



INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
STRASBOURG

VEHICLE

Improvement of energy storage systems for electric vehicles

INSA Strasbourg

April 22nd, 2021

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OVERVIEW

VEHICLE : Hybridisierung von Lithium-Ionen-Akkus mit Superkondensator: Ein Ansatz für den Betrieb von Reluktanzmotoren in Fahrzeugantrieben

VERBESSERUNG DER ENERGIESPEICHERSYSTEME FÜR ELEKTROFAHRZEUGE

VEHICLE : Source de stockage hybride batterie Li-ion / supercondensateurs avec une machine synchrone à réluctance variable pour les véhicules électriques

PERFECTIONNEMENT DES SYSTÈMES DE STOCKAGE D'ÉNERGIE DES VÉHICULES ÉLECTRIQUES



Trier University
of Applied Sciences

H O C H
S C H U L E
T R I E R



Dépasser les frontières :
projet après projet
Der Oberrhein wächst zusammen,
mit jedem Projekt

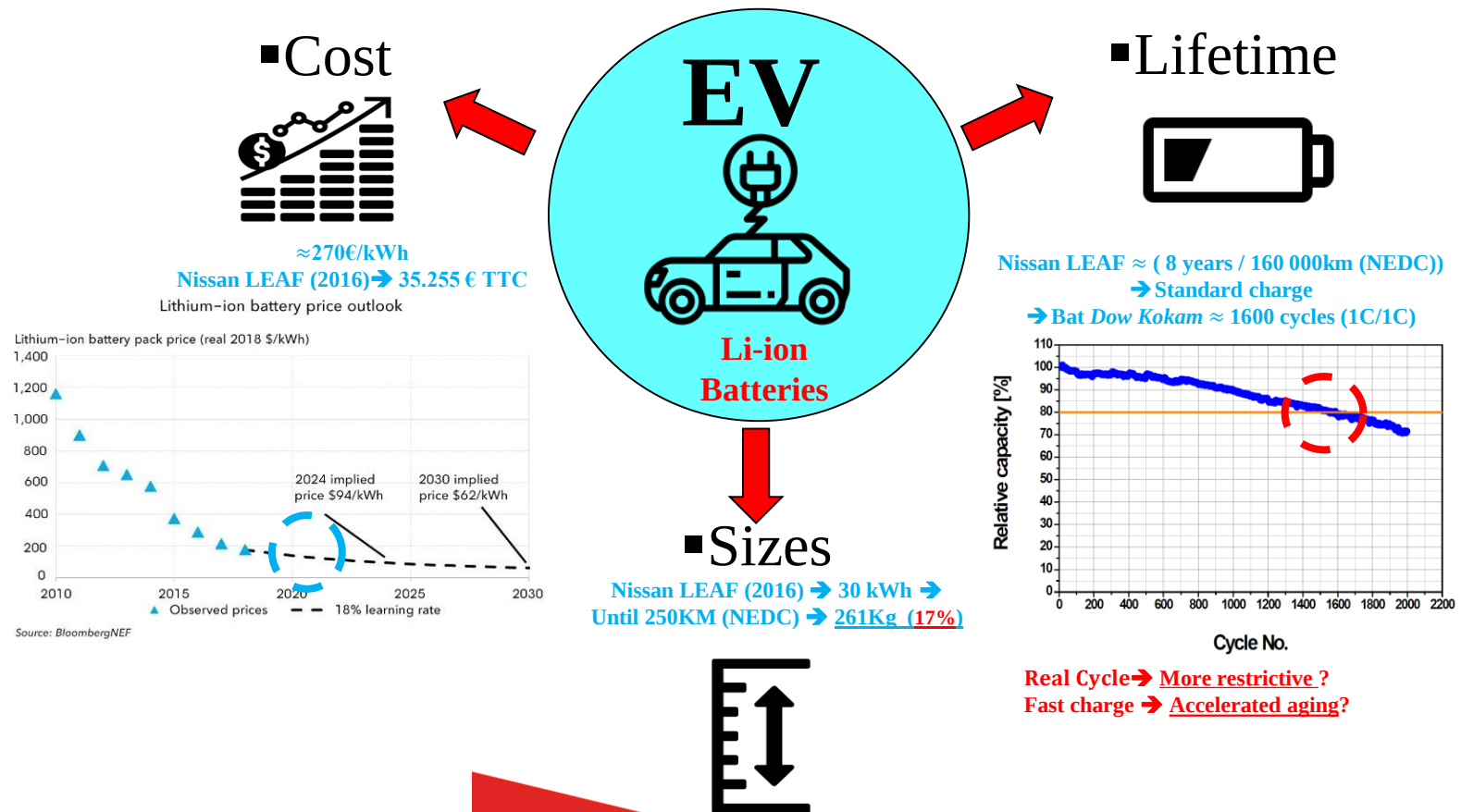


Fonds européen de développement
régional (FEDER)
Europäischer Fonds für regionale
Entwicklung (EFRE)

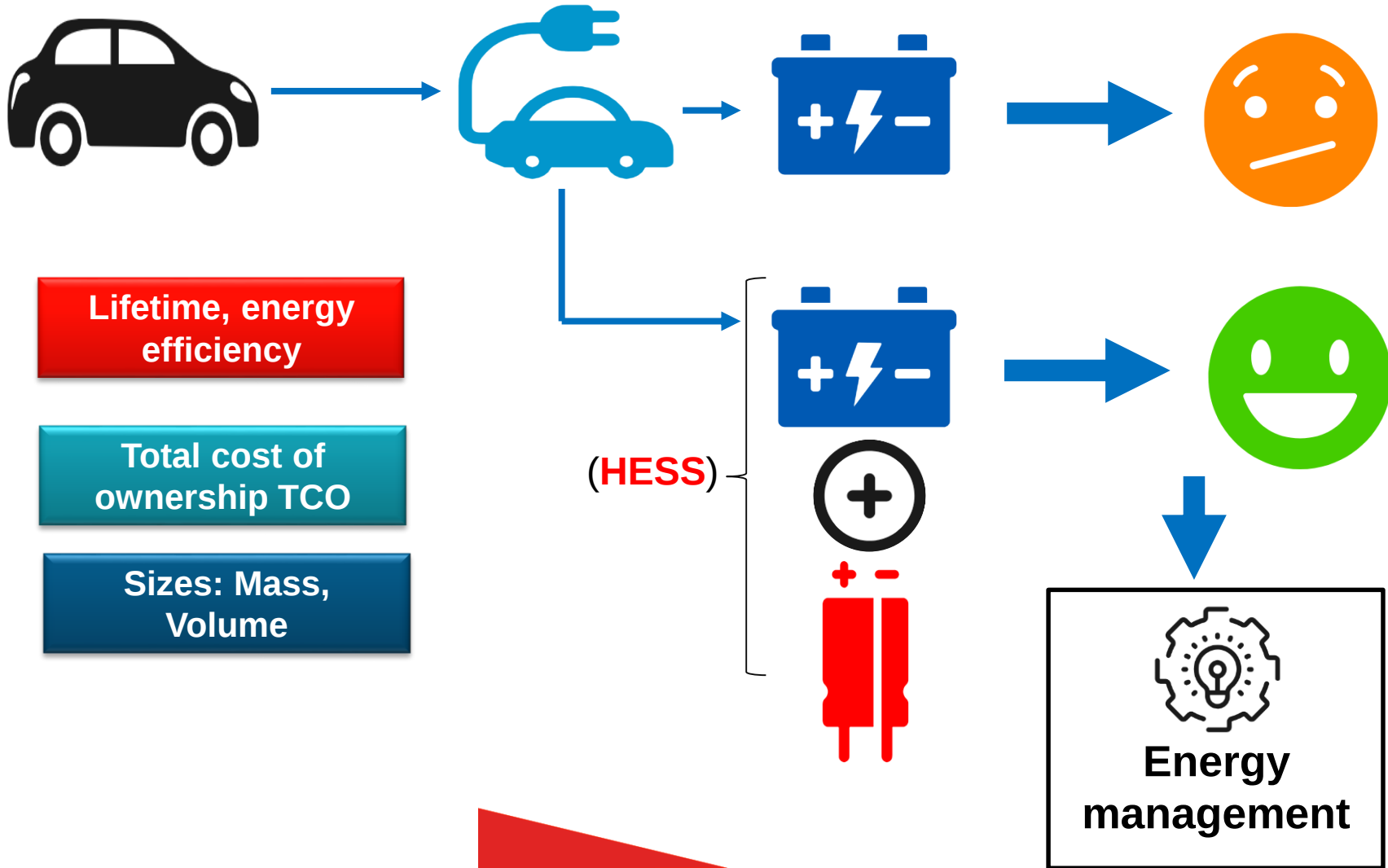


SCIENTIFIC ISSUE

ENERGY STORAGE SYSTEM: THE **WEAKEST LINK**

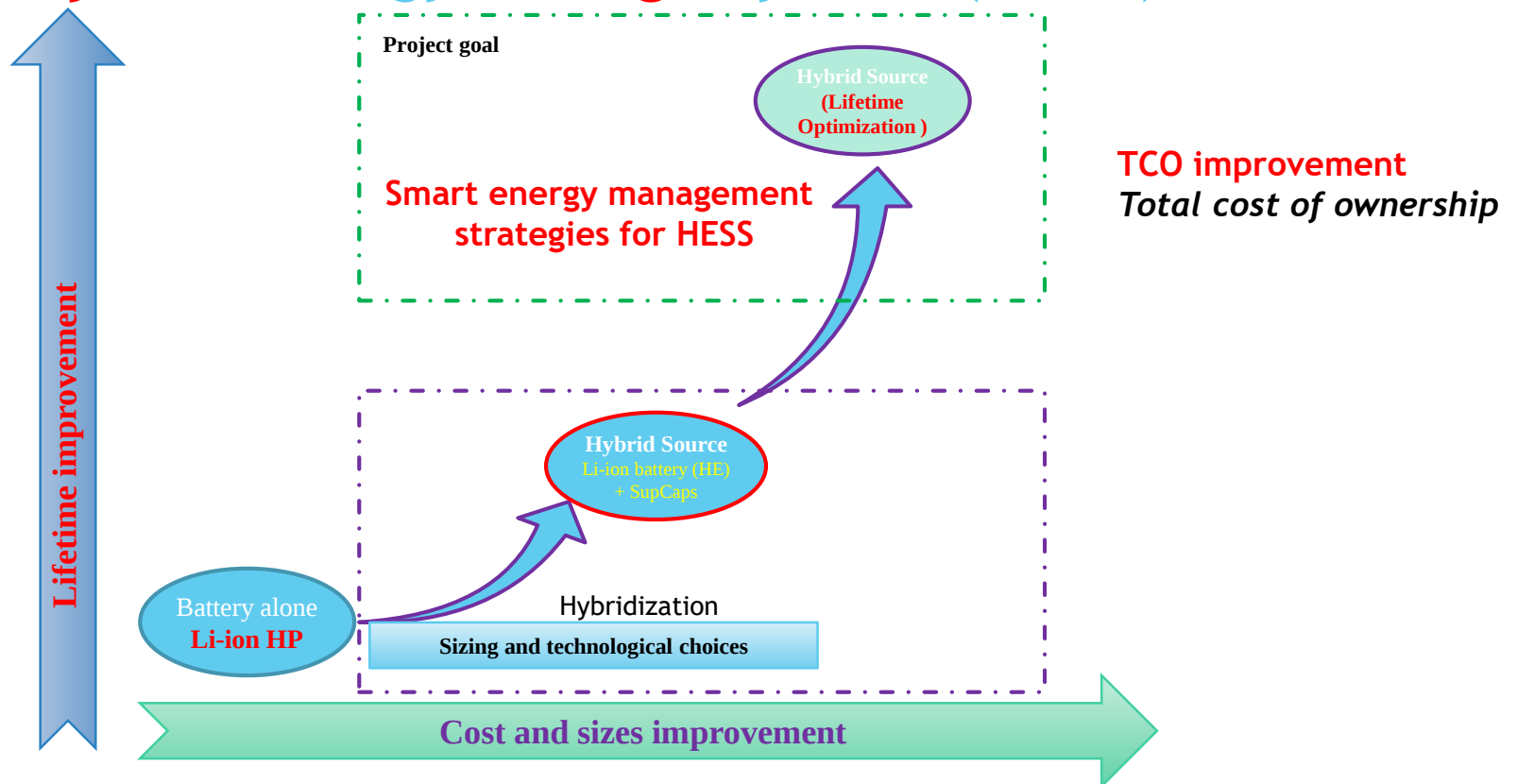


SCIENTIFIC ISSUE



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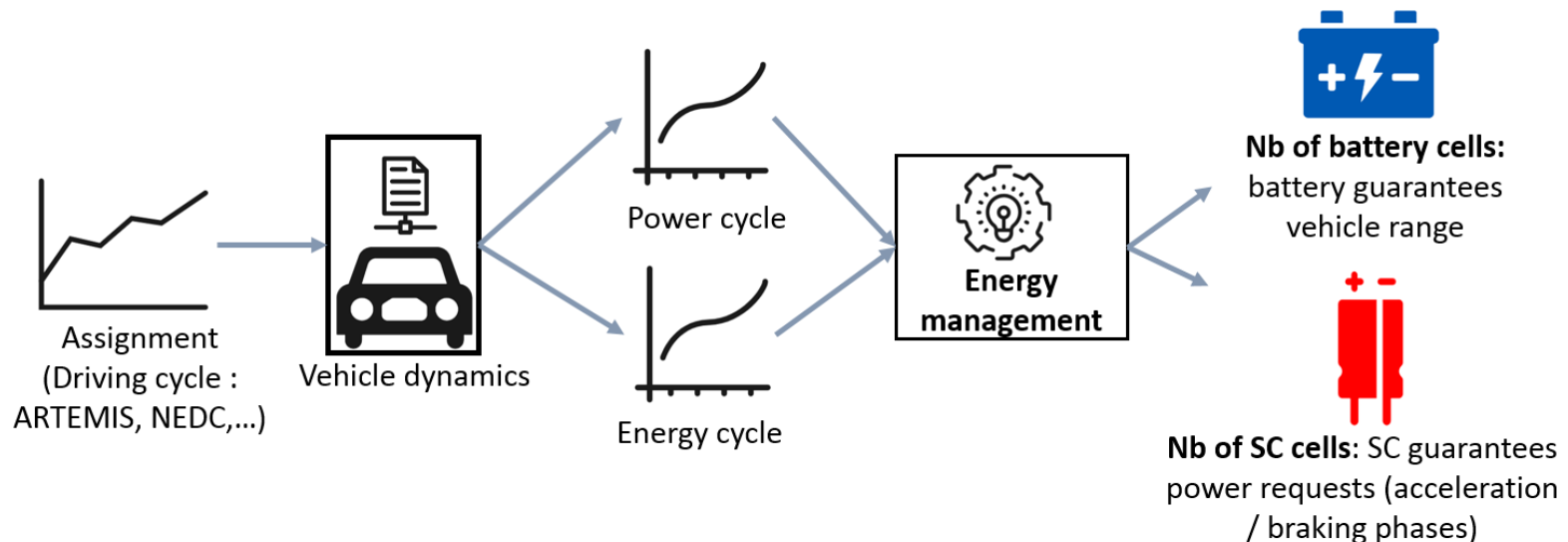
Hybrid energy storage system (HESS)



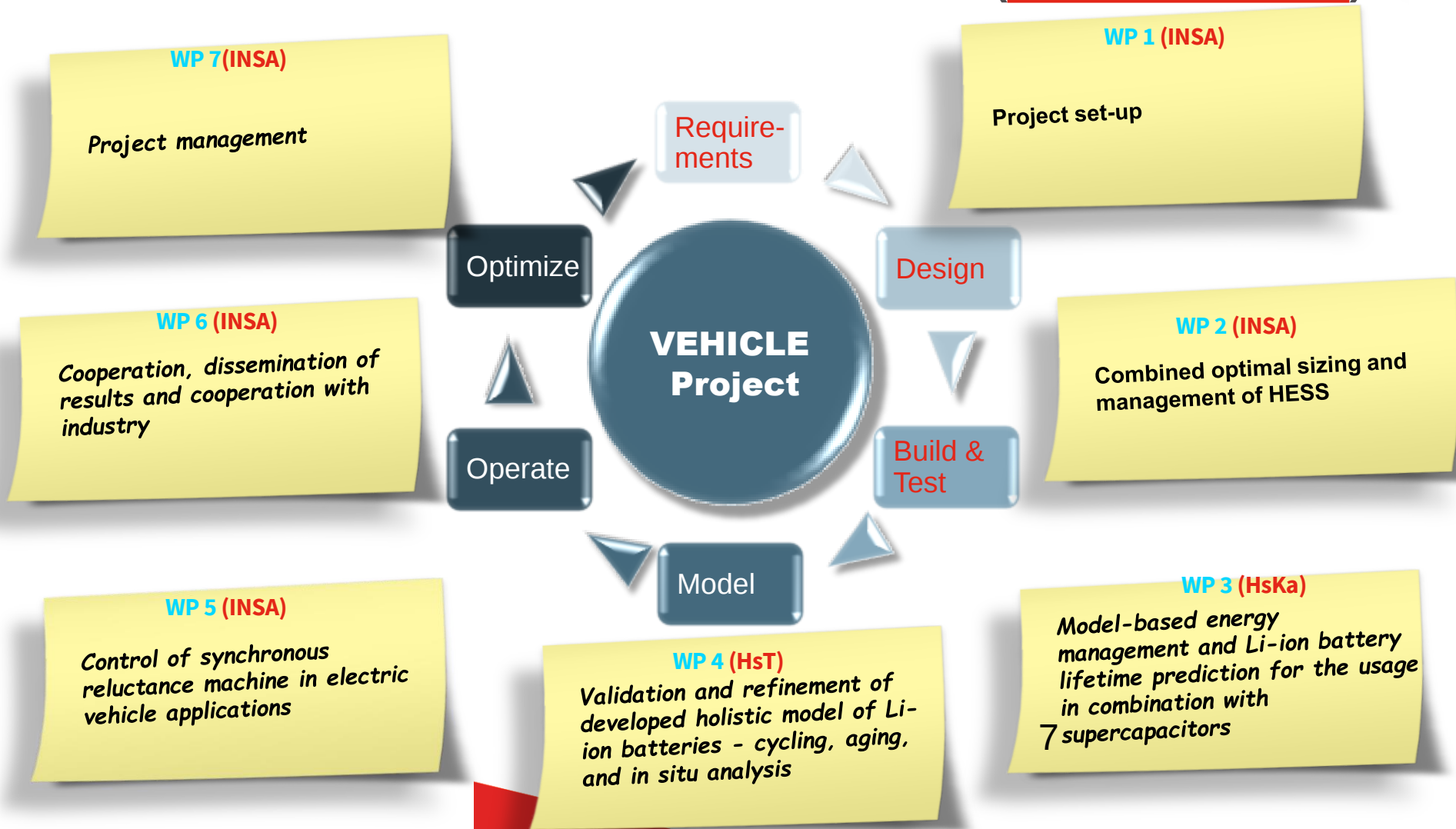
SCIENTIFIC APPROACH

HESS sizing , multiphysics modelling & intelligent energy management

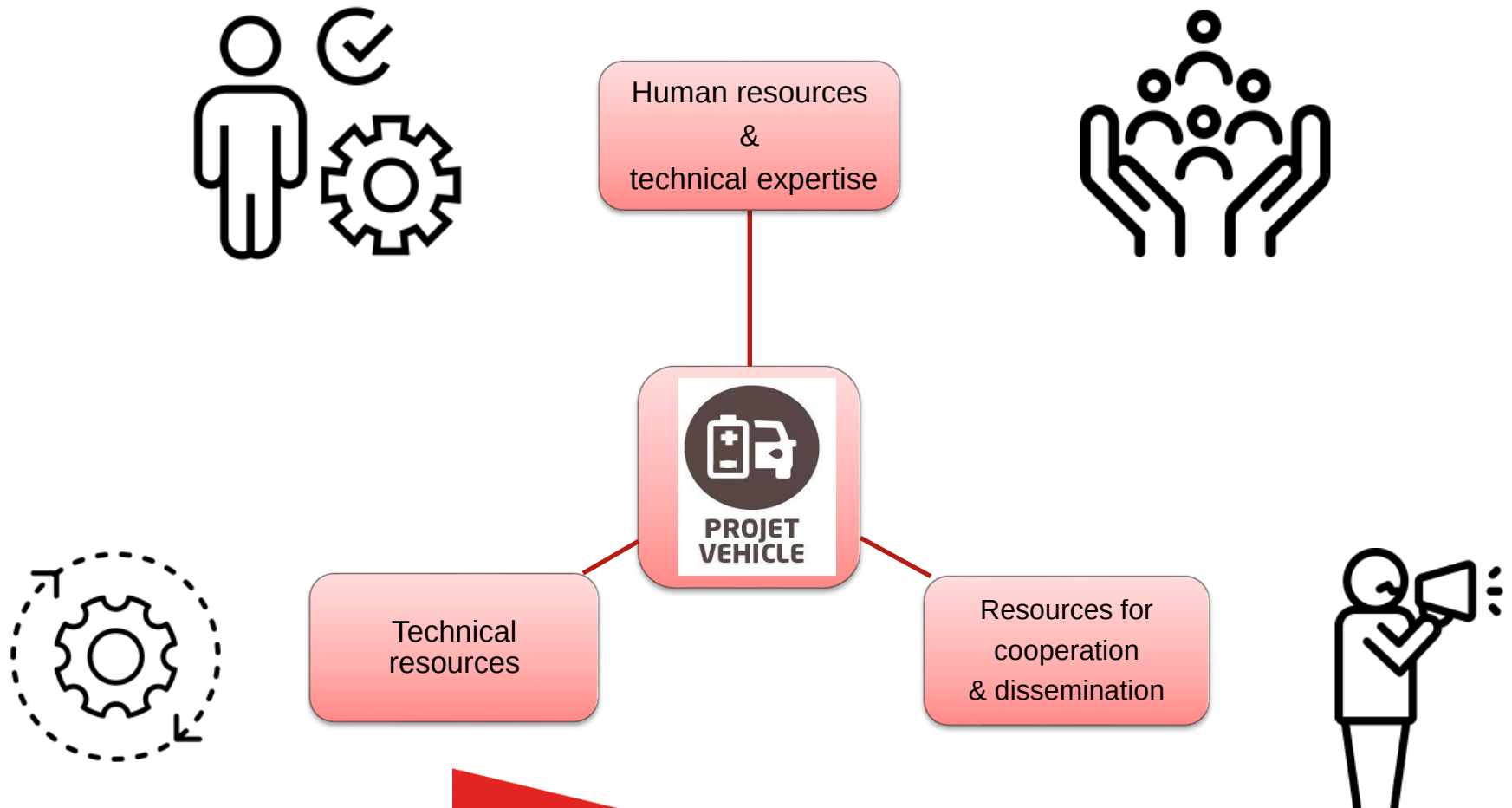
- HESS sizing algorithms (Li-ion battery / SC)
- Development & Implementation of energy management strategies
- Multiphysics modeling of (Li-ion battery / SC)



PROJECT IMPLEMENTATION ACTIVITIES (RESPONSIBILITY)



ADDED VALUE OF THE CROSS-BORDER APPROACH



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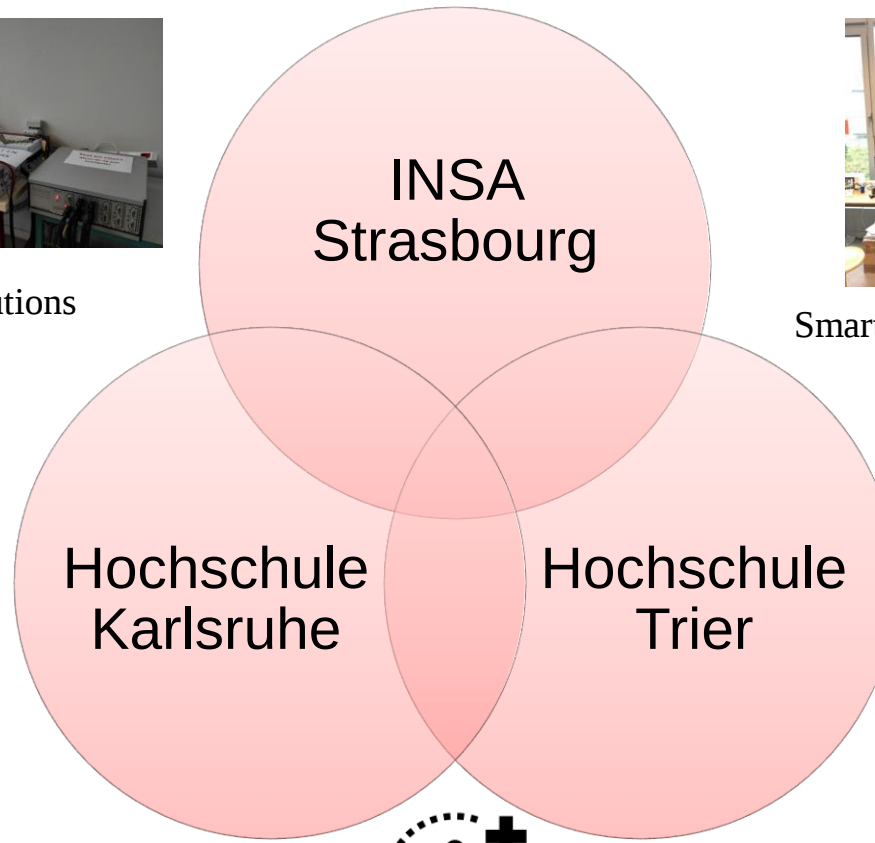
Hybrid energy storage solutions



Smart Management (EMS) based on
advanced AI algorithms



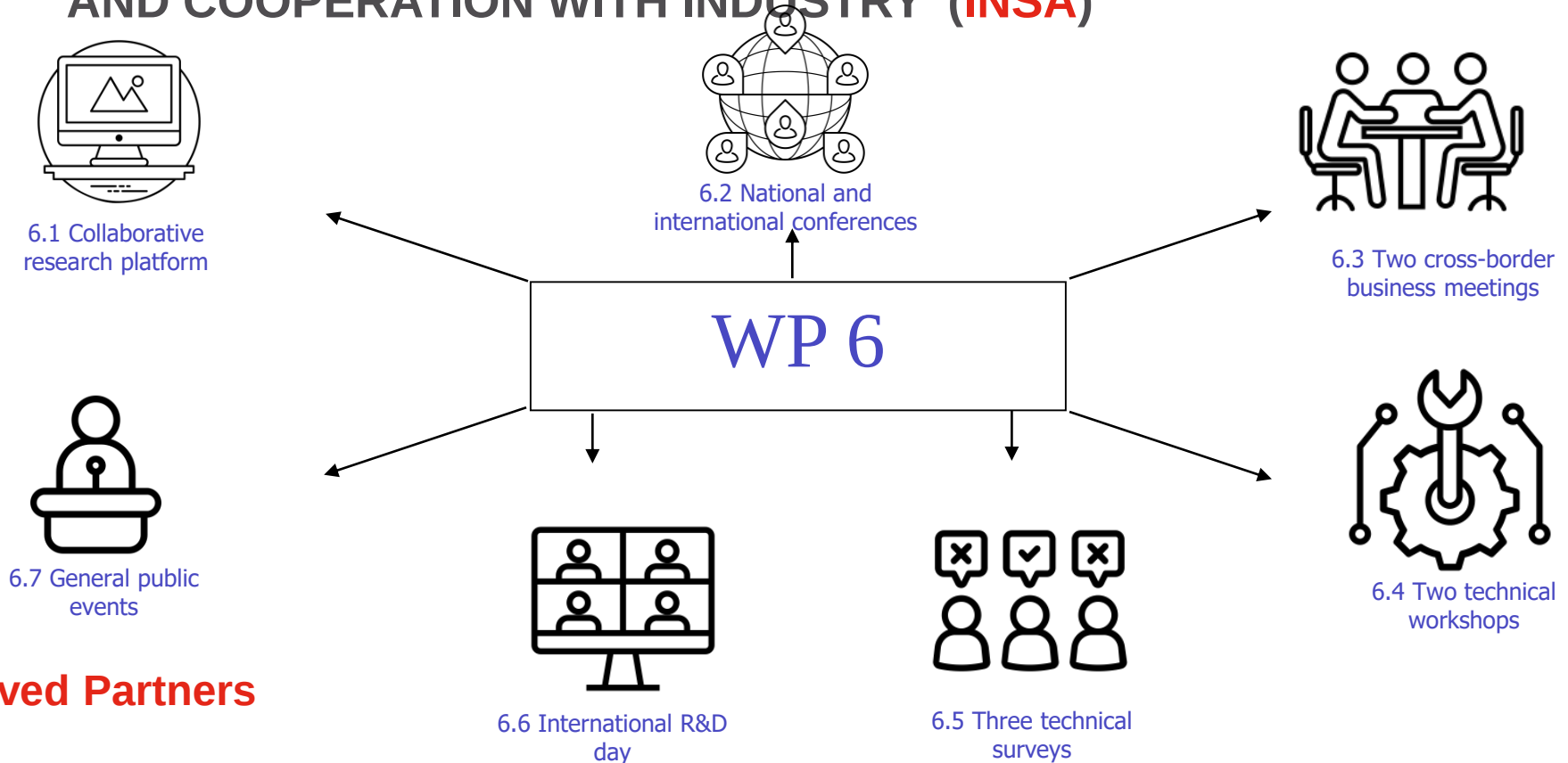
Generation of realistic
energy flow and
optimization of driving
cycles



Diagnosis of the aging of
Lithium-Ion batteries
In situ
analysis



WP 6: COOPERATION, DISSEMINATION OF RESULTS AND COOPERATION WITH INDUSTRY (**INSA**)



Involved Partners

- 1-HsKa
- 2-HsT
- 3-Centrale Lille
- 4-Université de Nantes
- 5-Sheffield Hallam University
- 6-CCI Alsace Eurométropole
- 7-CVC Südwest
- 8-IEE

Specific objective 3: Increase the number of applications and innovations developed by cross-border consortiums in the Upper Rhine

RESOURCES FOR COOPERATION & DISSEMINATION



INSA entreprises

638 entreprises partenaires de l'INSA Strasbourg



TriRhenaTech



ICube laboratory

With around 650 members, a laboratory close to companies



**Hochschule
Karlsruhe
Technik und Wirtschaft**
UNIVERSITY OF APPLIED SCIENCES

Trier University
of Applied Sciences

H O C H
S C H U L E
T R I E R



GROUPE INSA

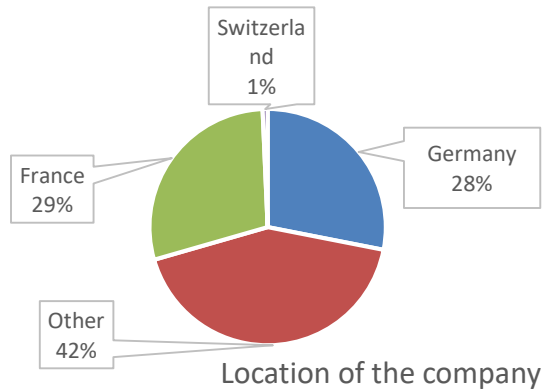
COOPERATION WITH INDUSTRY

- Interreg is interested in regional development
→ cooperation with industry, transfer of technology
are crucial success indicators for the project
- Cooperation with industrial clusters : PVF and CVC
- First survey on hybrid energy storage successfully conducted
- Participation in conferences and fairs



SURVEY RESULTS

> 300 respondents, of which 152 answers are complete



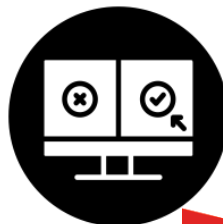
Impact of electrification

I'm impacted :	No=31% / Yes=69%
Product may disappear:	No=68% / Yes=32%
E-components opportunity :	No=46% / Yes=54%
Already Li-Ion activities :	No=46% / Yes=54%

Benefits of a HESS ?

Specific power :	60%
Specific energy :	40%
Lifetime :	56%
Vehicle Perf :	52%
Efficiency :	42%
Compactness :	35%
TCO reduction :	18%
Lower price :	17%

→ Electrification is an important topic for the respondents, yet the knowledge about HESS is limited





Yasser Ghoulam
at IEEE – International Conference
on Electric Vehicular Technology
in Bali (2019)



Théophile Paul
at Automotive Battery Management Systems for EV/HEVs
in Berlin (2019)



Théophile Paul and Inès Jorge at
IEEE VVPC –
Vehicle Power and Propulsion Conference
in Hanoi (2019)



