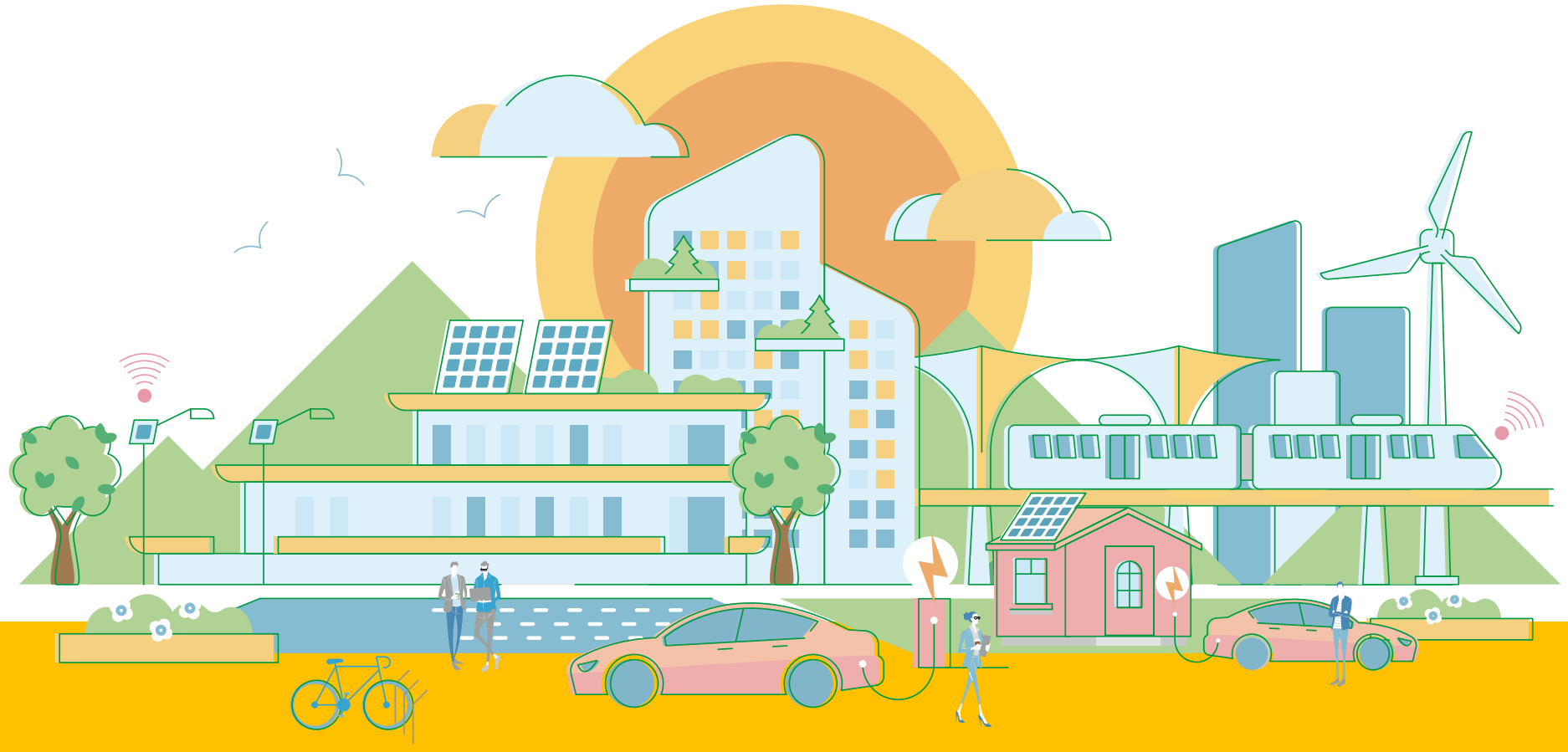
# CHAdeMO's V2G technology: an accelerator of shift towards carbon neutrality

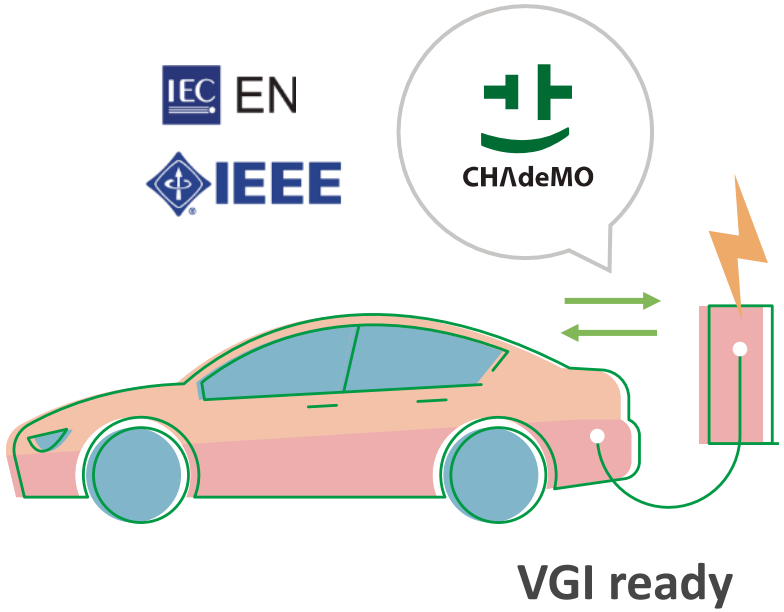
14 June 2022 @EVS35

**Mika Zaurin Cazanova | CHAdeMO EU**



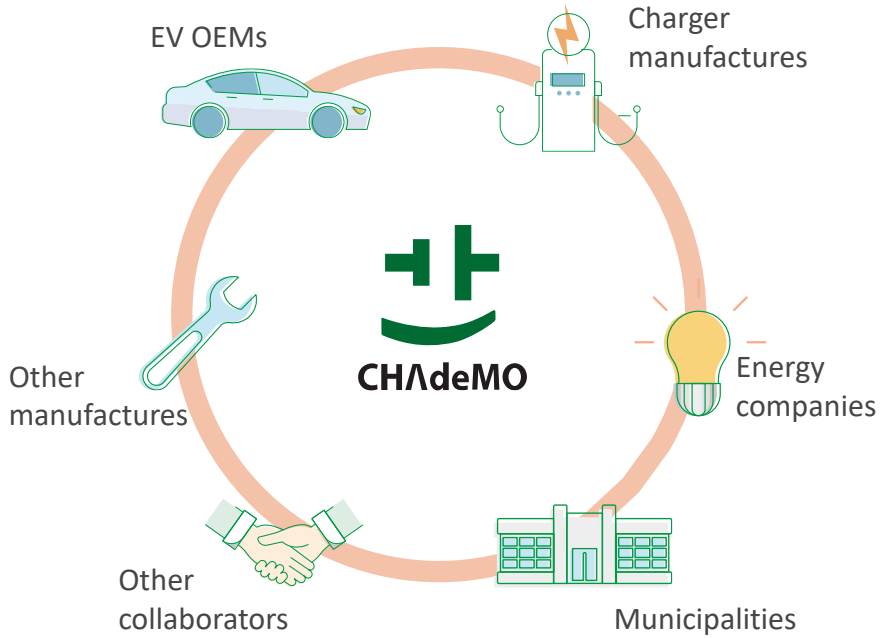
# CHAeMO is the name of tech. & org.

## DC charging Standard




VGI ready

## Organisation




develop certify promote

CHAdeMO

# Electrification is a key step to carbon neutrality

CO2 emission

Transportation is responsible for 24% of direct CO2 emissions from fuel combustion[2]

Global warming

To prevent warming beyond 1.5°C, we need to reduce emissions by 7.6% by 2030[1]

Our responsibility

Electrification is an efficient measure to achieve climate neutrality

Source: [1]UNEP facts about the climate emergency, [2]IEA Tracking Transport 2020

CHAdeMO

# 500+ members adhere to CHAdeMO's values


And many, many more..

**537**

**entities from**

**48**

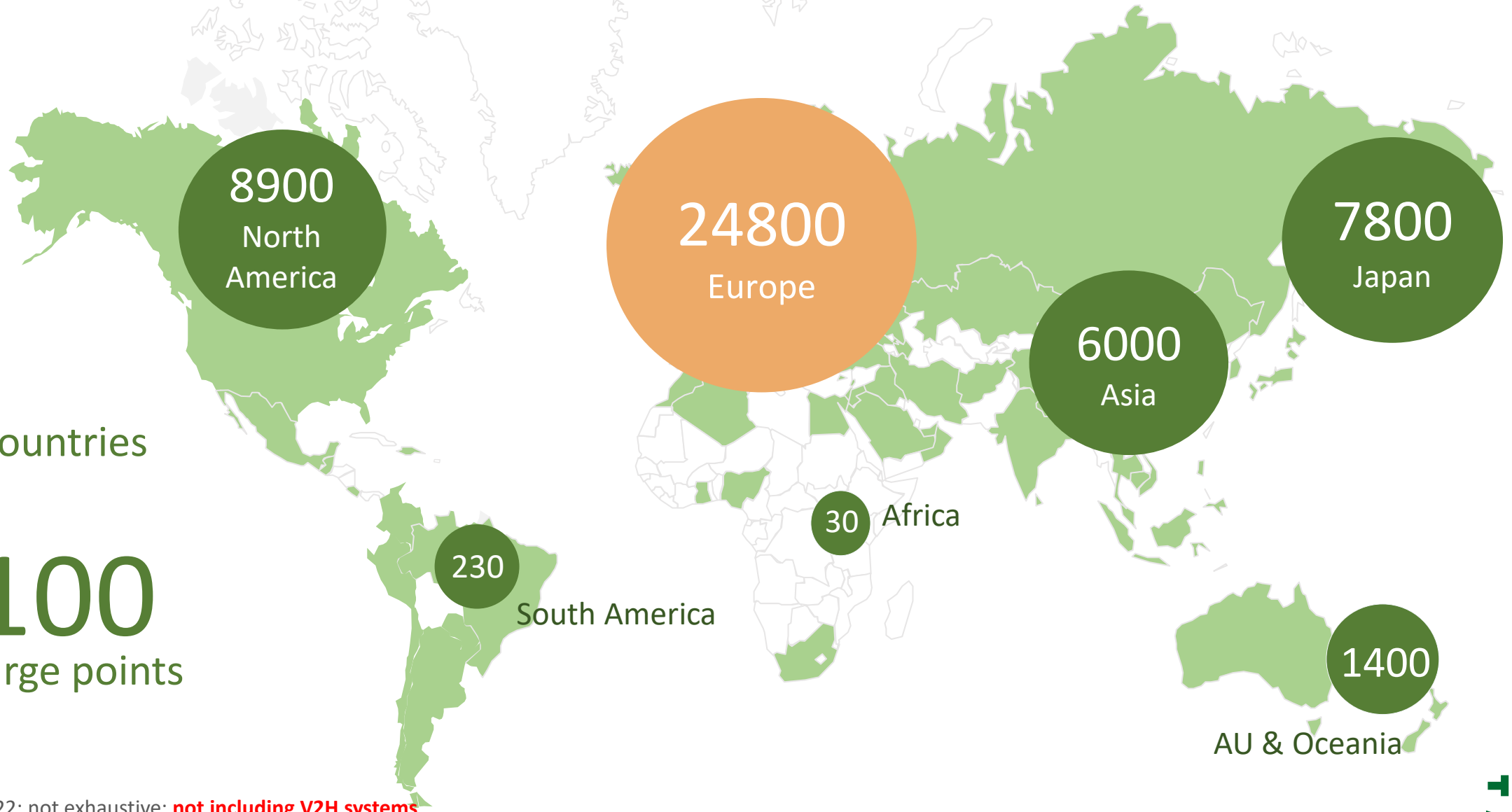
**countries**

**165**

**from EU**

CHAdeMO

# ≈ 50 000 CHAdeMO charge points deployed




TOTAL

**98** countries

**49 100** charge points

Note: as of May 2022; not exhaustive; **not including V2H systems**

Source: ChargeMap, PlugShare, EAFO, Zap-Map, NOBIL, Girève, GoingElectric, ChargeHub

CHAdeMO

# About our paper

## Purpose

- To provide a comprehensive overview of the V2G demonstration projects and
- To explore how best to advance the wider adoption of V2G

## Methodology

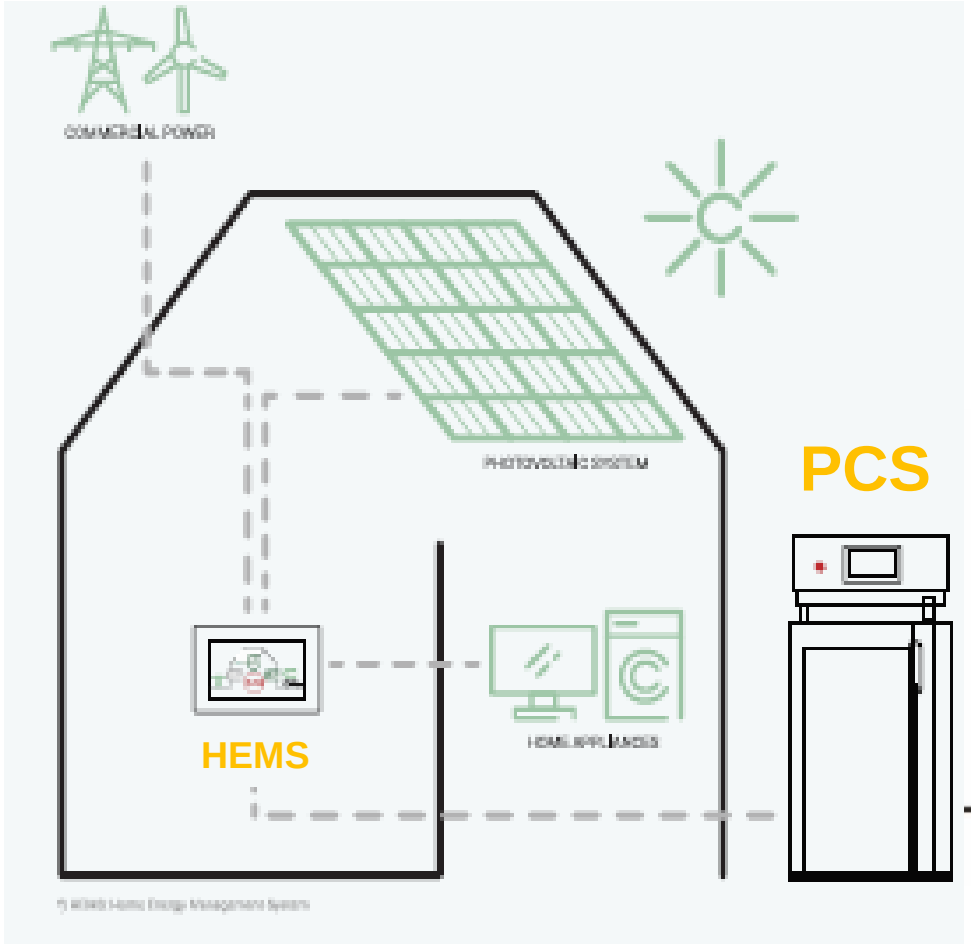
- An extensive review of reports
- Survey research
  - *How many DC V2G chargers were deployed in total?*
  - *What were the services offered?*
  - *What are the major qualitative outcomes of your project?*
  - *What were challenges you faced during your project?*
- Results of CHAdeMO V2G webinars' post-event surveys

## Observations

- Not many reports are available in the public domain & limited number of new data
- Need more in-depth research with the data from on-going and upcoming demo projects

CHAdeMO

# What is V2G (vechile-to-grid)?




CHAdeMO

Typically up to
**10-11kW**

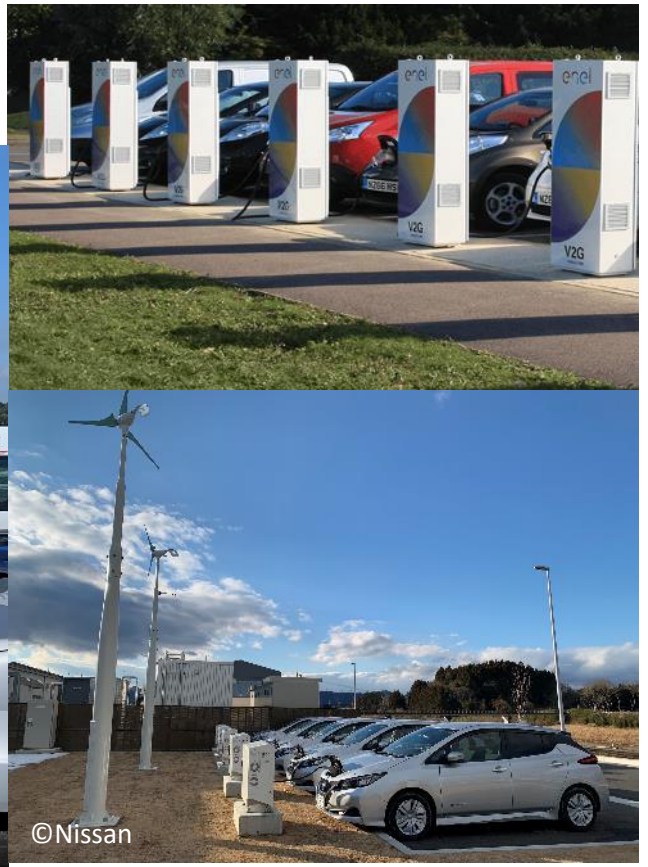
**V2G protocol**

CHAdeMO

# Examples of V2G applications

Micro-grid optimization for building or home


EV as mobile battery e.g., disaster relief

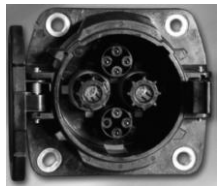




Balancing the grid for to help integrate RES

CHAdeMO

# The enabler of V2G

IEC62916-3

| | CHAdeMO (Global) | CCS Combo1 (US) | CCS Combo2 (EU) |
|---|---|---|---|
| |   |   |   |
| **DC bi-directional** | CHAdeMO V2X (2014); IEEE 2030.1.1 ✓ | ISO/IEC 15118-20 (to be published in 7/2022, currently only available for PLC) + IEC 61851-1 Ed.4 (to be started) | |
| **AC bi-directional** | **(Type 1 or 2 AC plug)** | **Type1 AC plug** + Bi-d. OBC + ISO/IEC 15118-20 + IEC61851-1 Ed.4 (to be started) | **Type2 AC plug** + Bi-d. OBC + ISO/IEC 15118-20 + IEC61851-1 Ed.4 (to be started) |

Source: IEC; https://www.iec.ch/dyn/www/f?p=103:38:12691962765287::::FSP_ORG_ID,FSP_APEX_PAGE,FSP_PROJECT_ID:1255,23,23481

CHAdeMO

# V2G Product development

2012
Nichicon
2013
Allard Power
Furukawa (IKS)
Tsubakimoto
2014
e8 Energy
CHAdeMO Specs
Mitsubishi Electric
2015
CHAdeMO Certification
Honda
Andromède Power
Enil X
ABB
MAGNAMCAP
ides
novâtes
ZAPTEC
Osasco
Wallon
EVTEC
Indra
AME
ENDESA
Fermata Energy
DELTA

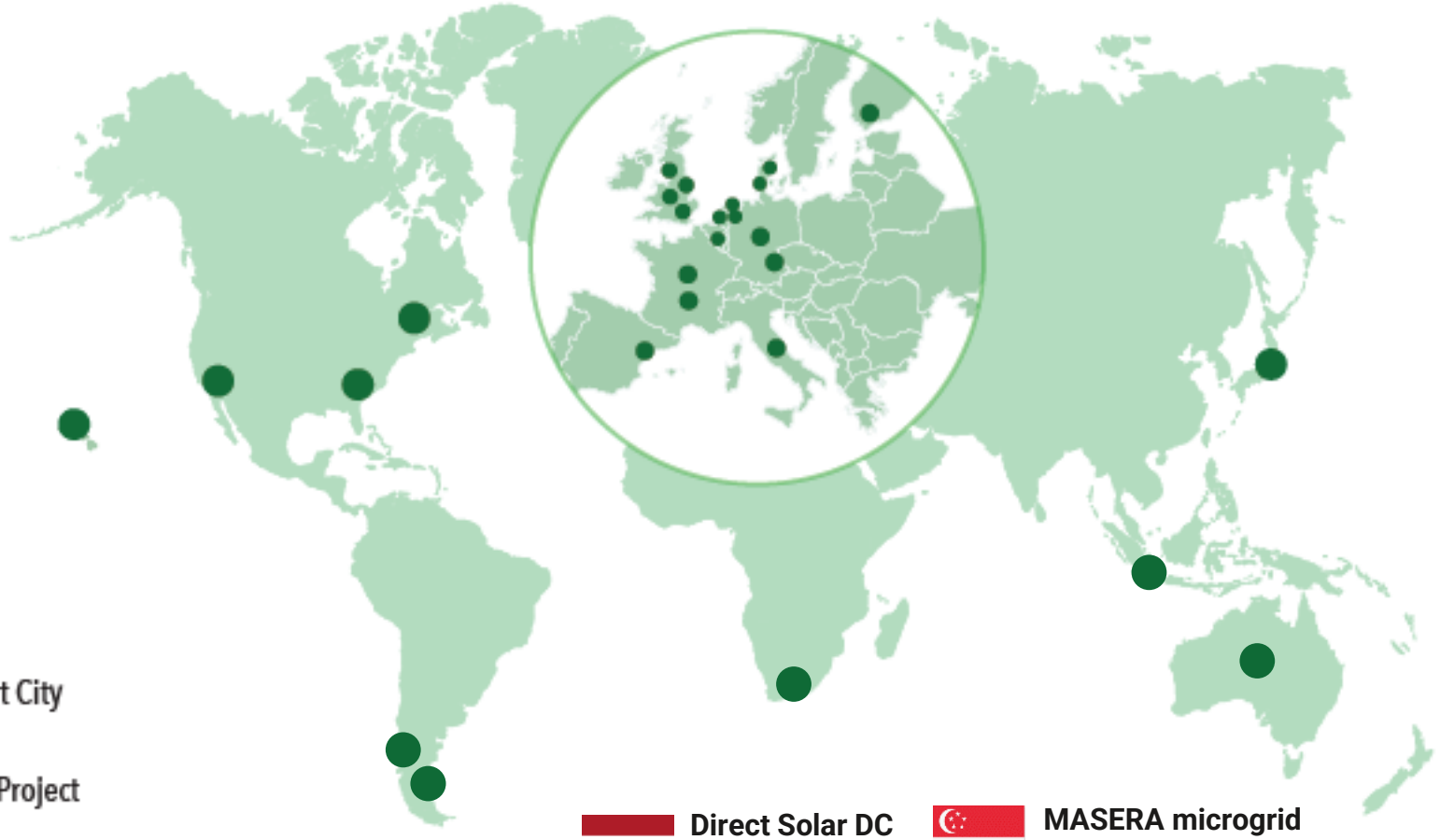
V2G/B/H (Grid)

V2L

V2H

CHAdeMO

# V2G projects & commercial applications



- JUMPSmartMaui, USA
- LA Air Force Base, USA
- UCSD, USA
- PowerStream, Canada
- Yokohama Smart City Project, Japan
- Nikola Project / Parker Project, Denmark
- Nuvve Project, Denmark
- Amsterdam Smart City, Netherlands
- NewMotion V2G Project, Netherlands
- GrowSmarter, Spain
- **Peak Drive**, Canada
- **reset Project**, Germany
- **UYILO E-Mobility Programme**, South Africa
- **UNDP Windhoek V2G**, Namibia
- Nissan HQ Project, France
- GridMotion, France
- Genoa Pilot, Italy
- Suvilahti Pilot, Finland
- Nissan-Enel Project, UK
- DriveElectric, UK
- **Sciurus Project**, UK
- Redispatch V2G, Germany
- SEEV4-City, UK, Norway, Netherlands, Belgium, Germany
- **Domestic Energy Balancing EV Charging Trial**, UK
- **Direct Solar DC V2G Hub**, NL
- **Share the Sun Project**, NL
- **V2G Elate**, BE
- **MASERA microgrid project**, Singapore
- **Realising Electric Vehicle to Grid Services**, AU
- **Blue Switch**, Japan

Source: CHAdeMO website, https://www.v2g-hub.com

CHAdeMO

# Resilience & disaster relief: Blue Switch Initiative

## Overview

- Nissan's initiative
- Address social concerns and regional challenges using EVs
- A model of coop. between local authorities and industry
- 2018 - ongoing
- 170 projects implemented


https://twitter.com/nissanmotor

## Activity

**Typhoon No. 15 in Chiba, 2019**

- One of the largest deployments of EVs as emergency power sources
- **Over 930,000 households** affected, especially in Chiba Prefecture where blackouts continued for a long time
- Provided **over 50 EVs and 50 V2L devices** to medical and welfare institutions

## Results

- Electricity provided to the local authorities as well as to medical and welfare institutions
- Social value of V2G demonstrated
- Blue Switch to be expanded to other countries

Photo by Nissan

Source: https://global.nissanstories.com/en/releases/nissan-blue-switch
https://withnews.jp/

CHAdeMO

# V2G for home: Project Sciurus

## Overview

- The world's largest residential V2G project
- To validate the technical and commercial potential for a domestic V2G
- 2018-2021 (completed)
- Funder: Innovate UK
- Partners:

cenex, INDRA, UKRI Innovate UK, KALUZA, NISSAN, ovo energy

## Activity

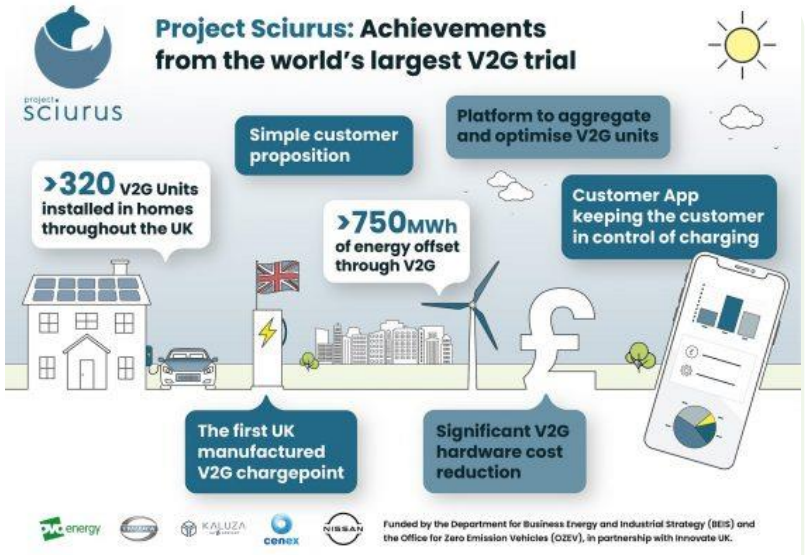
- Installed 300+ V2G chargers + apps across UK homes
- Paid customers 30p (€0.34) per kWh exported to the grid
- Monitored the charging and discharging behaviours

project sciurus

OVO customer app


Indra V2G

## Results




- **>750MWh** of energy offset through V2G
- **£80 (€ 91)** V2G credits/m
- **£360 (€411)** annual bill savings

Source: Project white paper, Jan 2021, https://www.cenex.co.uk/app/uploads/2021/01/V2G-Commercial-Viability-1.pdf

CHAdeMO

# V2G for Fleets: Flexitanie Project

## Overview

- The first large-scale V2G trail in France
- To understand customers' perception of V2G & to assess how V2G can optimise the RE intermittency
- Led by:

dreev GROUPE EDF  izivia GROUPE EDF

- Funded by:

La Région Occitanie Pyrénées · Méditerranée  RÉPUBLIQUE FRANÇAISE Liberté Égalité Fraternité  ADEME AGENCE DE LA TRANSITION ÉCOLOGIQUE

## Activity

- Install 100 V2G chargers for fleets of companies and local authorities
- = 1 MW virtual power plant (VPP)
- Pay customers 20 €/charger/m if the EV is plugged in long enough


ABB V2G photo by EDF

## Results


Photo by EDF

- **25 V2G chargers** installed
- **100+ charge points** installed
- **V2G solution certified by RTE**

Source: Project white paper, Jan 2021, https://www.cenex.co.uk/app/uploads/2021/01/V2G-Commercial-Viability-1.pdf

CHAdeMO

# Barriers & lesson learnt

## Technical

- **Reduce hardware cost**
  - ✓ €5700 (pres.) >> **€2500**
- **Explore the AC V2G option** but some issues remain
  - ✓ On-board-charger is costly
  - ✓ Complicated to fulfil different grid code requirements

## Customer-side

- **Provide more guidance and education** for V2G to gain **public acceptance**

## Commercial & business

- **Encourage users to plug-in more**
  - ✓ High plug-in rate of 75% = annual revenue of €510
- **Develop more V2G capable vehicle models**
- **Target the 'right customer segments':**
  - ✓ High plug-in availability
  - ✓ ≥ 40kWh battery
  - ✓ Grid-service capable

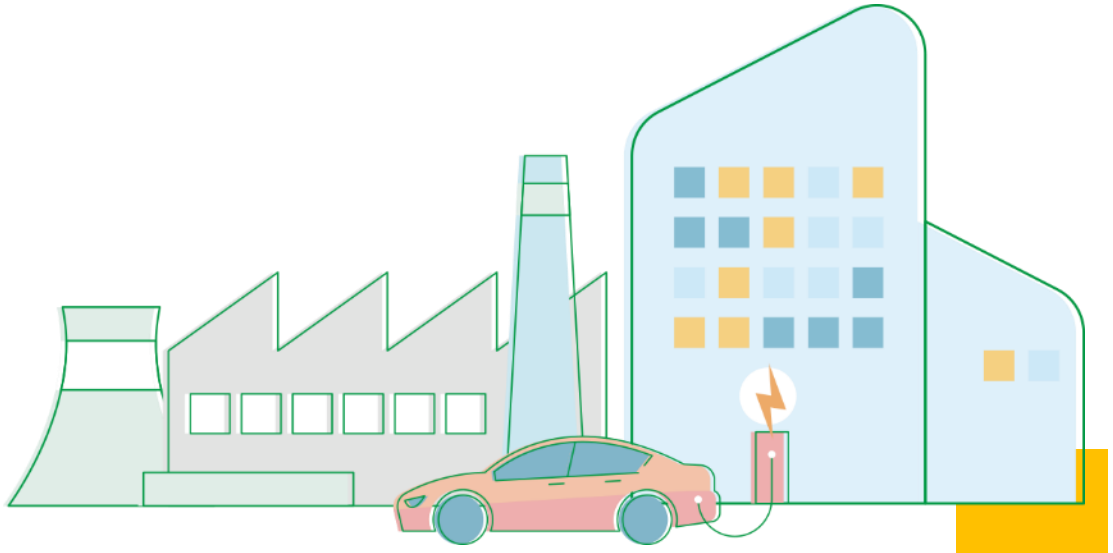
## Regulatory

- Make **grid connection process more transparent & simpler**
  - ✓ UK: an approval from DNOs is required, at times with high fees
- Make **procedure for providing frequency control services simpler**
  - ✓ In UK, each V2G unit requires individual validation by ESO
  - ✓ In France, TSO has type certified V2G

CHAdeMO

# Summary & Conclusion

- V2G can effectively provide environmental, social and economic benefits
  - ✓Blue Switch: V2G as effective tool for disaster relief
  - ✓Sciurus Project: V2G delivers environmental & financial values for residential use
  - ✓Flexitanie Project: V2G accelerates the integration of renewables energy sources
- Yet, there are technical, customer-related, commercial & business, and regulatory challenges remain
- More innovative solutions and collaboration are needed



# Thank you

**For more information and questions:**

**✉ info@chademo.eu**