

TIME Integrated Technology for Electric Mobility

E-Rmes Emilia-Romagna mobilità
elettrica sostenibile



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PROJECT OUTLINE

ACTIVITY

Development of integrated technologies for the powertrain of electric road vehicle

APPLICATION

Retrofit of used vehicles by implementing a full electrification of the traction system

MAIN RESULT

Design of component and subsystem and systems for:

- complete electric powertrain
- vehicle elements interacting with the powertrain

Retrofit procedure

TARGET

Full performance, long range, low cost EV

FIRST OBJECTIVE

M1 segment A vehicles (compact cars)

FUTURE OBJECTIVE

M1 segment B , 2.2t N1 vehicles



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RETROFIT CONCEPT

Used thermal engine car



- close to end-of-life
- outdated technology
- high emission
- high maintenance cost
- **LOW RESIDUAL VALUE**

TRANSFORMATION



Engine removal
Chassis modification
Installation of new components



renewed electric car



- life extended
- advanced technology
- zero emission
- near-to-zero maintenance
- **LOW COST EV**

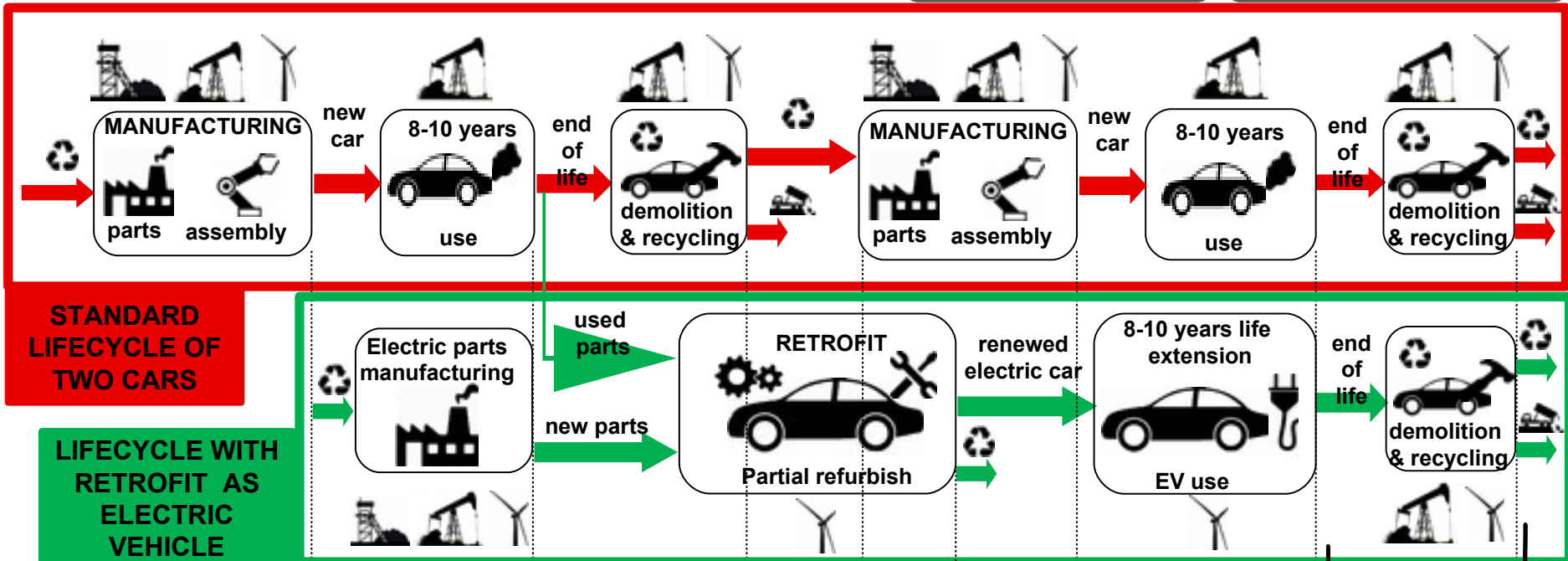
- **COMPONENT and PROCEDURE must be homologated by transportation authorities. Now possible in few EU Countries (Italy,...).**
- **TRANSFORMATION must be realized by authorized workshops.**





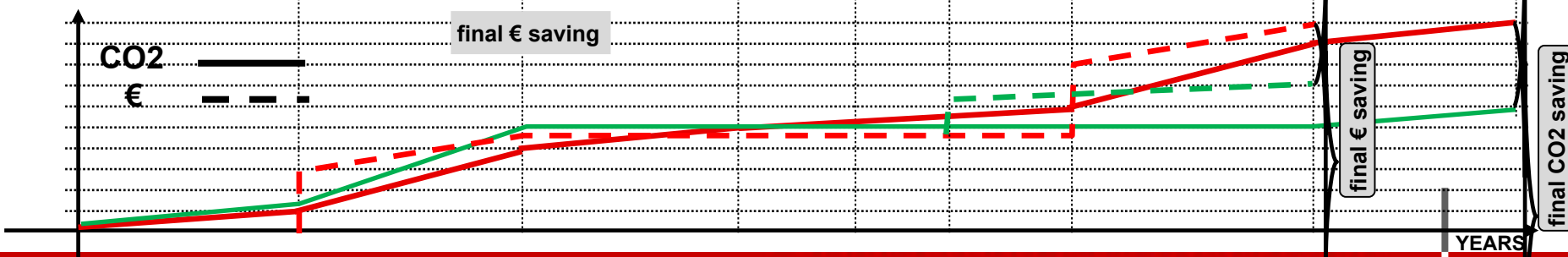
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RETROFIT AND CIRCULAR ECONOMY



STANDARD LIFECYCLE OF TWO CARS

LIFECYCLE WITH RETROFIT AS ELECTRIC VEHICLE

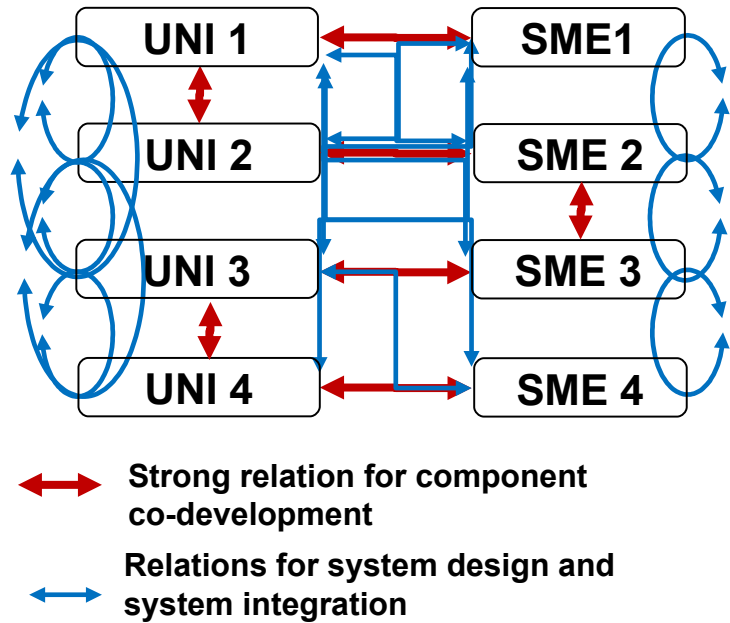




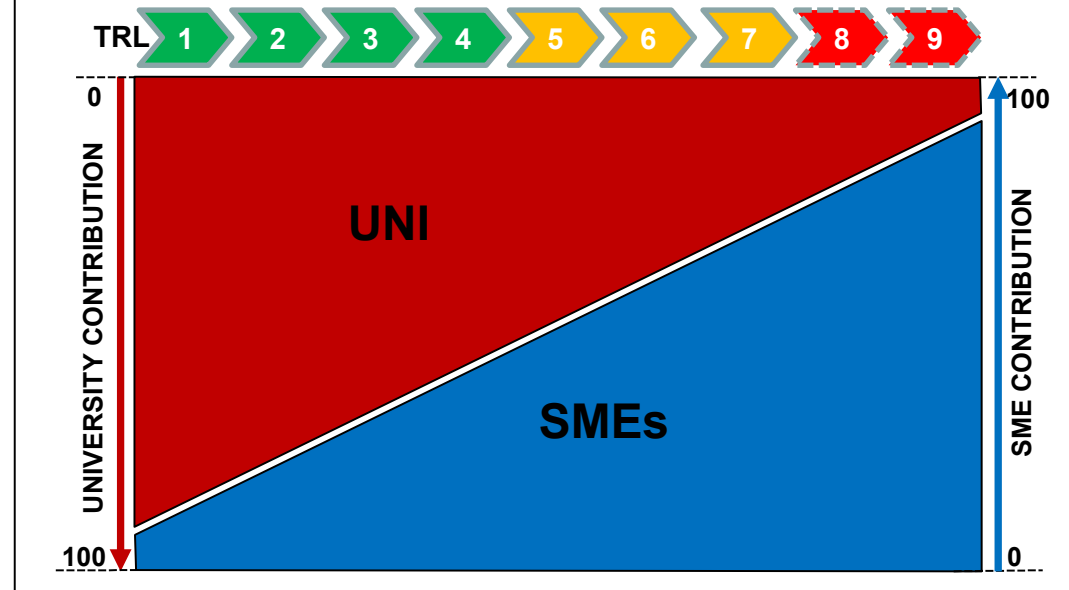
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TIME FRAMEWORK - DEVELOPMENT STAGE

RELATIONS



CONTRIBUTION TO THE TECHNOLOGY DEVELOPMENT



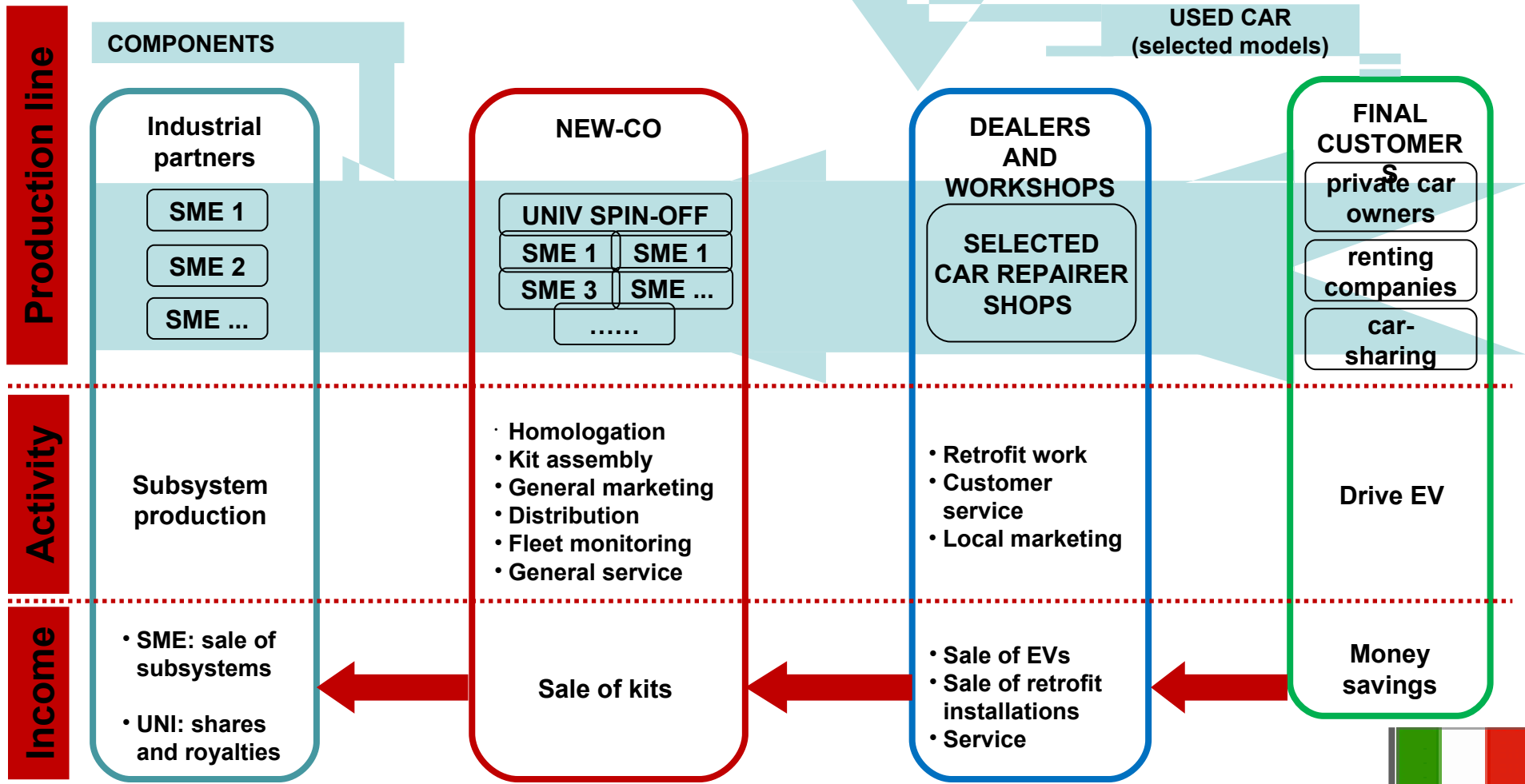
- **UNI:** University group
- **SME:** Small Medium Enterprise (industrial partner)
- **TRL:** Technology Readiness Level (1: basic concept;..... 9: ready for production)





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TIME FRAMEWORK - COMMERCIAL STAGE





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Project phases

DEVELOPMENT ACTIVITY	COMPETENCE	LEVEL	STAGE
<ul style="list-style-type: none">Single components (inverter, BMS, VCU, ecc..)Integration of powertrain componentsComponents dedicated to powertrain integrationPowertrain safety	<ul style="list-style-type: none">Power electronics, electrical machines and drives	COMPONENT	2014-2015 PAST
<ul style="list-style-type: none">Termofluidodynamic integration of powertrainMechanical integration of powertrain componentsPowertrain-vehicle electrical integrationPowertrain-vehicle mechanical integrationPowertrain HMIVTI	<p>.....plus:</p> <ul style="list-style-type: none">Structural mechanics,TermofluidodynamicsEmbedded electronicsInformatics,TLC	SYSTEM	2016 PRESENT
<ul style="list-style-type: none">ESCHVAC powertrain-integrationHMI infotainment-powertrain integrationVTI appsStyle design	<p>.....plus:</p> <ul style="list-style-type: none">Vehicle dynamicsApplied physicsAdvanced ICTStylists	COMPLEX SYSTEM	2017 FUTURE



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1st PROJECT OUTCOME

Base vehicle	FIAT Panda model 169
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SPECIFICATION	UNIT	VALUE
Rated motor power	[kW]	12.0
Max. motor power	[kW]	24.0
Stored energy	[kWh]	16.4
On board battery charger power	[kW]	2.2
Recharge standard		IEC 61851 Mode 3-A
Max recharge time 0 to 100%	[h]	8
Number of passengers		4
Mass in running order	[kg]	950
Dashboard	7" color touch screen	
Web interface	for powertrain monitoring and remote service	

PERFORMANCE	UNIT	VALUE
Max speed	[km/h]	108
Max. acceleration	[g]	0.37
Acceleration time 0-10km/h	[s]	0.82
Acceleration time 0-30km/h	[s]	2.9
Acceleration time 0-50km/h	[s]	6.1
Acceleration time 0-90km/h	[s]	22
Acceleration time 0-100 m	[s]	9.3
Acceleration time 0-500 m	[s]	26.7
Max. slope	[%]	35
Continuous slope at 30km/h	[%]	8
Max. pulling force	[N]	4350
Energy consumption on Artemis urban driving cycle	[Wh/km]	90
Range on Artemis urban driving cycle	[km]	190





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DEI - LEMAD

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