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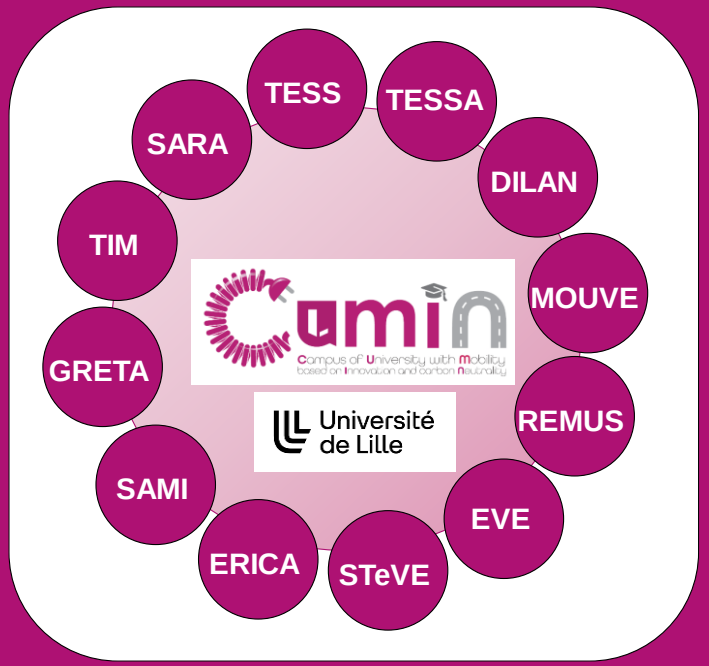
CUMIN - eCAMPUS



Nissan Leaf charging

Swapnil REVANKAR

Prof. Alain BOUSCAYROL, Dr. Ronan GERMAN,
Prof. Loïc BOULON, Prof. Audrey GROLEAU

L2EP, Université de Lille, France
Université du Québec à Trois-Rivières, Canada

Swapnil REVANKAR
(PhD Student)

Outline of the presentation

1. Context and objective
2. Experimental setup
3. Fast charging experiments
3. Conclusion

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Context and objective

eCAMPUS

electro-mobility for **CAMP**us of **U**niversities based on **S**ustainability

Objective: Develop methodologies for the research and implementation of electro-mobility in university campuses

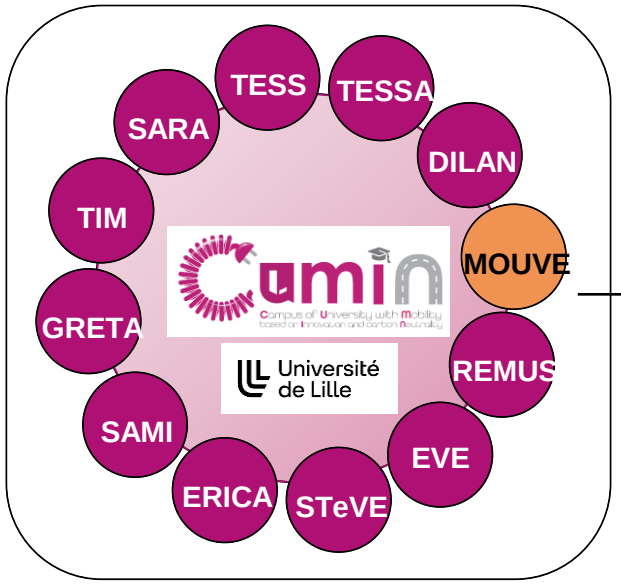
Missions:

1 – Hydrogen and electro-mobility for university campuses

2 – Analysis of the mobility on university campuses

3 – Analysis of the consumption of electric vehicles

4 – Electrification of the home-university mobility

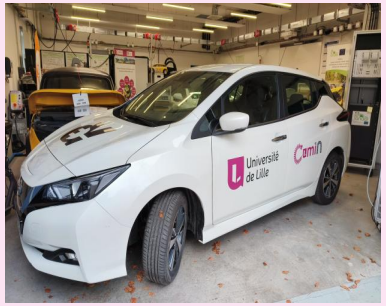


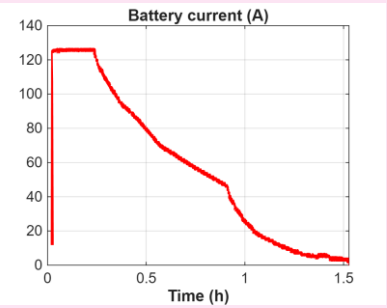
MObility and **U**se of electric **VE**hicles based on dedicated charging infrastructure

Université de Lille

UQTR Université du Québec à Trois-Rivières

Région Hauts-de-France





CHARGING NISSAN LEAF AT VARIOUS TEMPERATURES

L2EP Laboratoire d'électrotechnique et d'électronique de puissance de Lille

International collaboration

Collaboration between the University of Lille and the University of Québec à Trois-Rivières.

Laboratoire en loisir et vie communautaire

IAL (International Associate Laboratory):
International collaboration around a common scientific project.

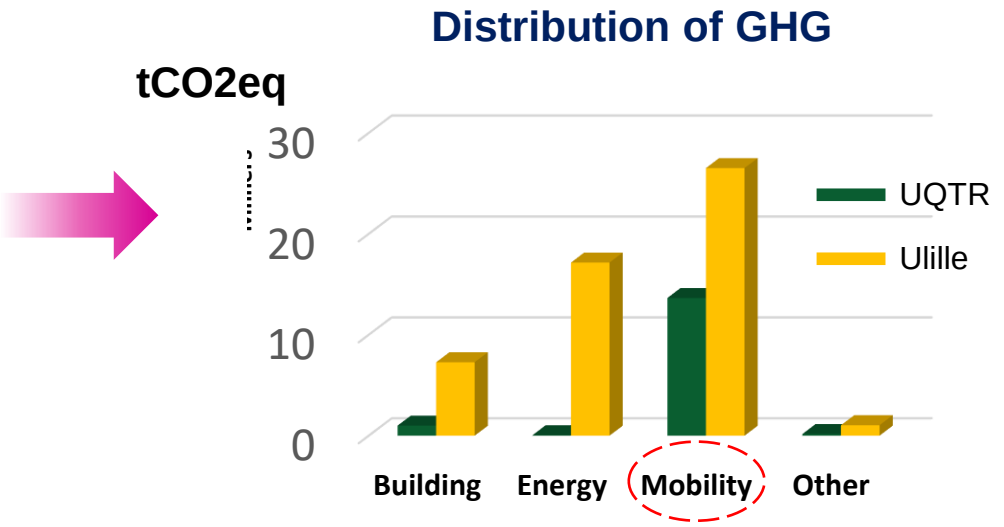
UQTR
Université du Québec à Trois-Rivières

Extreme climate
Temperature -30°C / +30°C
Population 16,000

Université de Lille

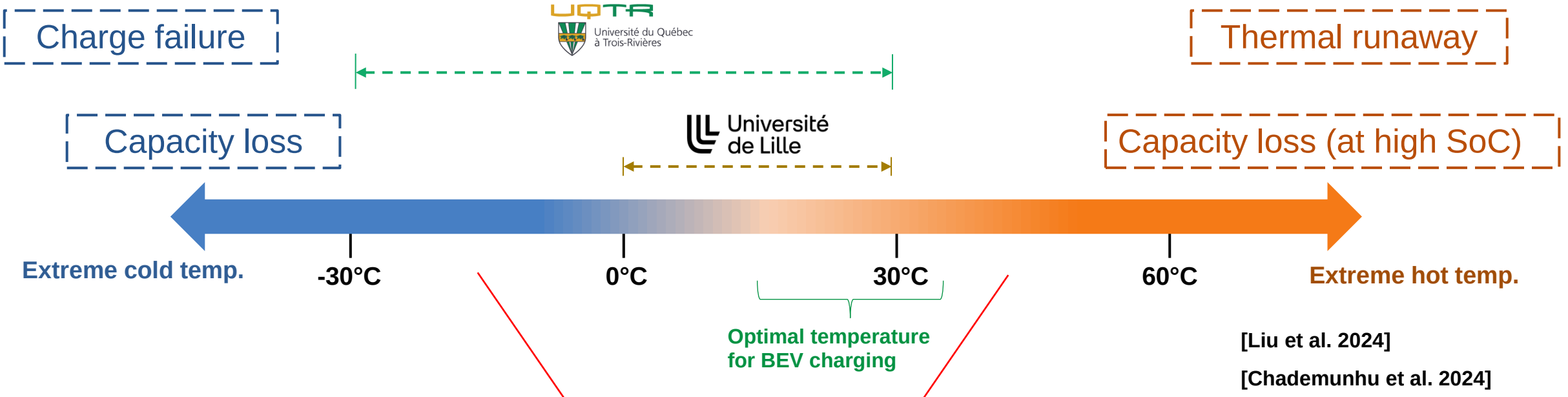
Mild climate
Temperature 0°C / 30°C
Population 22,000

GHG emissions caused by **mobility** are highest



[UQTR 2019] **[ADEME 2020]**

Impact of temperature on EV charging



[Liu et al. 2024]

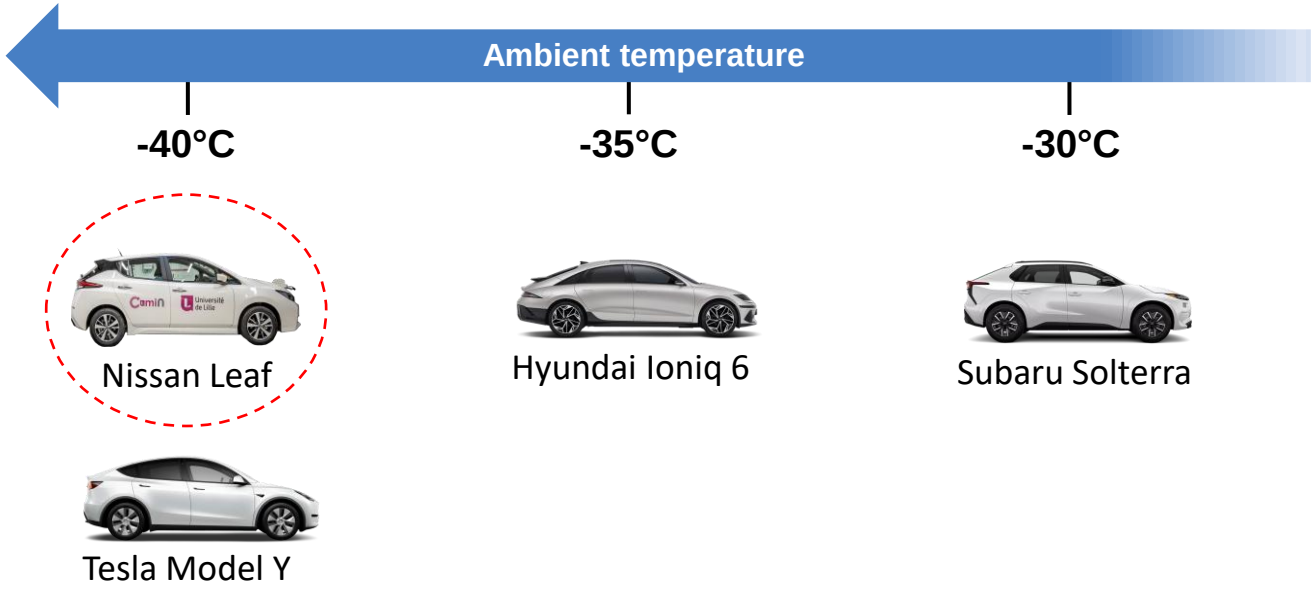
[Chademunhu et al. 2024]

Fast battery ageing and longer charging duration

Objective: Charging duration affected by battery temperature

Ambient temperature limit of EVs and chargers

Minimum operating limit of EVs



Most vehicles are rated to operate down to -30°C

For high temperature, most of EVs operate up to 45°C

NREL NATIONAL RENEWABLE ENERGY LABORATORY **Esparza et al. 2025, National Renewable Energy Laboratory**

International standards on operating temperature limit of chargers

-25°C and +40°C

NF EN 61851-1

-40ºC to +53ºC

Innovation, Science and Economic Development Canada

S-E-EVSE 01

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Experimental setup

Reference EV - Nissan Leaf

Nissan Leaf vehicles are used for experiments at both universities.

Model: ***Leaf ZE1 Acenta MY2019***

40 kWh battery

A dedicated Nissan Leaf will be available at UQTR soon

Preliminary charging test on volunteer-owned Nissan Leaf

62 kWh battery

One of the most popular EVs worldwide.

A strong market presence

[Borgonovo et al. 2023]

Affordable EV available in the market

[Pode et al. 2026]

Available chargers

Two types of chargers available for charging Nissan Leaf

Fast chargers

63 kW
(125 A, 500 V)

62+62 kW
(156 A, 1000 V)

Slow chargers

4.8 kW
(20 A, 240 V)

7.5 kW
(32 A, 400 V)

22 kW
(80 A, 400 V)

Charge connector type

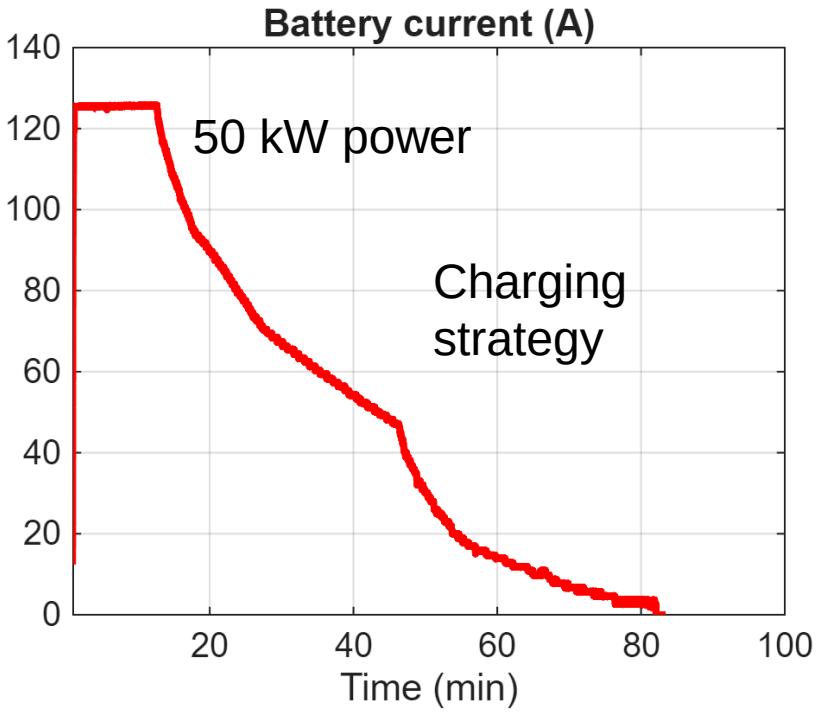
CHAdeMO
1.1

CHAdeMO
2.0

Type 2 AC

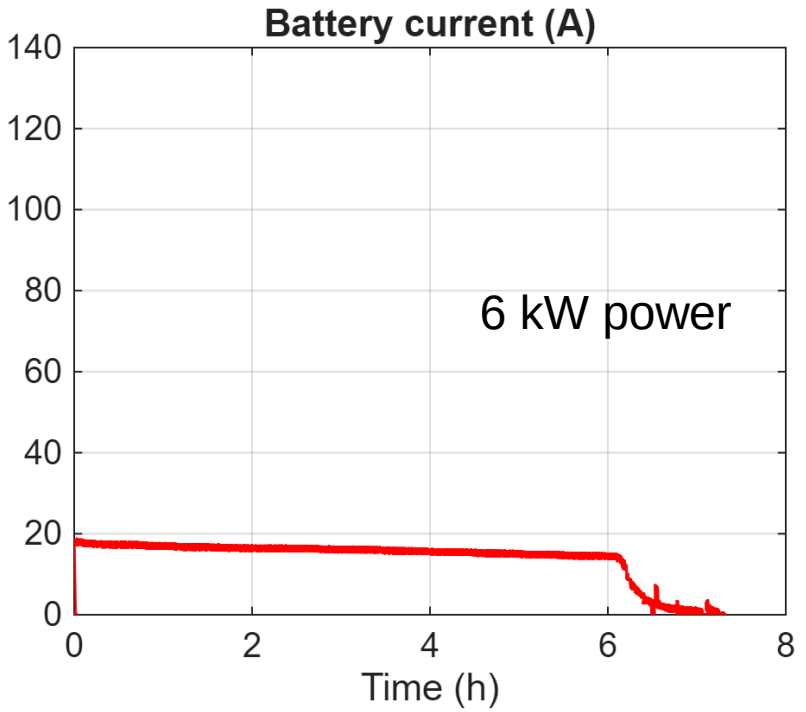
Comparison of fast and slow charging

Fast charging



1 hours and 20 mins to complete the full charge

Slow charging



7 hours to complete the full charge

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Fast charging experiments

Fast charging experiment procedure

always same charging station

EV driven until SoC below 30%

Park EV
inside / outside the platform

to influence the initial battery temperature.

Drive EV
to the
charging station

Fast charging
(SoC 100%)

CHAdeMO
63 kW

Data acquisition
dSPACE

This process is followed for all charging experiments

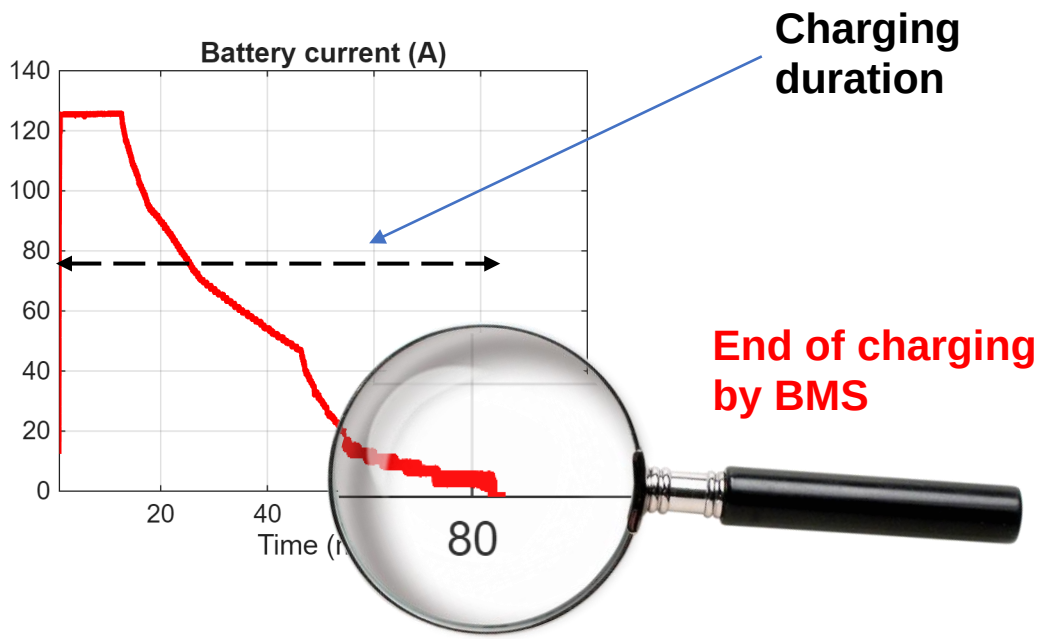
Experiments

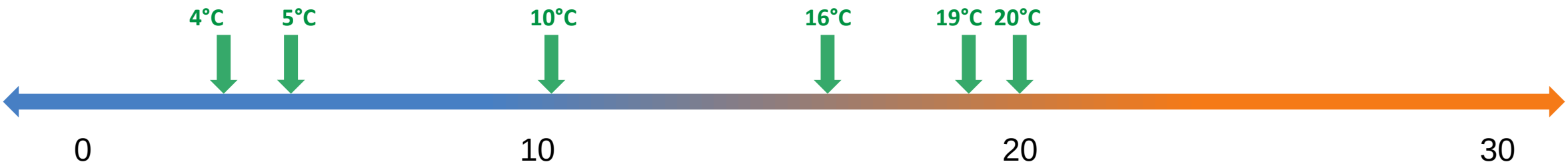
Fast charging experiments conducted at various temperatures

Ambient temperature **(-2°C to 14 °C)**

Initial battery temperature **(4°C to 20 °C)**

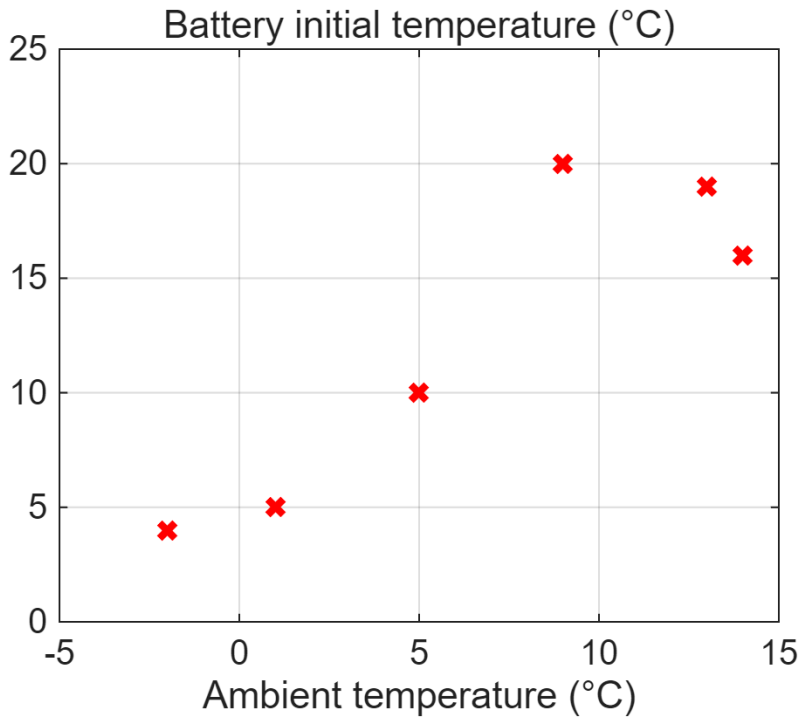
Charging duration calculated from 29% SOC

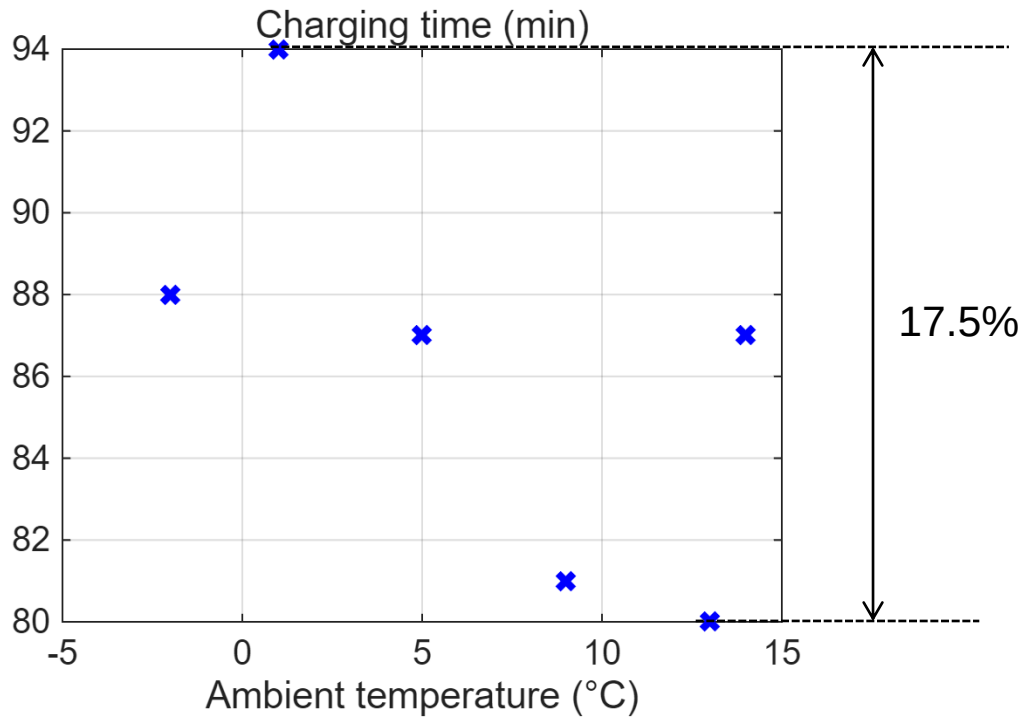




Results at various ambient temperatures

Experimental results obtained from fast charging experiments





6 fast charging sessions

ambient temperatures (-2 to 14°C)

Charging time is longer at low temperatures

Impact up to 17.5%

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Conclusion

Conclusion

- Temperature plays a key role in the Nissan Leaf's charging process
- Low temperatures can increase charging time (by 17%)
- Experiments show insights into the charging strategies for different temperatures

Perspective

- Charging duration at -30 °C in comparison to the 17% increased duration at -5 °C .

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Thank you for your attention

References

[Borgonovo 2023] Borgonovo A., 2023. « The European Electric Vehicle Market: An Analysis of Consumer Perceptions and Preferences: Perceptual Map ».

[Chademunhu et al. 2024] Chademunhu B.F., Gupta S., Mishra P.K., 2024. « Enhancing Cold-weather Performance of Electric Vehicles through Innovative Thermal Management Strategies », *in: 2024 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT)*. Présenté à 2024 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT), IEEE, Bangalore, India, p. 1-6. https://doi.org/10.1109/CONECCT62155.2024.10677109

[Liu et al. 2024] Liu J., Yadav S., Salman M., Chavan S., Kim S.C., 2024. « Review of thermal coupled battery models and parameter identification for lithium-ion battery heat generation in EV battery thermal management system ». *International Journal of Heat and Mass Transfer* 218, 124748. https://doi.org/10.1016/j.ijheatmasstransfer.2023.124748

[Pode et al. 2026] Pode R., Diouf B., 2026. « The Second-Hand Market in the Electric Vehicle Transition », *in: Decarbonization of Road Transportation: The Electric Vehicle (EV) Transition*. Springer, p. 193-234.

[U.S. Army Corps of Engineers et al. 2025] U.S. Army Corps of Engineers, USDOE Office of Energy Efficiency and Renewable Energy (EERE), National Renewable Energy Laboratory (NREL), Golden, CO (United States), Esparza E., Truffer-Moudra D., Hodge C., 2025. « Electric Vehicle and Charging Infrastructure Assessment in Cold-Weather Climates: A Case Study of Fairbanks, Alaska (No. MainId:93891, MainAdminId:75729, UUID:424b9312-b91d-4b1d-b118-67d) ». https://doi.org/10.2172/2500794

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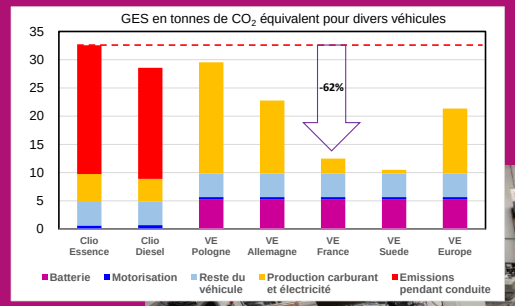

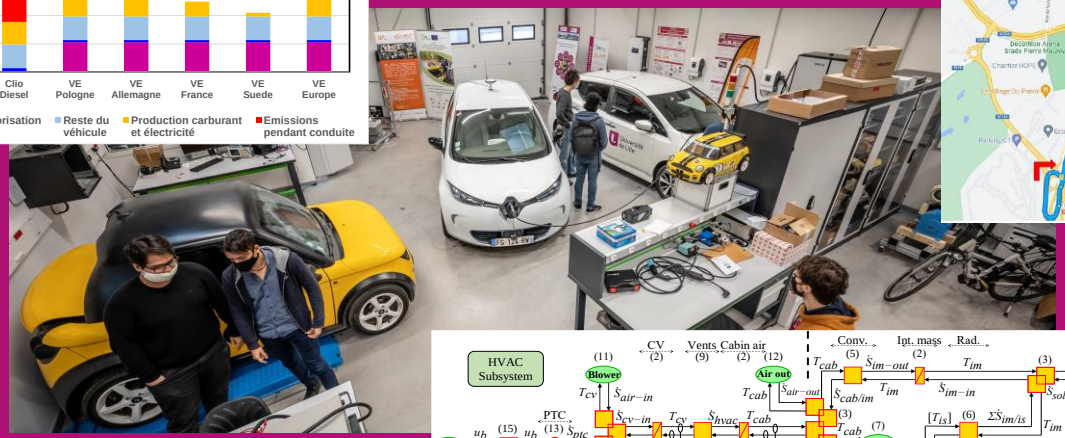

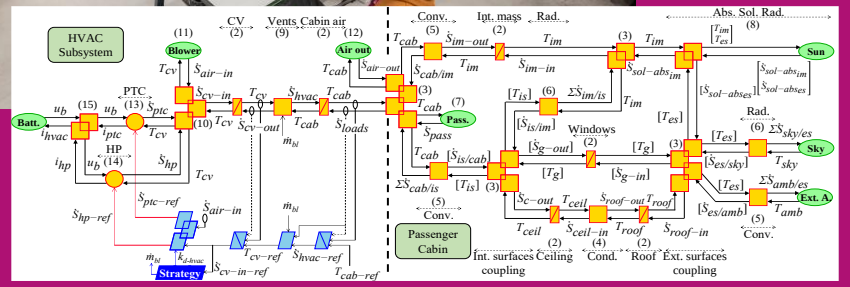

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