WORLD MATERIALS FORUM

GROUPE RENAULT

Material efficiency from a corporate perspective

Cécile de Guillebon,
Global Director Facility Management,
Renault Nissan Mitsubishi Alliance

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Automotive Industry: Groupe Renault

- Circular business principals
- Current material usage
- KPI:
  - ✓ steel,
  - ✓ aluminum,
  - ✓ glass,
  - ✓ plastic
  - ✓ PGM
- Regulation as an enabler toward efficiency
- Vision: Expansion of circular Business

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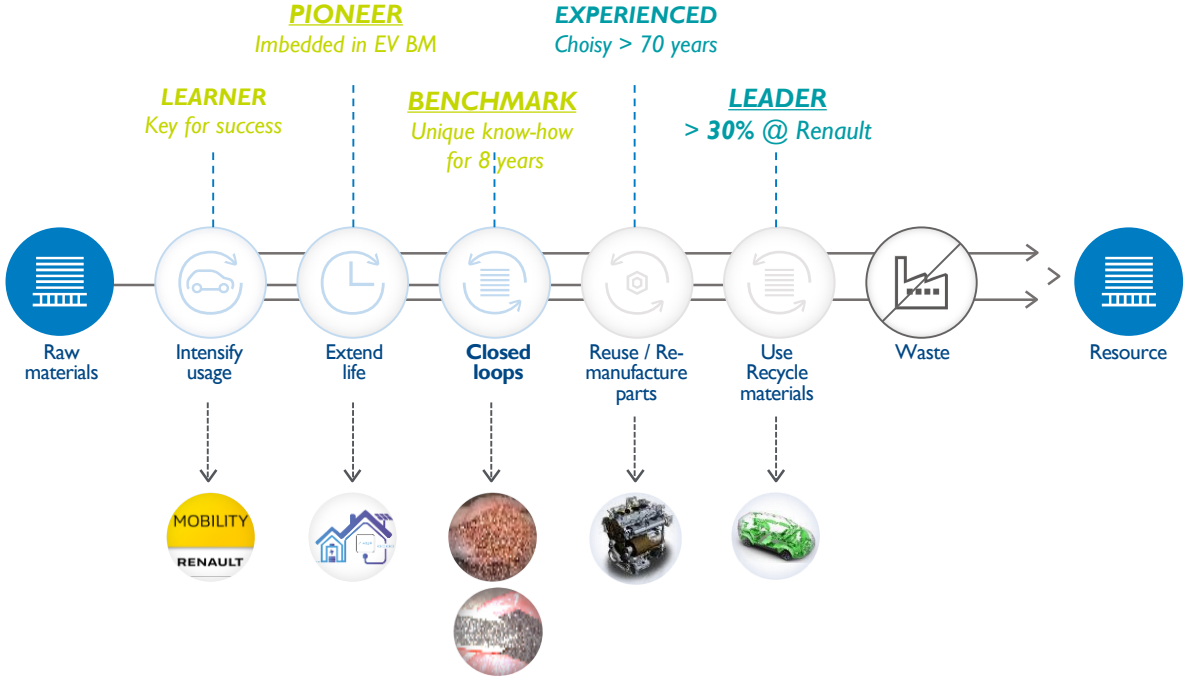
What is your status regarding Materials?

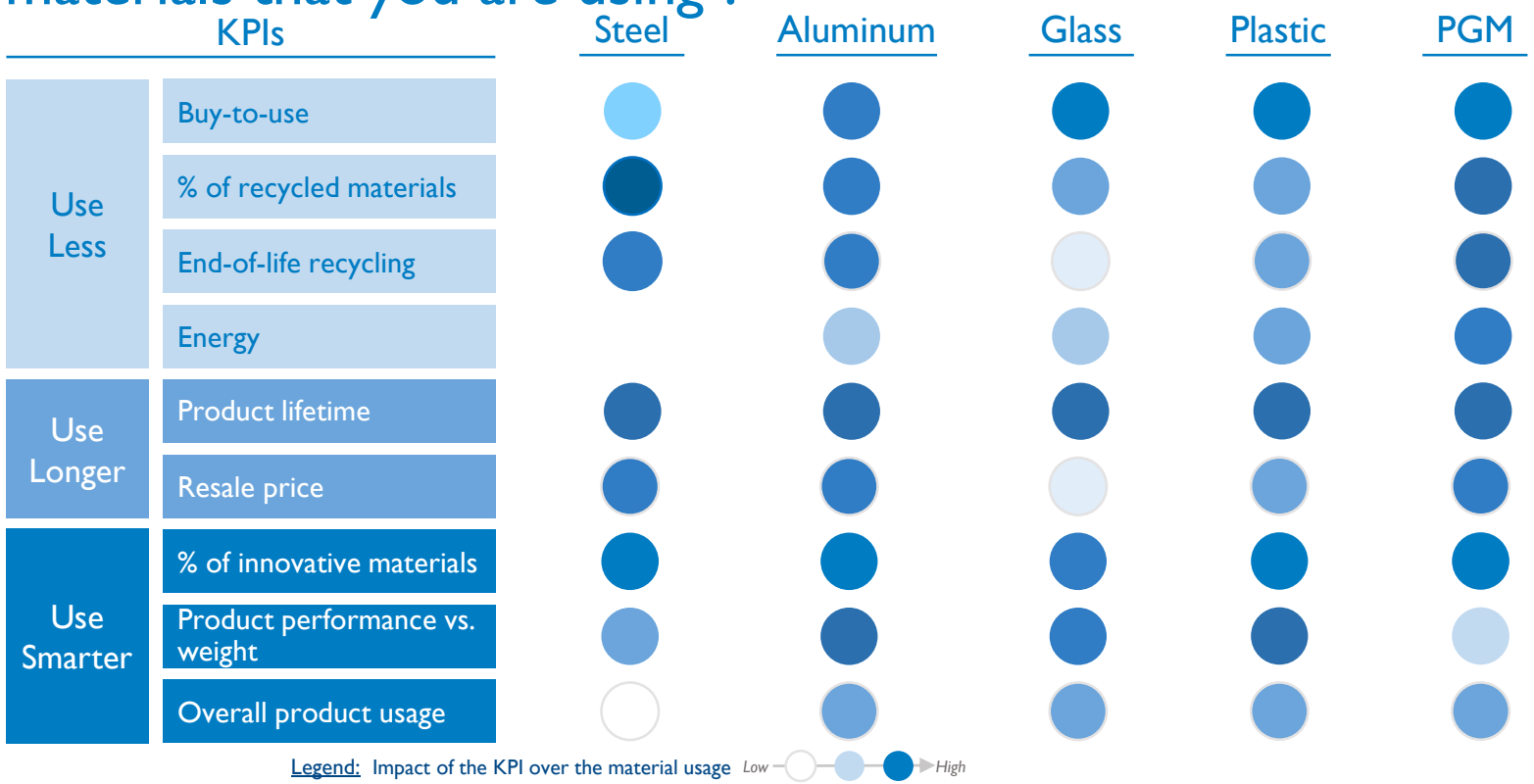
CIRCULAR BUSINESS PRINCIPALS APPLIED ALL ALONG THE PRODUCT LIFE CYCLE TO **REDUCE RESSOURCE CONSUMPTION** AND **PRESERVE ITS VALUE RENAULT RECOGNIZED WORLWILDE AS A BENCHMARK, BEYOND AUTO SECTOR**

FUNDING MEMBER & GLOBAL PARTNER** OF **ELLEN MAC ARTHUR FOUNDATION (FOR 10 YEARS)



Source: Groupe Renault – Strategic Environmental Planning

❶ What is the estimated interest/impact of each KPI over the materials that you are using ?



Source: Groupe Renault – Strategic Environmental Planning

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What is your current material usage per business line?

Groups & Suppliers - 2017	Steel	Cast Iron	Aluminum	Glass	Plastic	Total
KT	3 600	430	390	155	650	5 225
% of total	69%	8%	7%	3%	12%	100%

What are the main "Material efficiency" challenges for your company? What materials and what main levers to improve their efficiency do you envisioned?

→ Use lighter Material (Al)
→ Batterie Energy density: reduce Co + Ni use while increasing compacity to improve automony/price/ weight
→ Increase recycled material ratio in new vehicle (above 30% - Renault bench in EU automotive sector) in order to desensitize to material price fluctuation and potential future scarcity (secure supply), while reducing carbon footprint.

Source: Groupe Renault – Strategic Environmental Planning

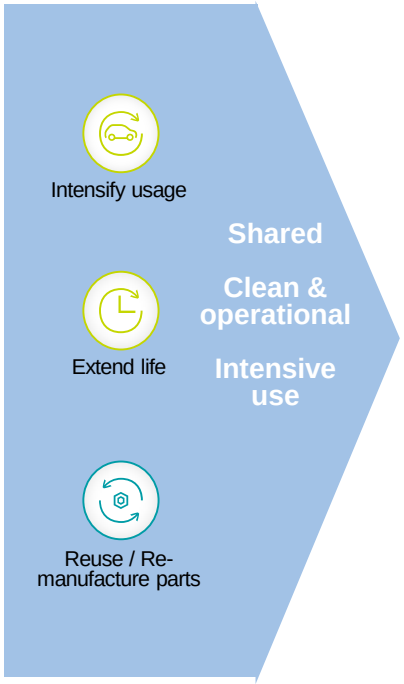
❷ Regulation: the company is pushed by the regulatory environment

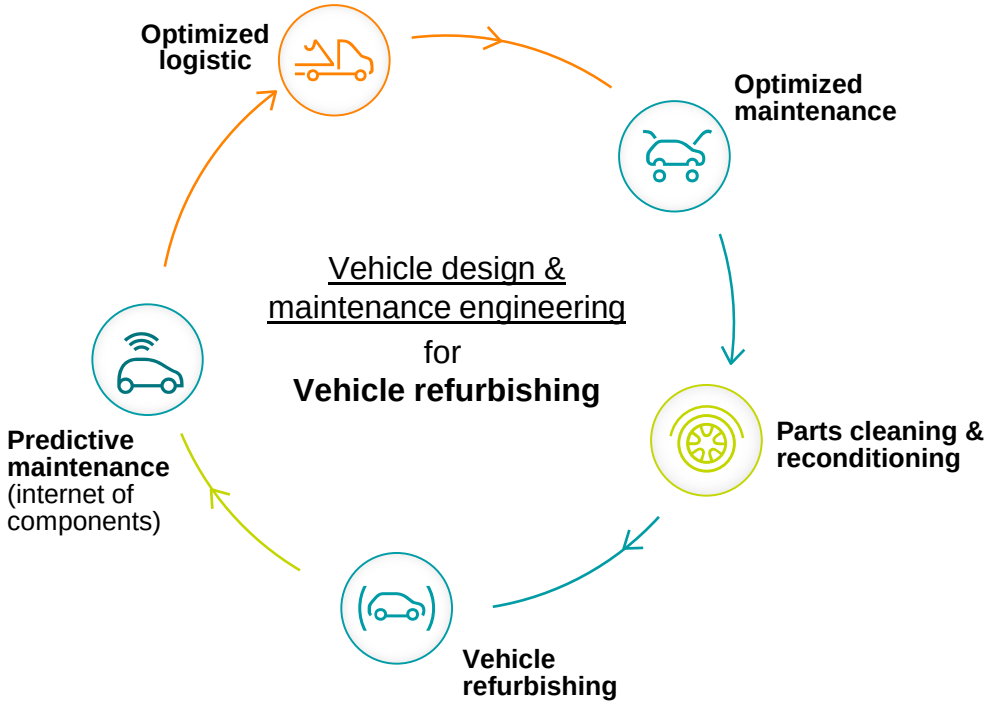
HOW AND WHY APPLY CIRCULAR PRINCIPLES TO MOBILITY SERVICES

→ **REGENERATIVE FLEET MANAGEMENT** *(COMPULSORY FOR ROBOT TAXI WITH NO RESALE VALUE)*

TERRITORIES will value **social & environmental efficiency of Mobility** (decongestion, air quality, lower footprint)

CUSTOMERS & OPERATORS will focus on **quality** services (incl. cleanliness) and **total cost of OPERATION / MOBILITY**





Source: Groupe Renault – Strategic Environmental Planning

❸ What is your vision of material efficiency in the future?

NEW BUSINESSES & NEW PROJECTS

RENAULT MID TERM PLAN 2022: CONSOLIDATE AND EXPAND CIRCULAR BUSINESS & PROJECTS TO NEW GEOGRAPHICAL AREAS AND EV RELATED ACTIVITIES

EFFICIENCY IN RESOURCES AND VALUE ADDED USE INTENSITY | GAIA | CHOISY | indra | + INTERNATIONAL EXPANSION

RECYCLED MATERIAL USE IN RENAULT CARS

+50% volume 2022/2013

Battery recycling For Co, Ni supply

RECYCLE MATERIALS IN SHORT LOOPS

Wiring (Copper)

E-Motor (Copper)

Industrial waste metal loop (Al)

Catalytic conv

Fabrics from seat belts

Bumper (PP)

REUSE PARTS

Resell of 2nd life parts

Parts Remanufacturing

Battery repair

EXTEND LIFE

Electric motor parts remanufacturing

Battery 2nd life reconditioning

INTENSIFY USE

NEW MOBILITY SERVICES

Vehicle regeneration

Source: Groupe Renault – Strategic Environmental Planning

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Real Estate Industry

- Status & Major Trends
- KPI in buildings:
- Enabler to push KPI
- Vision

Status:

- Labels to support professionals in making the right choices: BREAM, HQE, WELL
- Just replace what is needed: ex carpets – Designers with Vintage fashion: « garage style » fittings
- Shift from Energy Savings to Carbon Footprint
- Initiative to enhance circular economy: needs organisation ahead & time

Negative trends:

- frequent refurbishment
- Systematic demolition

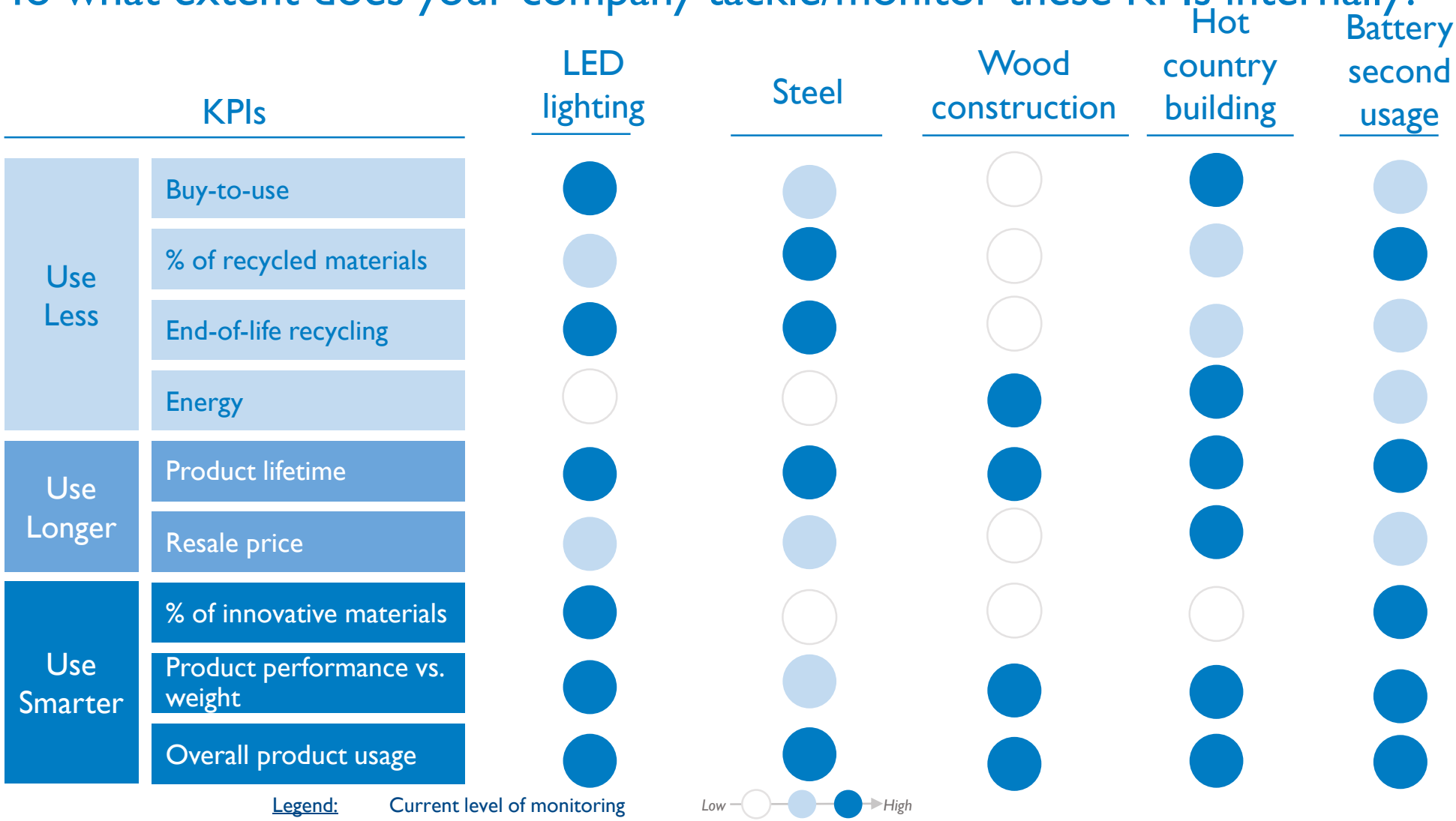
Positive trends

- Local know-how and customs
- Use : 3 shifts in industry – flex office – open fab lab
- Digital

KPI

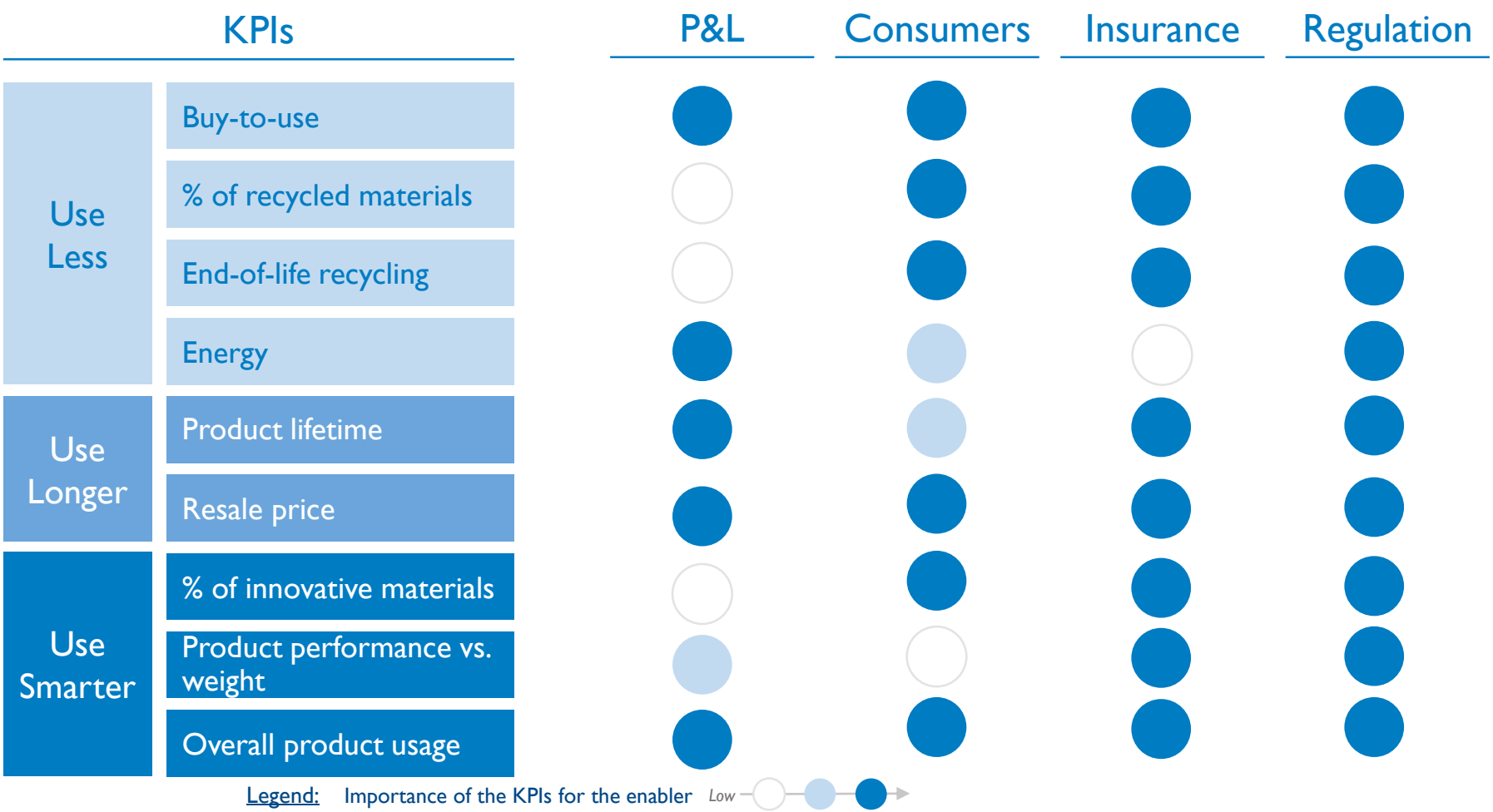
- LED lighting
- Steel
- Wood construction
- Hot country building
- Battery second usage

To what extent does your company tackle/monitor these KPIs internally?



Source: WMF & Arthur D. Little analysis

❷ To what extent do the enablers push for / value each KPI?



Source: WMF & Arthur D. Little analysis

Recycle carpet

A future for used carpet

Take Back

DESSO Take Back™ is our take back system for any type of used carpet, except for carpet containing PVC.

Rather than it being wasted in landfills or furnaces, Desso reuses the carpet as a valuable raw material

Separation

Refinity® is an innovative separation technique enabling the yarn and other fibres to be separated from the backing.

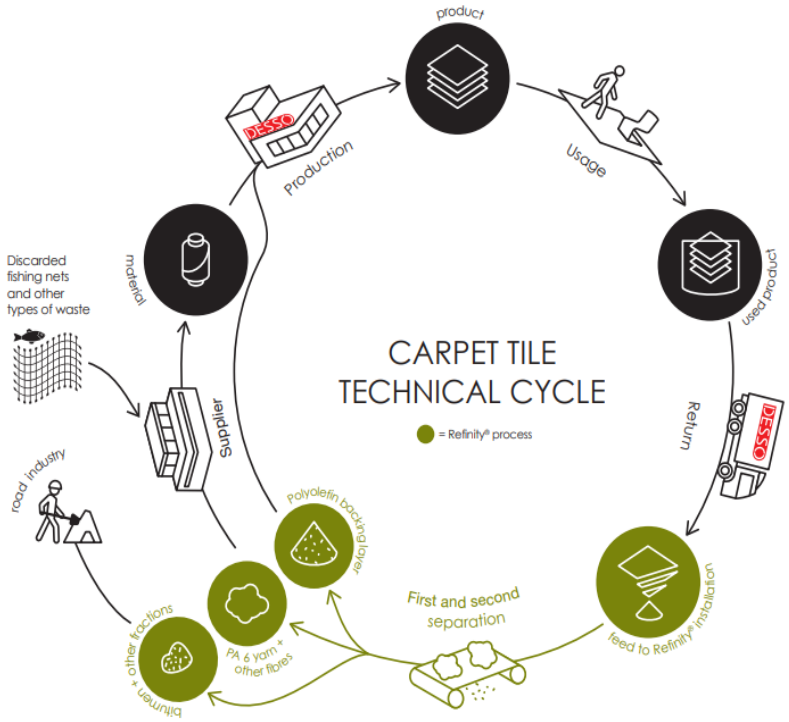
This produces two main material streams which can then be recycled.

Recycling

After an additional purification stage, the PA 6 yarn (with the required purity) is returned to the yarn manufacturers for production of new yarn.

Bitumen backing is recycled as a valuable raw material for the road and roofing industry.

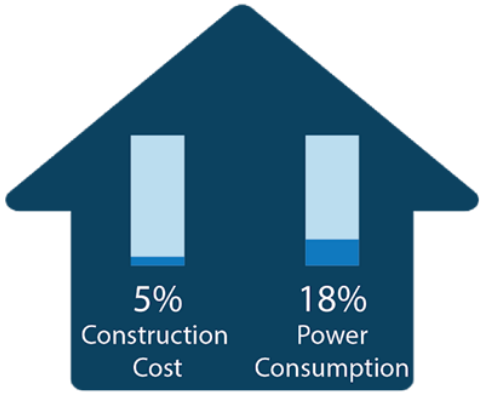
The polyolefin based layer of the DESSO EcoBase® backing is fully recyclable in Desso's production process



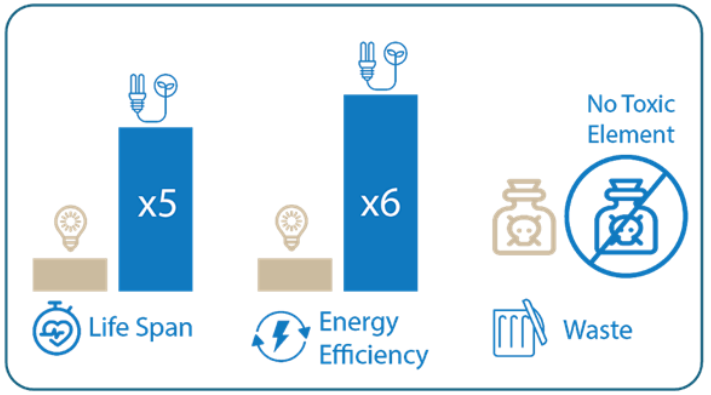
All non-recyclable fractions will be used as secondary fuel in the cement industry.

❸ What is your vision of material efficiency in the future?

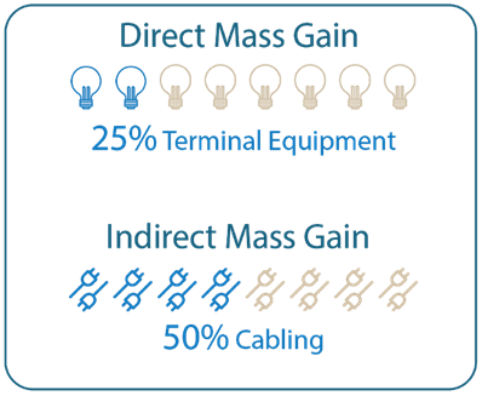
LED lighting: a technological and efficiency breakthrough



The cost of Lighting



LED vs Discharge Lamps



Gains

RENAULT LED Program: switch to LED lighting

Include adaptive LED system

New Buildings

Renovation program financed by energy savings

Europe done, other country planned

Old Buildings

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❸ What is your vision of material efficiency in the future?

STEEL

Still 7% increase in 2018 in France for a volume of 766 000t

Running Project :
Industrial building (stamping) in Romania = 375t of steel to welcome 2 big cranes of 63t and 50t.

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❸ What is your vision of material efficiency in the future?

WOOD CONSTRUCTION

Representing about 8% of market share in France, wood construction is a growing alternative for big construction

- As a combination to concrete and steel in order to increase environmental performance

❸ What is your vision of material efficiency in the future?

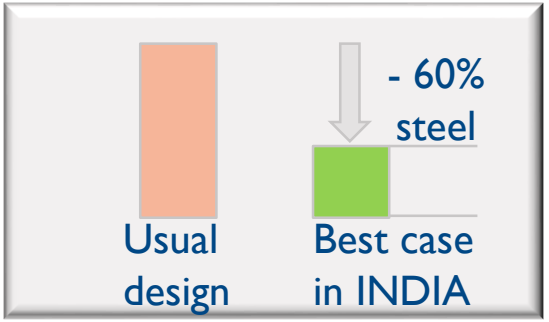
HOT COUNTRY BUILDING

20 328 sqm

Natural ventilation

Steel structure saving :

Optimized design, 3 walls structure, no hanging.



❸ What is your vision of material efficiency in the future?

- Do you see increasing batteries second usage in building ? Which needs for what customers ?

B2B, using Kangoo EV batteries for building, e.g. AMPERE at La Défense near of Paris,

- To reduce power grid by self consuming of energy and power (approx. 112 kWh), w/o renewable energy
- To cut off invoice from reducing power subscription
- To correct characteristics of tension for industrial demands

B2C, using batteries for housing, partnership Powervault with scaling of the capacity units,

- To reduce power grid by self consuming of energy and power (by a few kWh),
- To cut off invoice from reducing individual power subscription

EV internal Renault source

Translation of KPI to Real Estate ongoing process

UTILISER MOINS	KPI ➔ poids des déchets	= total bon de pesée par catégorie de déchet
	KPI ➔ % de matériaux recyclable	= total de matériaux recyclable utilisé par catégorie
	KPI ➔ % de matériaux recyclé utilisé	= % dans le total utilisé par catégorie
	KPI ➔ consommation Energie de l'ouvrage	= total consommé par Energie/prévision conso
UTILISER PLUS LONGTEMPS	KPI ➔ durée de vie de l'ouvrage	= durée programmée avant rénovation/durée de vie
	KPI ➔ prix de revente (valeur marché)	= cout ouvrage par m²/px m² marché au moment du PV
UTILISER PERTIENT	KPI ➔ utilisation global de l'ouvrage	= t utilisation/temps disponibilité
	KPI ➔ apport naturel vs destination	= lumière en kw+(chaud et froid) en kw/besoin en kw
	KPI ➔ performance ouvrage vs destination	= % de satisfaction

Arthur D Little