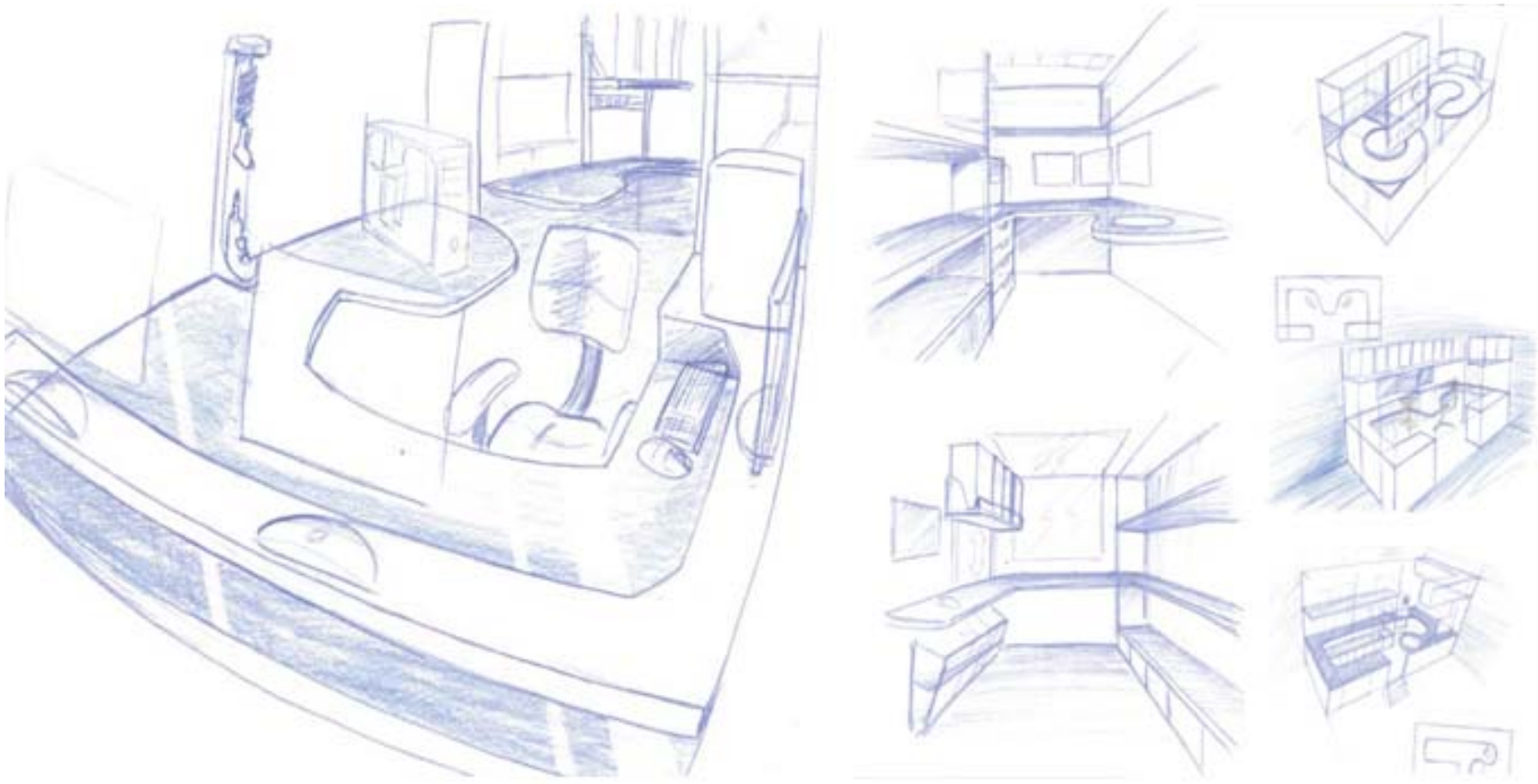
Operations needed: Design and development of **PILOT PLANT**

Lay out concept definition: based on operations (product)



Operations needed: Design and development of **PILOT PLANT**

Lay out concept definition: based on operator (worker)



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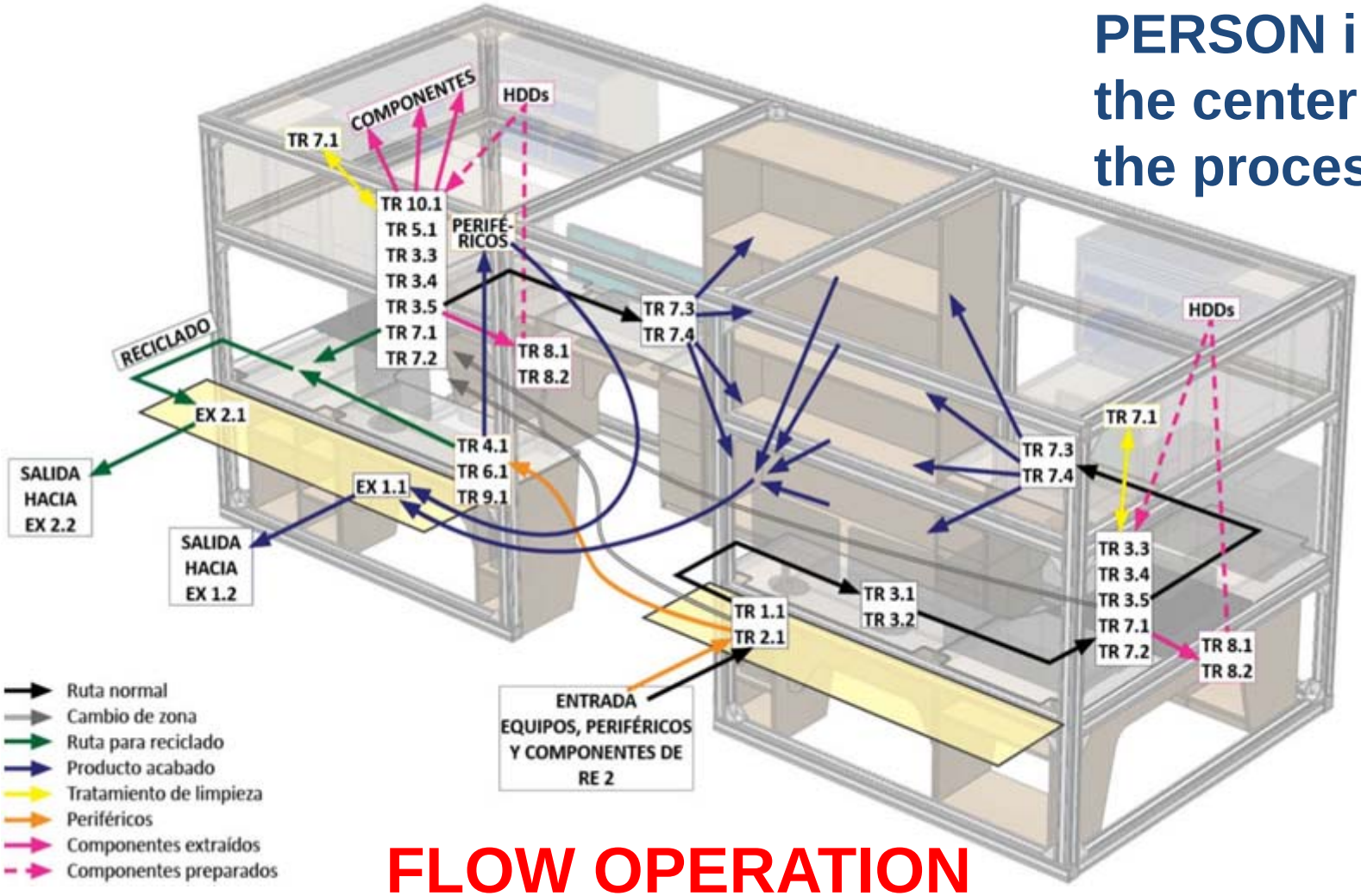
Operations needed: Design and development of **PILOT PLANT**

Lay out – flow operation and PILOT PLANT

PERSON in the center of the process



FLOW OPERATION

Operations needed: Design and development of **PILOT PLANT**

PILOT PLANT design:

Operations needed: Design and development of **PILOT PLANT**

PILOT PLANT design:

PERSON in the center of the process

PILOT PLANT design and development: CONSTRUCTION

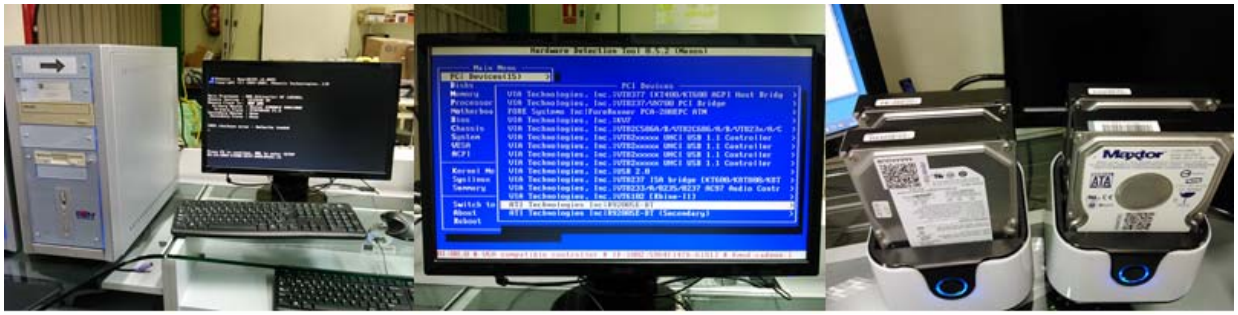
PILOT PLANT re-use process

1- Recollection

2-Treatment or processing

PILOT PLANT re-use process

2-Treatment or processing



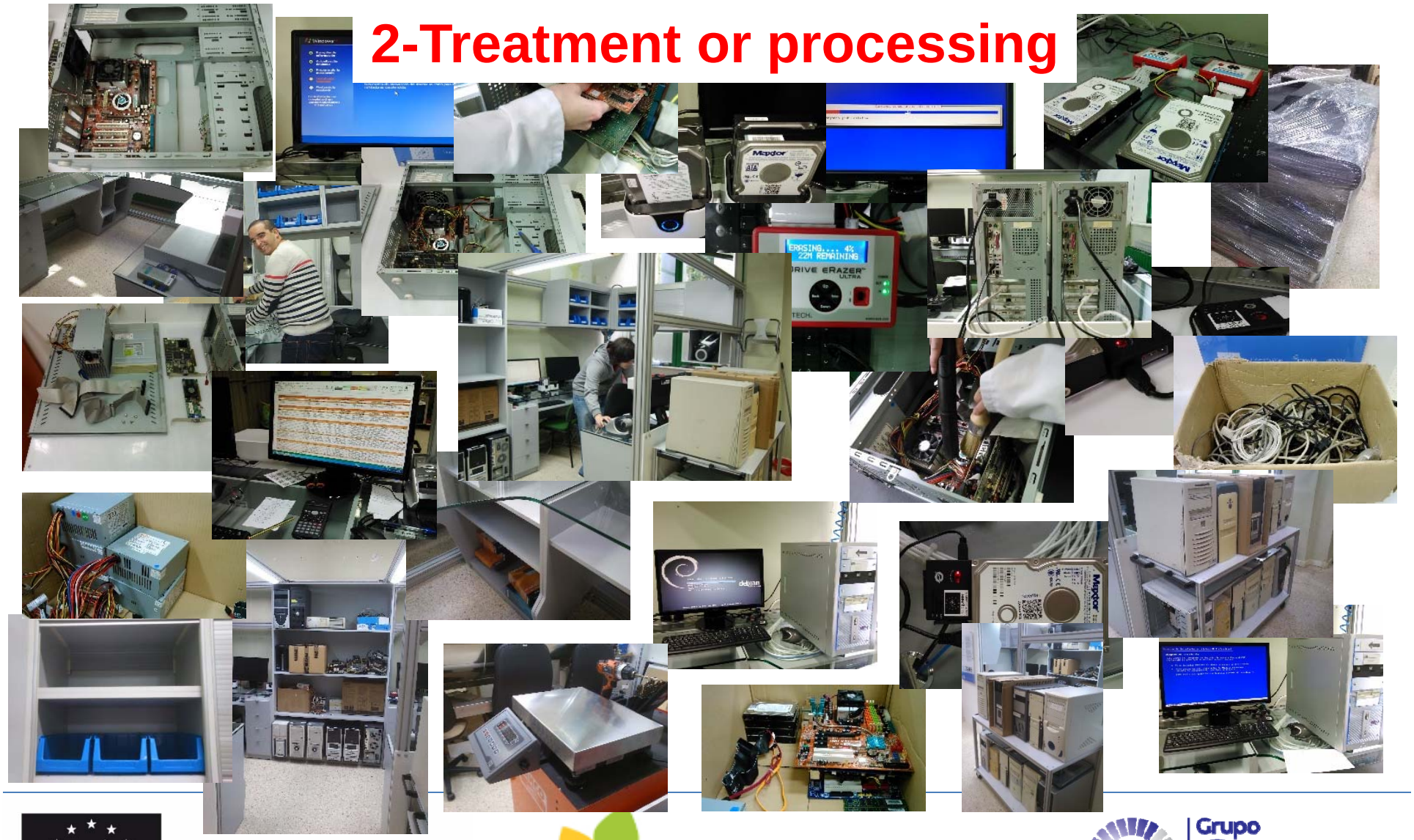
- **Turn-on and first check T3.2**
- **Checking hardware T3.4**
- **HDD formatting T8.1**

- **Internal hardware cleaning (TR7.1)**

Classification: **cables/components**

- **Assembly of components (TR7.2): motherboard / HDD**
- **SO installation (TR7.3)**

2-Treatment or processing



RESULTS: Equipments for Demo 1

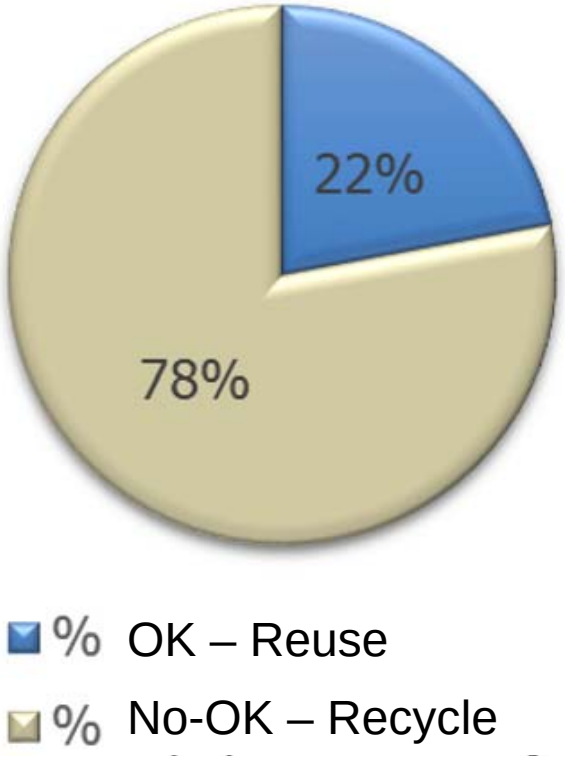
First processing (start-up and test stage)

- From 12/05/2014 - el 19/05/2014
- Number of days: 6 days
- Computers processed: 33 ud. (358,9 kg)
- 7 ud OK (75,2 kg) **=> 21% OK**

Demonstration of a full operative stage processing

- From 5/06/2014 - el 14/07/2014
- Number of days: 20 days (working month)
- Computers processed: 90 ud. (934,9 kg)
- 20 ud OK (194,8 kg) => **23% OK**

AVERAGE



RESULTS: Equipments for Demo 2

First processing (start-up and test stage)

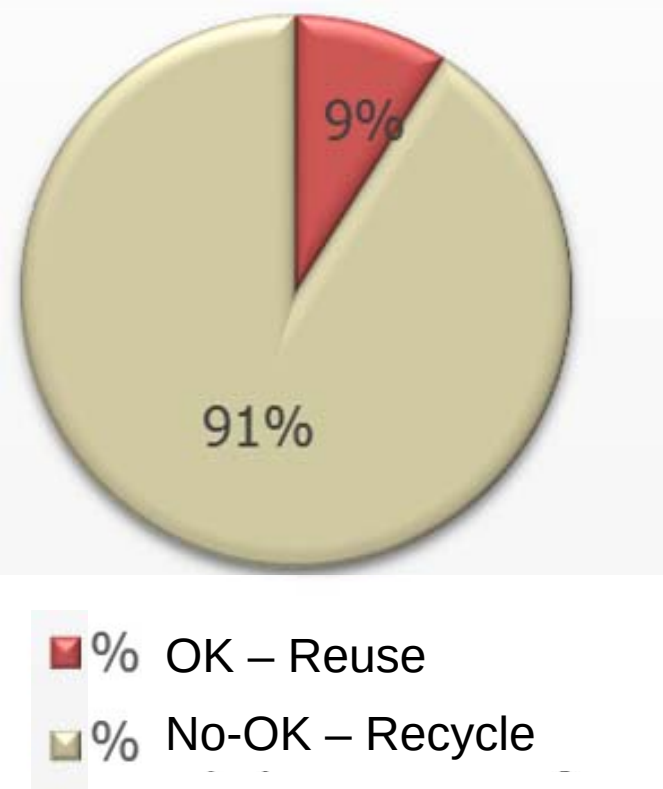
- From 26/05/2014 - el 3/05/2014
- Number of days: 7 days
- Computers processed: 23 ud. (299,4 kg)
- 12 HHD + 3 power supply + 3 mother board (14,8 kg) **=> 5% OK**

Demonstration of a full operative stage processing

- From 18/08/2014 - el 15/09/2014
- Number of days: 20 days (working month)
- Computers processed: 100 ud. (314,4 kg)
- 42 HHD + 20 mother board (37,0 kg)

=> 11% OK

AVERAGE



RESULTS: Equipments for Demo 3

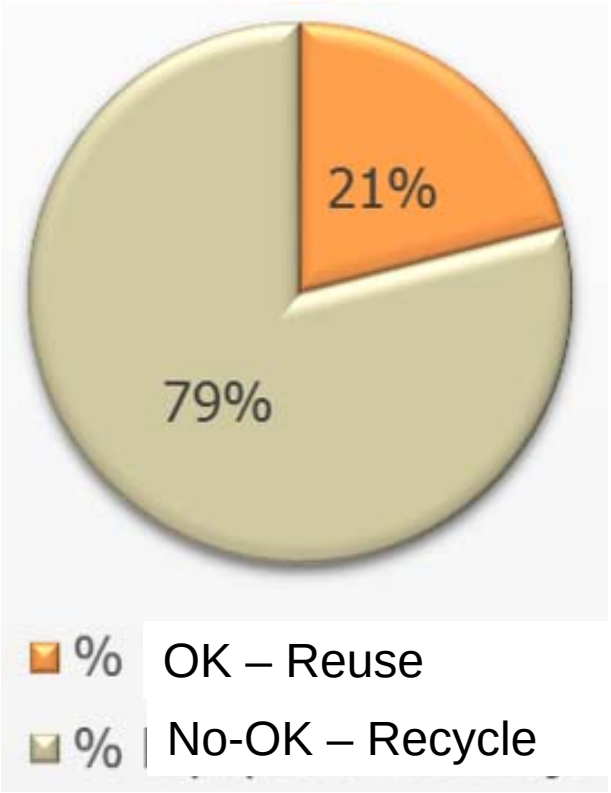
First processing (start-up and test stage)

- From 19/05/2014 - el 23/05/2014
- Number of days: 5 days
- Computers processed: 42 ud. (417,4 kg)
- 7 ud OK (80,0 kg) **=> 17% OK**

Demonstration of a full operative stage processing

- From 15/07/2014 - el 12/08/2014
- Number of days: 20 days (working month)
- Computers processed: 68 ud. (697,6 kg)
- 16 ud OK (194,8 kg) => **24% OK**

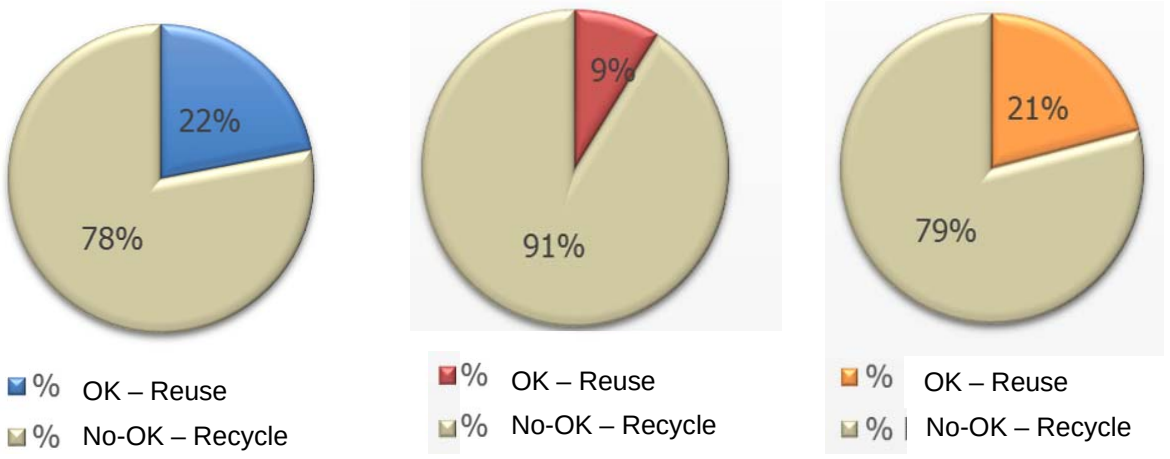
AVERAGE



RESULTS: ***resume***

DEMO	Dates	Number of days	Computers processed	Acceptable to reuse
Demo 1	12/05/2014 - 19/05/2014	6 days	33 units (358,9kg)	7 units (75,2kg)
Demo 2	26/05/2014 - 03/06/2014	7 days	23 units (299,4 kg)*	12 components* (14.8 kg)
Demo 3	19/05/2014 - 23/05/2014	5 days	42 units (417,4kg)	7 units (80,0kg)

DEMO	Dates	Number of days	Computers processed	Acceptable to reuse
Demo 1	05/06/2014 - 14/07/2014	20 days	90 units (934,9kg)	20 units (194,8kg)
Demo 2	18/08/2014 - 15/09/2014	20 days	100 units (400 kg)*	75 components* (300 kg)
Demo 3	15/07/2014 - 12/08/2014	20 days	68 units (697,6kg)	16 units (177,59kg)



CONCLUSIONS

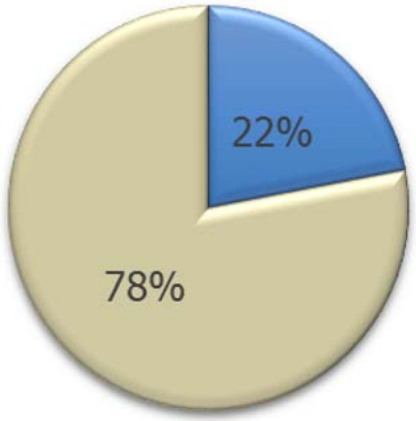
- This paper ***Design and development of a pilot plant for WEEE-computers reusing*** is focus on the work development by research **group CIMA** at **University of Vigo (Spain)** within the project **ecoRaee (ecoWEEE)**
- **ecoRaee** (6th/35 LIFE+2011 Environm.&Govern. sub-prog. main objective is **demonstrating** a valid (technically and economically) industrial **process for reusing WEEE-PCs**

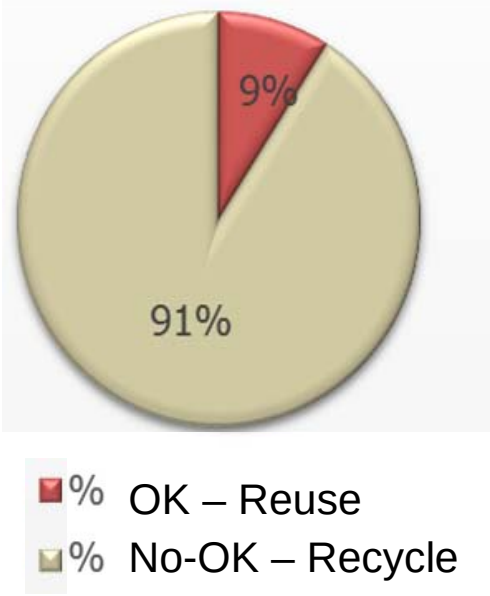
CONCLUSIONS

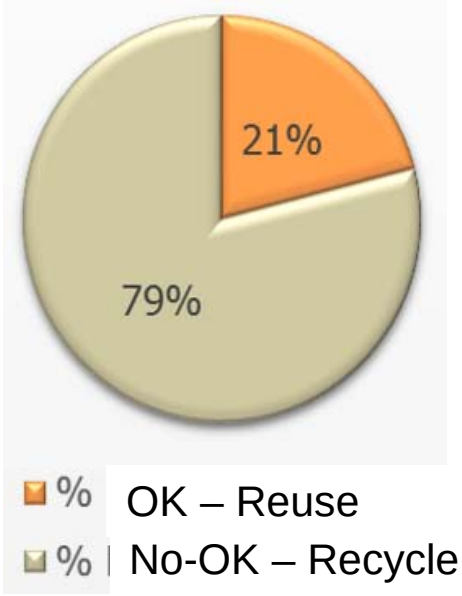
- **ecoRaee** team:
  - University of Vigo: **CIMA Group** (and others)
  - Two companies: Revertia and EnergyLab
- ecoRaee defines a WEEE reuse process based on **circular economy** to give a ***'new-life'*** to PCs
- **PCs' *new-life*** is demonstrated with FOUR DEMOS
- A **pilot plant** was defined and constructed

CONCLUSIONS

- **Results** of reuse process (D1-D2-D3 at University of Vigo)








Thanks for
your attention!!