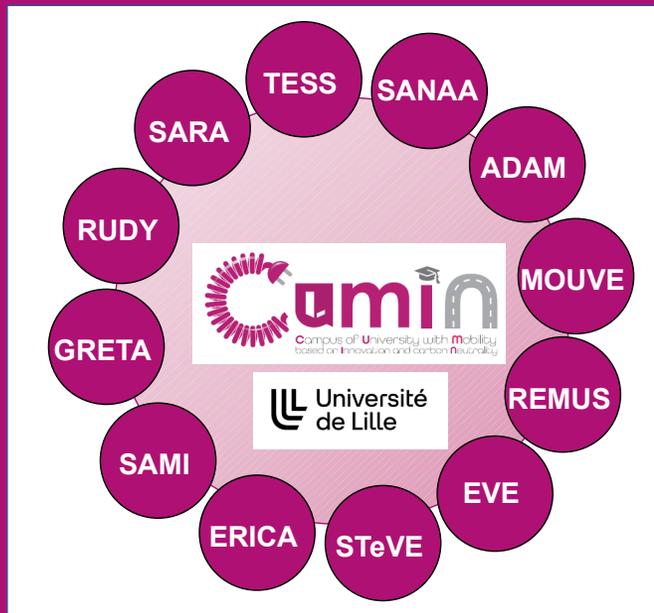




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CUMIN seminar 2026 – Tuesday February 3rd

CUMIN - EVE

Study on CUMIN's Electric Vehicles: Simulink vs Simscape

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Université de Lille

Presentation summary



Context and goal



The studied vehicle



Some results



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I. Context and goal

I. Context and goal

A. In which part of CUMIN does our project fit?



EVE = Electric Vehicle, Estimation of mobility for an eco-campus

EVE consists in simulations of different driving scenarios based on functional EMR representations.

However, industries are more likely to use structural representations to simulate their new products' behaviours.

So, is it possible to do EVE's simulations by using a structural representation ?

Our goal is comparing two different matlab toolboxes to prove that it's possible to use a structural equivalent to the EMR in the industry.

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I. Context and goal

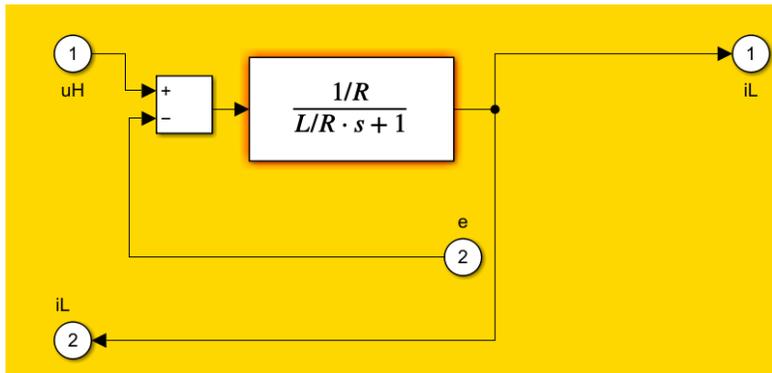
B. Differences between structural-based and functional-based representation softwares

Functional-based software:

No way to distinguish different kinds of physics :
electricity, mechanics, thermodynamics, etc.

The user has to build his own model from scratch

Necessity to build the source code inside each
block

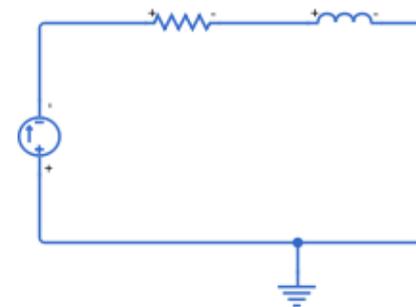


Structural-based software:

A distinction between electricity, mechanics,
thermodynamics and every other field of physics
exists

Pre-defined blocks exist with a source code written
by default

Some blocks' source codes are unknown



I. Context and goal

C. Some different structural-based and functional-based representation software

Structural-based :



Matlab Simscape

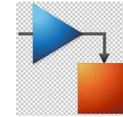


Simcenter Amesim



AVL Excite

Functional-based :



Matlab Simulink



Scilab Xcos



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II. The studied vehicle

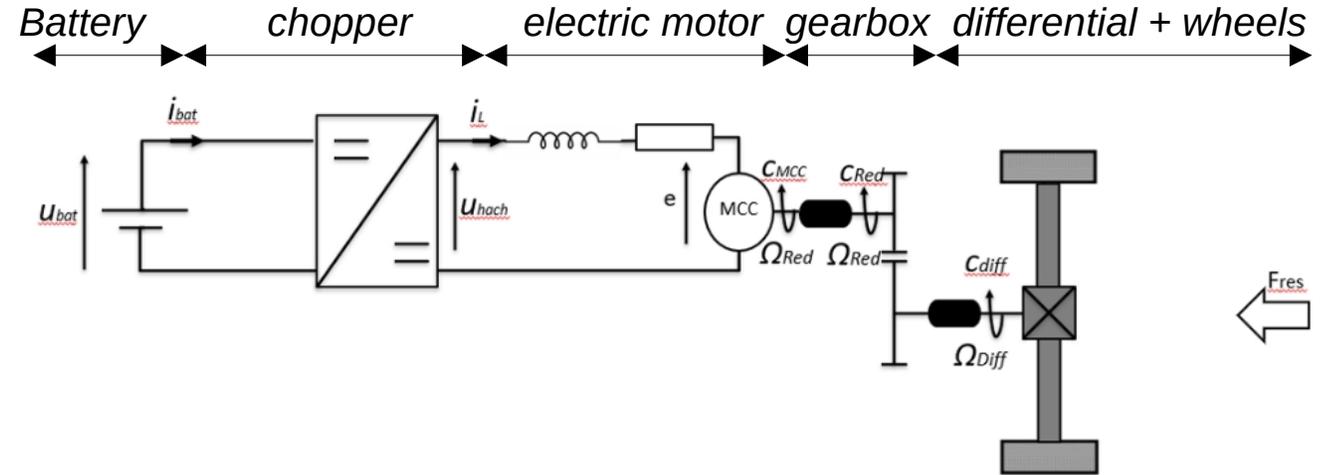
II. The studied vehicle

A. The vehicle the study is based on

The study is based on a second-generation Nissan Leaf in its 40kW version



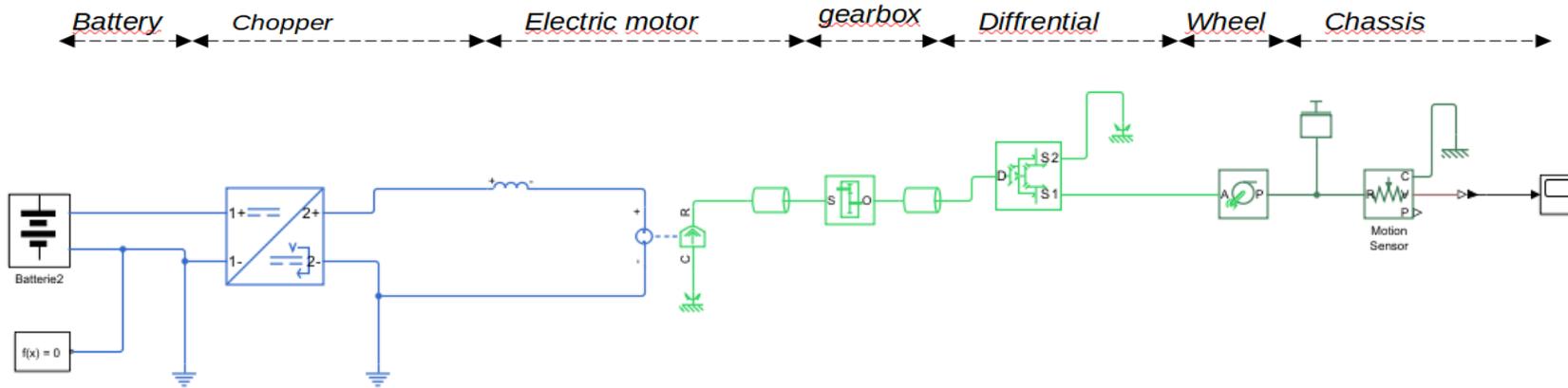
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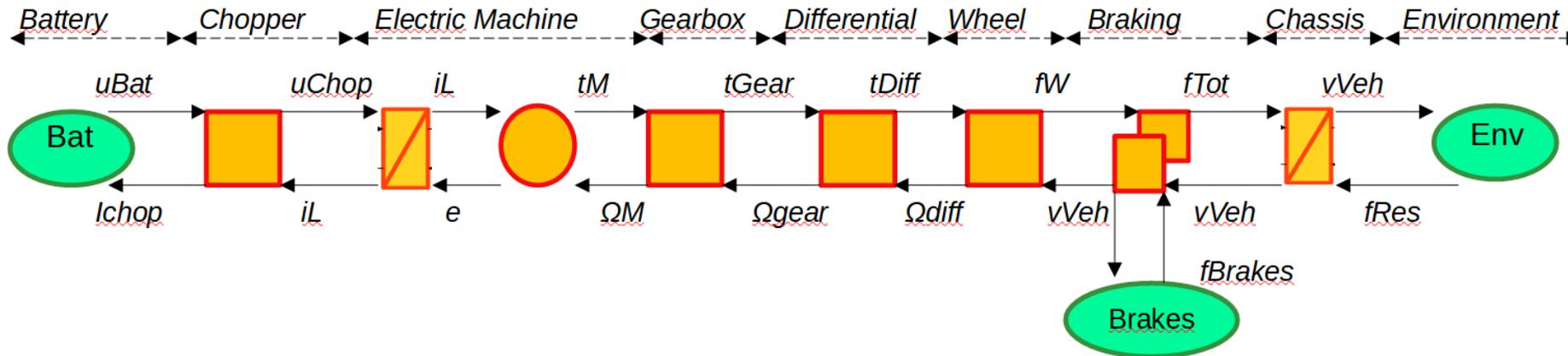
Structural scheme of the vehicle

II. The studied vehicle

C. Structural representation of the vehicle on Simscape



D. EMR representation of the vehicle





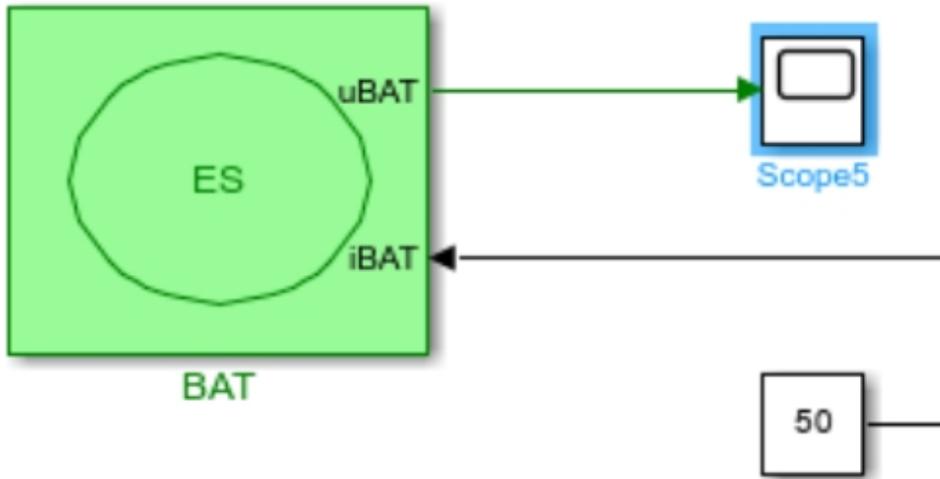
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III. Some results

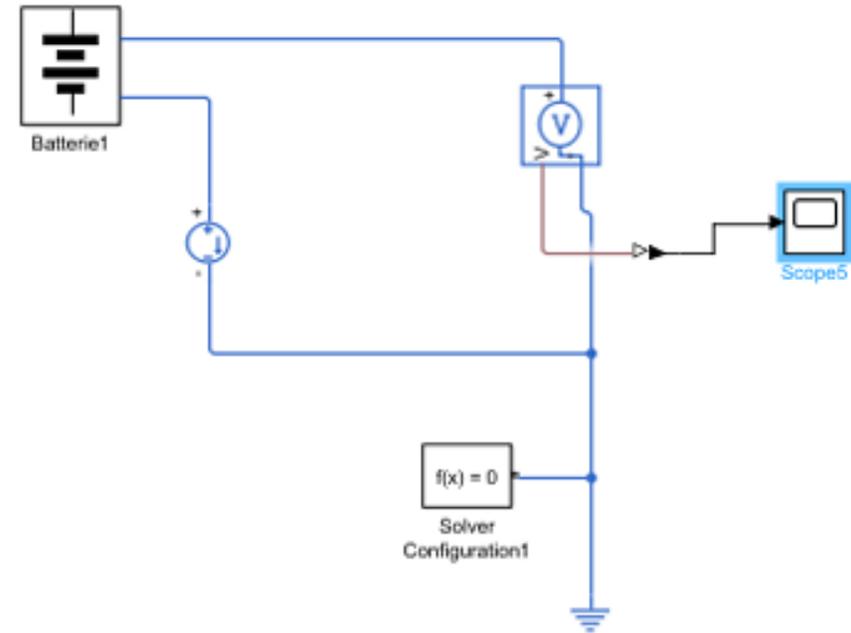
III. Some results

A. Battery block

Battery representation on simulink :

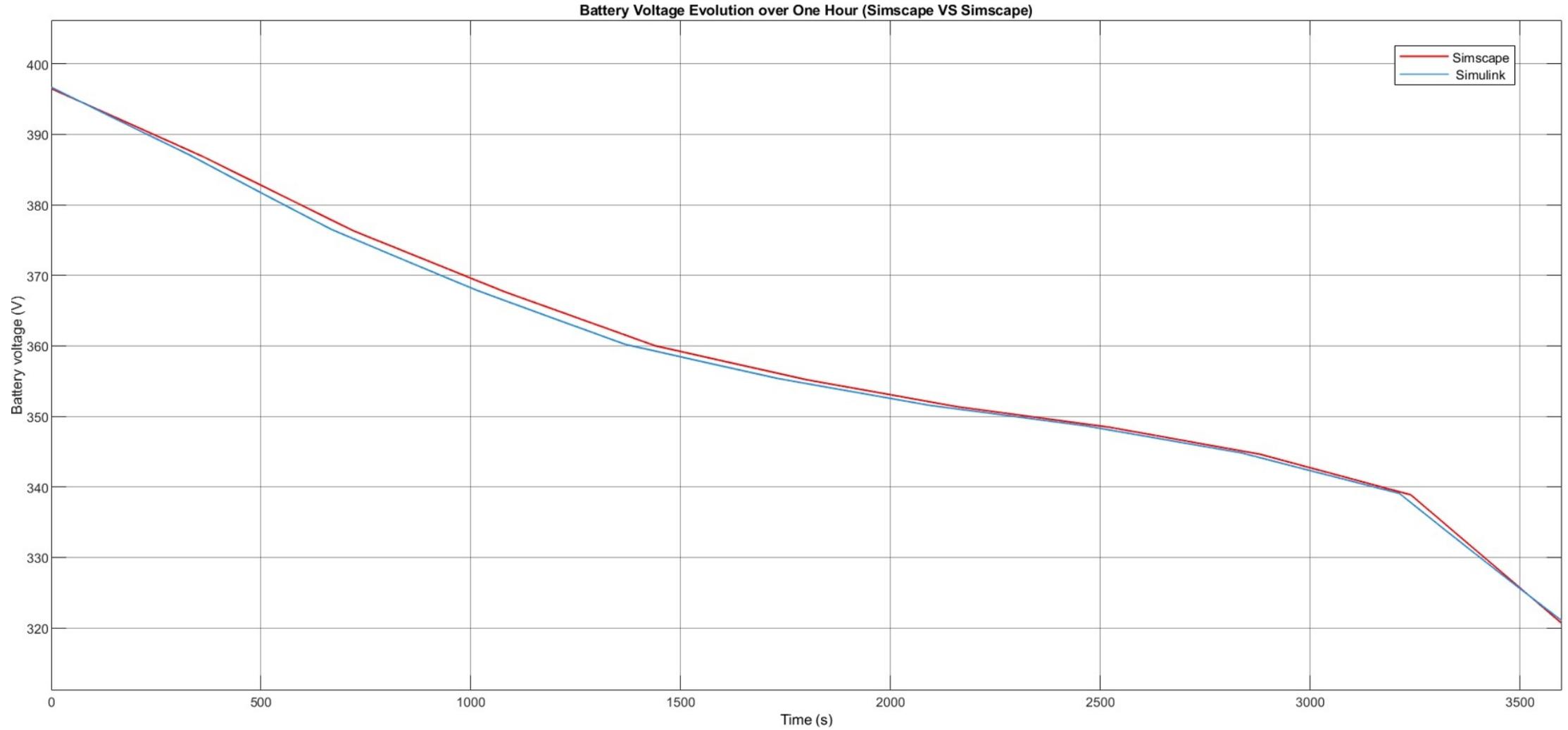


Battery representation on Simscape :



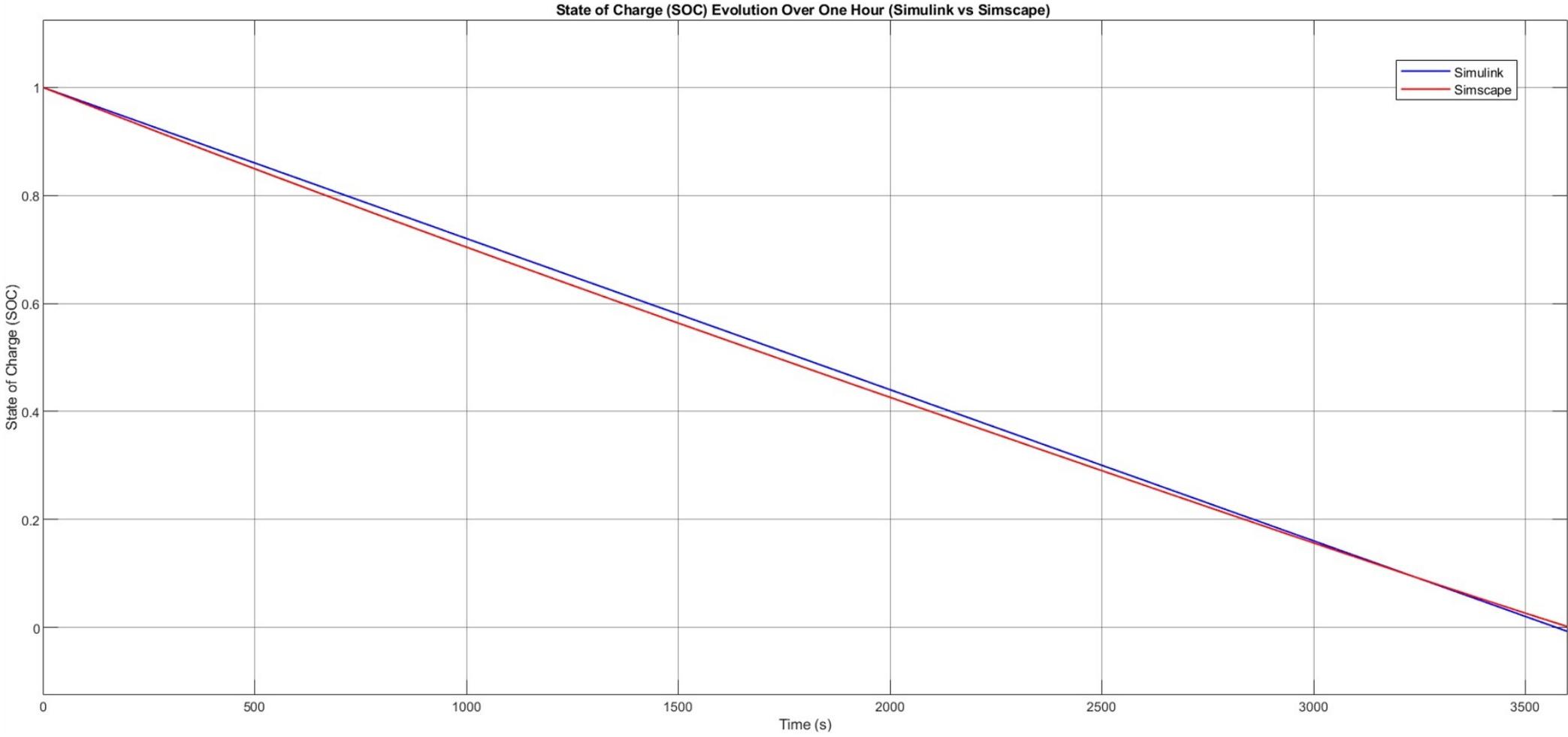
III. Some results

A. Battery block



III. Some results

A. Battery block



Conclusion and perspectives

To conclude, the results are quite promising about the possibility to do the same kind of energetic studies we often see on EVE, using a structural-based toolbox like Simscape.

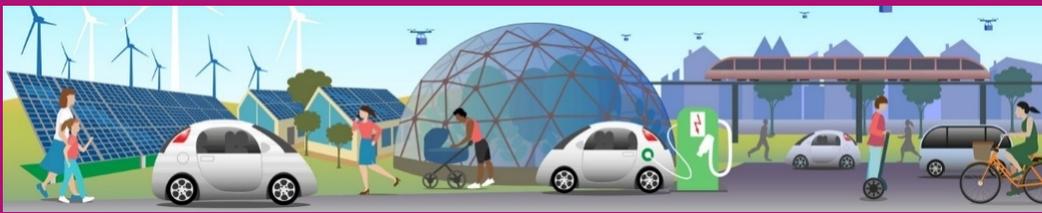
For the battery, as well for the other elements we're testing, the results are very close between Simulink and Simscape.

We have also seen the limits of the structural-based toolbox, even if this part of the work is still in progress.

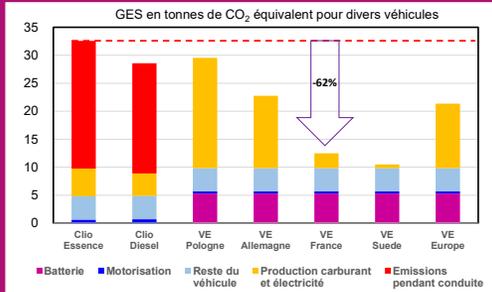
The main limit of Simscape is the way you make your command. Even though, there is already a function written by default inside most of the blocks, to make the equivalent to the MSC and strategies, we had to switch to a functional command, so using Simulink.

So for a simple model representation, Simscape is easier to manipulate...before you try to make the command.

At the end of this project, we are willing to have a high level of correlation between Simulink and Simscape for the whole Nissan Leaf



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Our university as an exciting living lab towards eco-cities through an innovative transdisciplinary framework !

