



The 27th INTERNATIONAL
ELECTRIC VEHICLE
SYMPOSIUM & EXHIBITION.

Barcelona, Spain
17th-20th November 2013

Development of an in-series hybrid urban bus model and its correlation with on-board testing results

UNIVERSITY INSTITUTE OF AUTOMOBILE RESEARCH / TECHNICAL UNIVERSITY OF MADRID



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Objective

Why a model?

Configuration of the hybrid bus

Model

Simulation conditions

Measurements

Results and comparison

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“Get as good a hybrid urban bus model which enables to predict its behavior under real city service”

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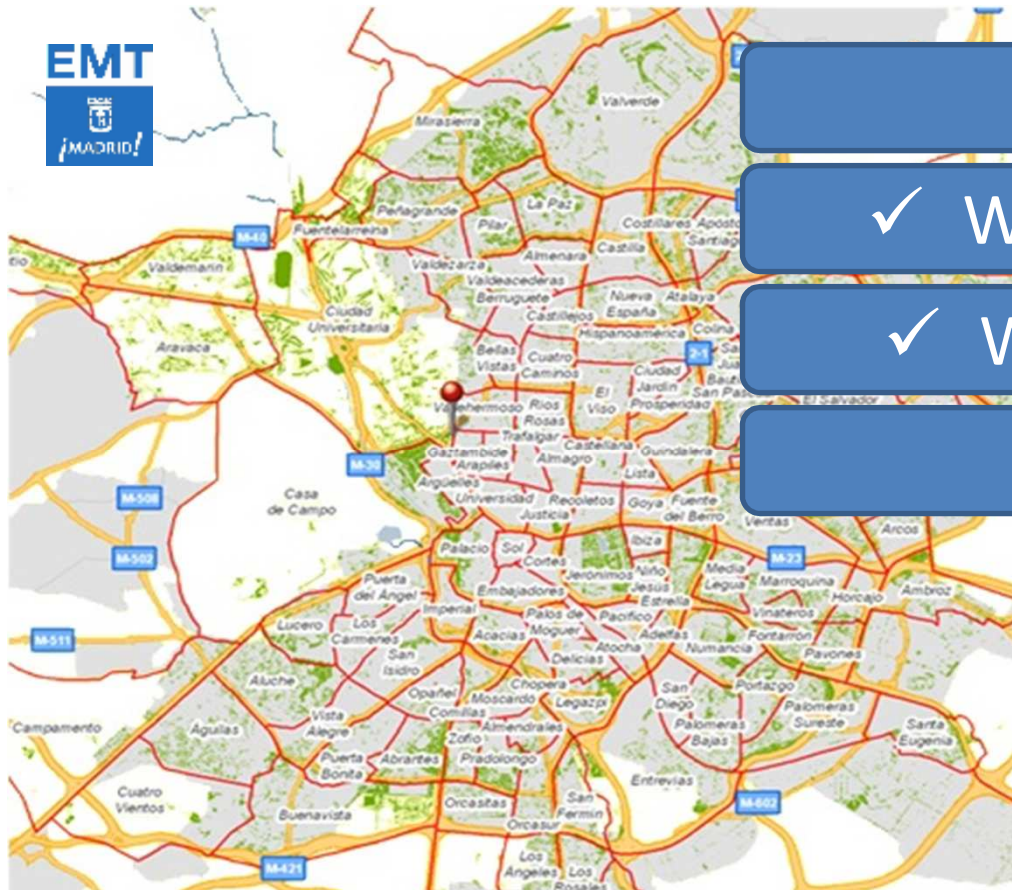
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Why a model?

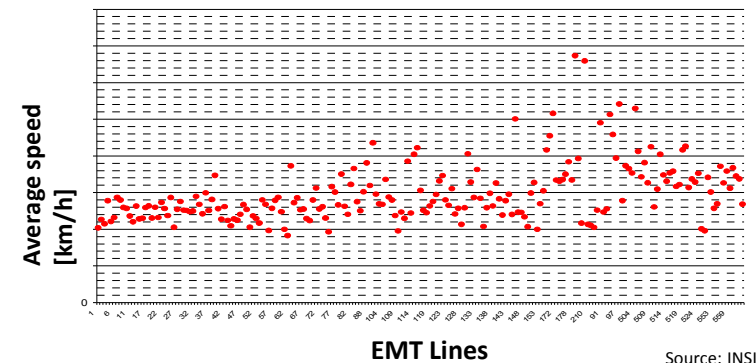


✓ Up to **200** bus lines

✓ Widely varying average *speeds*

✓ Widely varying average *ramps*

✓ Collapsed city centers



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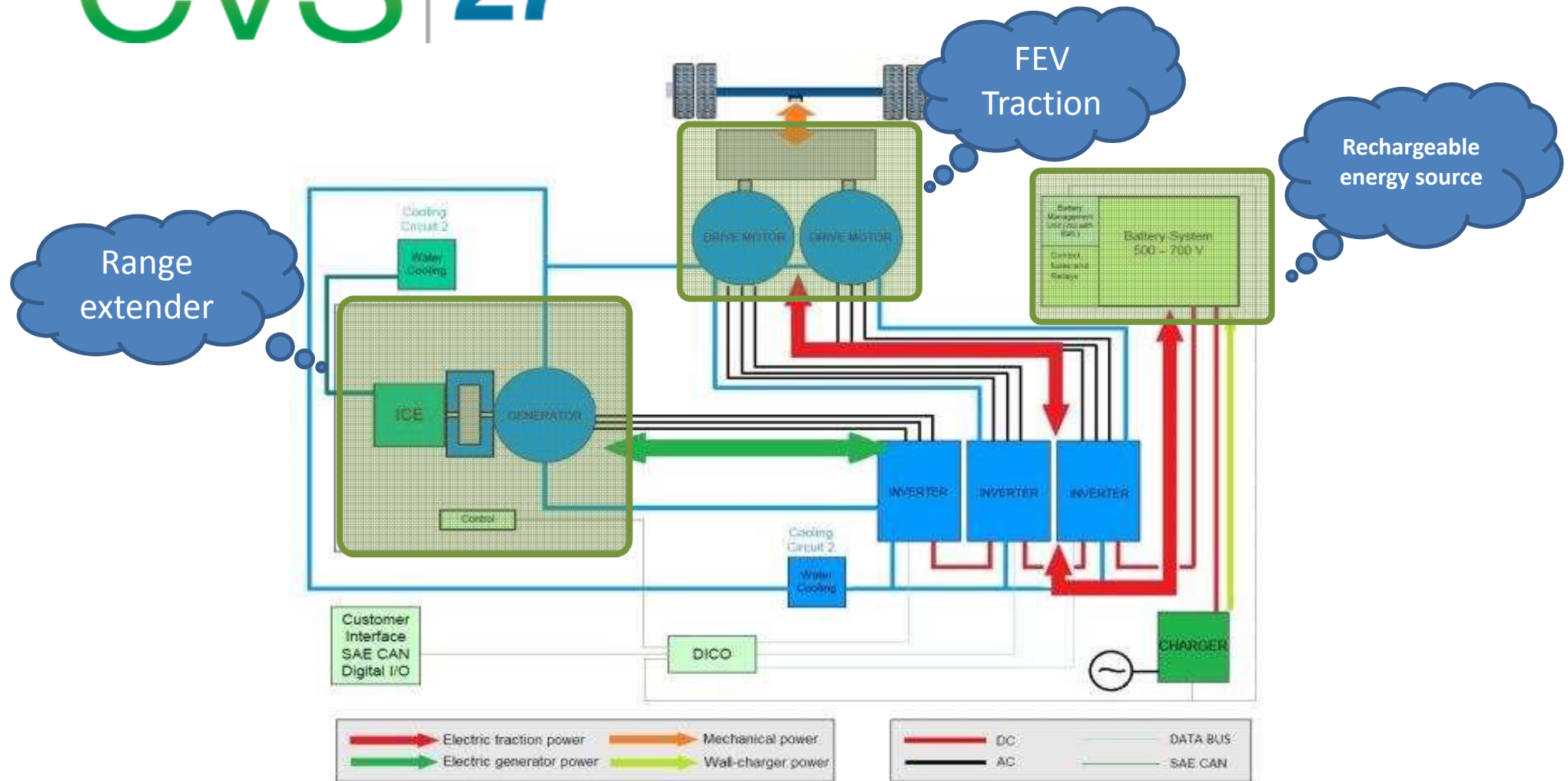


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Configuration of the hybrid bus



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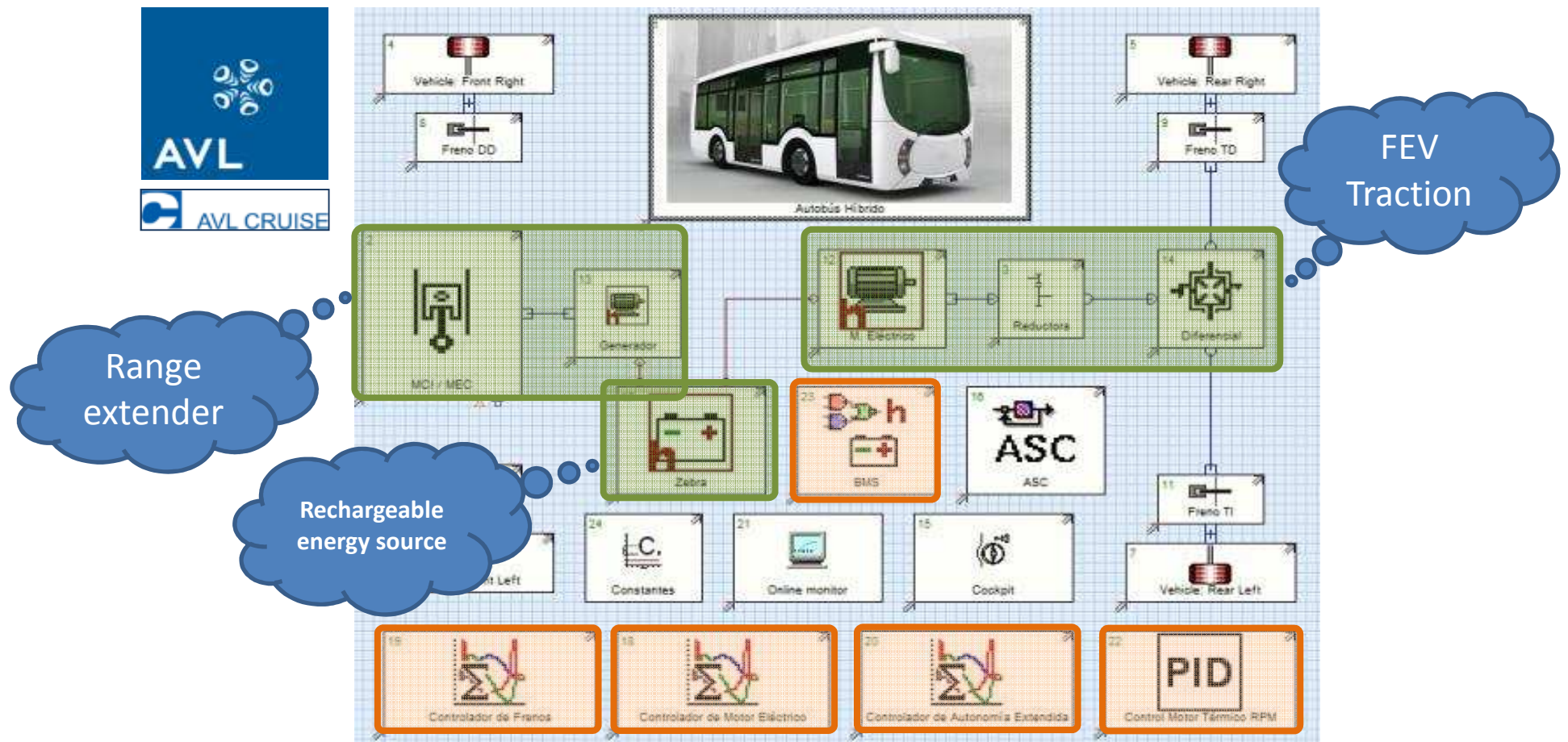
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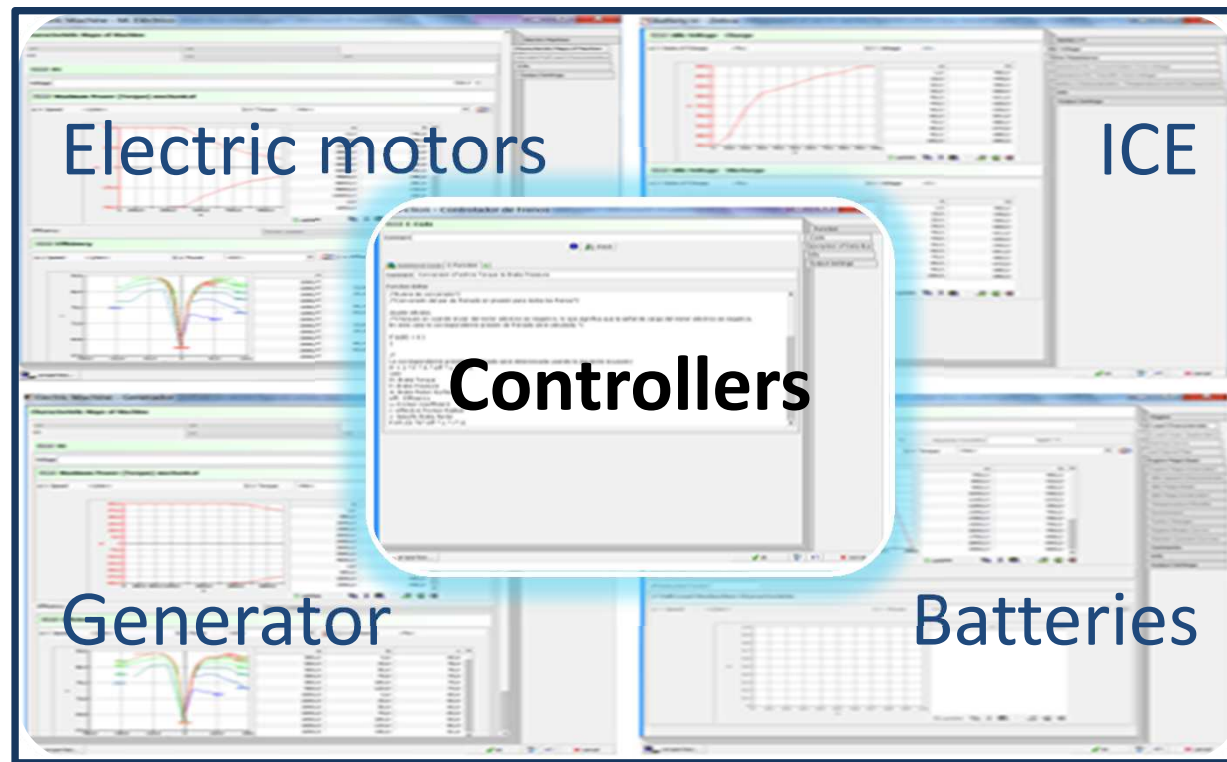
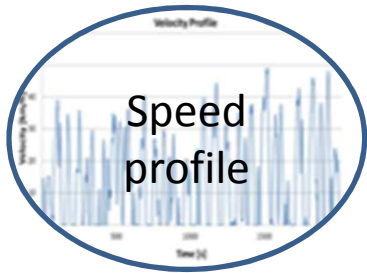


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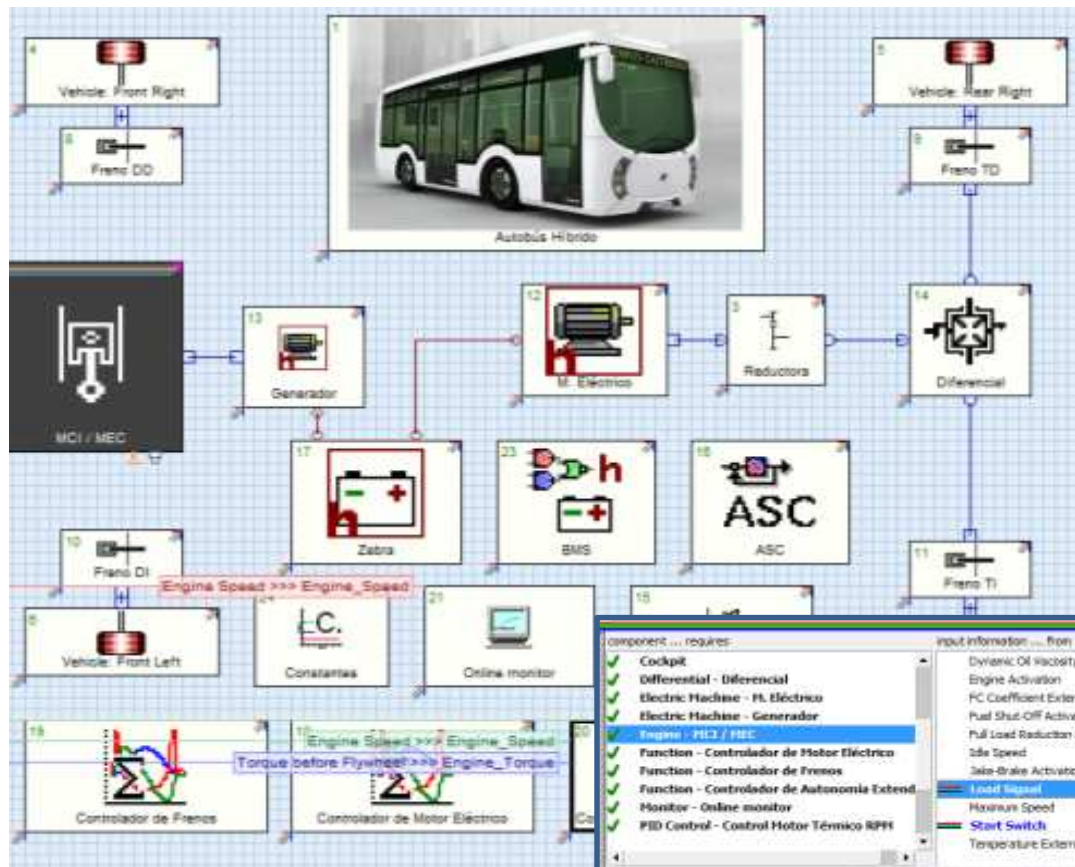


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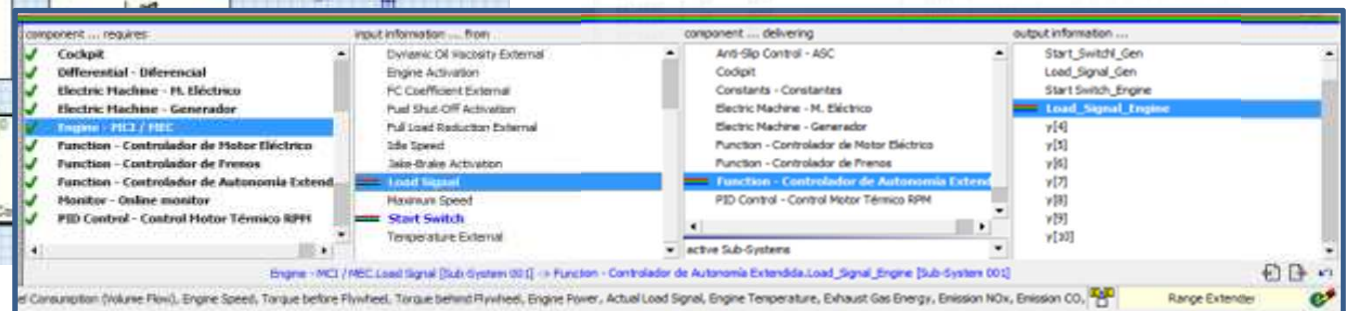
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Filter: X None

Time	Bus	Type	ID / Symbol	Prio	PGN	SA	DA	DLC	Data
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65,1773	1	Rx	EEC2	6	61443	0	255	8	00 AF 00 00 00 00 00 00
65,1776	1	Rx	TCO1	6	65132	0	255	8	00 00 00 00 00 00 05 39
65,1848	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,2044	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,2249	1	Rx	EEC2	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,2252	1	Rx	TCO1	6	65132	0	255	8	00 AF 00 00 00 00 00 00
65,2255	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,2445	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,2649	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,2747	1	Rx	CCVS	6	65265	0	255	8	00 05 39 01 00 00 00 00
65,2750	1	Rx	EEC2	6	61443	0	255	8	00 AF 00 00 00 00 00 00
65,2753	1	Rx	TCO1	6	65132	0	255	8	00 00 00 00 00 00 05 39
65,2855	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,3050	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,3245	1	Rx	EEC2	6	61443	0	255	8	00 AF 00 00 00 00 00 00
65,3248	1	Rx	TCO1	6	65132	0	255	8	00 00 00 00 00 00 05 39
65,3251	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,3450	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,3655	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,3772	1	Rx	CCVS	6	65265	0	255	8	00 05 39 01 00 00 00 00
65,3775	1	Rx	EEC2	6	61443	0	255	8	00 AF 00 00 00 00 00 00
65,3778	1	Rx	TCO1	6	65132	0	255	8	00 00 00 00 00 00 05 39
65,3850	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00
65,4056	1	Rx	EEC1	6	61444	0	255	8	00 00 00 20 98 00 00 00

Hex View: Rx Bus 1, 18FE6C08h (TCO1) DLC 8
0 02 10 00 00 00 00 05 47

Stopped Dynamic: 108,6854 s Total: 13030 Rev: 13030 Xmb: 0 Warn: 0 Errors: 0



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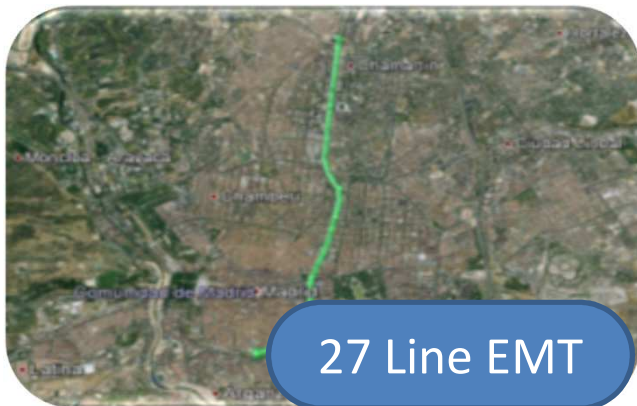
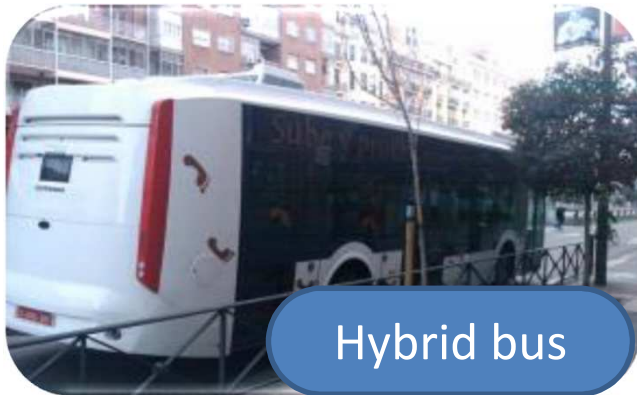
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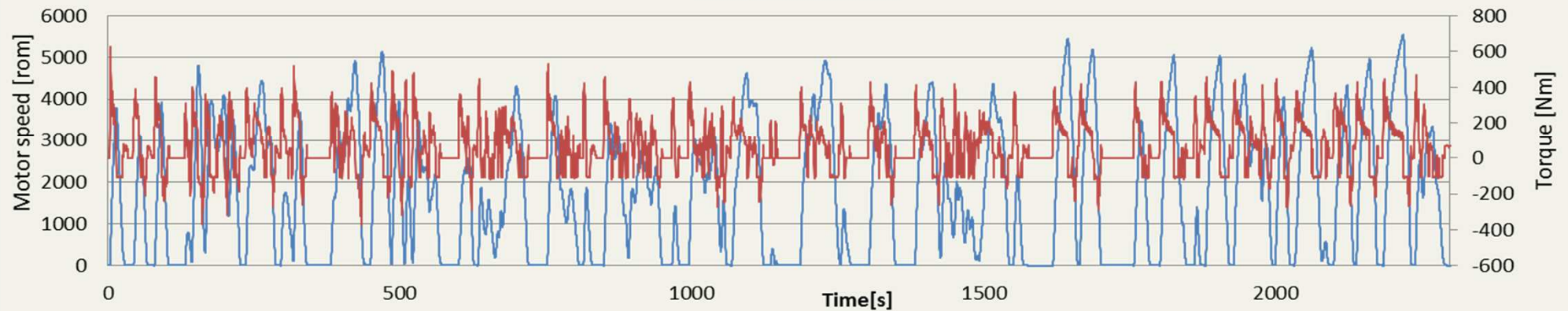


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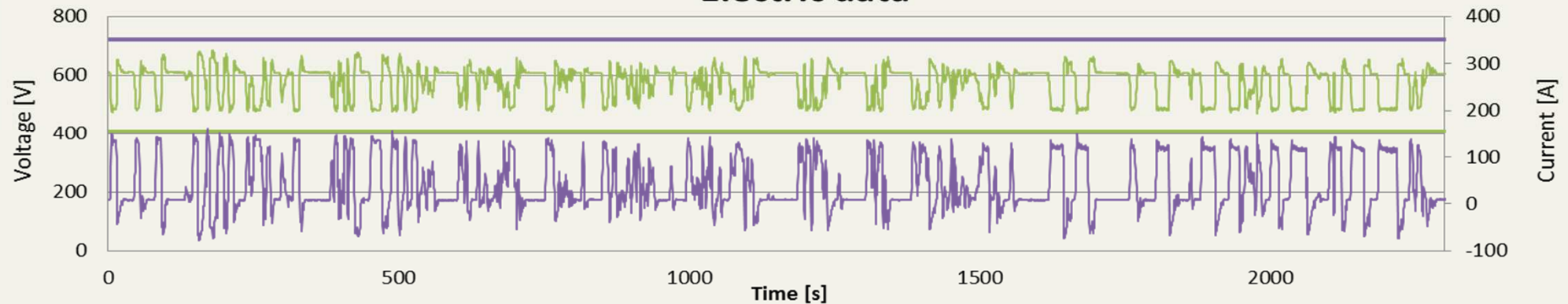


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Drive Motor



Electric data



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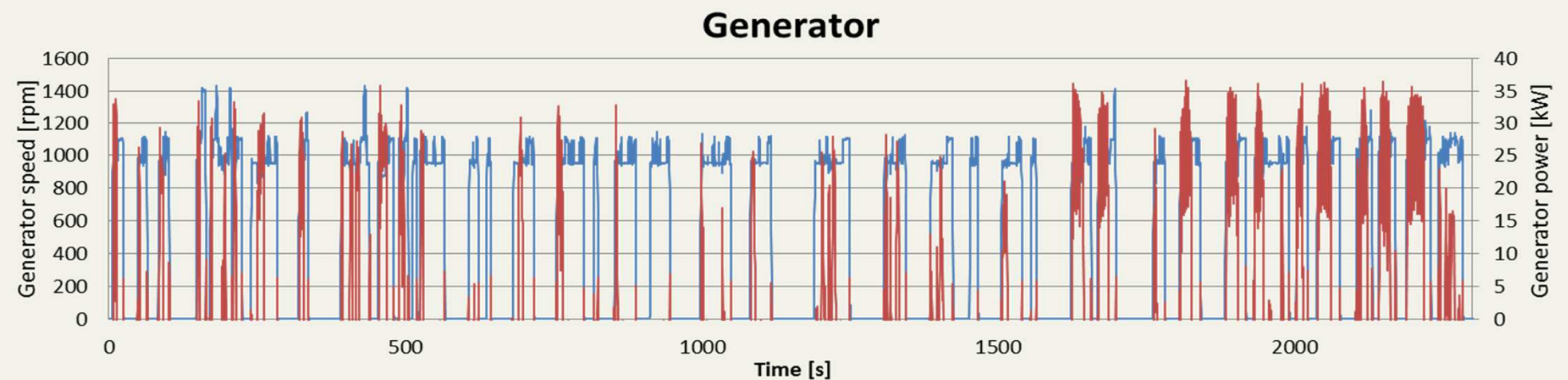
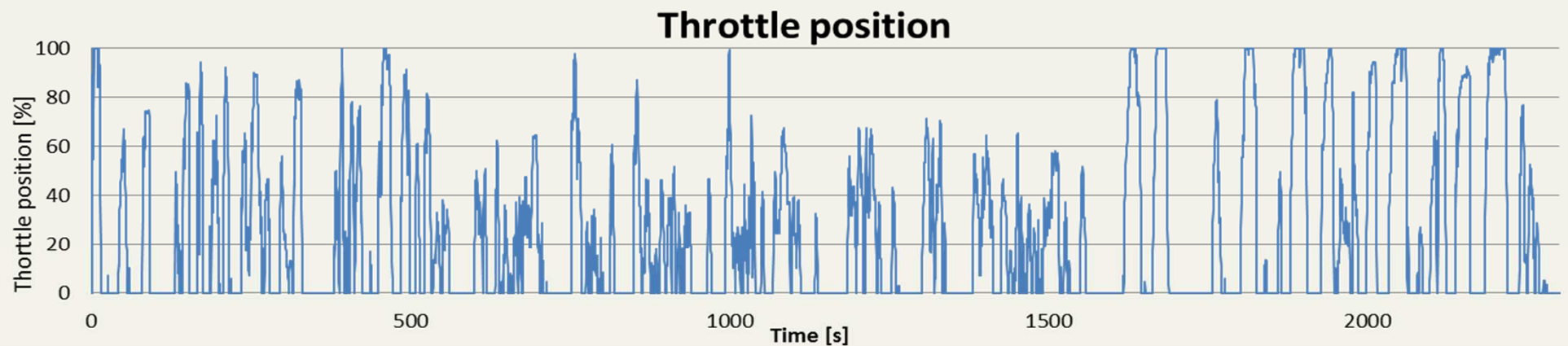
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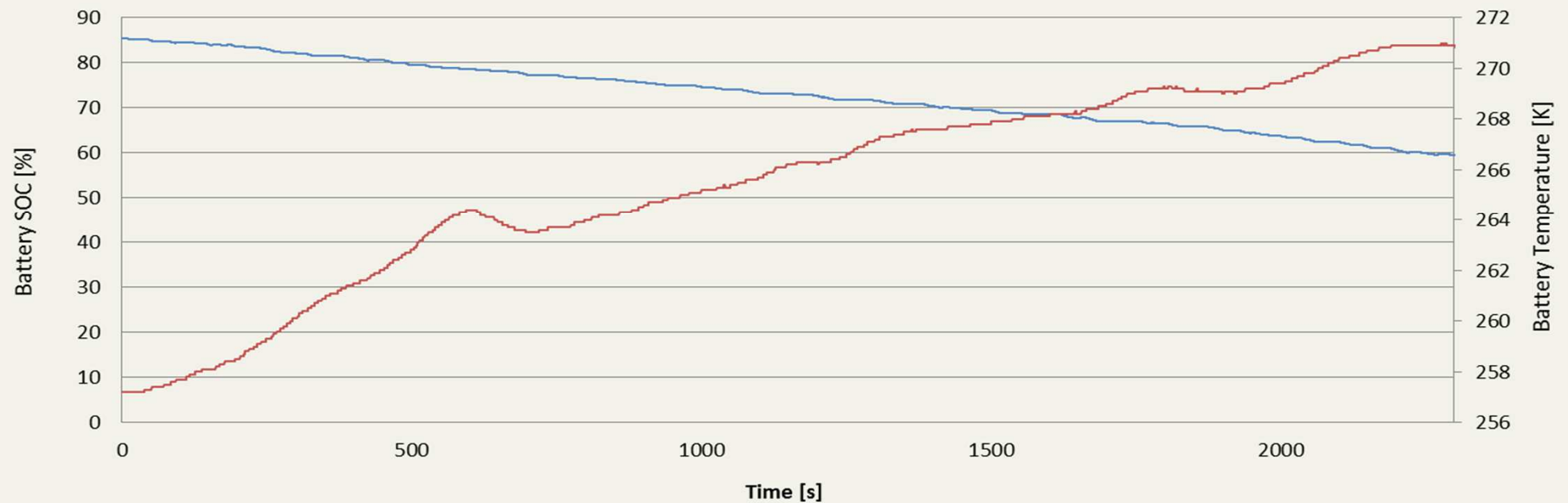


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Battery



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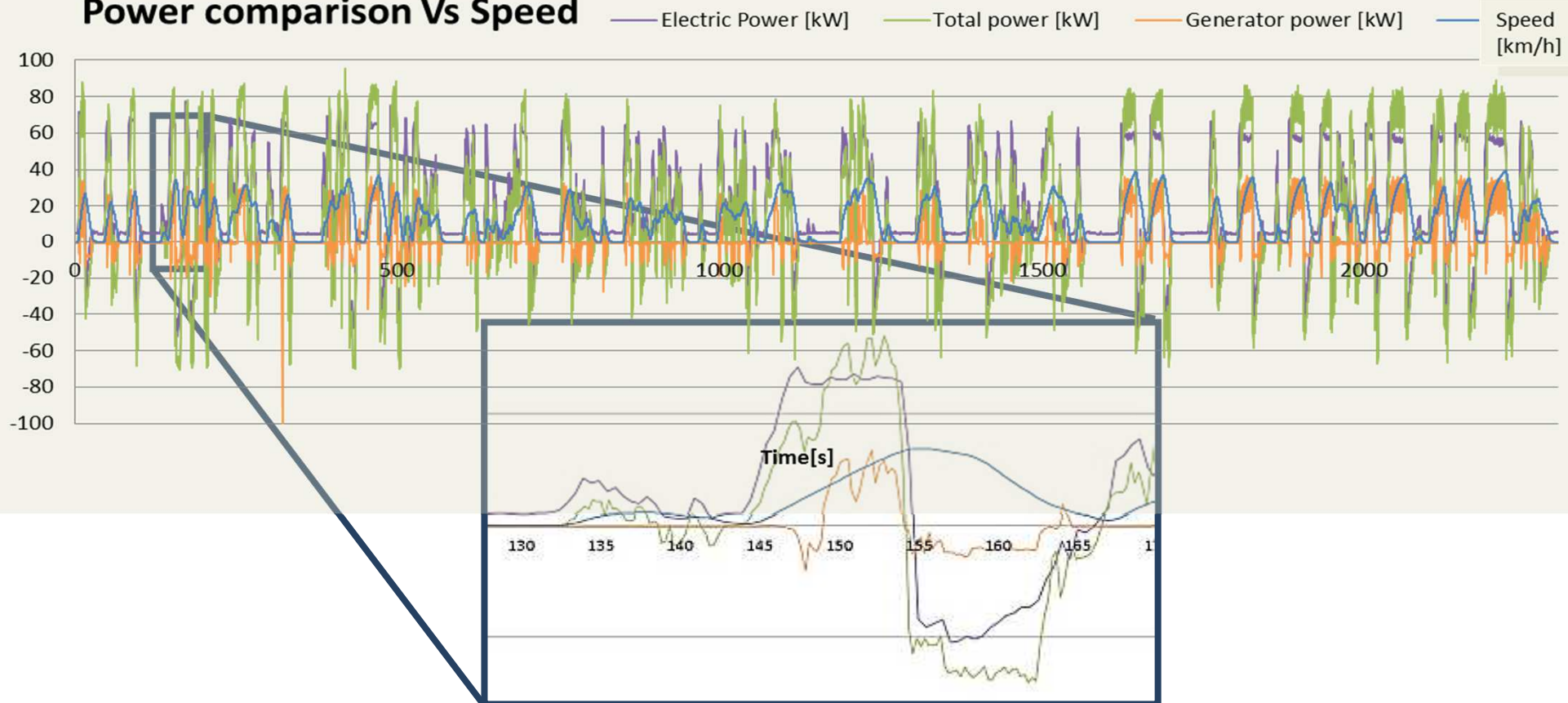


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Power comparison Vs Speed



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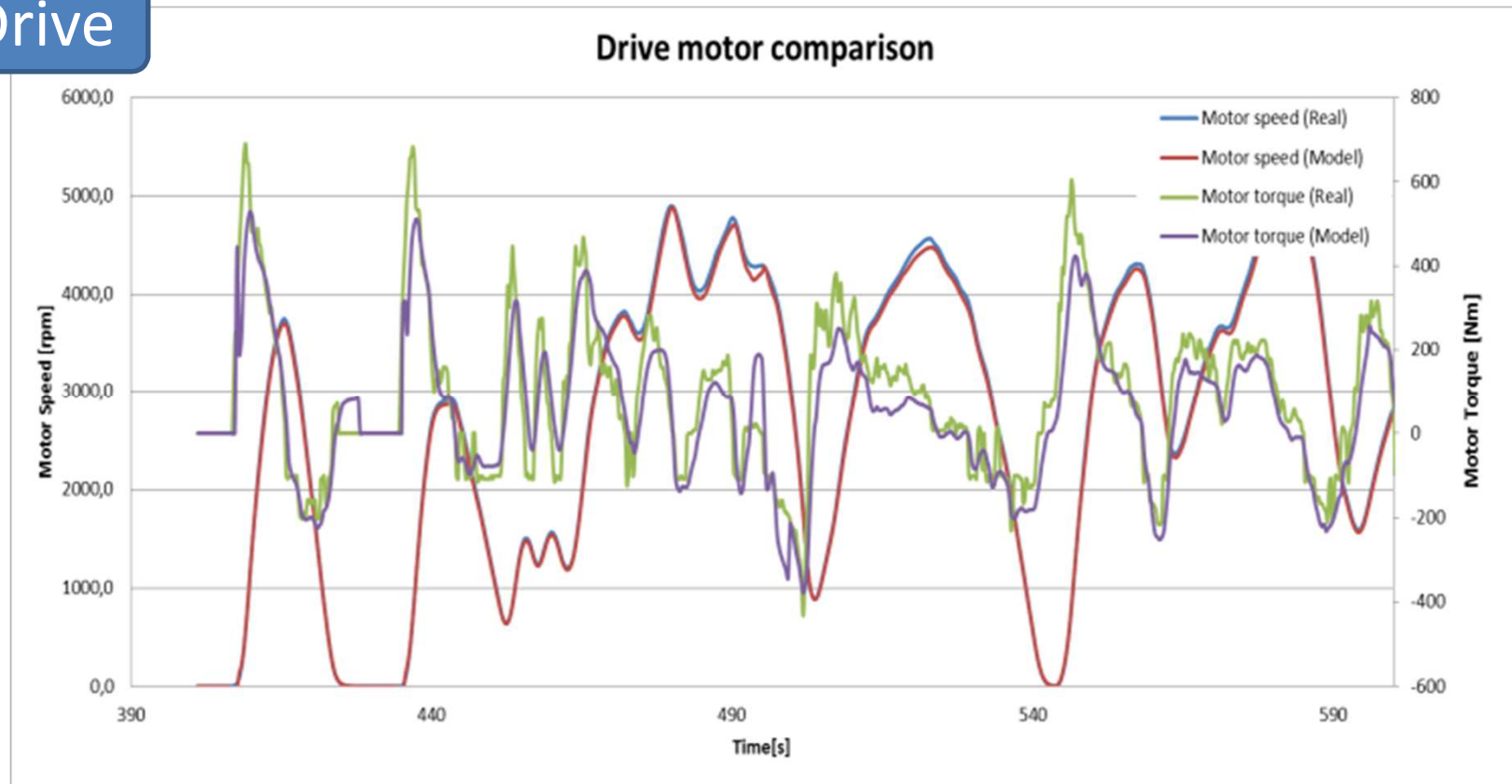


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Drive



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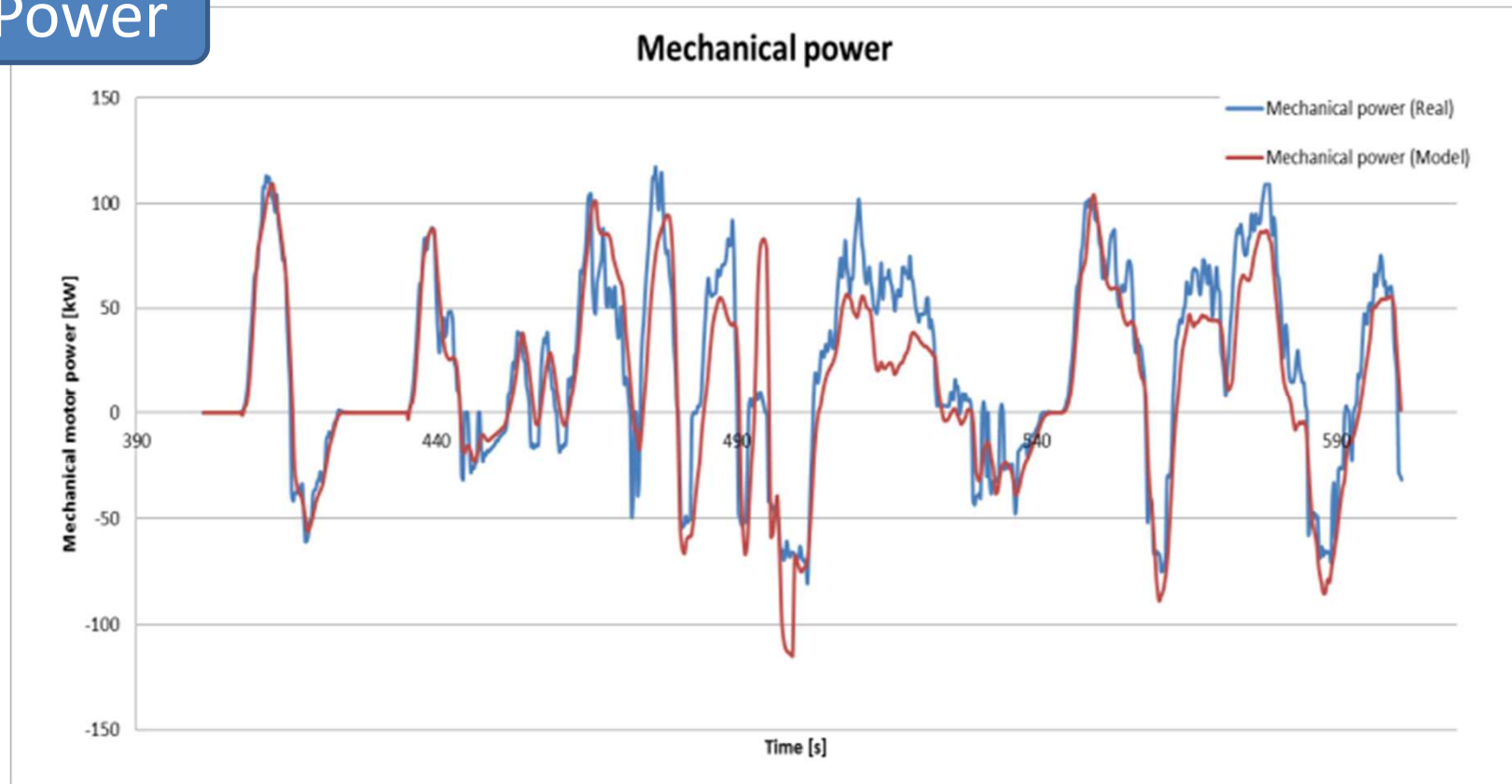


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Power



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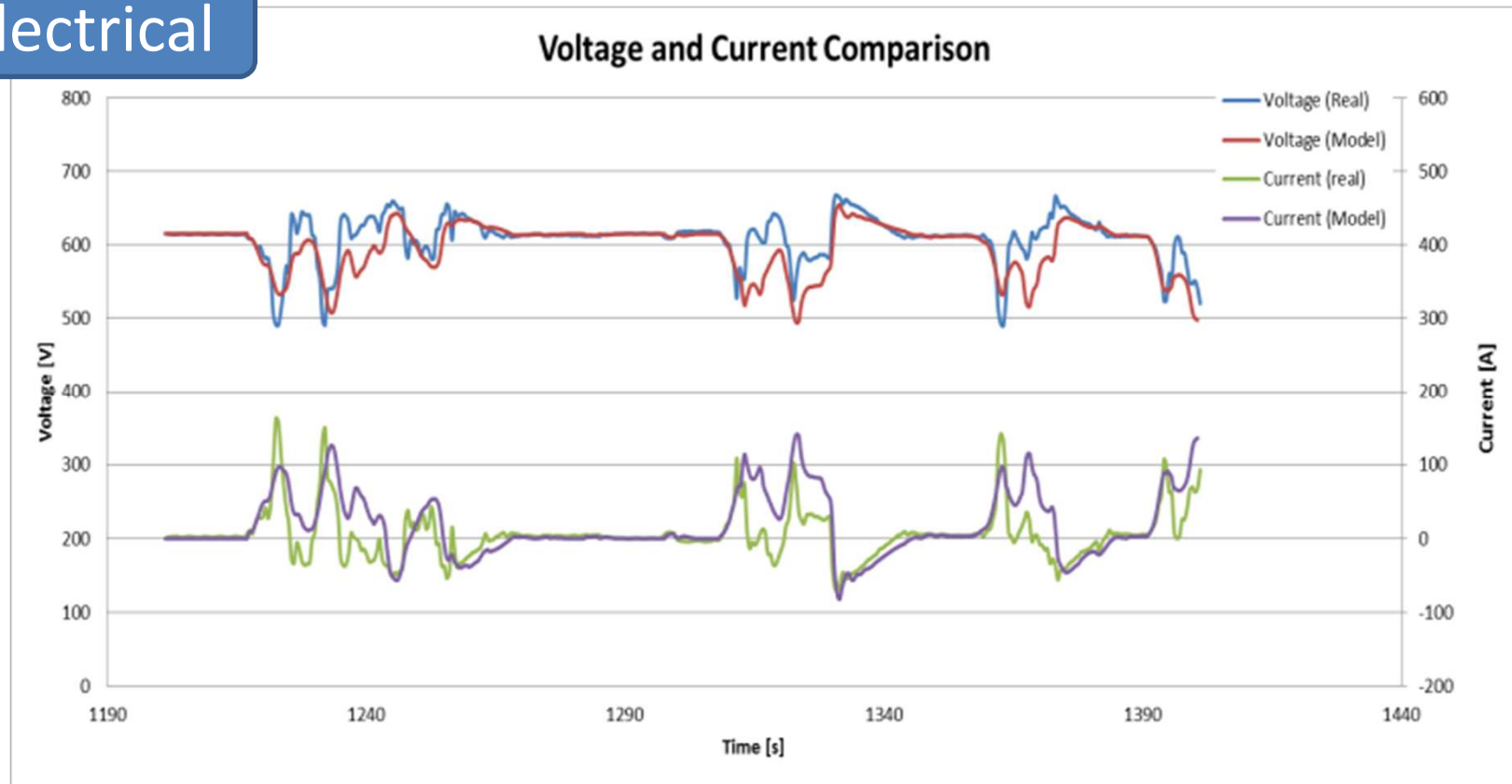


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Electrical



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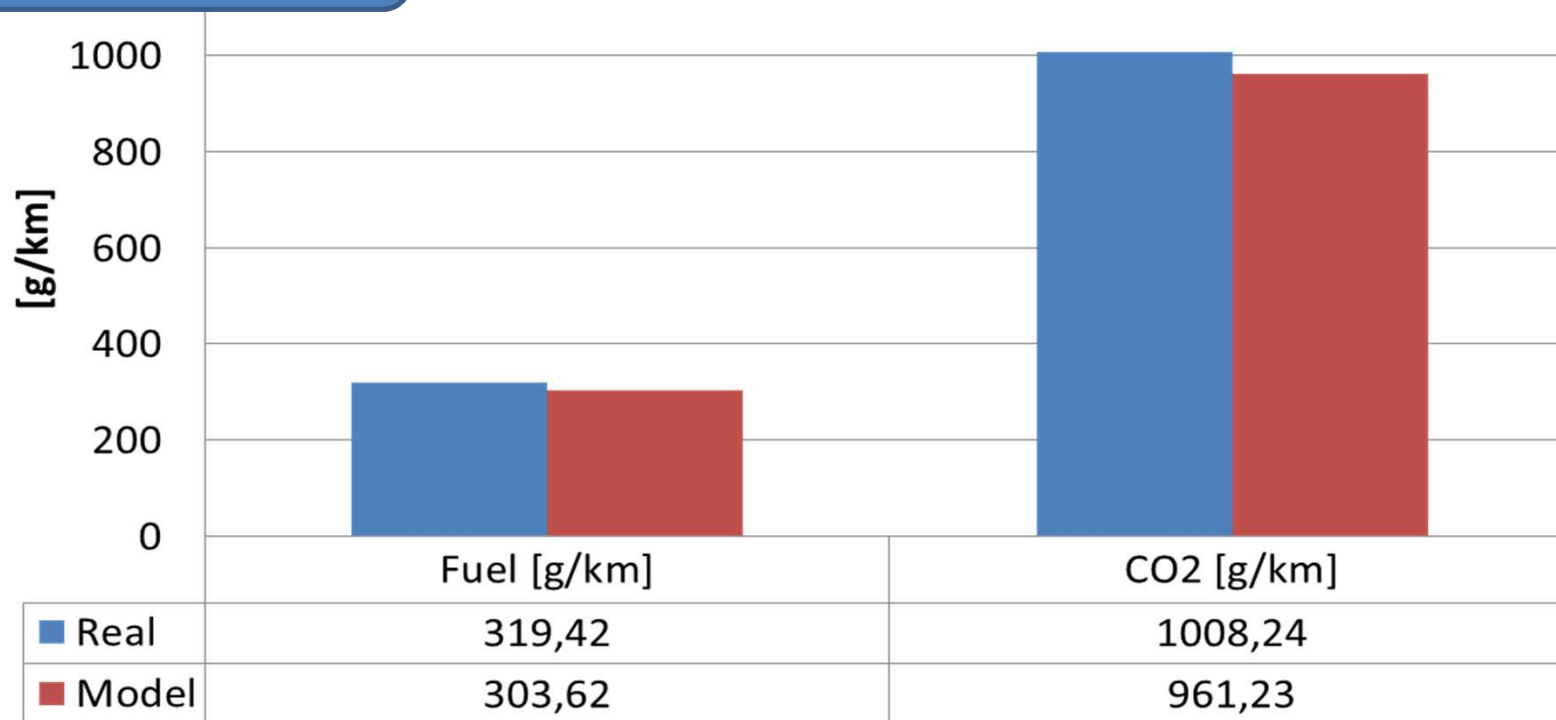


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Consumption & Emissions



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- The software model shows high accuracy.
- Good synchrony between performance and efficiency.
- The model is reliable enough for further simulations with diverse routes.
- It can be useful for public companies to decide where and how use a vehicle.
- It also could be useful to improve control strategies.

Use the hybrid and electric powertrain test bench at INSIA to improve model accuracy



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20
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