

# Vehicle-Grid Integration summit

## - A movement of world-wide demonstrators



DTU Risø, Nov 21-22, Roskilde, Denmark  
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**DTU Electrical Engineering**  
 Department of Electrical Engineering

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$

$$\int_a^b \epsilon \Theta^{\sqrt{17}} + \Omega \int \delta e^{i\pi} = \{2.7182818284\}$$

$$\chi^2 \Sigma !$$

## Energy sector



**A national emphasis** on developing a stable and economic power-system based on renewables.



## Transport sector



**A strong political ambition** - end of combustion car sales in 2030



**Vehicle-Grid  
Integration  
(VGI)**



## VGI 1 – a new challenge



A case study where electric vehicles are added to a typical Danish distribution system.

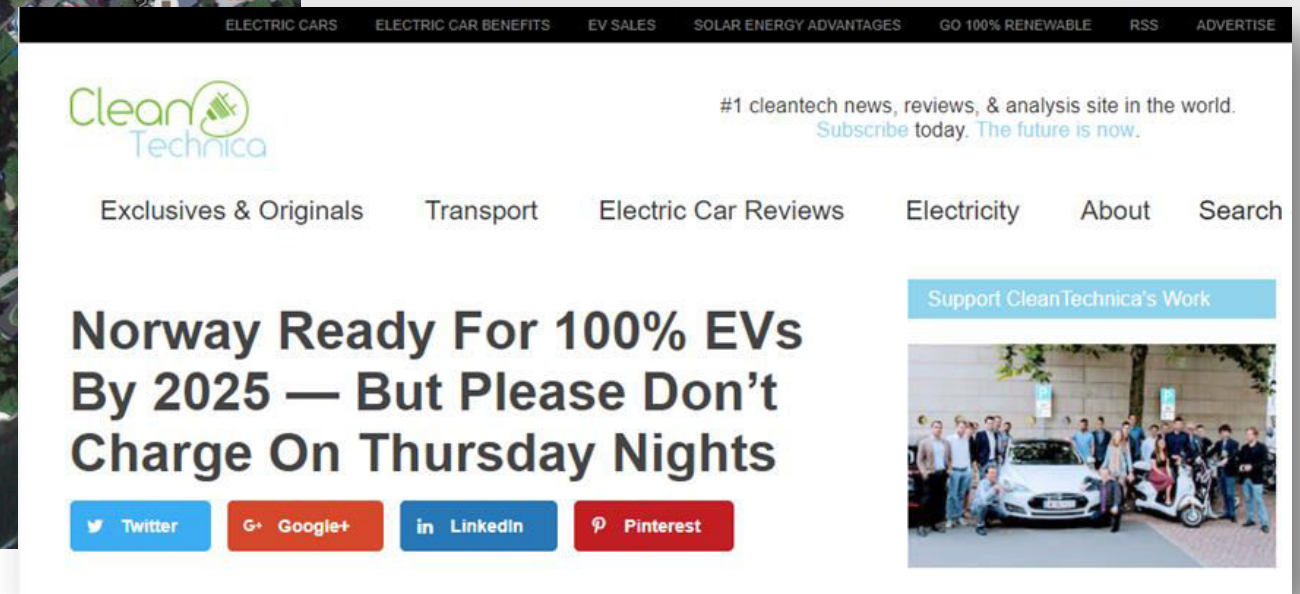
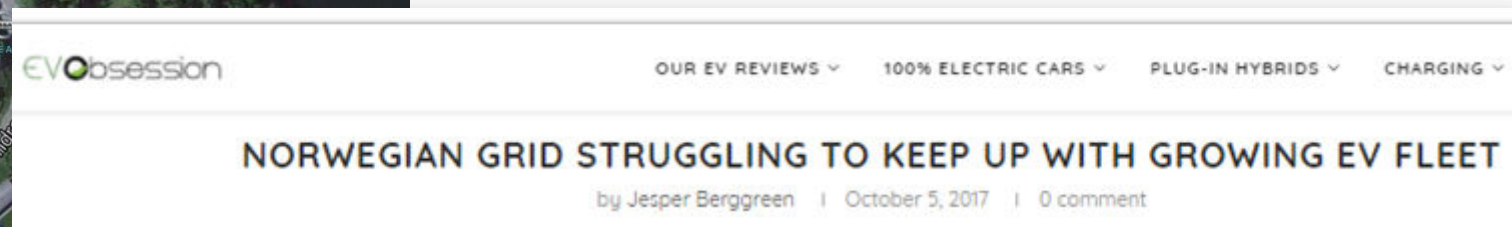
Describes a **need of investment** for distribution system operators, associated with the introduction of heatpumps and electric cars.



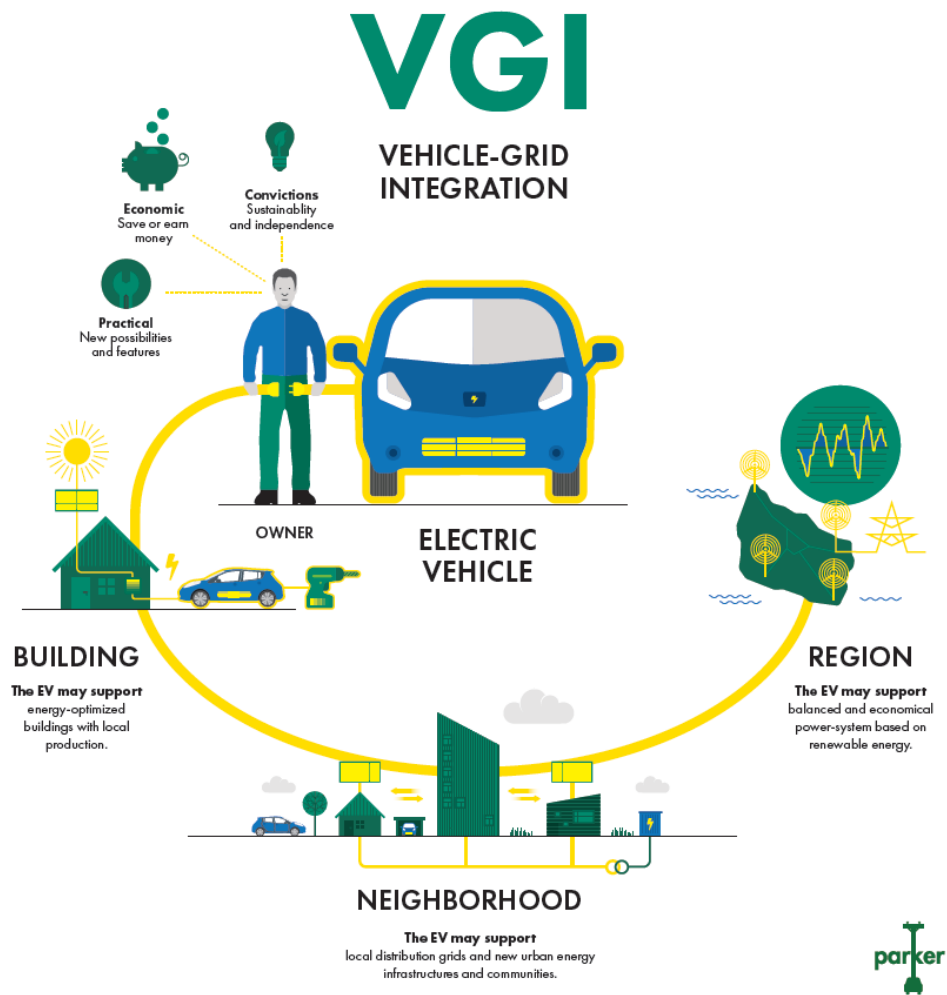
# VGI 1 – a new challenge



Nesøya, March 2018

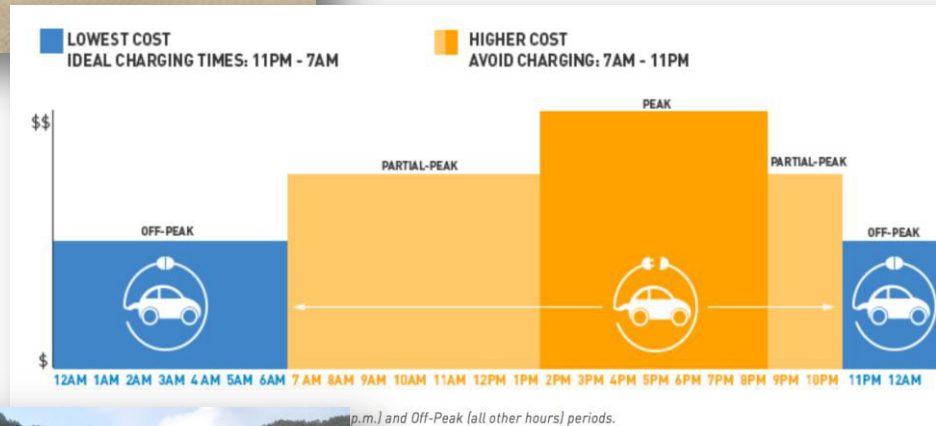


# VGI 2 – a new opportunity



## Frequency regulation in Denmark

## Time-of-use tariffs in the US



## Mobile power in emergencies in Japan



# The **parker** Project



# The Parker project



Thomas Parker, 1843 – 1915

## Background:

An uptake in the support of **V2G** in new generation of vehicles and chargers.

## Goal:

Demonstrate that **contemporary** electrical vehicles, using V2G, can participate in **advanced** smart grid services.

Funded by:



# The Parker project





# The Parker project



# The Parker project



Source: Nissan Denmark



# The Parker project

## Three main topics:



### **Practical experience**

Explore how electric vehicles may support the power system – using both lab and field testing



**Bjoern E. Christensen**



**Seyedmostafa Hashemi Toghroljerdi**



### **Business potential**

Investigate the profitability of current and future grid services



**Jens Christian Morell Lodberg Høj**



### **Technological readiness**

Understand EV and charger readiness in providing grid services using V2G



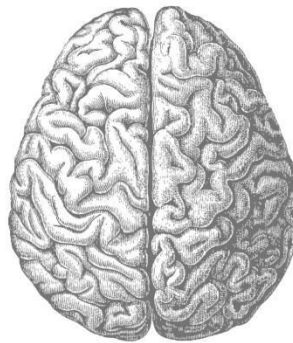
**Thomas Meier Sørensen**



# The Parker project



- ✓ **16 Academic publications, Published 11**
  - **10 Journal papers, Published 5**
  - **6 Conference papers, Published 6**
- ✓ **1 Technical report (Energinet pilot)**



- ✓ **11 Student projects**
  - **2 Bachelor thesis**
  - **4 Master thesis**
  - **5 Special courses**



# The Parker project



Suzanne Damgaard Taylor

Ronnie Ranch Høgstrup



- **Website:**  
27 news stories, 6,227 visitors, **13,530 pageviews**
- **Twitter:**  
105 tweets, 144 followers, **74,707 impressions**
- **LinkedIn:**  
66 posts, 151 followers, **63,252 impressions**
- **Video:**  
16 videos on YouTube, **2,691 views**, 4.2 hours of viewing time
- **Press:**  
2 press releases, **110 press mentions**



# PROGRAM OVERVIEW

## Day one - November 21<sup>st</sup>

09.00 – 09.15	Arrival and Registration
09.15 – 10.00	Opening Session
10.00 – 11.00	Parker – Practical Experience
11.00 – 11.25	Break and VGI Exhibits
11.25 – 12.15	Parker – Business Potential
12.15 – 13.00	Lunch and VGI Exhibits
13.00 – 13.30	Parker – Technological Readiness
13.30 – 13.45	Parker - Recommendations, conclusions and next steps
13.45 - 14.15	Technological Presentation
14.15 - 14.45	Open discussion and Parker wrap-up
14.45 – 17.00	ACES - Project Overview
17.00 – 19.00	Walking tour and buffet

## Day two - November 22<sup>nd</sup>

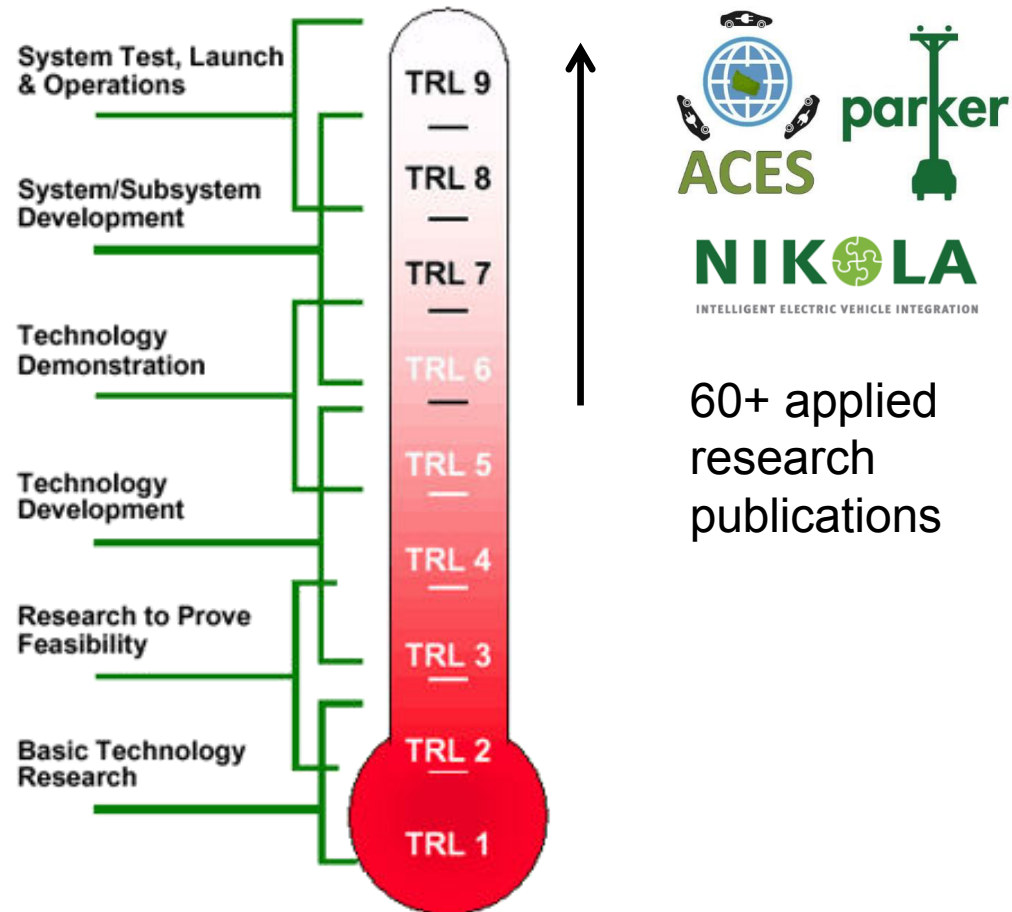
09.00 – 09.20	Opening Session
09.20 – 09.45	Keynote 1
09.45 – 11.05	V2G Worldwide Overview
11.05– 11.30	Coffee Break
11.30 – 12.50	Cutting Edge Demonstrators
12.50– 13.40	Lunch
13.40 – 15.00	OEMs on V2G
15.00 – 15.15	Coffee Break
15.15 – 15.45	Keynote 2
15.45 - 16.00	Wrap Up



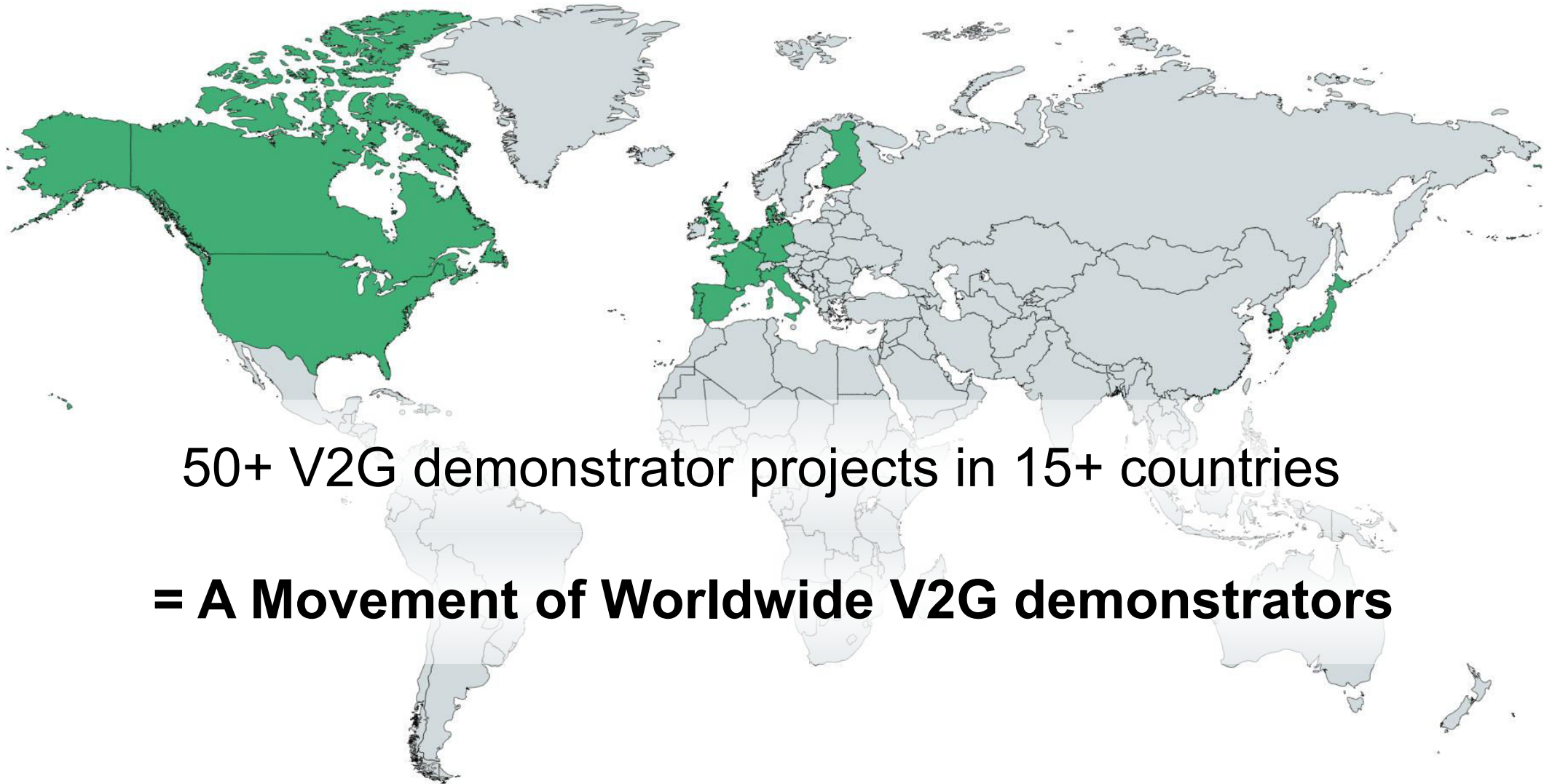
- Industry
- Initiatives
- Projects

Ultimate goal:

“Getting VGI technology in the hands of all EV owners - to the benefit of everyone”



Willett Kempton  
 Professor, University Of Delaware and CTO,  
 NUVVE  
 No-one has done more to push VGI  
 technology up the TRL latter



50+ V2G demonstrator projects in 15+ countries  
**= A Movement of Worldwide V2G demonstrators**

Based on figure/data by EVConsult/Everoze



Together we may **ANSWER FUNDAMENTAL QUESTIONS** regarding VGI



### Unofficial **top-4 FAQ:**

1. “Will I still have enough energy for driving?”
2. “Will it damage my battery?”
3. “How much can I earn/save?”
4. “Will the grid be overloaded?”



Questions collected throughout all sections using:



slido

1. **Open browser** (PC or Mobile)
2. Go to **Slido.com**
3. Use code: **#VGI**

## Thank you to the supporting team:

- ★ Anne Due
- ★ Magnus Fich Rabjerg
- ★ Linas Kaminskas
- ★ Eva Bülow Nielsen
- ★ Stine Lykke Wagner
- ★ Helle Faber



## Special thanks:

- ★ Ole Jan Olesen



# Thank you!



## Have a great VGI summit.