



# INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM & EXHIBITION



## The value of vehicle-to-grid on the distribution grid level

EVS32 - 2019  
Lyon, France

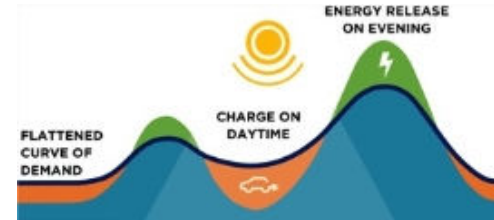
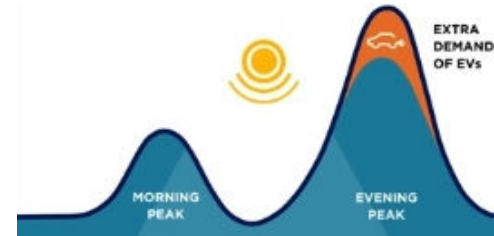




# Agenda

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- About EVConsult: A brief introduction
- The world of V2G
- The value of V2G on the distribution grid level
- Vision on the future of V2G



# About EVConsult

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**Accelerating the transition towards  
zero-emission mobility**





# About EVConsult

Unique global expertise in the field of e-mobility

- Over 10 years of experience
- Completed over 300 e-mobility projects
- Largest independent EV Office
- Multidisciplinary backgrounds  
(e.g. technical, commercial, economic, legal)
- Partners across the world
- International experience with e-mobility  
strategy, project management and innovation
- Vehicle-to-grid (V2G) specialists



# About EVConsult

## Government



Ministerie van Economische Zaken

## Energy & Utility



## Automotive & Operators



Volkswagen



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# About EVConsult

## A selection of our V2G projects

### Global review of V2G projects

UK Power Network & Innovate UK



### City-zen V2G, Amsterdam

NewMotion, Alliander, Enervalis



### FCR Netherlands

NewMotion, TenneT, Mitsubishi, Nuvve



### V2G for large fleets & shared vehicles

Province of Groningen and Drenthe



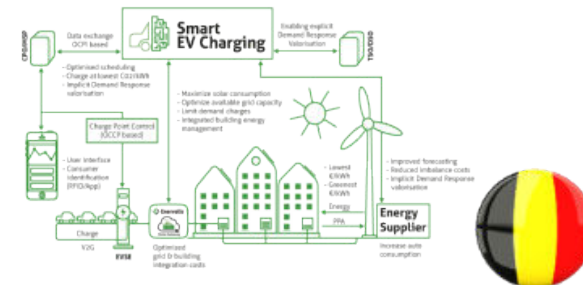
### First AC V2G charge point

Municipality of Utrecht



### FCR mix of V1G & V2G

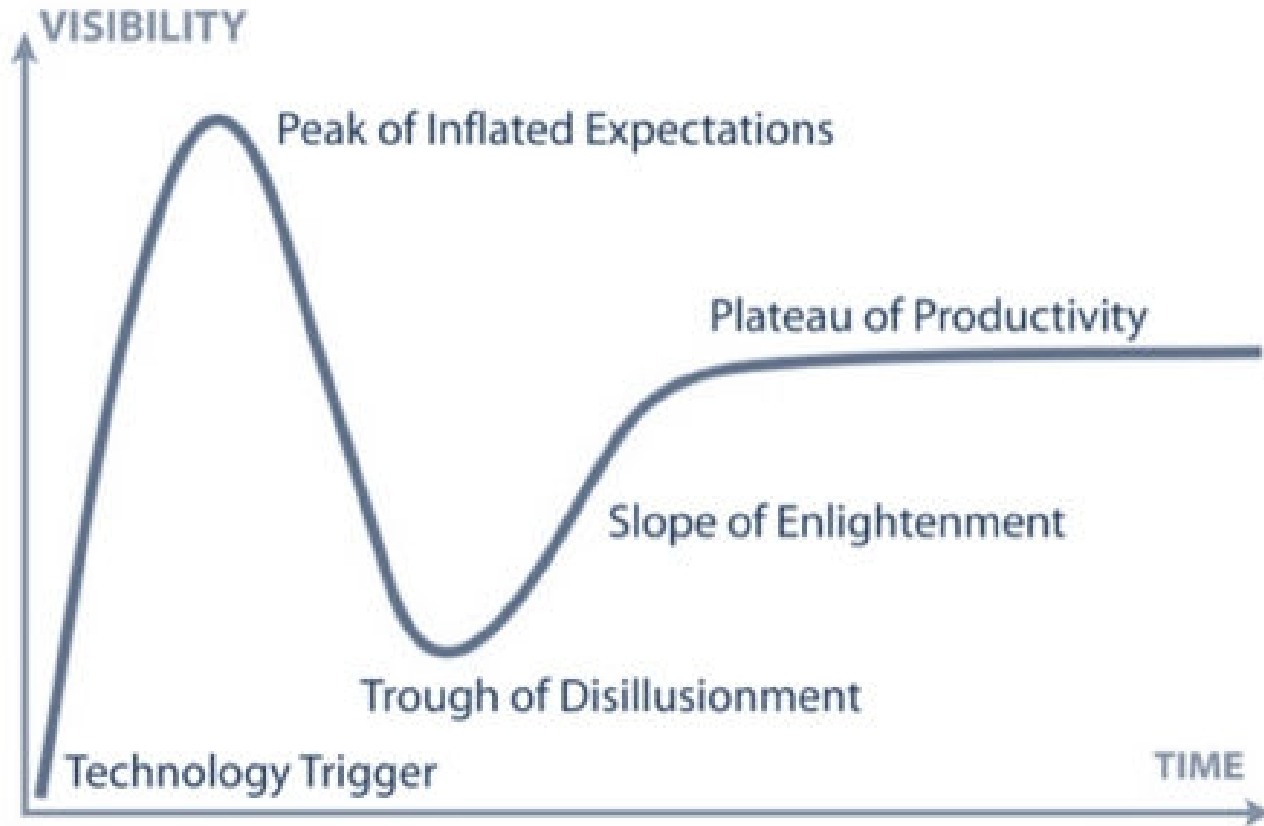
EVConsult, Elia, NewMotion, Enervalis





# My personal V2G hype cycle

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# Global review of V2G projects



## THE V2G MAP OF THE WORLD



V2G: GLOBAL ROADTRIP



Innovate UK



# Global review of V2G projects



## LESSONS



### FOR NETWORK OPERATORS



**1. ADAPT INTERCONNECTION STANDARDS & PROCESSES**



**2. CLARIFY THE VALUE OF DSO SERVICES**



**3. DESIGN SERVICE SPECIFICATIONS WITH V2G IN MIND**

### FOR INDUSTRY



**4. MATURE THE HARDWARE**



**5. TARGET SERVICES WHERE V2G ADDS VALUE**



**6. SEGMENT USER BEHAVIOUR**



# Value of V2G

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## Research Project:

What is the value of vehicle-to-grid (V2G) to distribution system congestion management for the DSO?

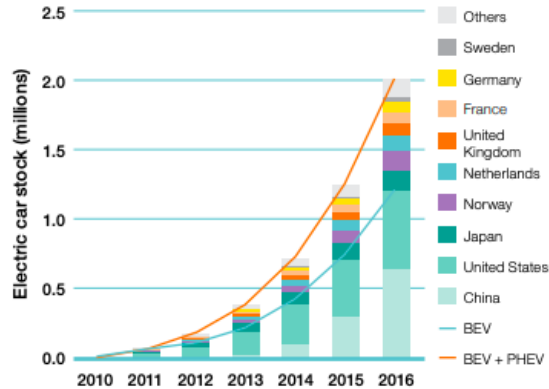
In collaboration with:



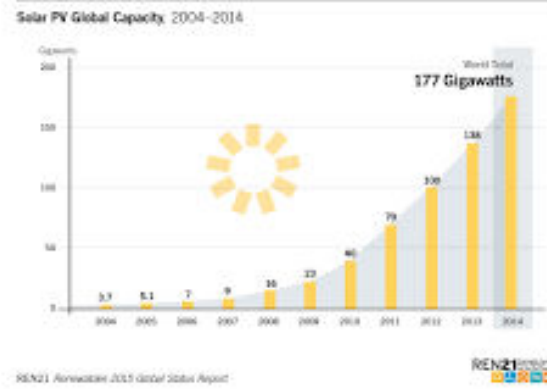
# Value of V2G

## Transition to sustainable energy system

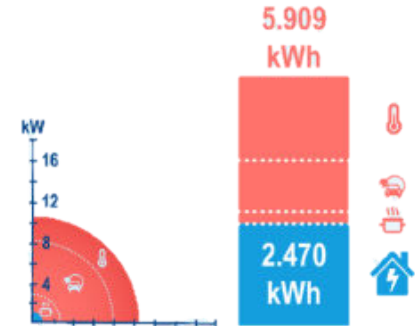
### 1. EVs



### 2. Solar



### 3. Heat pumps, electric cooking, etc.



> Will cause significant extra load AND congestion on grid





# Value for DSO

## An alternative to grid reinforcements

Scenario 1:  
Smart charging + grid upgrades



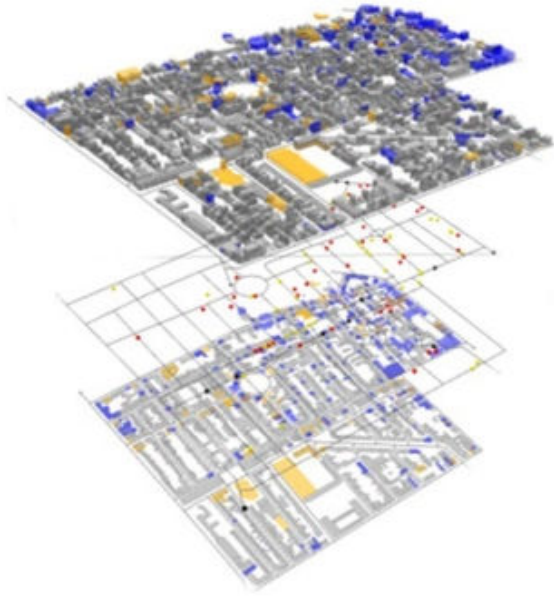
Scenario 2:  
Vehicle-to-grid (V2G)



# Methodology

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## Sparkcity model, an Agent-Based Model (ABM)



### Why ABM?

- Ability to model accurate driving behaviour
- Heterogeneity of agents
- Time and location specific

**'upload' a city and play**  
simulate the real-life behaviour  
of the people living there



# Case study

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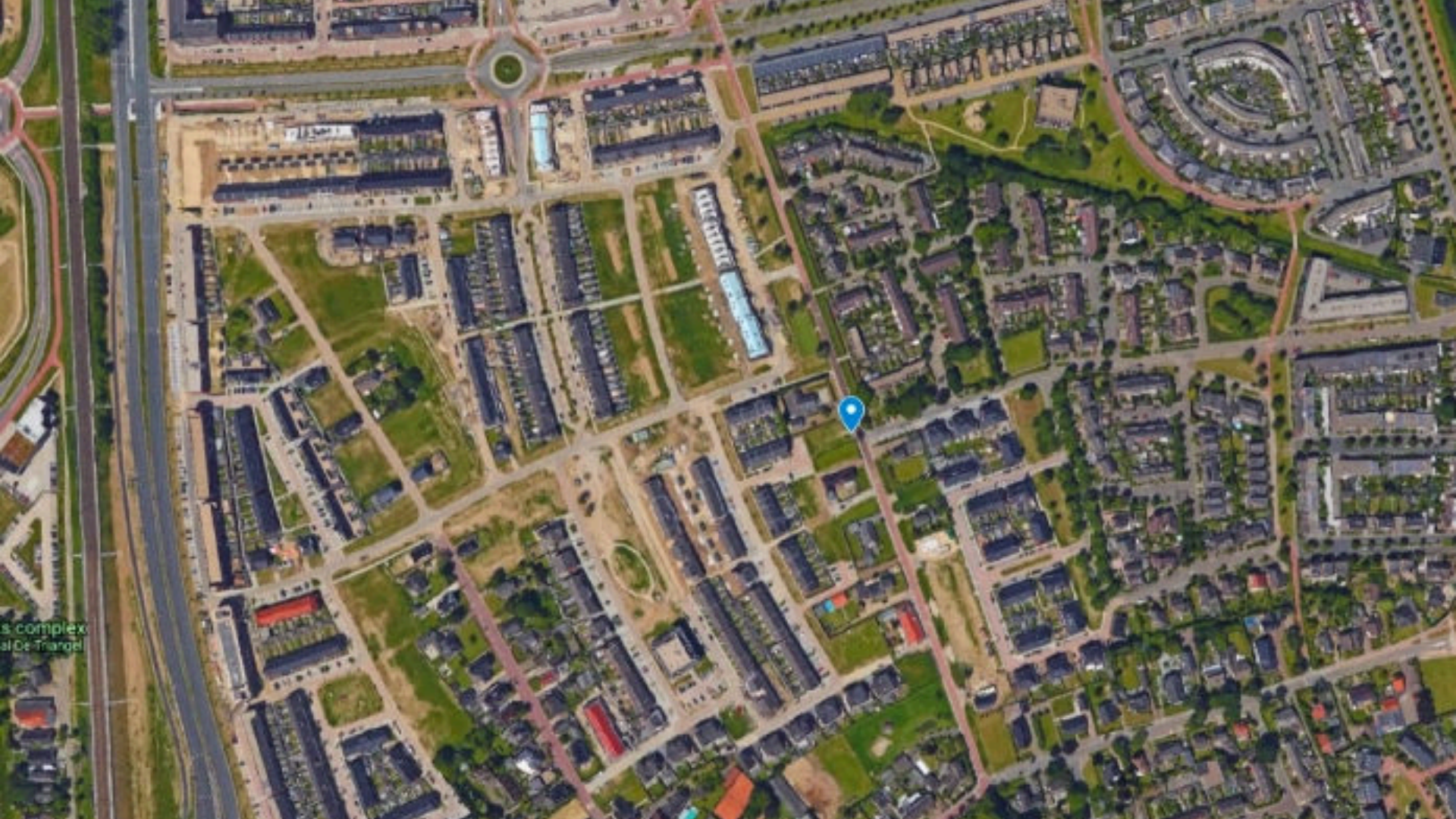


## Nijmegen Noord (Lent) - 2030

- $\pm 3.000$  households
  - 30% of households have solar PV
  - 35% of cars is an EV
  - 1 out of 3 chargers is V2G
- 
- Grid is already constrained
  - Flexibility market is piloted







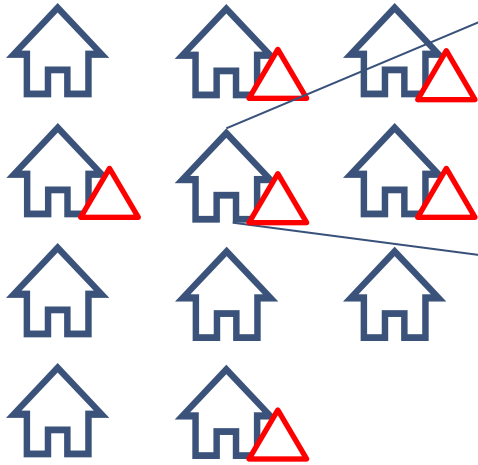
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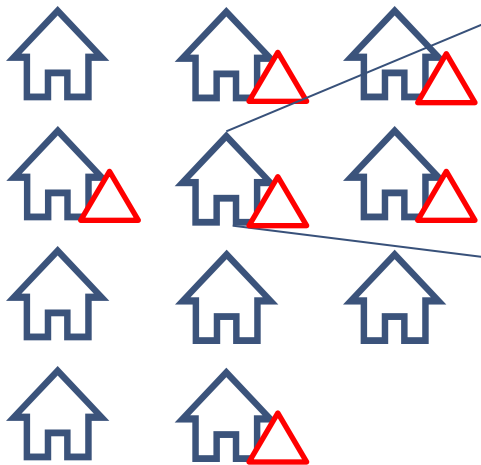
# Results

## Electrical load in transformers in smart charging scenario



# Results

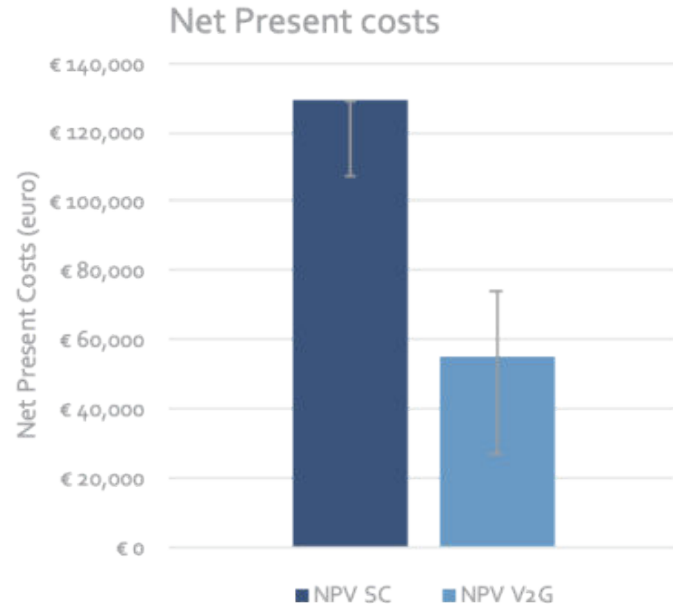
## Electrical load in transformers with V2G charging



# Value of V2G for local grid

## Cost benefit analysis of different alternatives

- 10 year timeline
- CAPEX Transformer €50.000
- CAPEX V2G per V2G charger €500
- Reimbursement per kWh for battery usage €0,04
- Interest rate 3.1%



# Conclusions

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- V2G is able to lower overload in majority of local grid transformer stations
- V2G charging can be a cost effective solution for congestion management





# Vision on the future of V2G

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# Vision on the future of V2G

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2017-2018



2019-2020



# Vision on the future of V2G

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2017-2018



2019-2020



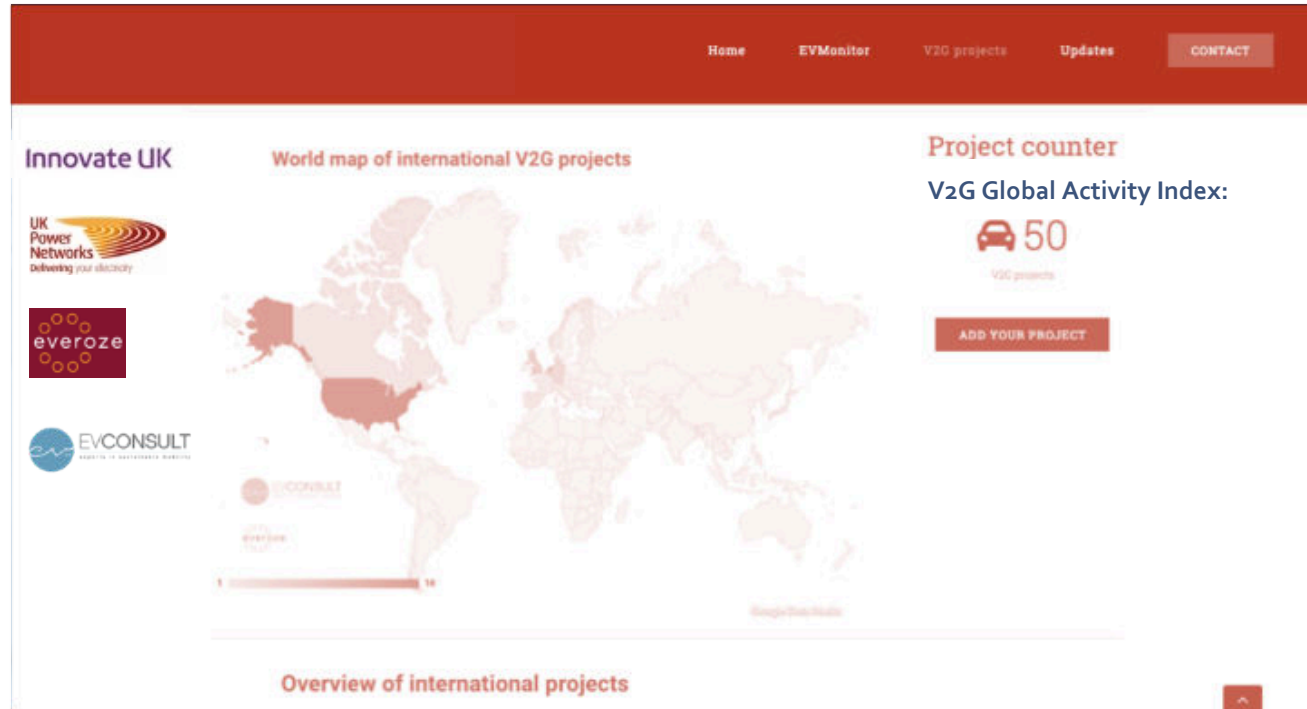


# Amsterdam V2X



# v2g-hub.com

## Mapping the world of V2X





# Sjoerd Moorman

EV Consultant  Expert V2G & Smart charging 



## What I work on:

EV strategy: Roadmaps - Business plans - Fleet transition plans

Innovation: Charging hubs - Smart Charging - V2B / V2H / V2G

- World-first Global Review of Vehicle-to-Grid projects
- Smart Charging Strategy & Roadmap for DNO UK Power Networks
- Market sizing for Vehicle-to-Building 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  
(>70,000 learners worldwide)



+31 6 11903585



s.moorman@evconsult.nl



Sustainable Energy Technology  
Delft University of Technology



Find me on LinkedIn, Twitter





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