



# *Smart Solar Charging pilot*

*Introduction to Smart EV Charging through the  
Smart Solar Charging pilot*

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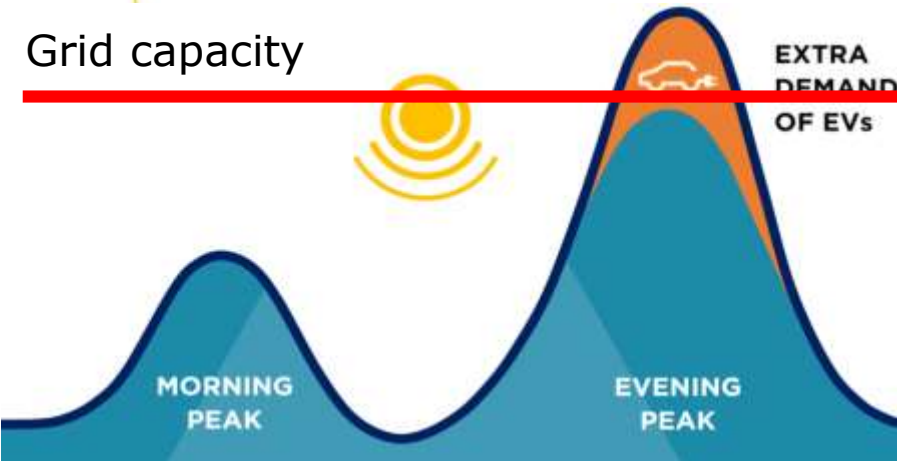


# Smart charging

## Uncontrolled charging

## Smart charging

Grid capacity



Adjusted from: <http://www.amsterdamvehicle2grid.nl/>



# Smart charging

- Smart charging: shifting EV demand over time
- Based on different objectives:
  - Minimizing charging costs
  - Avoiding grid congestion
  - Providing balancing reserves
  - Energy independence
  - Maximizing solar self-consumption
  - ...

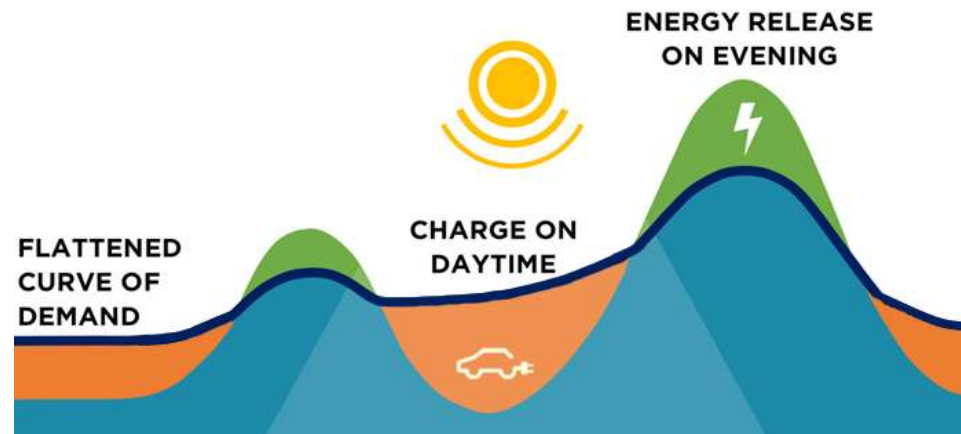


# Smart charging

## Uncontrolled charging



## Smart charging with V2G



Adjusted from: <http://www.amsterdamvehicle2grid.nl/>



# Smart Solar charging project

- Goal: Get insights in the electricity system of the future
- 5 pilot projects:
  - Installing EV charging stations and monitoring EV charging behavior
  - High installed PV capacity
  - Introduction of 30 electric sharing cars
  - Measuring power flows in electricity grid
  - Installing and monitoring V2G charging station
  - Testing algorithms

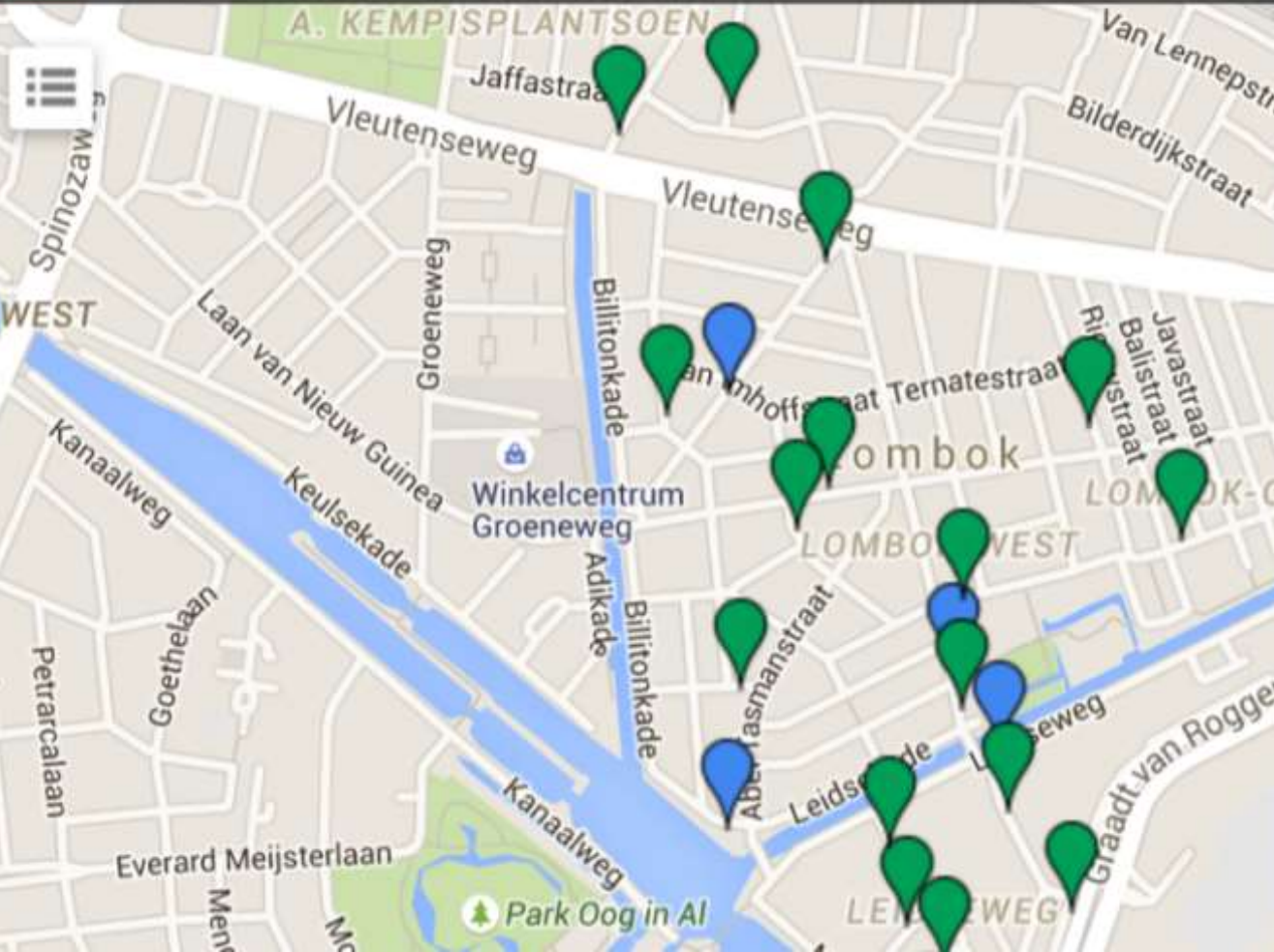
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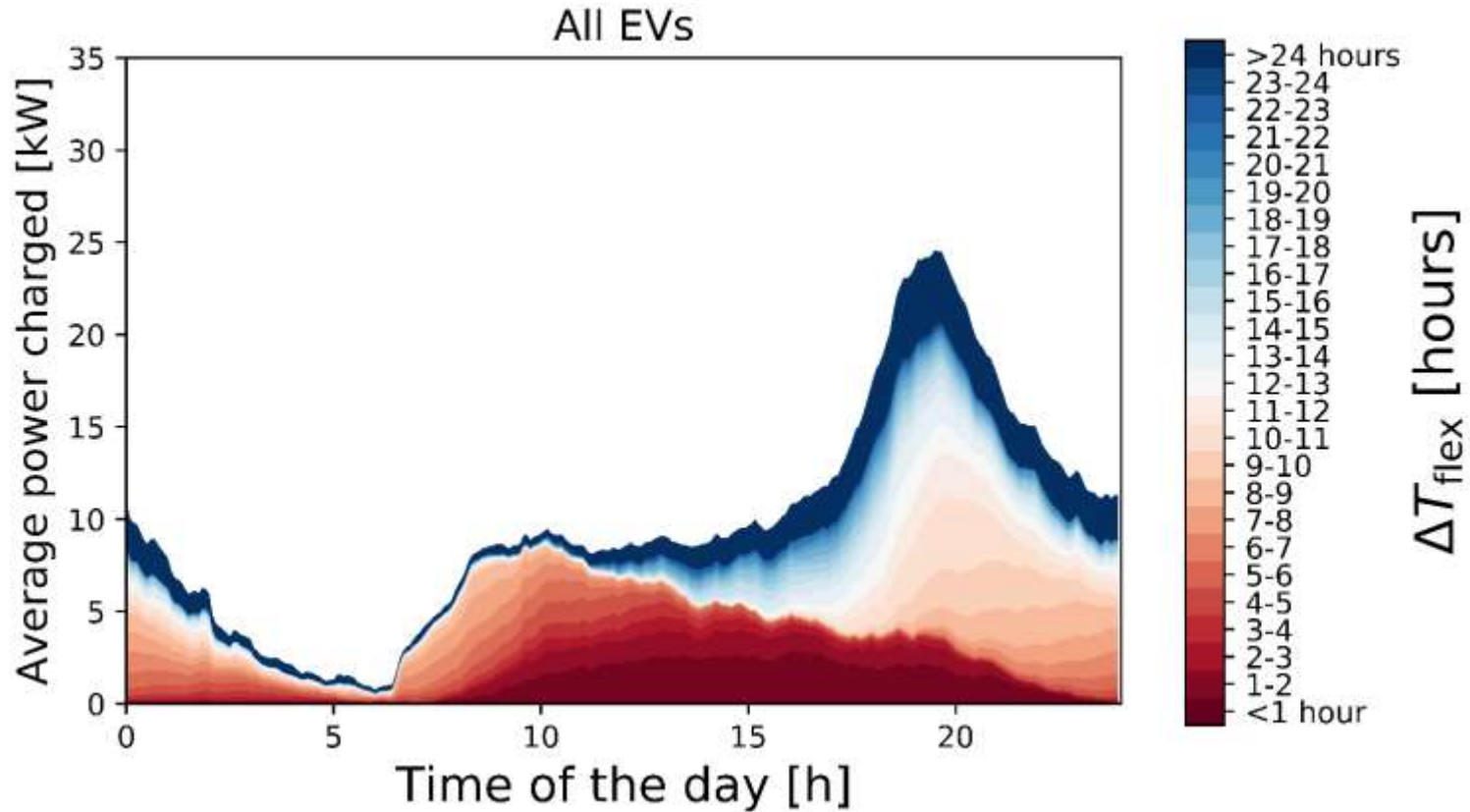


# Laadpalen Lombok





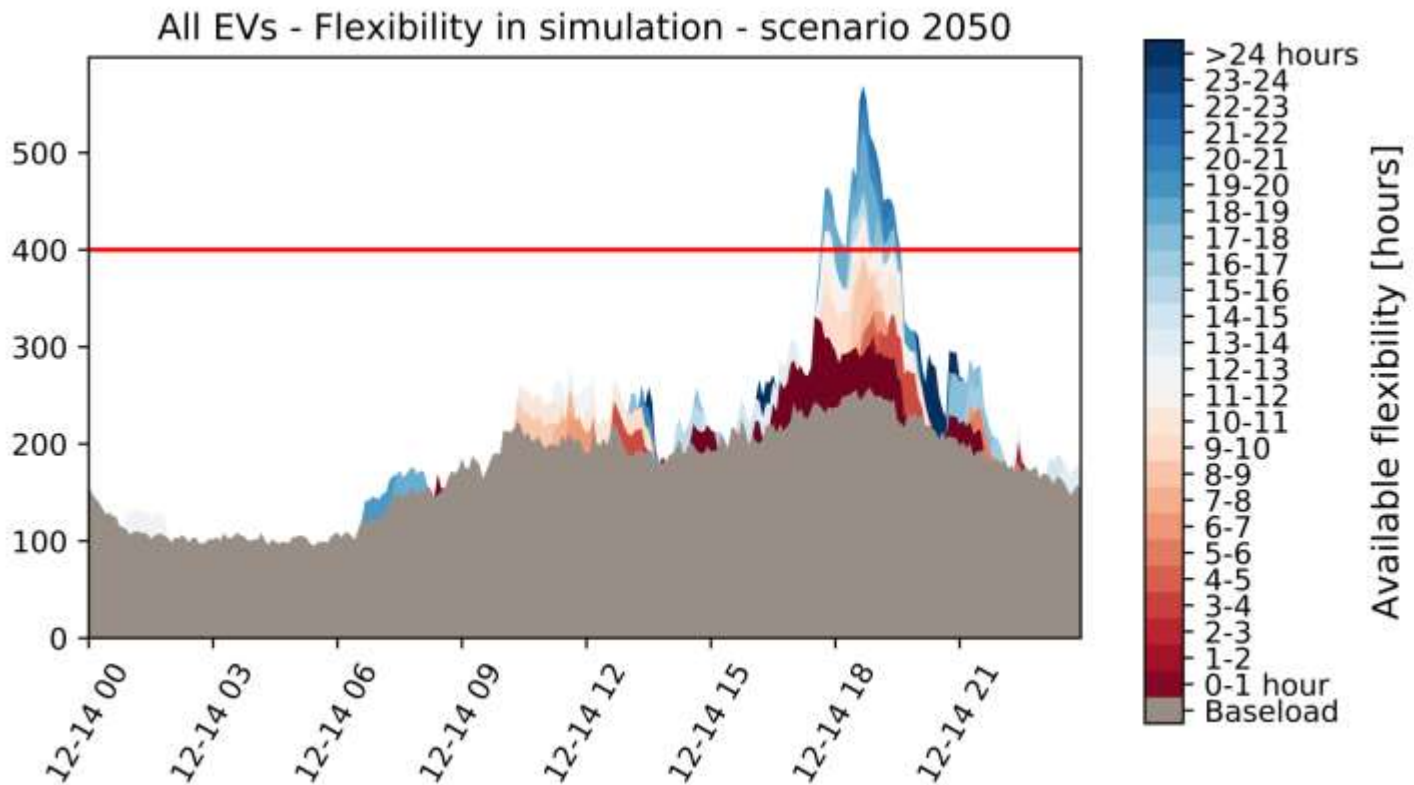
# Research output



M. K. Gerritsma, T. A. AlSkaif, H. A. Fidler, and W. G. J. H. M. van Sark, "Flexibility of Electric Vehicle Demand: Analysis of Measured Charging Data and Simulation for the Future," *World Electr. Veh. J.*, vol. 10, no. 1, p. 14, 2019.

# Research output

- Day with maximum peak in simulated month December, '2050'



# Research output

EVs can also be used to mitigate light flicker induced by rapid PV fluctuations

	% of Timesteps between 9:00-17:00	
	Visible light flicker	Annoying light flicker
No EV grid support	12.8%	2.1%
Max. allowable ramp rate = 1 kW/20s	6.1%	0.0%
Max. allowable ramp rate = 6 kW/20s	3.1%	0.0%
Max. allowable ramp rate = 10 kW/20s	2.8%	0.0%
Max. allowable ramp rate = 15 kW/20s	2.0%	0.0%
<b>Max. allowable ramp rate = 20 kW/20s</b>	<b>0.8%</b>	<b>0.0%</b>
Max. allowable ramp rate = 25 kW/20s	1.1%	0.0%
Max. allowable ramp rate = 30 kW/20s	1.6%	0.0%
Max. allowable ramp rate = 40 kW/20s	2.4%	0.0%



# Thank you for your attention!

Questions?

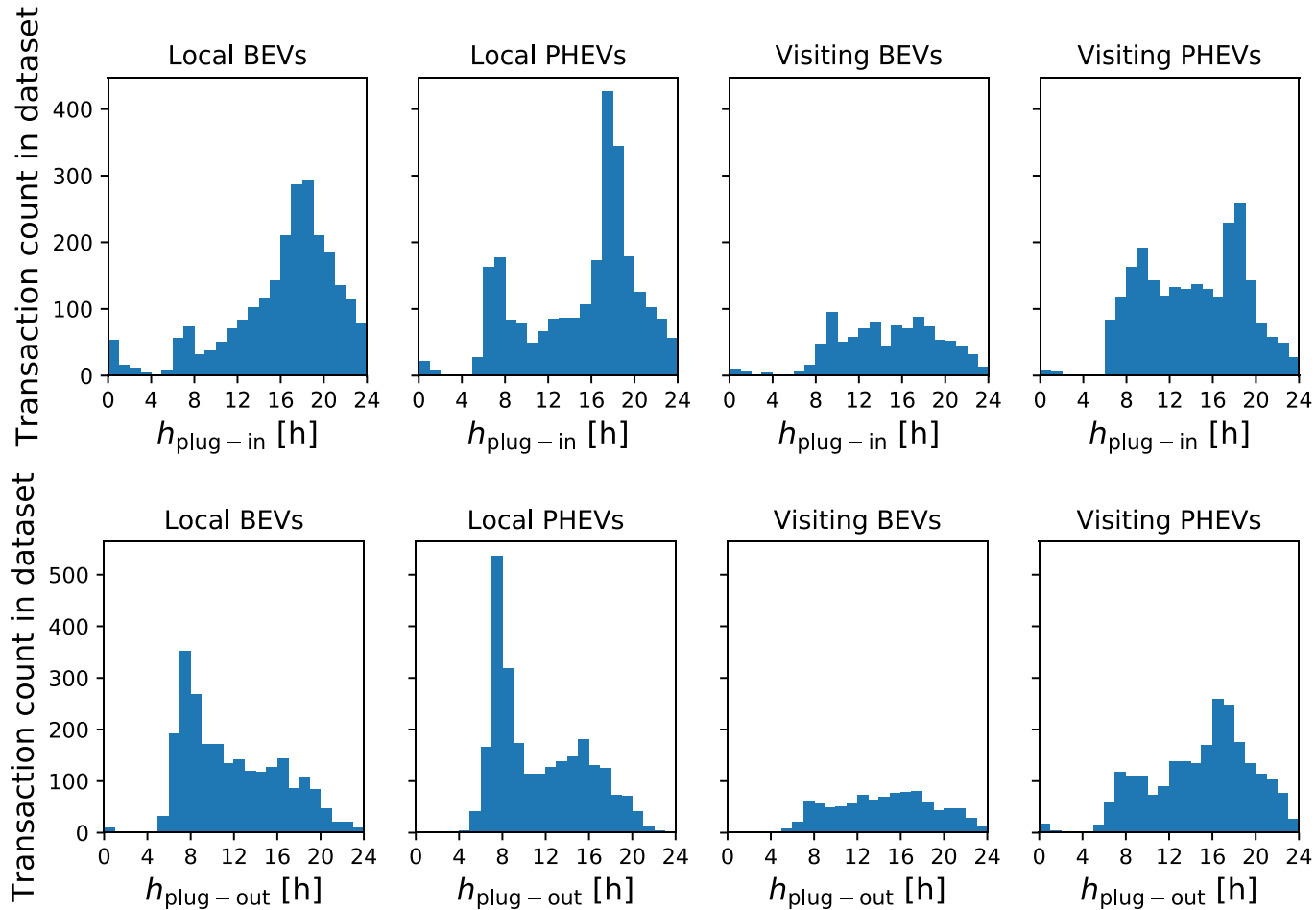


## Discussion

- Smart charging algorithms have no value yet and should not be implemented in the coming years
- Does V2G have a future?
- Can the aggregator be restricted in smart charging (e.g. by the DSO), if their charging behavior can cause grid congestion?



# Results data analysis





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