JOURNÉE TECHNIQUE

Batteries : comment les recycler ou leur donner une seconde vie ?

ENVIRONMENTAL ASSESSMENT OF EV BATTERIES SOME DATA AND IMPROVMENT POSSIBILITIES

Stéphane MOREL, *RENAULT*

www.jt-batteries.record-net.org

21 MAI 2019
PARIS

ENVIRONMENTAL ASSESSMENT OF EV BATTERIES
SOME DATA AND IMPROVMENT POSSIBILITIES

MAISON DE LA RATP, PARIS – May 21st 2019

STÉPHANE MOREL - Senior Specialist Material Eco-Efficiency & Strategy
VIOLAINE POULAIN – Specialist Life Cycle Assesment

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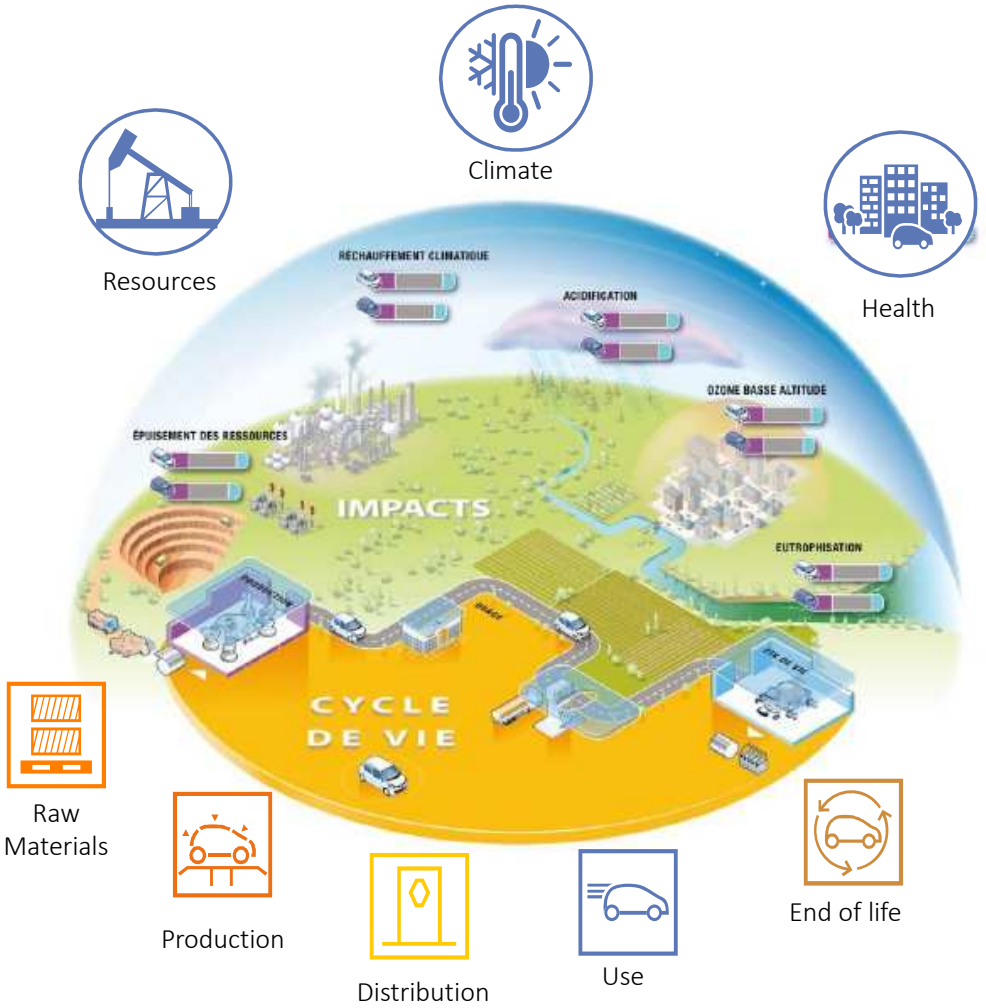
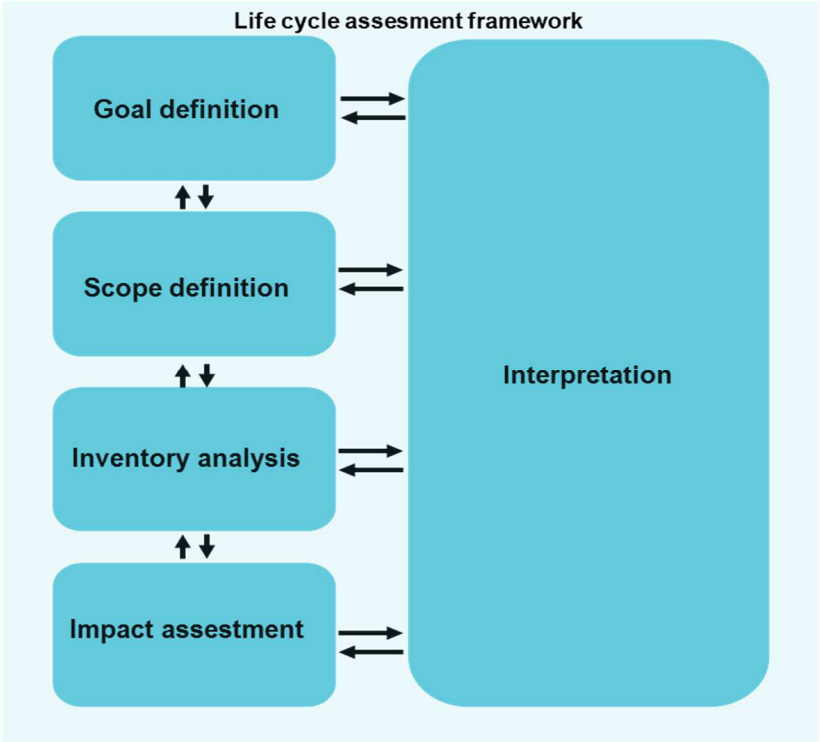
PRODUCT LIFE CYCLE ASSESMENT



ISO 14044:2006 Preview

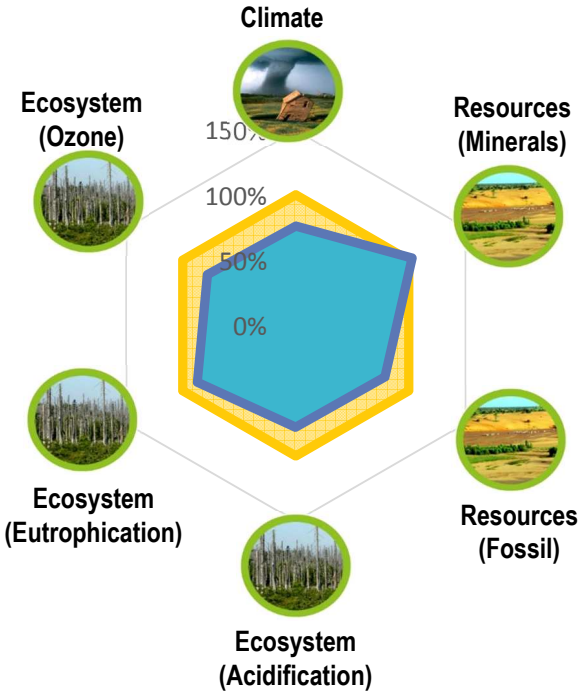
Environmental management -- Life cycle assessment -- Requirements and guidelines



SINCE 2005 … MAJOR USAGES OF LIFE CYCLE ASSESSMENT

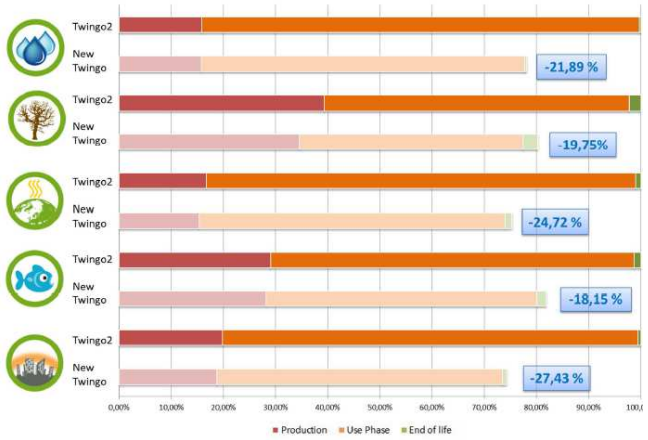
NEW TECHNOLOGIES

Environmental orientation



PRODUCT IMPROVMENT

Vehicle performance



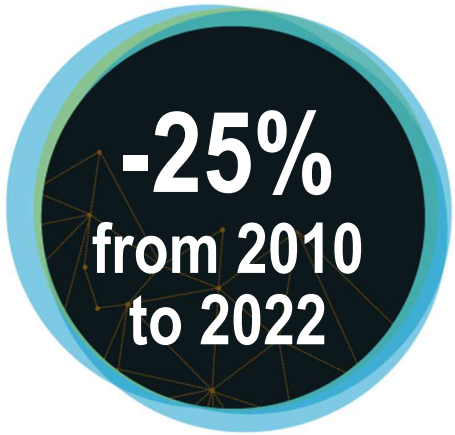
CARBON FOOTPRINT

KPI Group 2010-2022

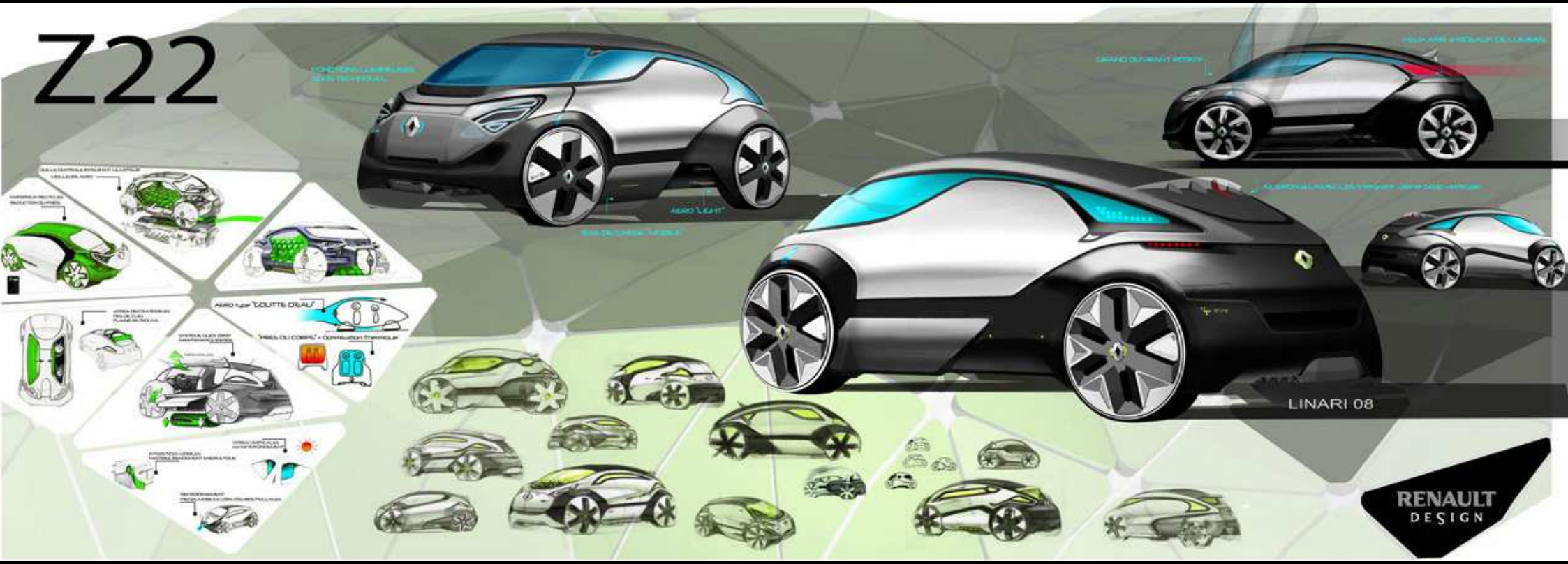
Climate

DRIVE THE CHANGE

DRIVE THE FUTURE



NEW CHALLENGE, AN INNOVATIVE PRODUCT …



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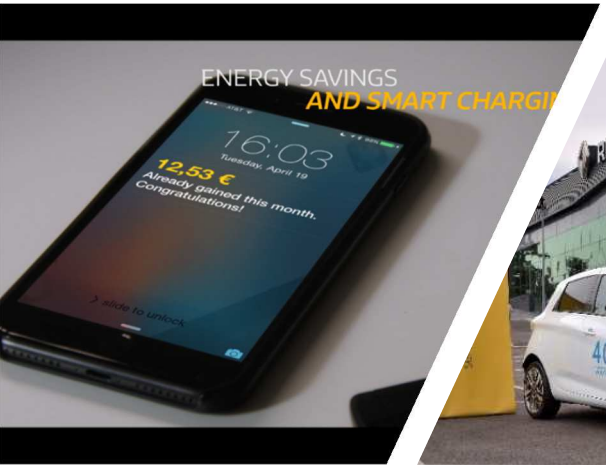
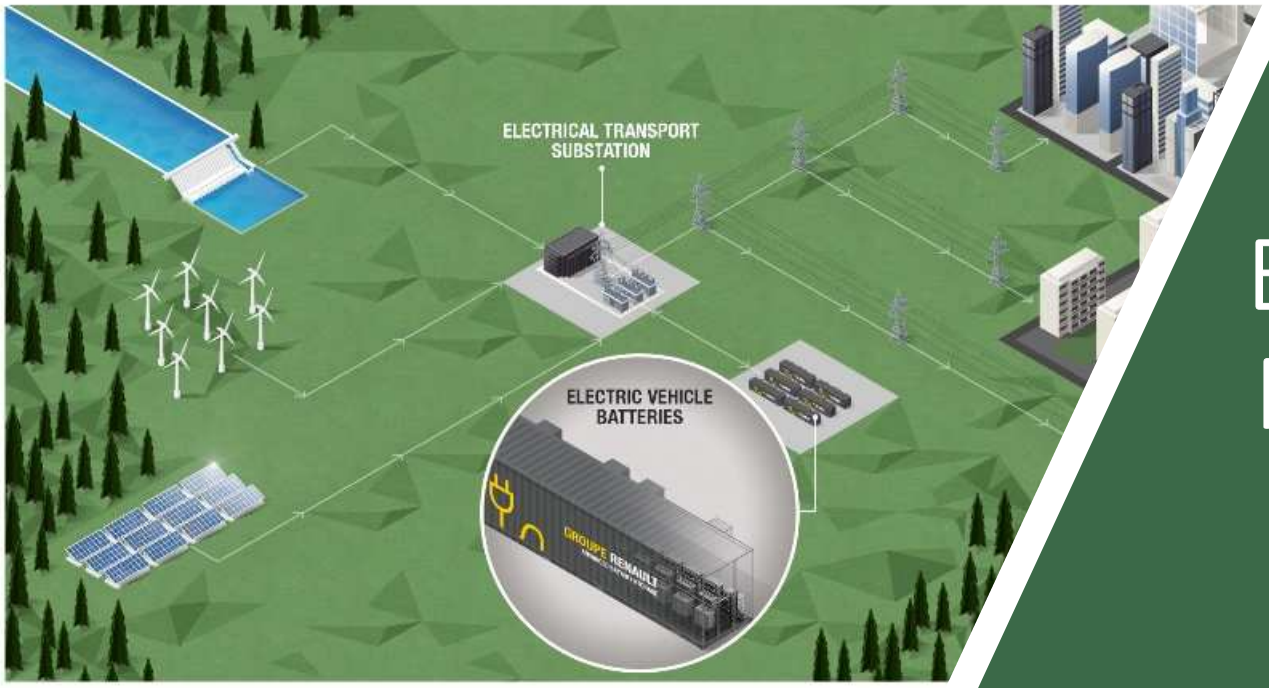




ELECTRIC VEHICLES, MUCH MORE THAN A VEHICLE

END OF LIFE BATTERIES IMPACT

IMPACT OF BATTERIES PRODUCTION – ELECTRIC VEHICLE LCA

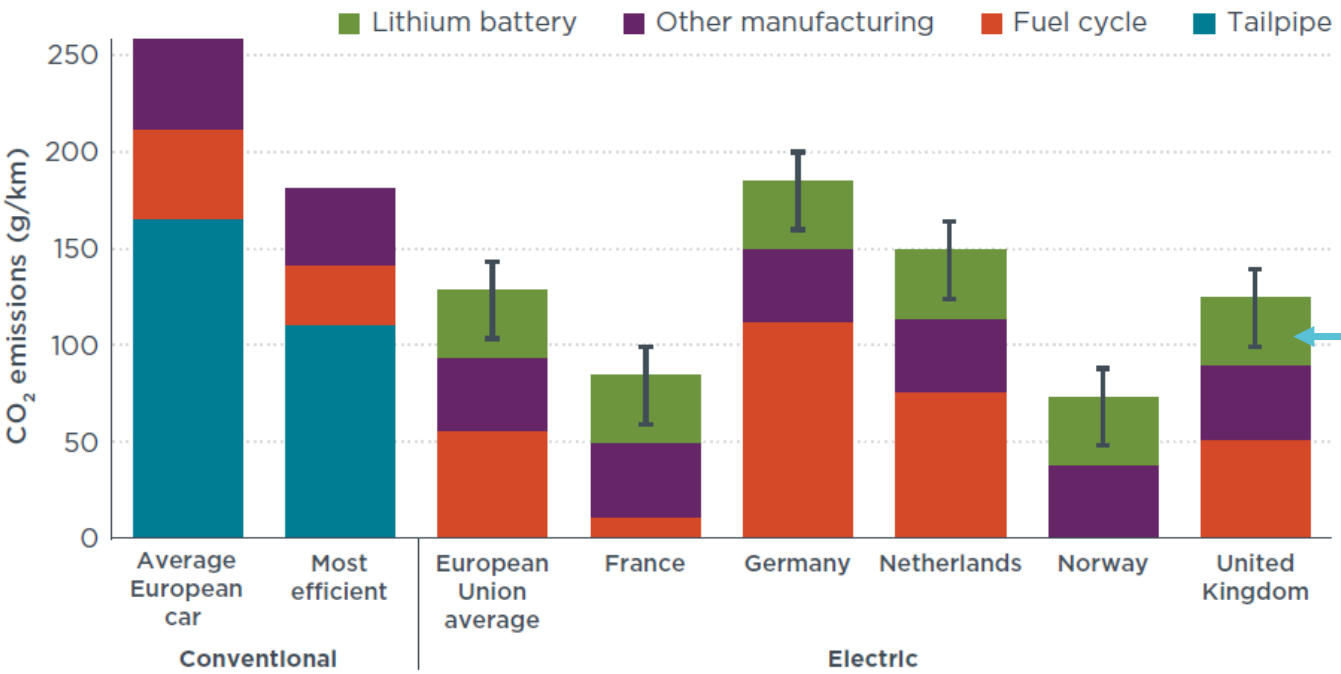
www.theicct.org

icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

BRIEFING

FEBRUARY 2018

EFFECTS OF BATTERY MANUFACTURING ON ELECTRIC VEHICLE LIFECYCLE EMISSIONS



Effects of battery manufacturing on electric vehicle life-cycle greenhouse gas emissions

Figure 1. Life-cycle emissions (over 150,000 km) of electric and conventional vehicles in Europe

- In France battery manufacturing represents 40% CO_2 emission of EV LCA

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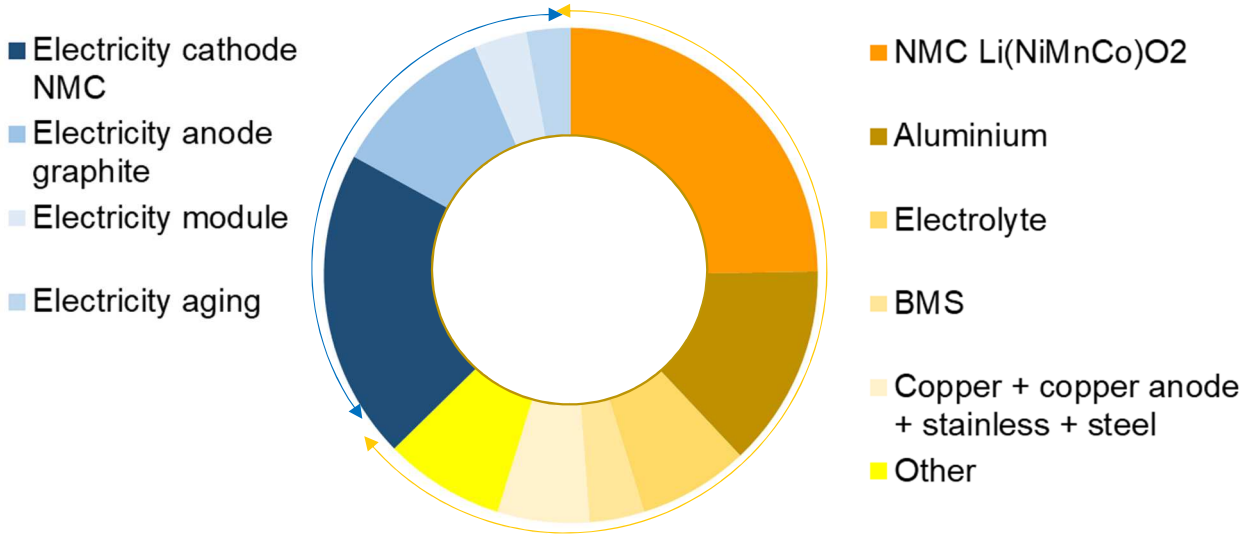
END OF LIFE BATTERIES IMPACT

IMPACT OF BATTERIES PRODUCTION – ORIGIN OF CO2 EMISSIONS

Battery Origin of CO_2-eq (Production)

37 %

CO_2 emissions from electricity - *current sourcing*



63 %

CO_2 emissions from materials extraction and refinement

Prod->NMC, Cells & modules manufacturing & assembly in KR, Pack assembly in FR
Gabi software calculations

- 37% Battery manufacturing CO_2 emission depend on country elec mix
- 24% Battery manufacturing CO_2 emission based on NMC& Li extraction & refinement

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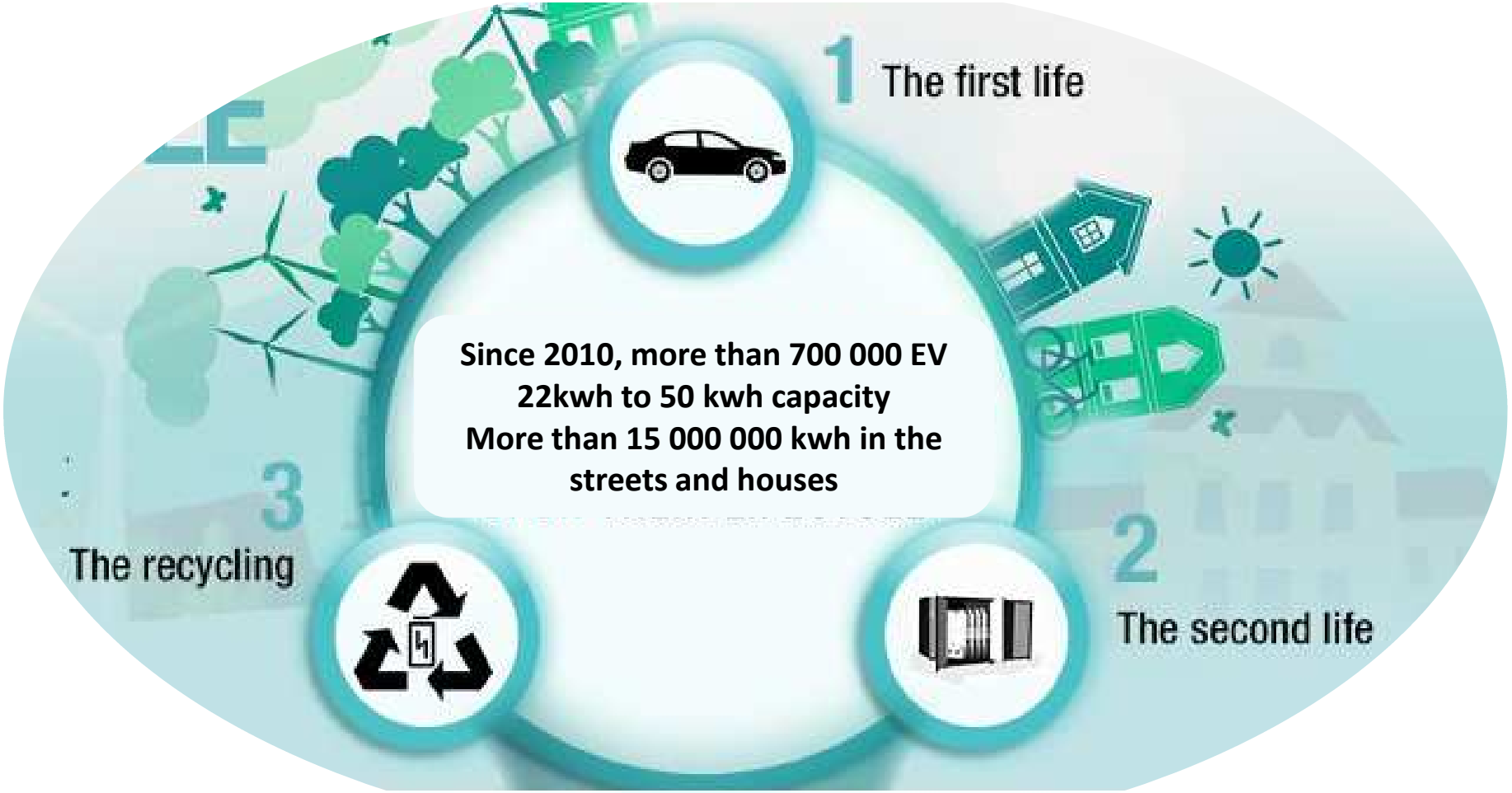
IMPACT OF BATTERIES – AFTER SERVICE IN A CAR



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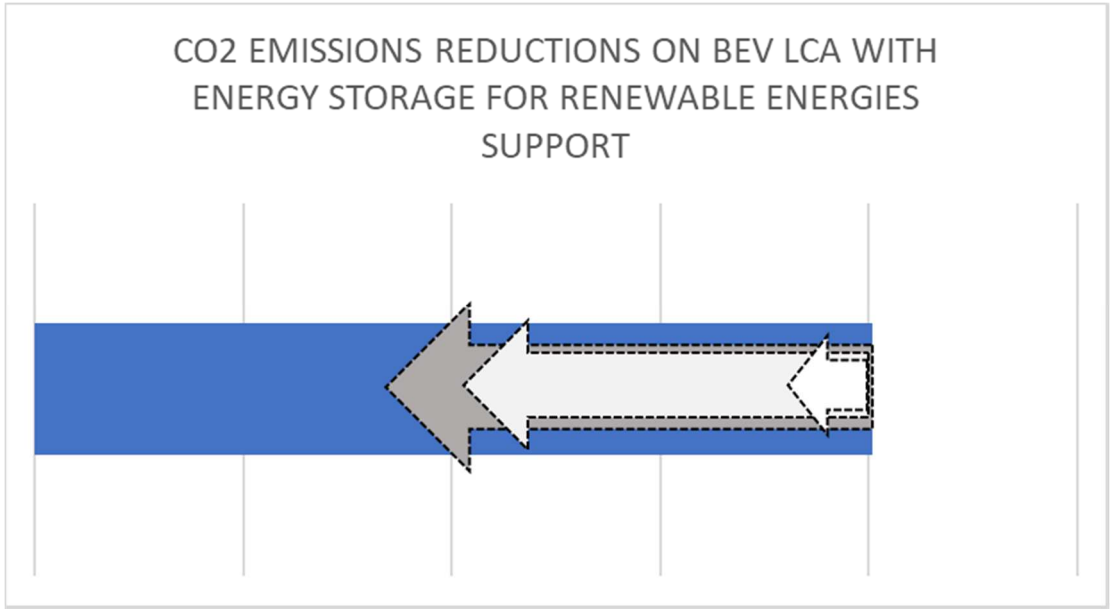
END OF LIFE BATTERIES IMPACT

BENEFITS OF BATTERIES VEHICLE TO GRID – SUPPORT RENEWABLE ENERGY DEVELOPMENT

1 The first life

- The use of BEV as storage (V2G, SC & Second life) will support the development of renewable energies



Estimation of CO2 reduction for electricity production on an island with 36%, 50% & 60% renewable electricity production

- With renewable energies, V2G, SC & 2nde life can reduce electricity carbon intensity (results geographicaly changing)

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2

The second life

Multiple applications in LCA: methodology, and case study on batteries with a second life

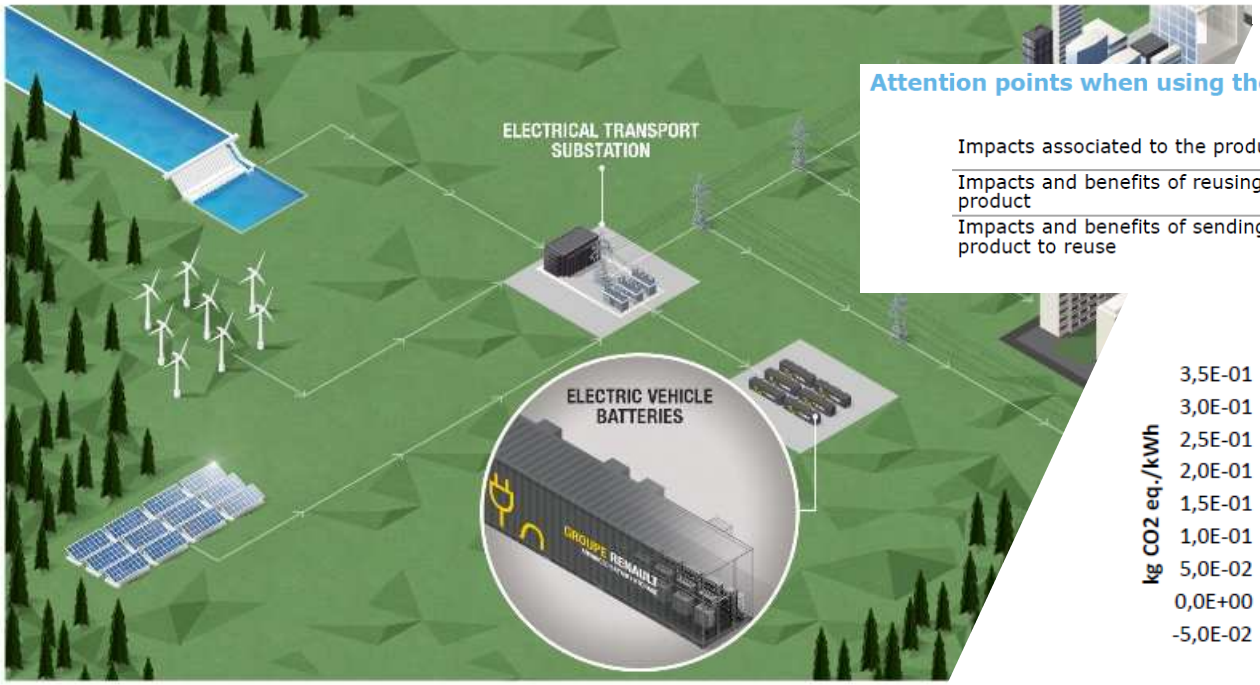
March 21, 2019

Deloitte.

gingkO 21

SCORE LCA

ADVANCED BATTERY STORAGE

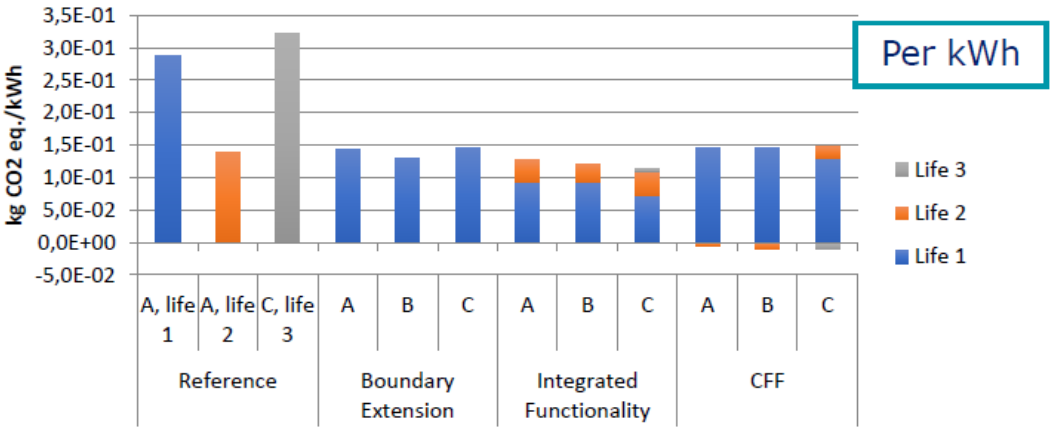


Attention points when using the CFF for product loops

Impacts associated to the product	$(1- R_1)\ E_V + R_1 \times E_{reused}$
Impacts and benefits of reusing a product	$-(1 - A)\ R_1 \times (E_{reused} - E_V \times Q_{Sin}/Q_p)$
Impacts and benefits of sending a product to reuse	$+(1 - A)\ R_2 \times (E_{reuslingEol} - E^*_V \times Q_{Sout}/Q_p)$

- Allocation factor between upstream and downstream
- Reuse rate
- Remanufacturing LCI
- "New" product LCI
- LCI of substituted product
- Quality factor

NMC battery - Global Warming Potential



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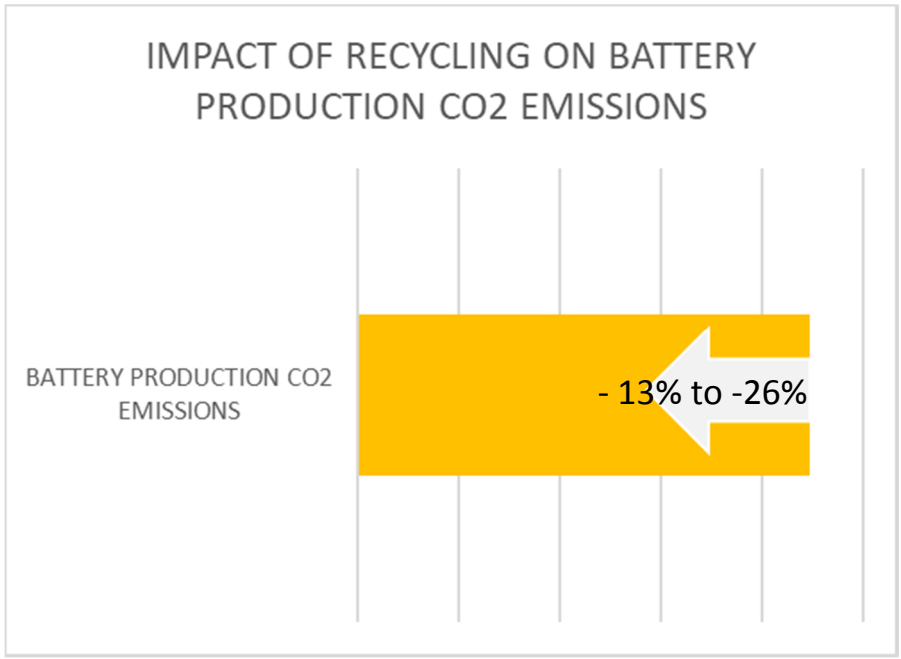
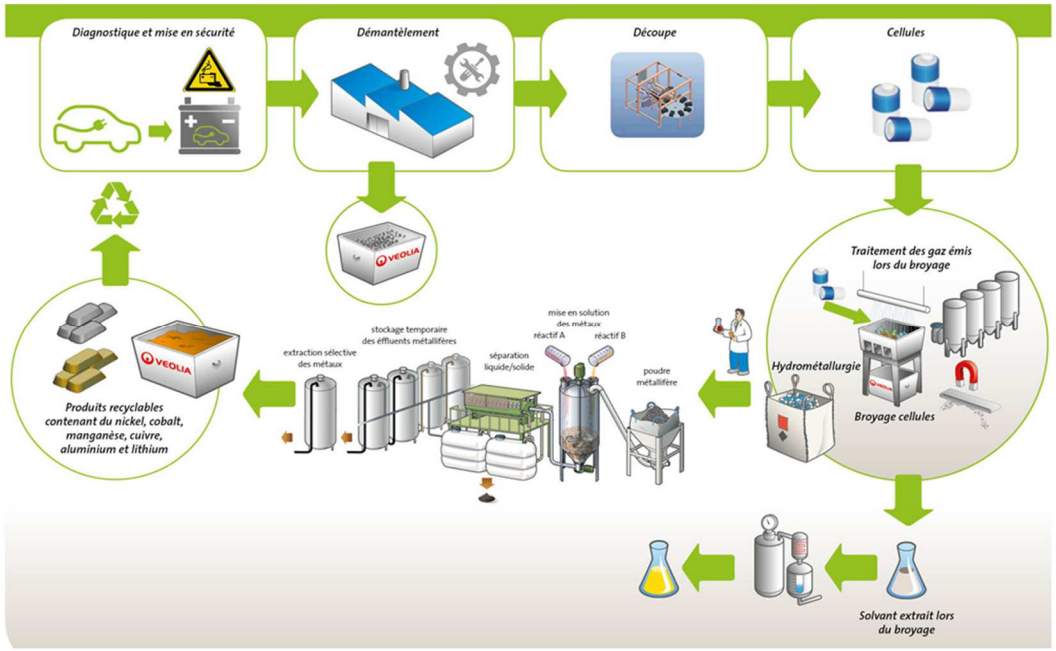
END OF LIFE BATTERIES IMPACT

BENEFITS OF BATTERIES RECYCLING





- - 13% of CO_2 emission of battery manufacturing with recycling incl. CFF formula; (Renault, VEOLIA, Gingko21)
- -26% of CO_2 emission of battery manufacturing with recycling (« Les enjeux du développement de l'électromobilité pour le système électrique » RTE and l'Avere, mai 2019)

HOW TO IMPROVE THOSE ASSESSMENTS ?

COLLECT ENERGY DATA FROM CELL FACILITIES

COLLECT LOCAL DATA FOR MATERIAL PRODUCTION

COLLECT CO2 DATA FROM RECYCLING FACILITIES

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HOW TO IMPROVE THOSE ASSESSMENTS ?

INCLUDE THE EFFECT OF LITHIUM AND MANGANESE RECYCLING

INCLUDE EFFECT OF BATTERY ECODESIGN AND « SECOND LIFE READY DESIGN »

CREATE ROBUST AND SHARED CALCULATION METHOD eg. SCORELCA

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TAKE HOME MESSAGES

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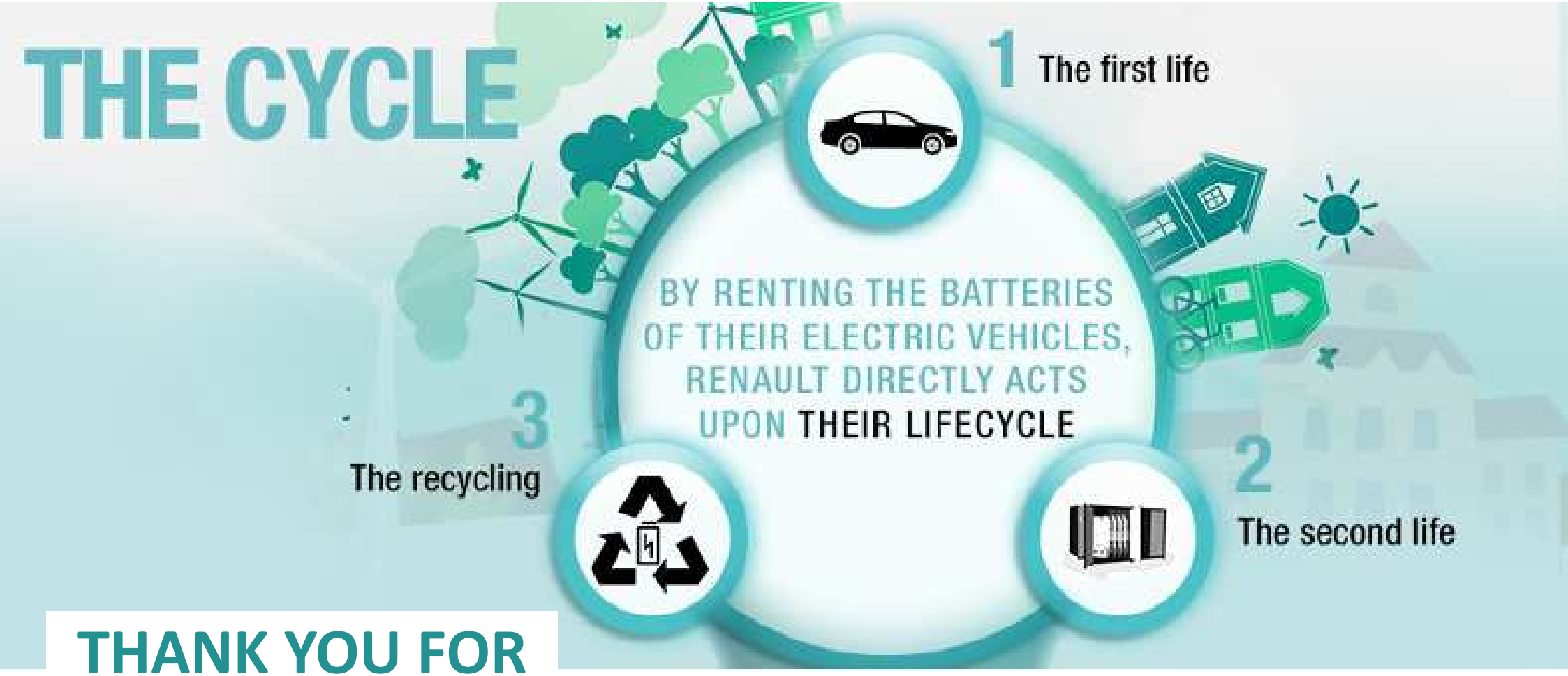

THANK YOU FOR YOUR ATTENTION

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| 21 mai 2019 | Paris

ADEME
Agence de l'Environnement et de la Maîtrise de l'Energie

RECORD