Vehicle-2-Grid

What will it take to be part of the V2G revolution?

TUMIVOLT, Webinar,
December 3rd 2021

EVCONSULT
experts in sustainable mobility

giz


TU Delft
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Our team

Unique global expertise in the field of e-mobility

- Over 10 years of experience
- Completed over 500 e-mobility projects
- Largest independent EV Office
- Multidisciplinary backgrounds
  (e.g. technical, commercial, economic, legal)
- International experience with e-mobility
  strategy, project management and innovation
- Vehicle-to-grid (V2G) specialists

Our clients

Government

Gemeente Amsterdam

Global Green Growth Institute

Transport for London

Provincie Noord-Holland

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THE WORLD BANK

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Automotive & Operators

Volkswagen

anwb

MITSUBISHI MOTORS

Qbuzz

newmotion charge smart

postnl

JAGUAR

LAND ROVER

Ahold

Our work

Accelerating EV in 500 projects in 20 countries

Our V2X experience

A selection

Global review of V2G - IUK & UKPN

City-zen V2G - Alliander Amsterdam

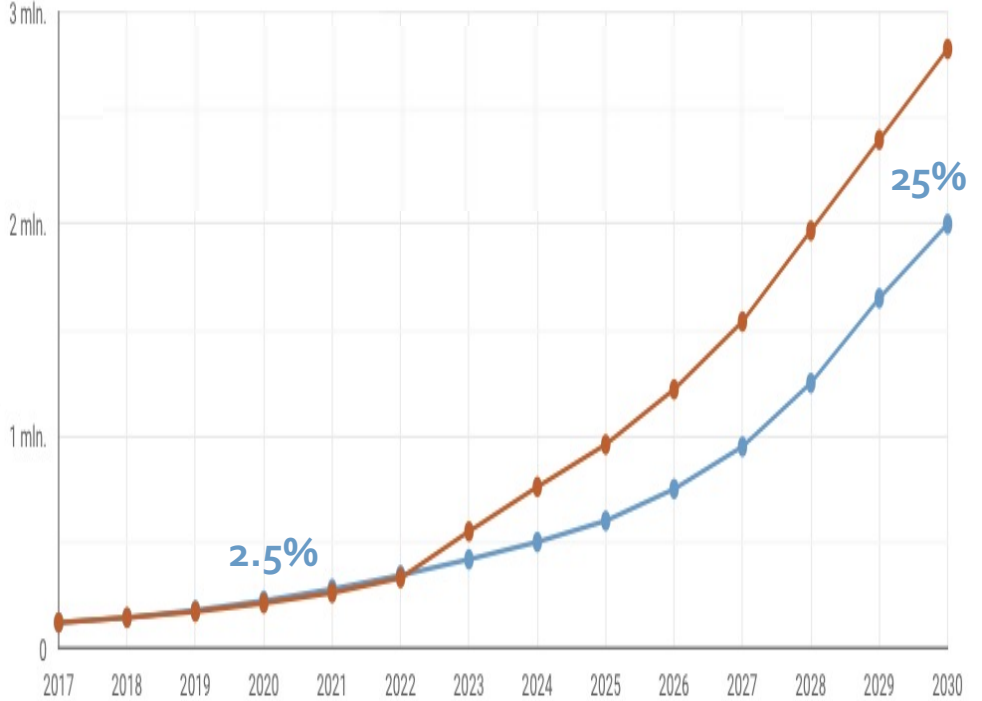
FCR Netherlands - TenneT

V2GO – Oxfordshire Country Council

J. Cruijff ArenA V2B - City of Amsterdam

FCR with V1G & V2G - Elia

E-mobility in the Netherlands



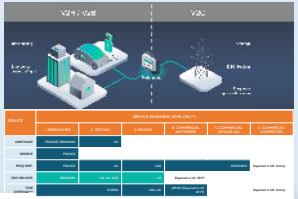
The decade of V2X scale up

- V2G **technology** works and is moving towards universal **standards**
- V2G has large **business potential** and **social impact**
- Charger evolution towards efficient, compact, user-friendly and inexpensive **next-generation bi-directional chargers**
- Development of attractive, integrated **customer proposition**
- V2G can supply many types of **energy services**, which vary widely in revenue, from €10 to €1,800 per year
- Strong **collaboration** among stakeholders accelerates rollout

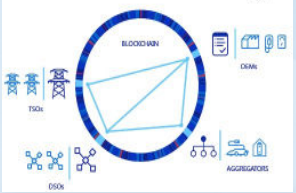
Topics for this presentation

What is V2G?
& its benefits?

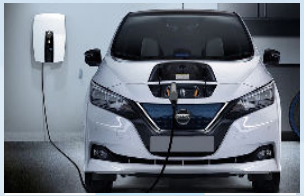
Use Cases
V2G applications



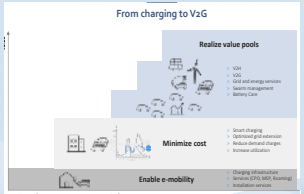
V2G Services
Types and current readiness level



V2G architecture
& Challenges to adoption



Requirements
Power grid & Asset level



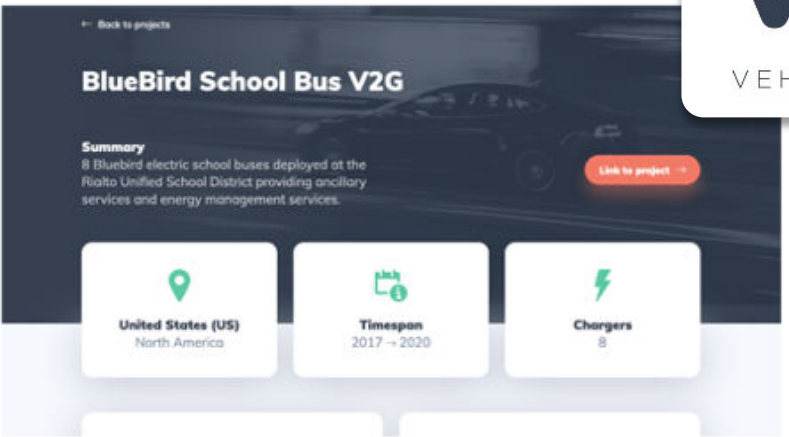
Roadmap to V2G
implementation in a country

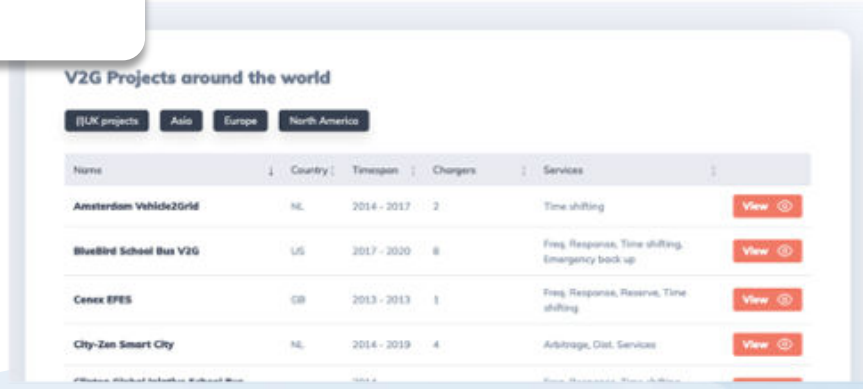
Creating a central resource for all V2G projects: V2G Hub

www.v2g-hub.com

V2G Hub

VEHICLE TO GRID





cutting-edge insights through learning by doing. Come take a look.

Learn more ↓

What is Vehicle-to-Grid (V2G)?

V2G is technology enabling bi-directional energy transfer from/to plug-in electric vehicles. Power from the vehicle's battery can be fed (back) to a home, an office building, a street or the national electricity grid. This way, an electric vehicle can be used as a battery, supporting a future of smart grids and decentralised renewable power production. This is distinct from 'dumb' one-way charging and 'V1G' or 'smart' charging where the rate and time of charge can be varied.

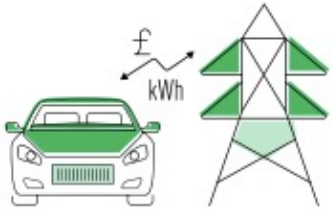
Go to services → Go to FAQ →

Benefits

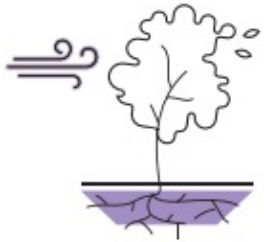
- Less concerns for grid overload
- Novel economic revenues for consumers
- Cheap and fast energy storage
- Making use of existing resources
- Supporting electrical grid, reducing concerns for grid overload
- Reduction of environmental impact

V2G benefits

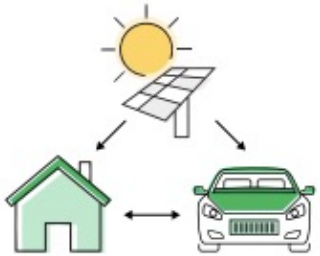
Value Propositions



Revenue-Generating Energy Trading



Resillience

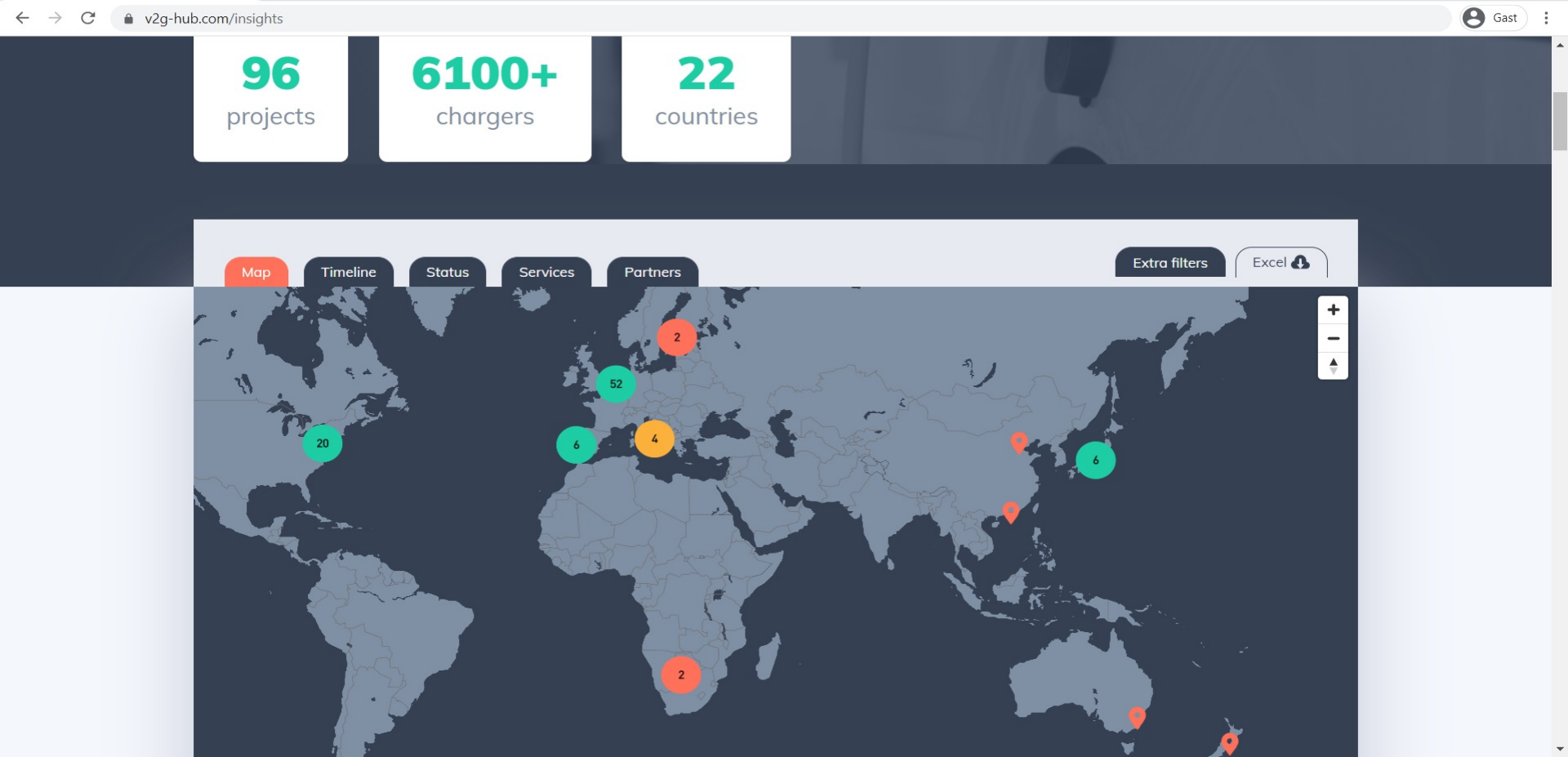


Personal Net Zero / Self Sufficiency

Benefit to Society

Enhanced Battery Management

Use Case V2G applications



Use Case V2G applications

Japan : M-Tech Labo

Services

- Time shifting for energy users
- Emergency back-up

Vehicles

Company cars

Beneficiaries

Building & fleet owner

Use Case V2G applications

Netherlands : City Zen

Services

- Distribution system services
- Arbitrage

Vehicles

Shared cars

Beneficiaries

Regional grid operator (DSO)

Shared EV driver

Use Case V2G applications

Hawaii: JUMPSmartMaui

Services

- Time shifting for energy users

Vehicles

Private cars

Beneficiaries

Grid operator

(EV drivers)

Use Case V2G applications

United Kingdom : Bus2Grid

Services

- Frequency Response
- Time Shifting for energy users
- Arbitrage

Vehicles

30 Electric buses

Beneficiaries

National grid operator (DSO)

Fleet owner

Use Case V2G applications

Netherlands: J. Cruijff ArenA V2B – City of Amsterdam

Services

- Time Shifting for energy users
- Emergency back-up

Vehicles

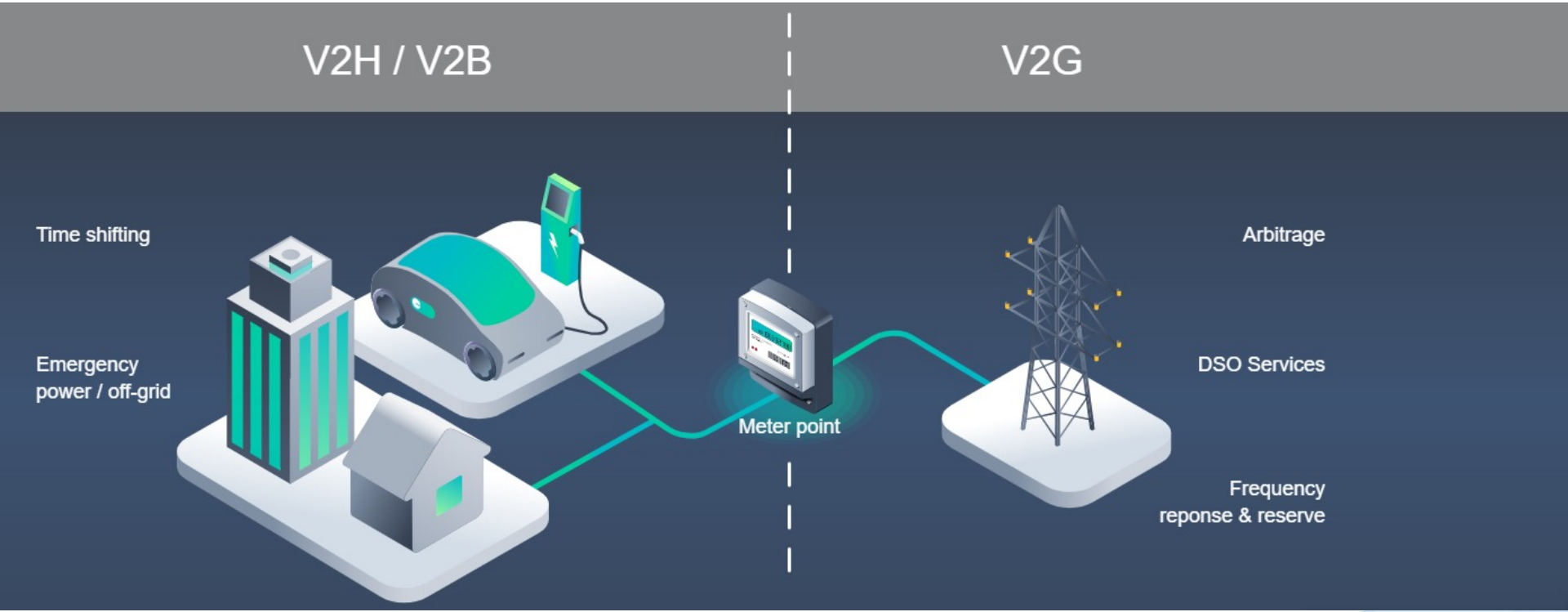
Private cars (of visitors)

Beneficiaries

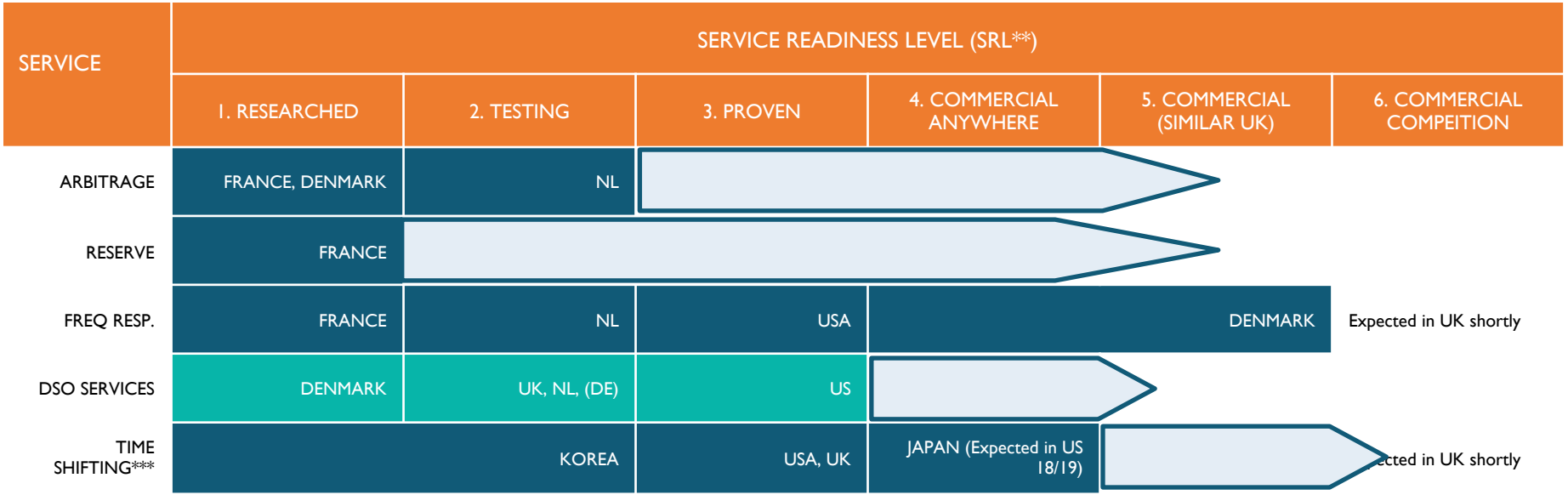
Regional grid operator (DSO)

Building owner

Types of V2G Services



Readiness level



Global V2G Roadtrip report (2018) - with indication of progress since

https://www.evconsult.nl/wp-content/uploads/2018/10/Final-Report-UKPN001-S-01-I-V2G-global-review.pdf

V2G architecture

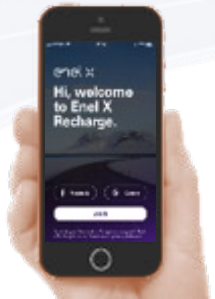
& Challenges to adoption

UTILITIES
& MARKETS

V2G CAR

USER

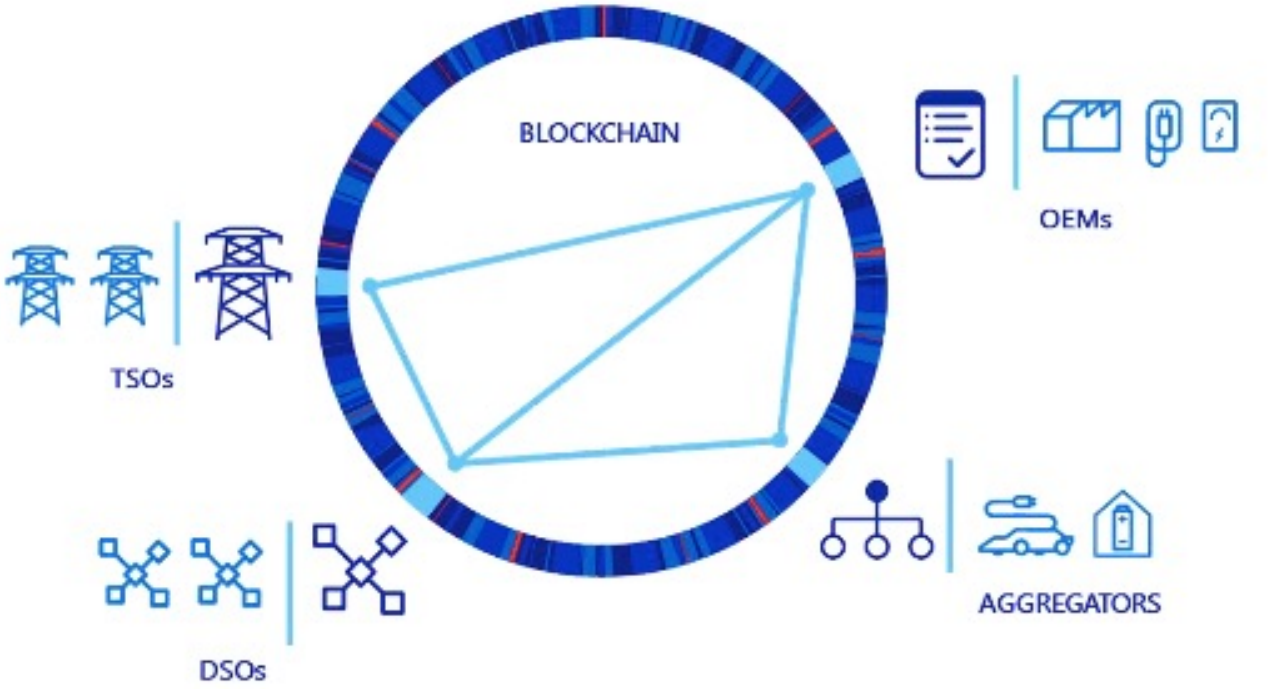
OPERATOR
& AGGREGATOR
PLATFORM



USER
INTERFACE

V2G CHARGE POINTS

V2G architecture

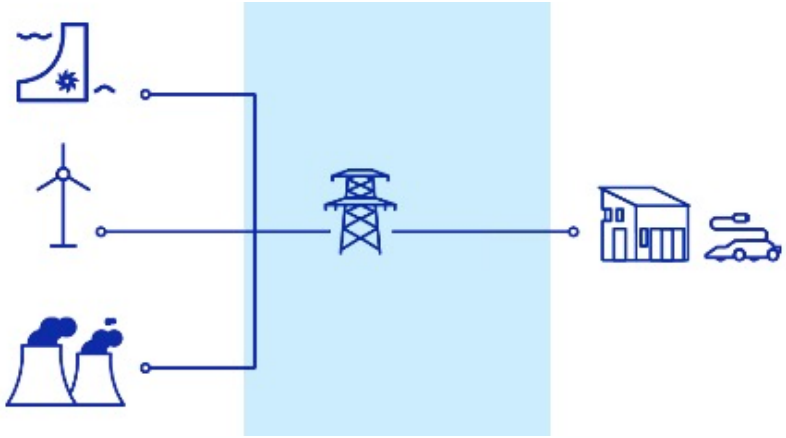


TenneT Crowd Balancing Platform
https://www.tennet.eu/our-key-tasks/innovations/crowd-balancing-platform-blockchain-technology/

Requirements

Power grid level

1. **Open data & digitalisation**
   Development of digital passports for EVs Elia & 50Herz
   Crowd Balancing Platform TenneT & European TSOs
2. **Smaller & shorter bids in existing flex markets**
3. **Creating of markets DSO services (local grids)**
4. **Adapt interconnection standards & processes**
5. **Time of Use tariffs**



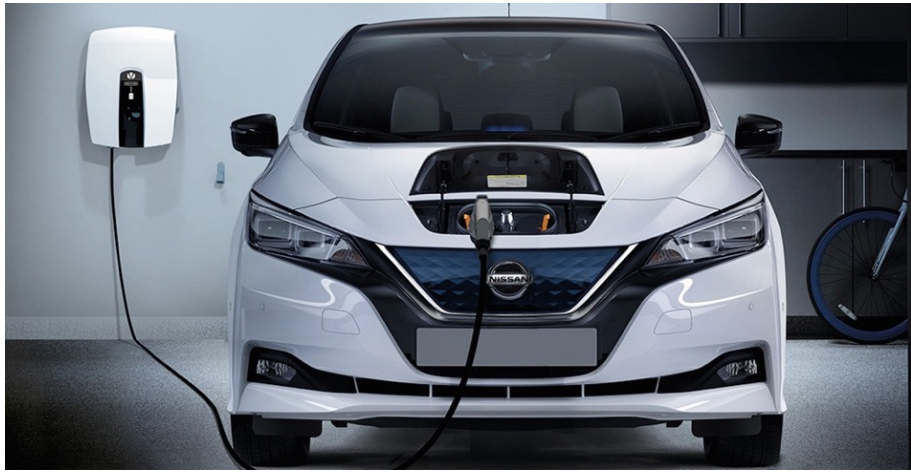
Requirements

Asset level

1. **V2G-ready car / vehicle**
   with bidirectional charging standard & plug

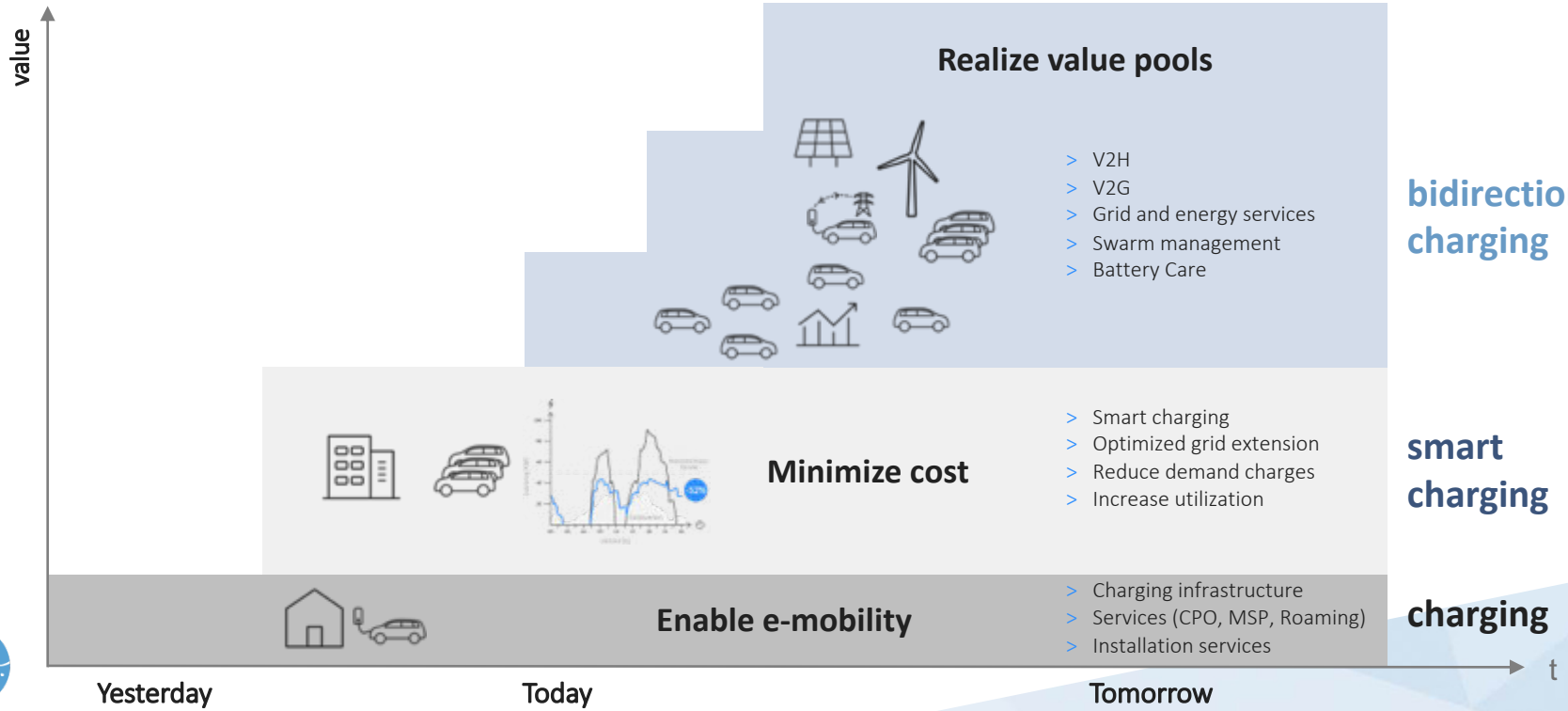
2. **V2G charger (AC or DC)**
   with bidirectional meter, upgraded controller unit, and extra safety components

3. **Link to energy management system**
   and smart meter at home or building
   + coupling to energy markets



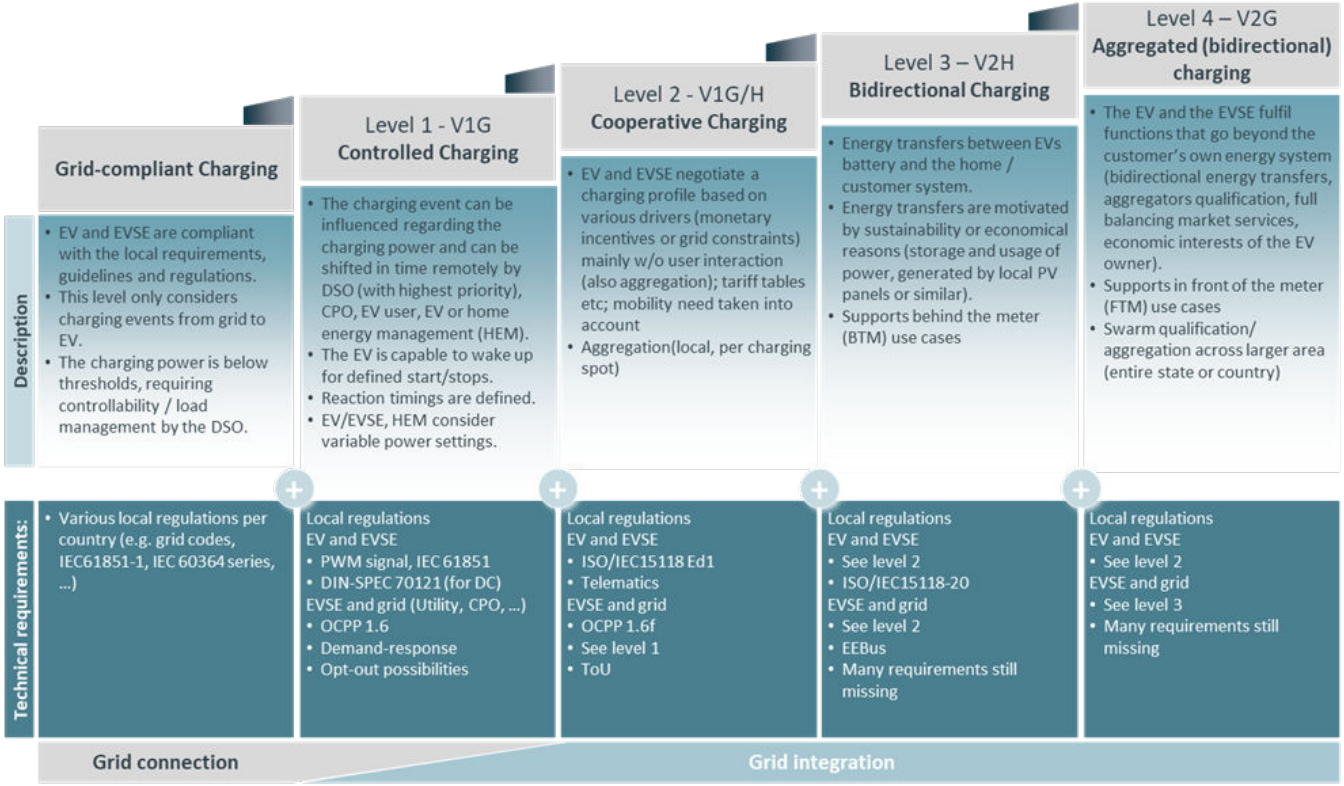
Roadmap to V2G implementation in a country

From charging to V2G



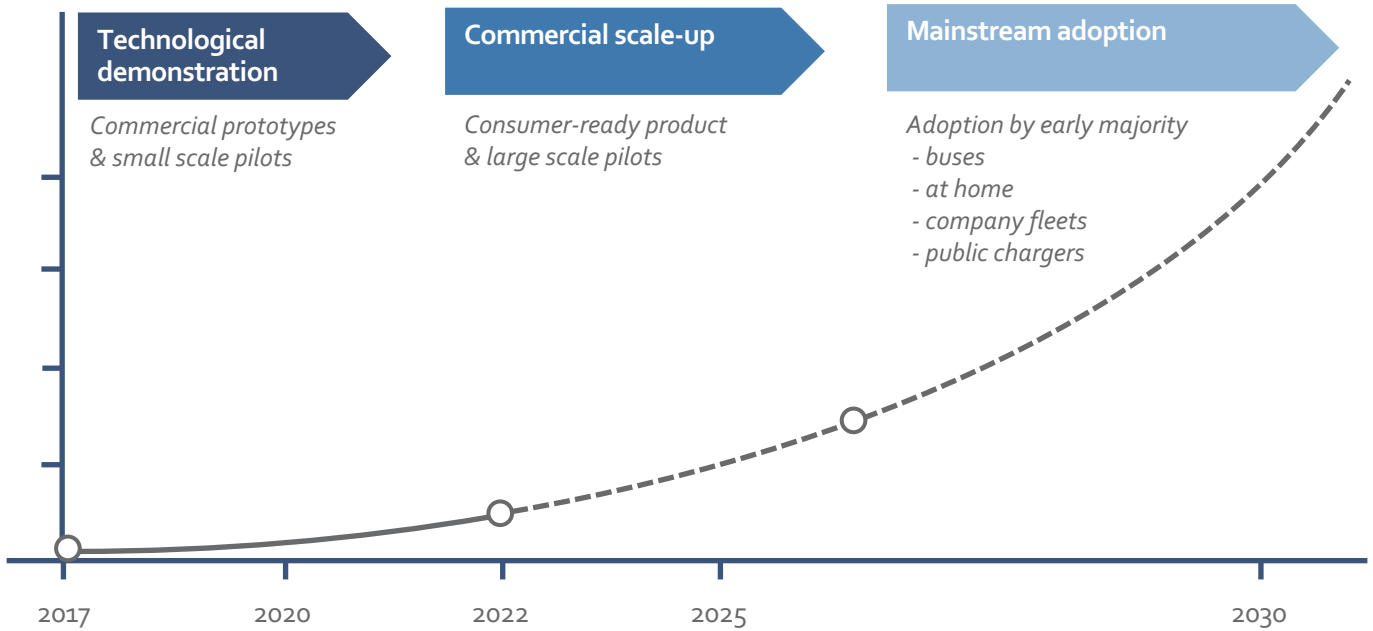
Roadmap to V2G implementation in a country

V2G standard



EV – electric vehicle, EVSE – electric vehicle supply equipment, DSO- distributed system operator ,CPO – charge point operator

Roadmap to V2G implementation in a country



https://www.evconsult.nl/en/lessons-from-the-vehicle-to-grid-integration-summit-in-denmark/

Roadmap to V2G implementation in a country

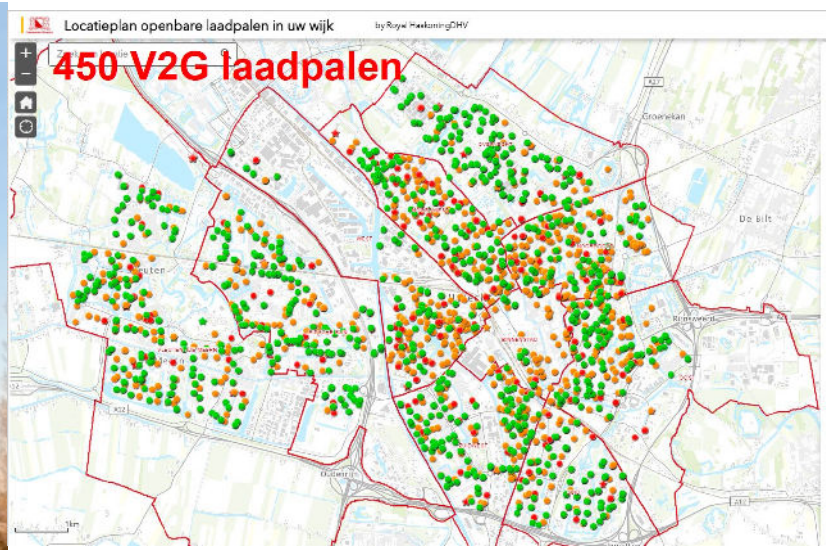
UK: Commercial scale-up phase

By 2050, up to 80% of households smart charge their electric vehicle (EV) and up to 45% actively provide V2G services

https://www.nationalgrideso.com/document/173821/download

the Netherlands: Commercial scale-up phase

Worlds largest bidirectional charging plaza



450 public V2G chargers
currently in the City of Utrecht

PAVING THE ROAD TO RENEWABLES

SMART INTEGRATION OF ELECTRIC VEHICLES TO INCREASE UTILISATION OF INTERMITTENT RENEWABLES INTO AN ISLAND ENERGY MIX

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What I work on:

EV strategy: Roadmaps - EV modelling - Fleet transition plans

Innovation: Charging hubs - Smart Charging - V2X

- World-first Global Review of Vehicle-to-Grid projects
- Smart Charging Strategy & Roadmap for DNO UK Power Networks
- Market sizing for V2B services in the UK
- Fast charging rollout business case for supermarket chain in France
- Fleet transition plan for City of Amsterdam
- World-first online EdX course on electric mobility (>140,000 learners worldwide)

https://www.evconsult.nl/en/v2xconference/

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