Les actions d'Orange pour réduire les impacts environnementaux de ses Infrastructures Réseaux

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orange™

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ENS Lyon 12 Novembre 2018

Orange Commitments

Energy Efficiency

Circular Economy

Les 3 axes de notre politique RSE

Digital trust Operator

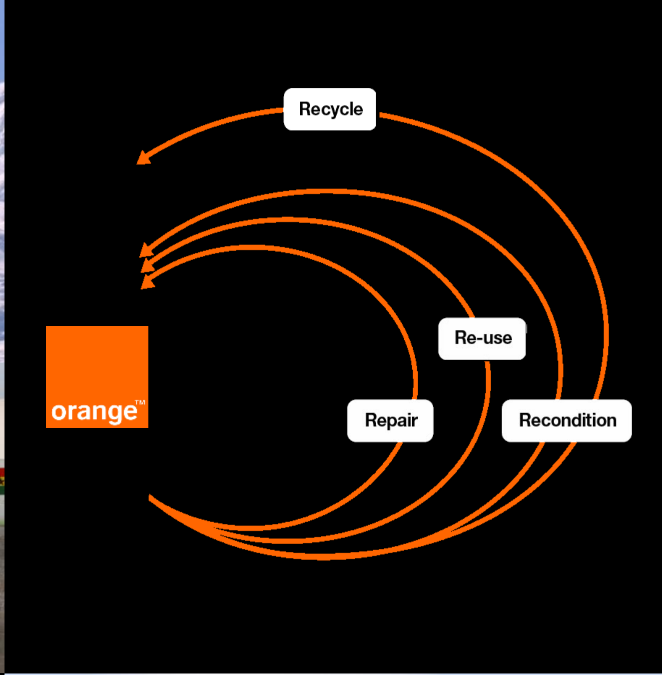
Orange actor of ecological transition

Contributing to socio-economic development

Orange Commitments

- **Reduce by 50% CO_2 emission per customer usages**
  Orange member of *Global Climate Action*

- **Integrate Circular Economy principal in all our processes**
  Orange member of Fondation *Ellen MacArthur*



Part I

Energy consumption


Orange, un opérateur éco-responsable
+ 3,8 %
sur le parc clients entre 2016 et 2017
x2
pour le trafic mobile
- 0,4 %
sur la consommation électrique
orange
Source : Orange Labs Networks

Energy Action plan

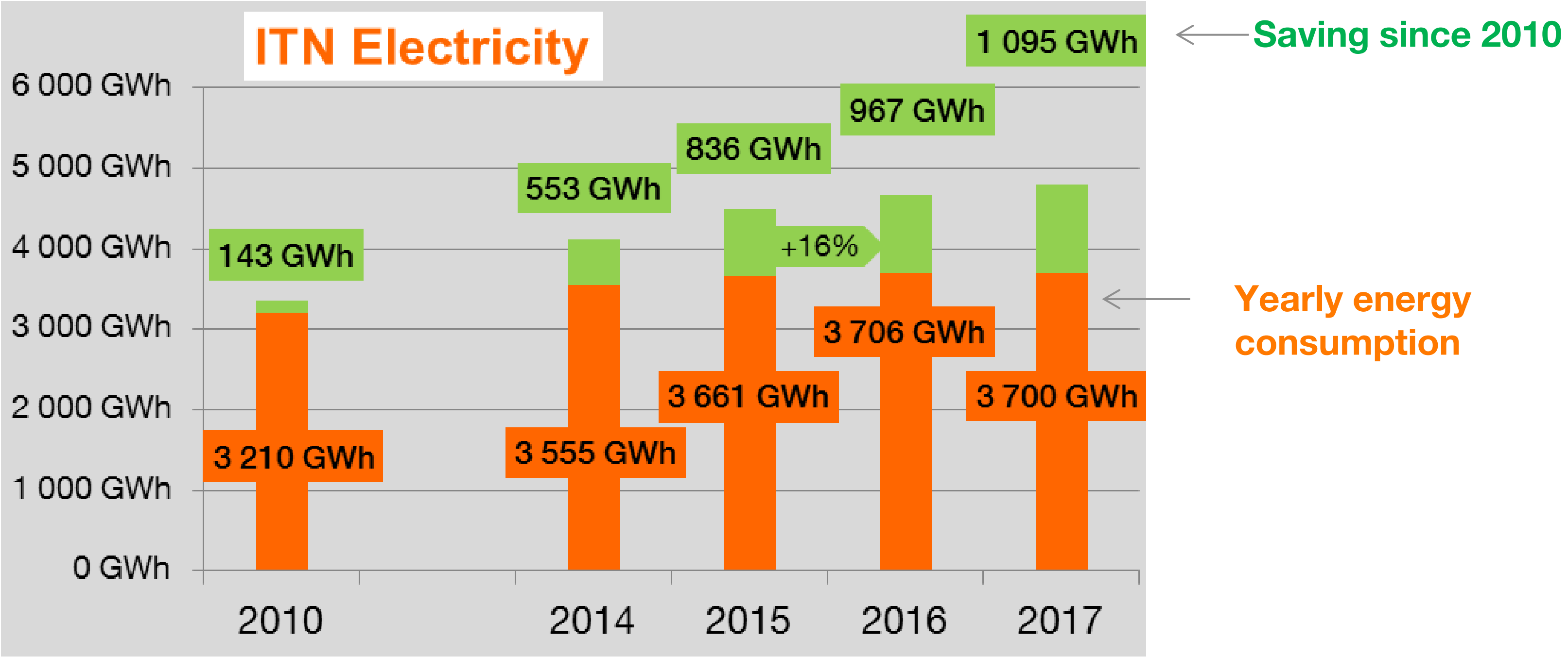
L.Dubois, J.Mesnage, S.Le Masson… (TGI/OLN)

Energy Action Plan Scope

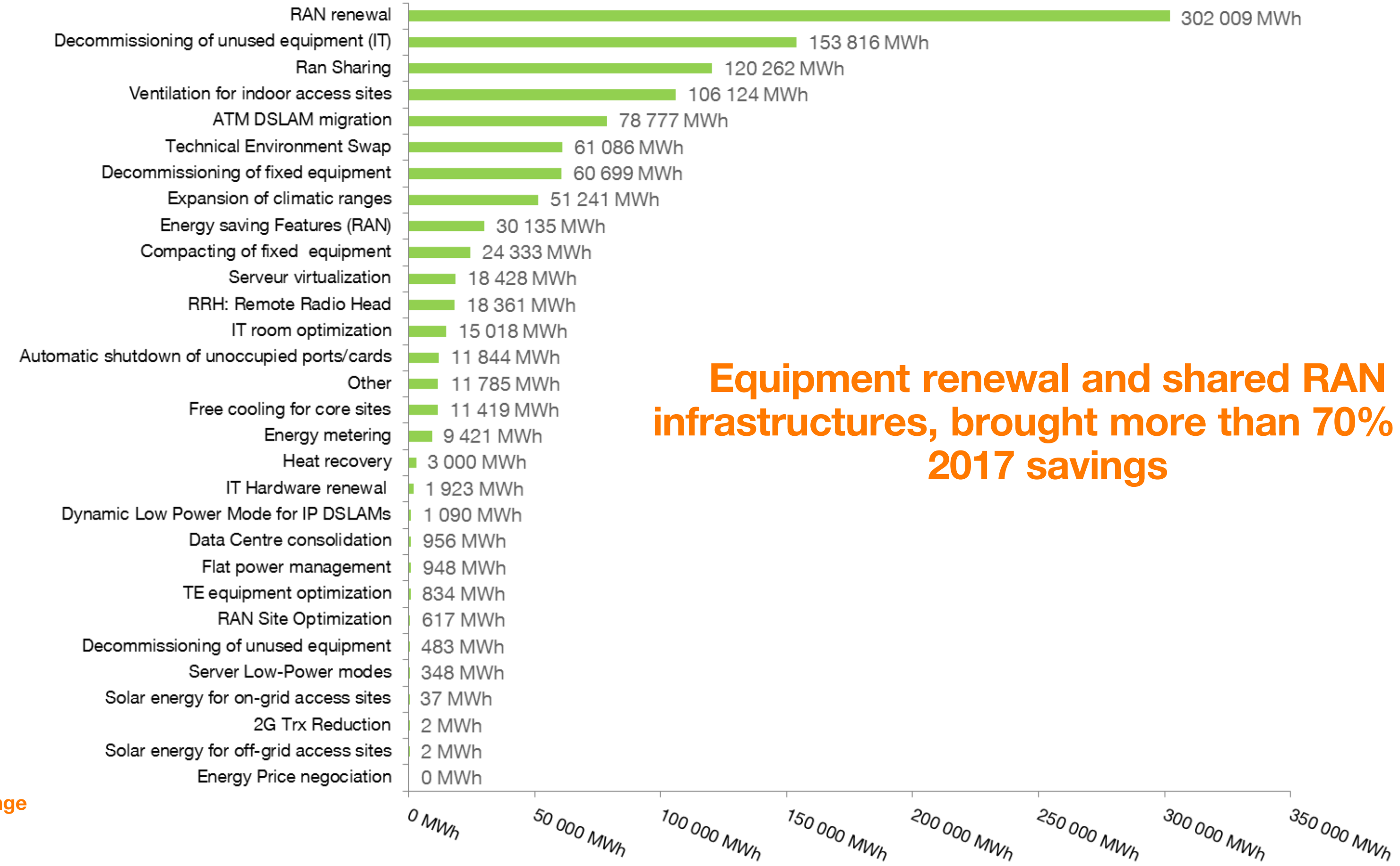
Objectives	**Reduce Energy OPEX**
Energy	**Electricity & Fuel**
Domains	**IT and Network (Radio Access Network, Fixed Acces Network, Technical Environment, Data Center, middle and core network)**
Countries	**France, Belgium, Moldova, Poland, Romania, Slovakia, Spain, Botswana, Cameroon, Congo Democratic Republic, Egypt, Guinea Bissau, Guinea Conakry, Ivory Coast, Jordan, Madagascar, Mali, Mauritius, Morocco, Niger, Senegal, Tunisia**
Excluded	**OBS, Orange Marine, Real Estate, Retail, Vehicle Fleet, Gas consumption…**

Energy Action Result of Electricity consumption & OPEX

Stabilization of energy consumption despite growth in networks (geographical & techno) and usages



2017 ITN electricity consumption savings per lever



Equipment renewal and shared RAN infrastructures, brought more than 70% of 2017 savings

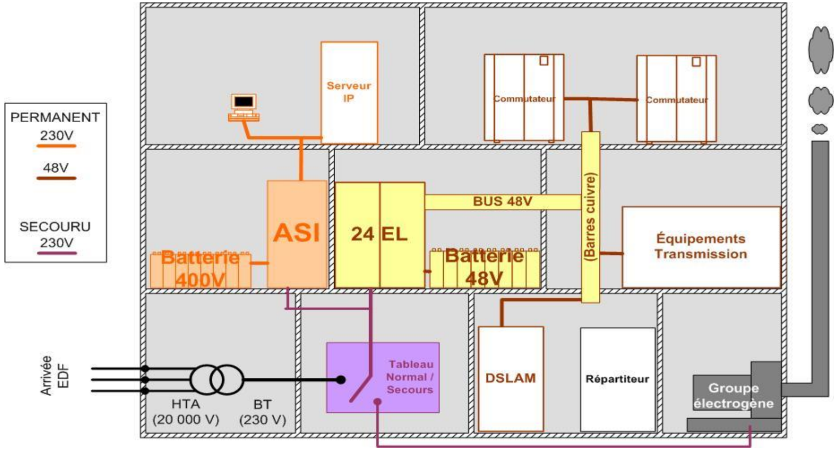
400 Vdc

D.Marquet & O.Foucault (TGI/OLN)

Why 400 V DC?

Context : Different voltages and currents used

- 48 V DC for telecom equipment,
- 230/400 V AC for Data Centres,

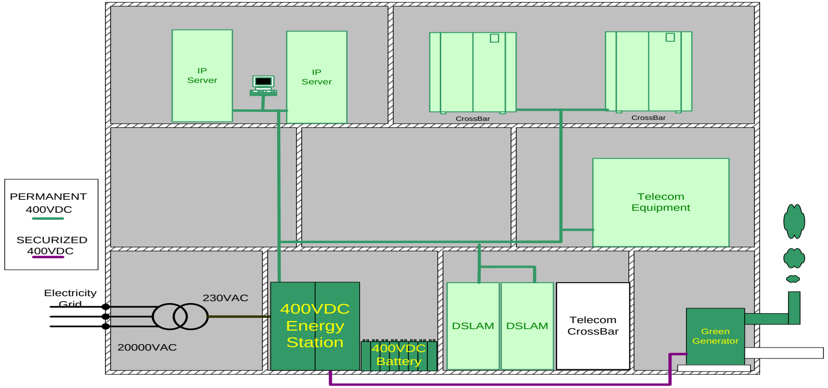


Objectives

Develop unique powering system: 400 V DC (ETSI normalized, ITU-T)

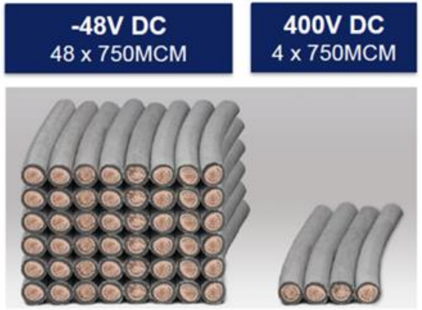
Simplify architectures and installations

Improve efficiency and reliability



→ **Reduction of Capex and Opex**

400 Vdc solution … some advantages



1 – Better sustainability, LCA and circular economy aspects (ITU-T 1400 series)

less copper, less electronic, less battery because less cable loss and no inverter

longer lifetime and more reuse possibility as high MTBF and simple to operate

less maintenance and fuel for maintenance trip

2 –Renewable Energy and smartgrid services are easier to implement

DC coupling of PV as defined in L.1205

less instability risk in DC when enabling load shaving, islanding and also full soft DC coupling of Diesel engine

3 - AC UPS →400V : which saving ?

7 to 15% energy saving compared to AC UPS big unit used at 30% load in 1+1

AC/400 modules : simple & reliable like AC/48, very low maintenance OPEX

3% saving in new 400VDC server PSU

Cooling

D.Nortershauser, S.Le Masson (TGI/OLN)

Power density is increasing

40 to 48 kW → Enough heat for 8 houses

hot spots problems and cooling
high energy consumption

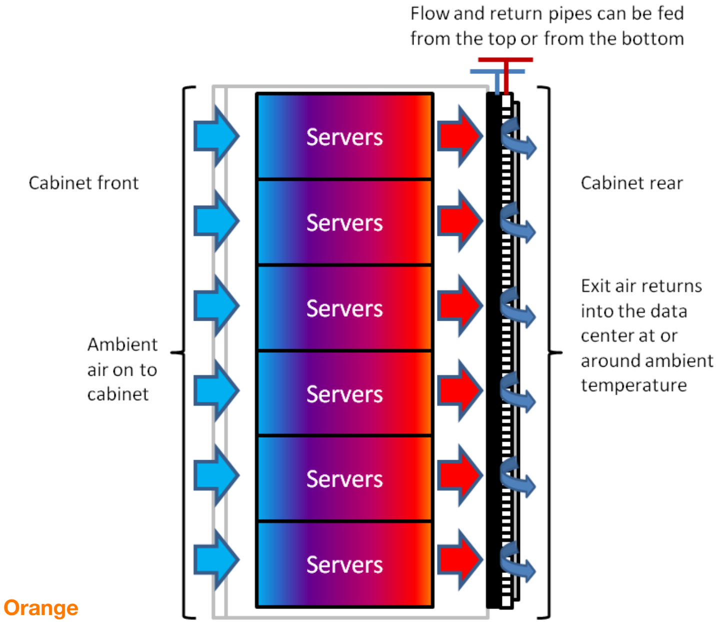
Air cooling is not adapted to ICT equipment evolution

- **Not sufficient to cool high density cabinets**
- **Low energy efficiency**
- **Reliability issues due to hot spots, dust, humidity**
- **No efficient and cost effective heat reuse**

➡ Switching to liquid cooling is necessary

Liquid cooling at cabinet level

- Use a rear-door heat exchanger to remove heat from servers
- Cold water or ambient water are possible
- Possibility to reuse hot water (heat is rejected outside otherwise)
- High savings energy: just need pumps



Liquid cooling at component level

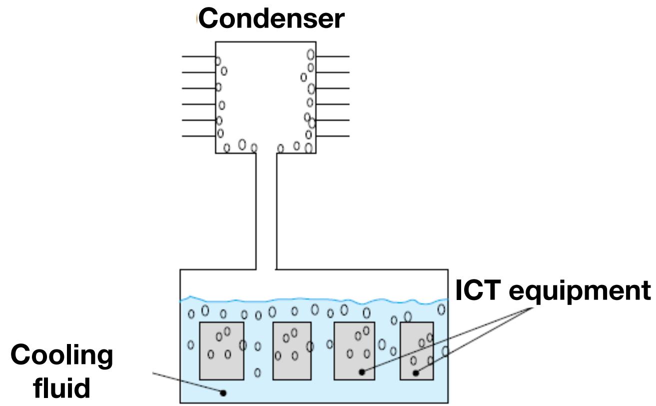
- Exchangers are in direct contact with the components
- Hot water (30-70°C) can be used
- Components with power consumption less 2 Watts are generally ignored
- No airflow → fans and heat sinks are removed
- Small pipes diameters introduce high pressure drops in water loop
  - ➢ rise of pump power consumption
- Geometry of exchangers depend of the servers

Water-Cooled IBM BladeCenter QS22

Credit: IBM Research – Zurich

Liquid cooling by immersion

Oil-based cooling system



Phase change system

- Two types of immersion cooling:
  - No phase-change: IT equipment are cooled by naturel convection.
  - Phase-change (research): liquid will evaporate on contact with hot spots (components with high heat dissipation). Gas returns to liquid on the condenser.
- No airflow: fans and heat sinks (in most cases) are removed

Circular Economy

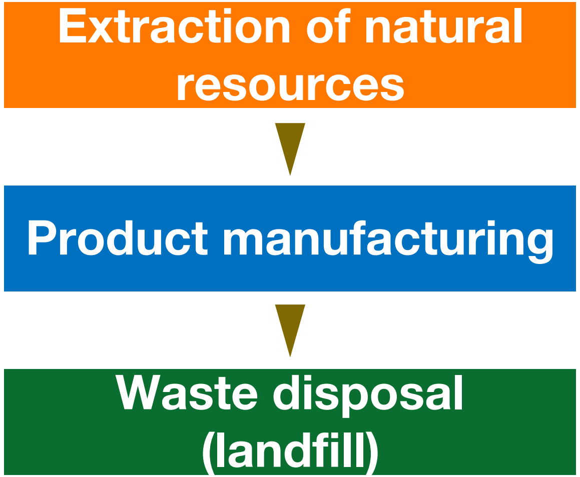
S.Vaija (TGI/OLN)

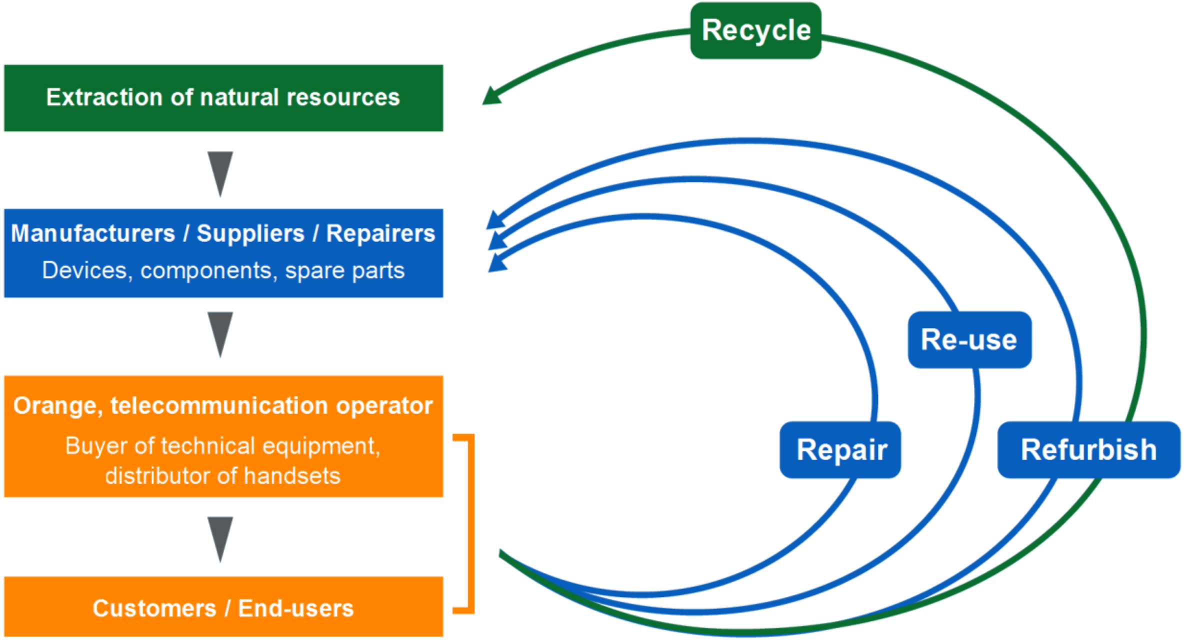
Switch from linear to circular economy

Current economy mainly based on the take – make – dispose principle

WEEE (waste of electric and electronic equipment) = hardly recovered and recycled

→ EU 2015 : 10 million tons of electronic equipment put on the market and 3 millions tons recycled





Reuse, « Stock Market Place » Orange in-house platform

For functional network equipment, which can still be required by others affiliates inside Orange Group

A platform to facilitate communication on 4 main actions:

- Request – someone is looking for an equipment, for ex. not available locally
- Excessive stock – someone has an excessive stock of equipment available
- Resell – someone is willing to destock equipment, i.e. sell them with a discount
- Exchange – someone has placed an order to a supplier, the product has not yet been delivered and it can still be delivered elsewhere

Reuse - Second hand equipment

Strategy launched within Technical Decision Committee in 2017

Two main ideas: cope with CAPEX constraint and sort suppliers (black & white lists)

Buying second hand equipment = strong lever for environmental footprint reduction and also useful operationally speaking:

- ✓ Price level from -30 to -90% of Orange price
- ✓ End Of Life legacy equipment no more available on the Original Equipment Manufacturer (OEM) market
- ✓ Opportunity to acquire spare parts for older equipment (buy entire equipment and disassemble it for spares)
- ✓ Can be bought from Brookers (equipment tested in laboratories, include a 12 months warranty. 10 broker partners have been sourced by Orange Group)

One thing to remember: be aware of environmental regulation when purchasing second hand

Introduce circularity in network equipment RFPs

For all Energy related products (ERP) CEN/CENELEC (JTC 10 Energy-related products - Material Efficiency Aspects for Ecodesign) are currently developing General method for the assessment of:

- Durability
- Ability to re-manufacture
- Ability to repair, reuse and upgrade
- Recyclability and recoverability
- The proportion of re-used components
- Recycled material content
- The use of critical raw materials

Standards should be available in 2020

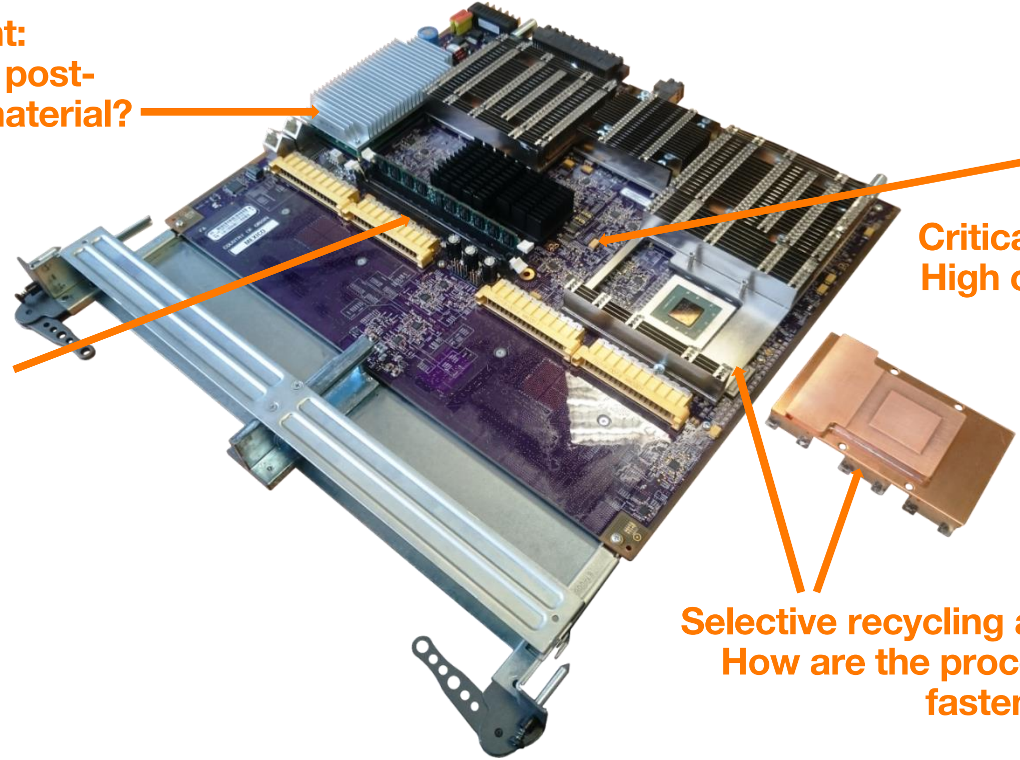
For the different types of equipment specific standards will be developed afterwards by dedicated standardisation bodies (ex. ETSI EEM-ICT)

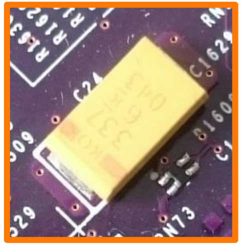
Trying to narrow the questions

Recycle content:
Intentionally added post-consumer recycled material?

Upgrade:

Available empty slots for key components?





Critical raw Materials content:
High concentration in specific components?

Selective recycling and refurbishment:
How are the processor's heatsink fastened?

Circularity KPI design based on questions added in RFPs

12 questions for the allocated between the 6 criteria (Durability, Reparability, etc.)

For each question a certain number of points are awarded according to the achieved performance

Remanufacturing time for field-serviceable components → according to time
Type of fasteners used on electronic boards → according to reuse potential / possible damage

Score on each criteria weighted t according to importance regarding Orange circular economy strategy and expected reliability of manufacturer answers

Reparability → important topic for equipment lifespan and avoid “beyond-repair” failures = Weight x 5
Critical Raw Materials → difficult to obtain answers from manufacturers, new topic = Weight x 1

Circularity KPI = score out of 100

Snapshot of current recycling process

Electronic equipment recycling process = shredding + some materials recovery

Recycling process focus on recovering precious metals from the motherboard, copper from cables and plastic/steel/aluminum scrap from casing

Massify electronic waste

Furnace and refining operations

About 20 metals are recycled with a 90 to 95% efficiency

The best current process but not without flaws

Two problems with this end-of-life process

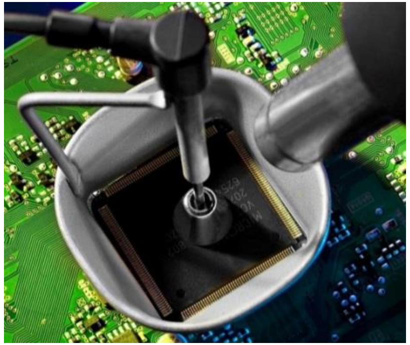
- ✓ **Some metals/critical materials are not recovered**
- ✓ **All the production effort to manufacture the component (e.g. energy used in factories) is lost**

Collaborative project with EcoSD eco-design network and several universities

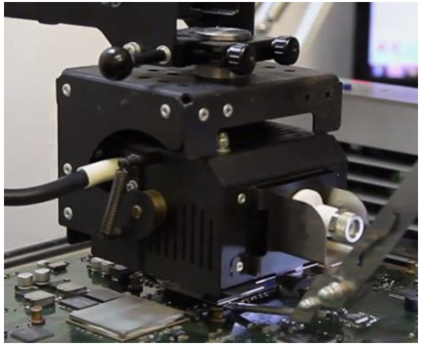
Case study: when devices are phased out should we recover some component for reuse/resell? If so, how to process for a maximum recovery efficiency?

Electronic components recovery challenges

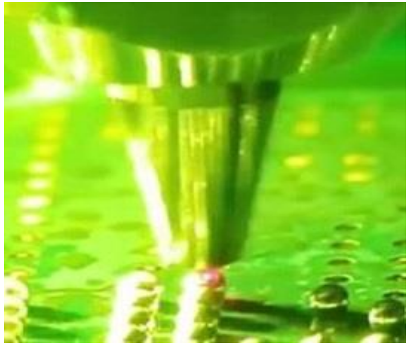
Integrated circuits, different ways to recover and rework them



Hot air



Infrared



Laser

Challenges:

- ✓ Keep the heat level at a minimum to avoid damaging the circuit
- ✓ Manual operations are cost intensive, some automation is required
- ✓ Some components might not be interesting for resell, but they contain high concentration of critical raw materials (e.g. Tantalum capacitors), selective recycling could be an opportunity
- ✓ Are the manufacturers ready to use second hand components in their equipment? What insurances, quality controls are required?


Thank you