CARILEC
An Association of Electric Energy Solution Providers

ELECTRIFICATION
Electric Vehicle Impact

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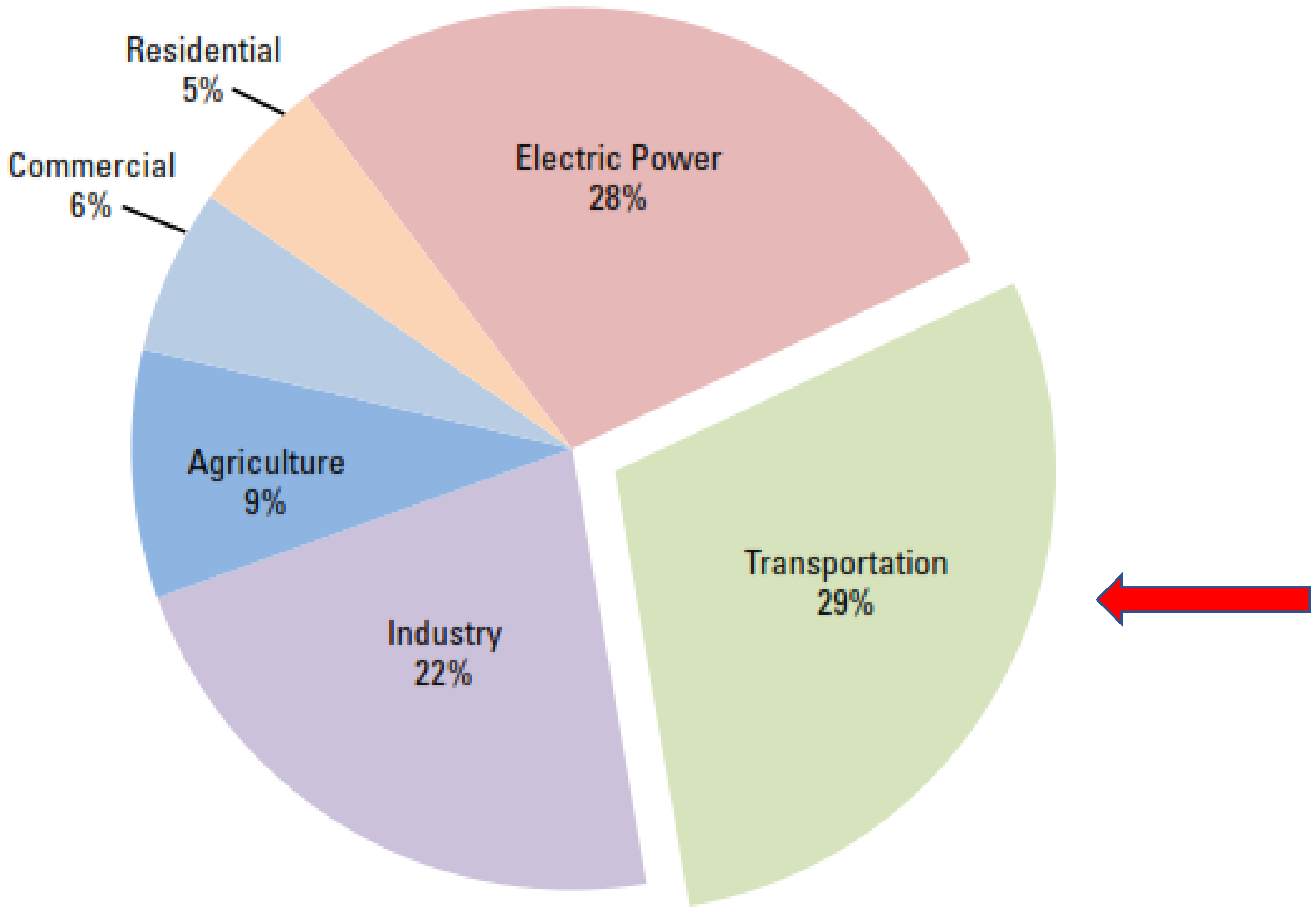
Trinidad and Tobago
EMobility 2020

GHG Emissions by Sector

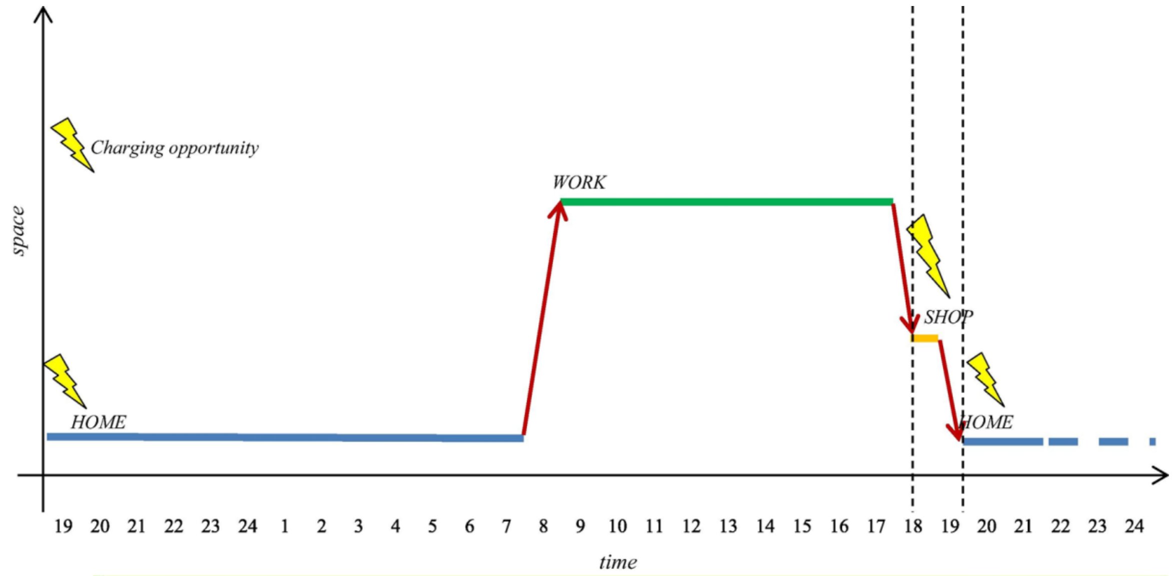


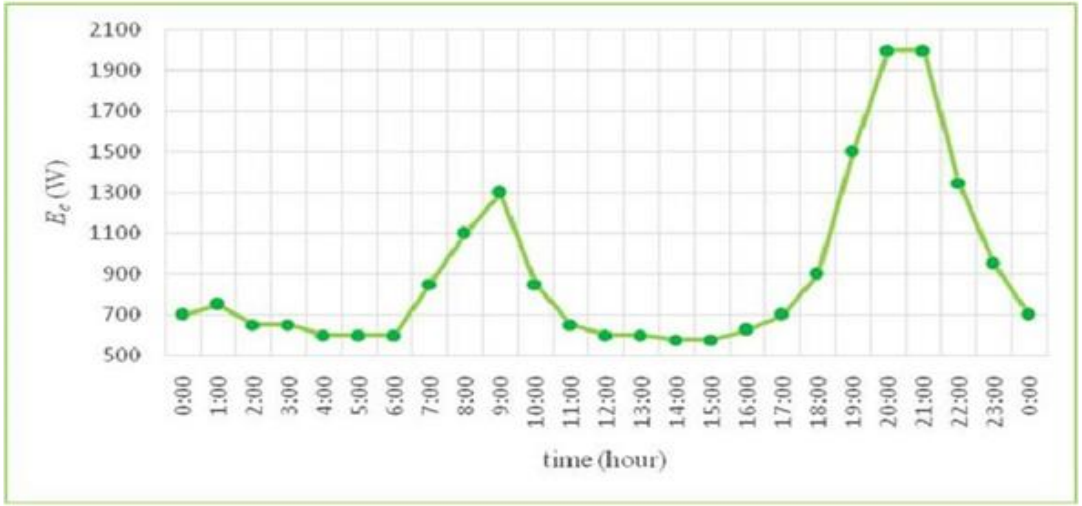
Road Transportation
= 0.85* 29 = 25% approx

EV averages 10km/kWh

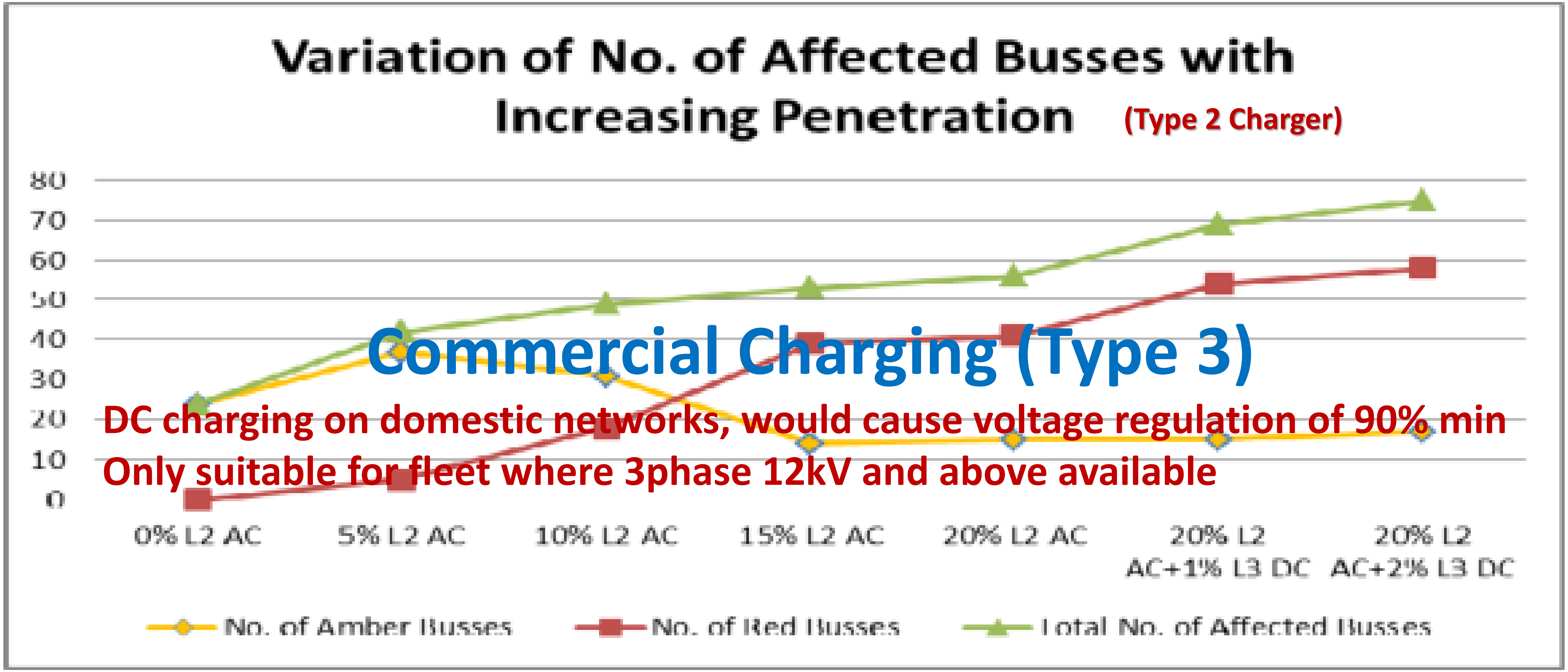
Characteristic of EVs

Vehicle parked 95% of time





Level	Power (kW)	Approximate Charging Time (Empty Battery)
1	1- 6	200 km (124 miles): +/- **20 hours** 400 km (249 miles): +/- **43 hours**
2	7 to 20	200 km (124 miles): +/- **5 hours** 400 km (249 miles): +/- **11 hours**
3 (DCFC)	Typically 50, occasionally 20	80% of 200 km (124 miles): +/- **30 min** 80% of 400 km (249 miles): +/- **1 hour**



Commercial Charging (Type 3)

DC charging on domestic networks, would cause voltage regulation of 90% min

Only suitable for fleet where 3phase 12kV and above available

Impacts of Uncoordinated Charging

Significantly stress the distribution system causing:

- Severe voltage fluctuations and violations.
- Degraded system efficiency and economics.
- Increasing the likelihood of blackouts due to network overloads.

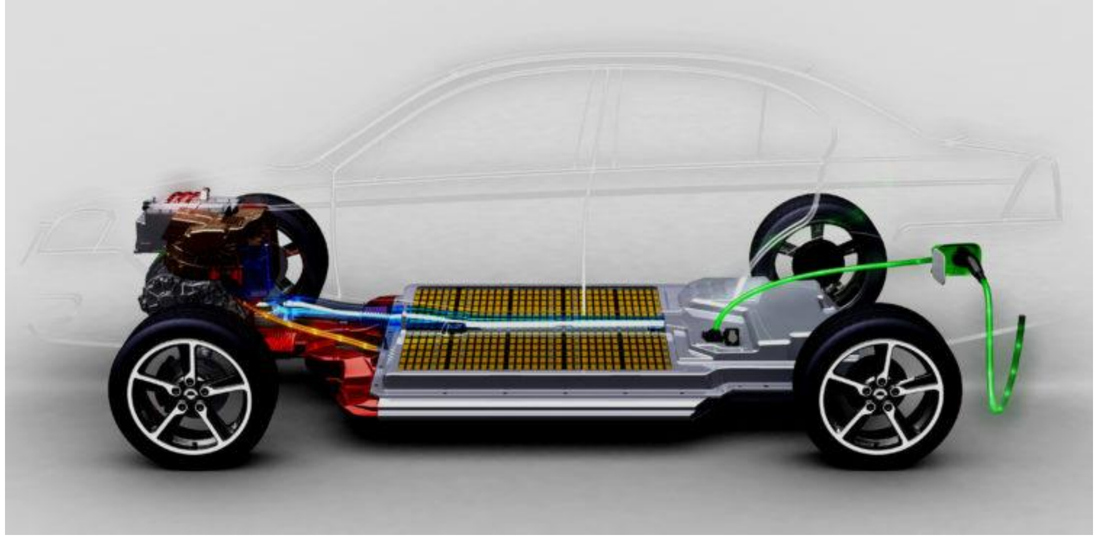
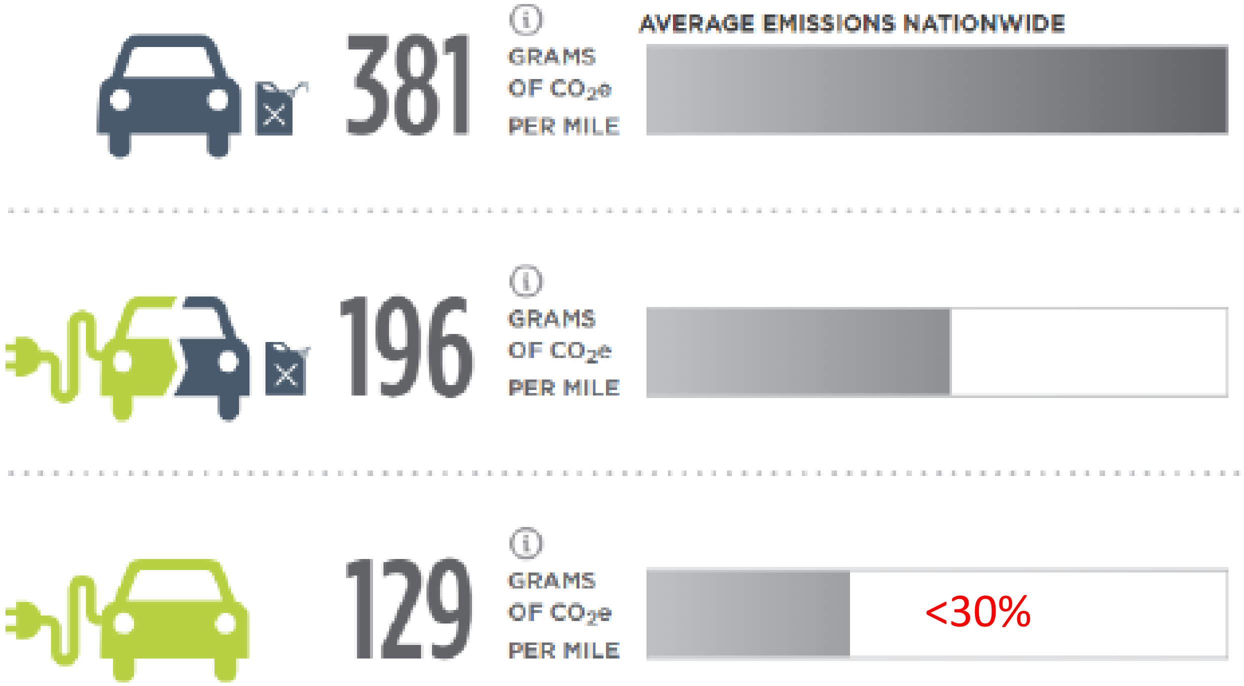


Image: https://www.zdnet.com/article/a-boot-camp-for-hacking-electric-vehicles/

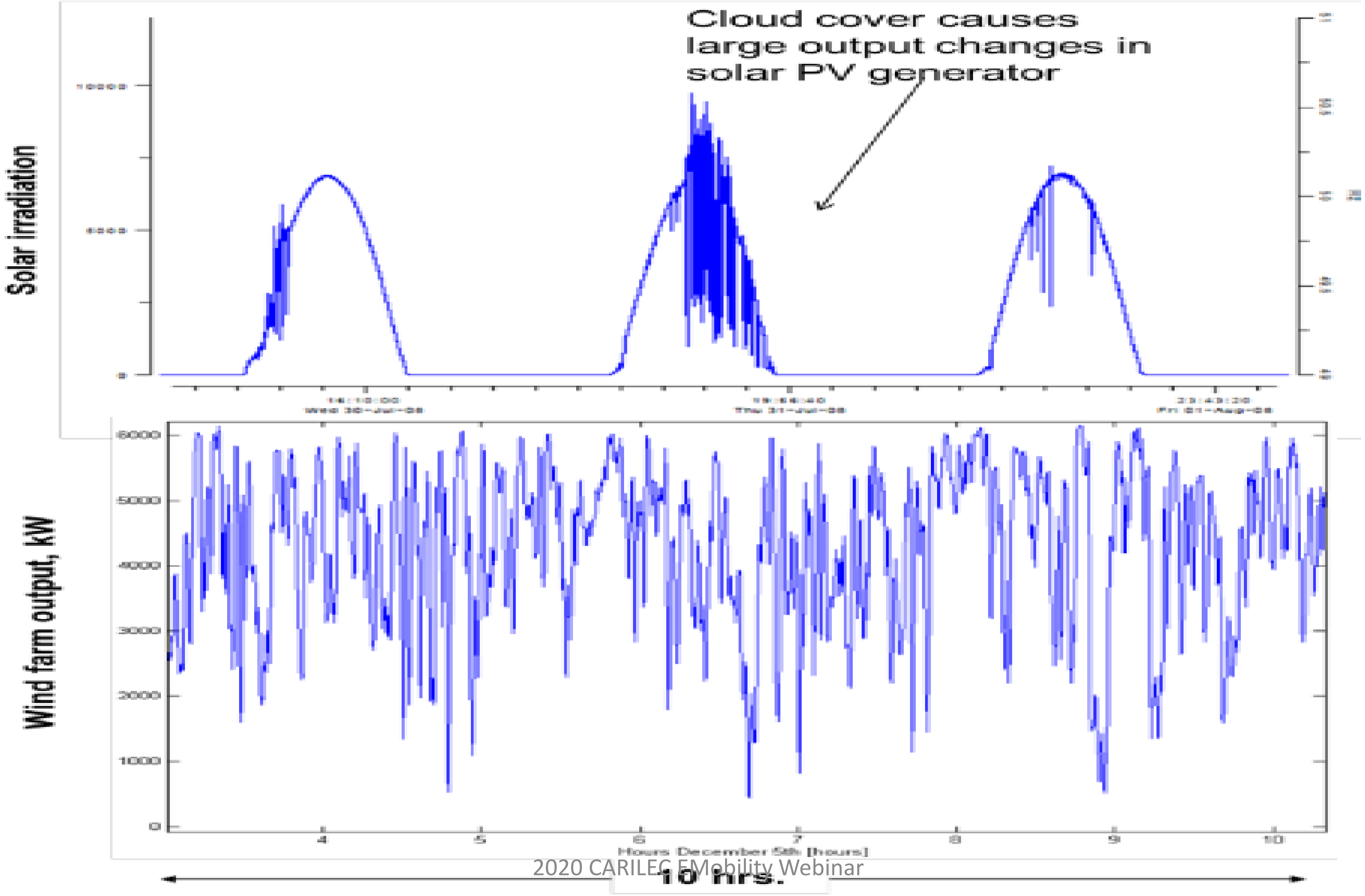
Benefits of EV: Role of EV in energy transition

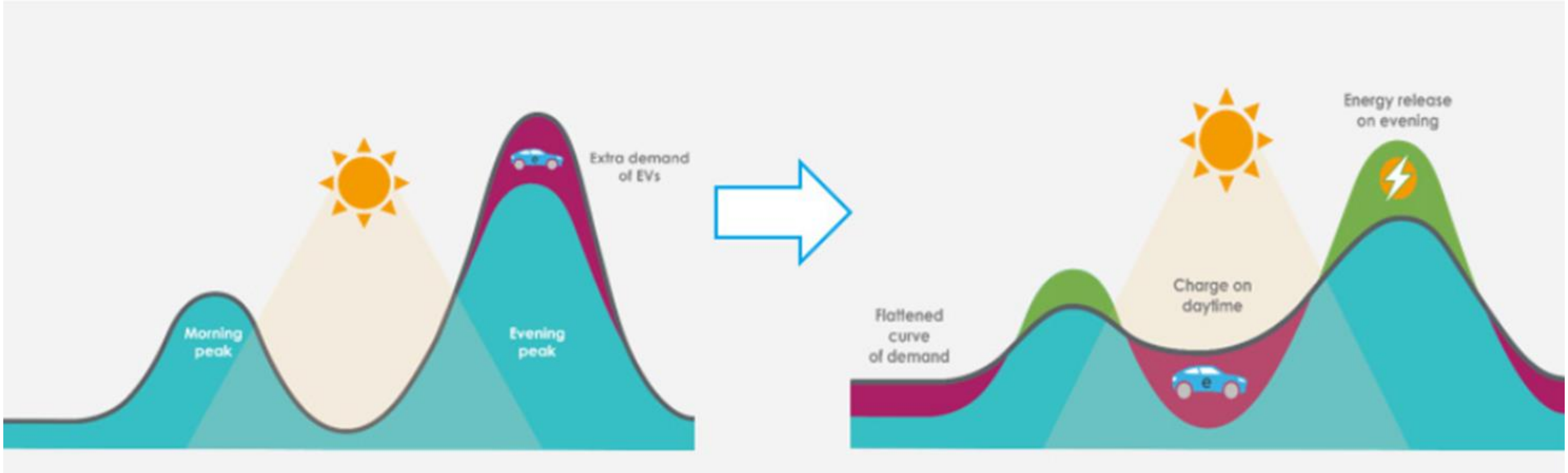
Policy Considerations

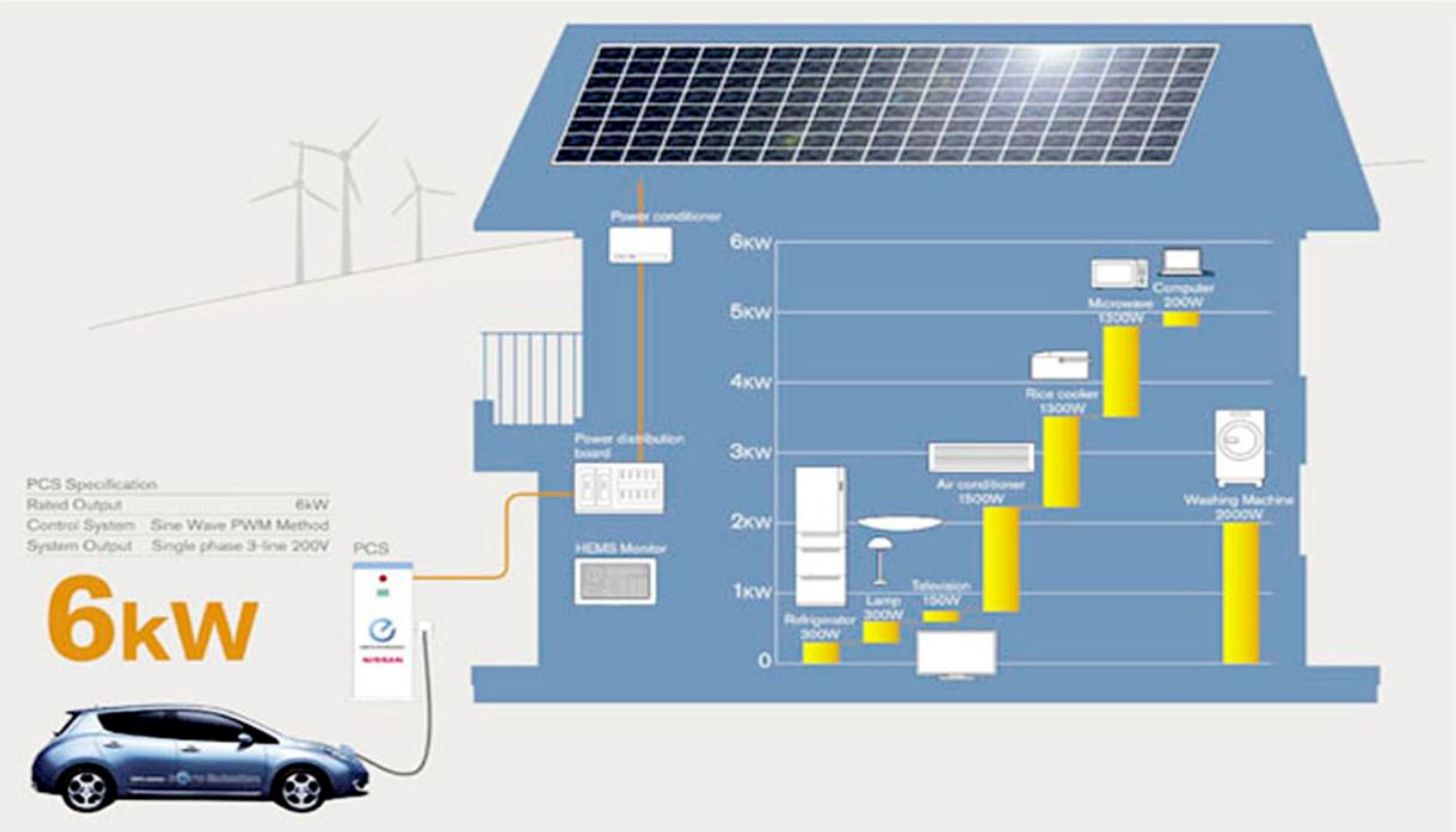
- Aligning with good policy practices for electric vehicles allows for a wider target population these vehicles.
- Reduce the dependency on fossil fuels use for combustion engines
- Align with NDC contributions throughout the Caribbean
- Modification of the transport sector is the simplest way to start promoting a greener environment



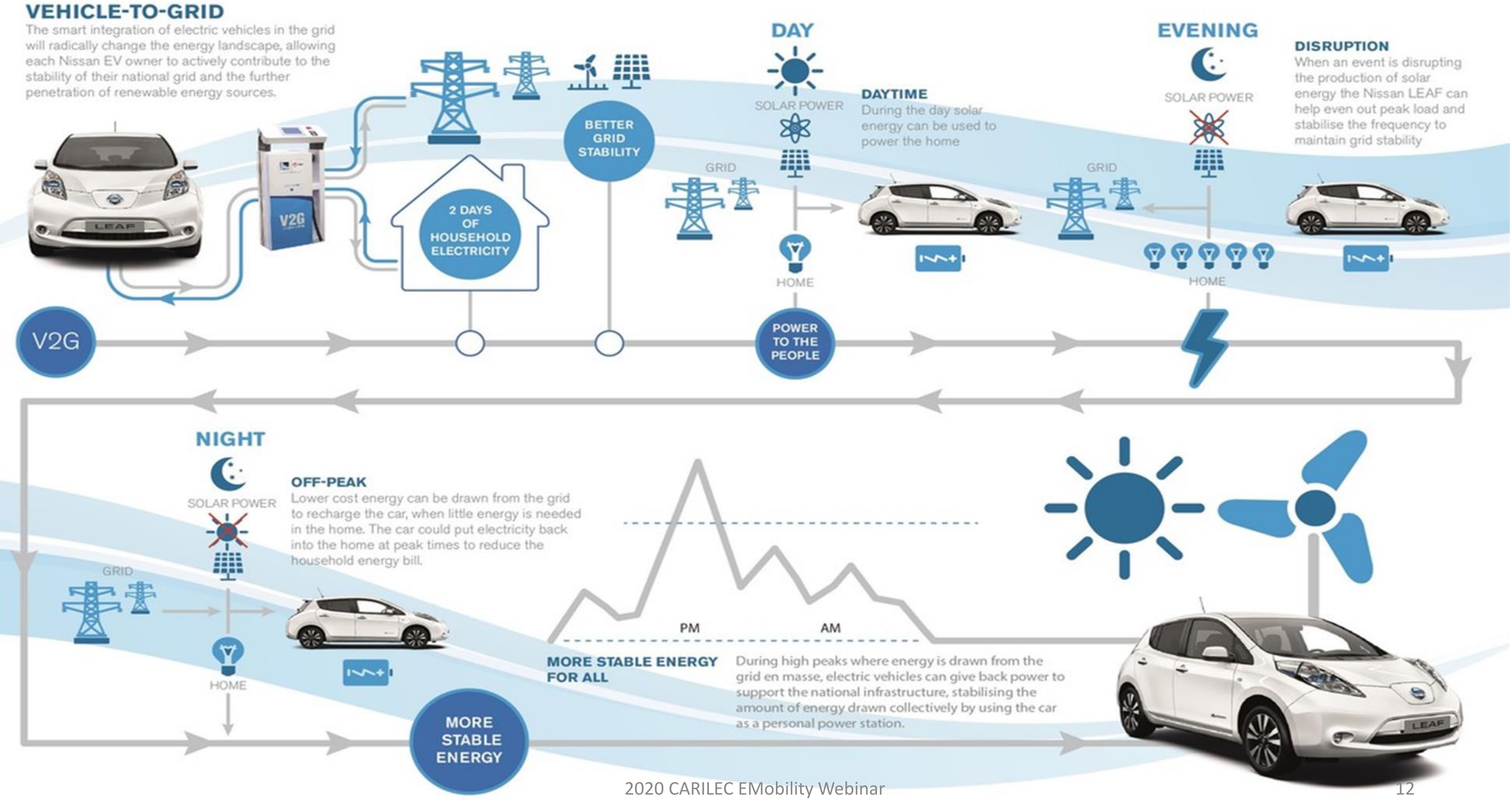
Renewable energy integration challenges
Managing power output fluctuations

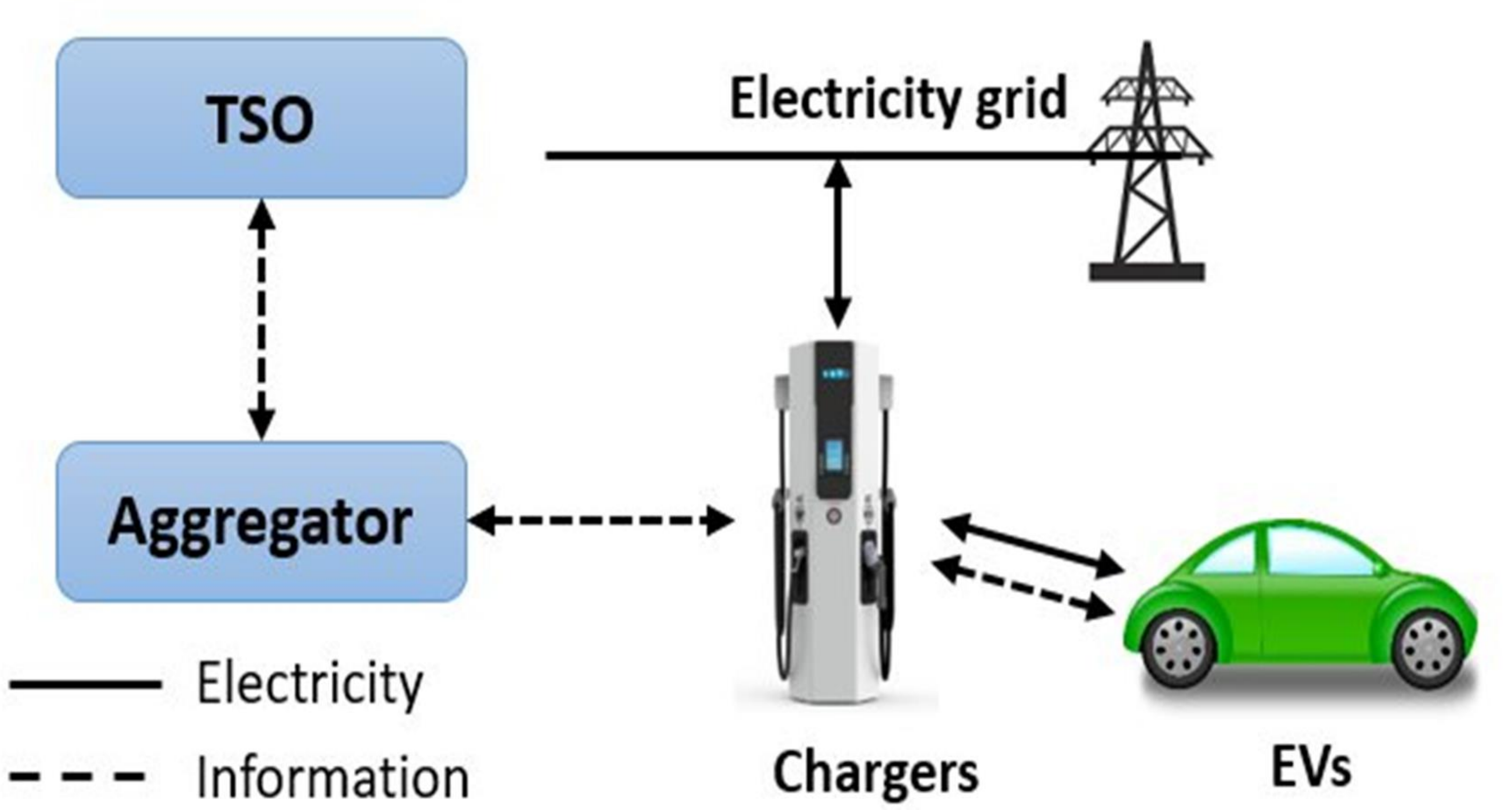


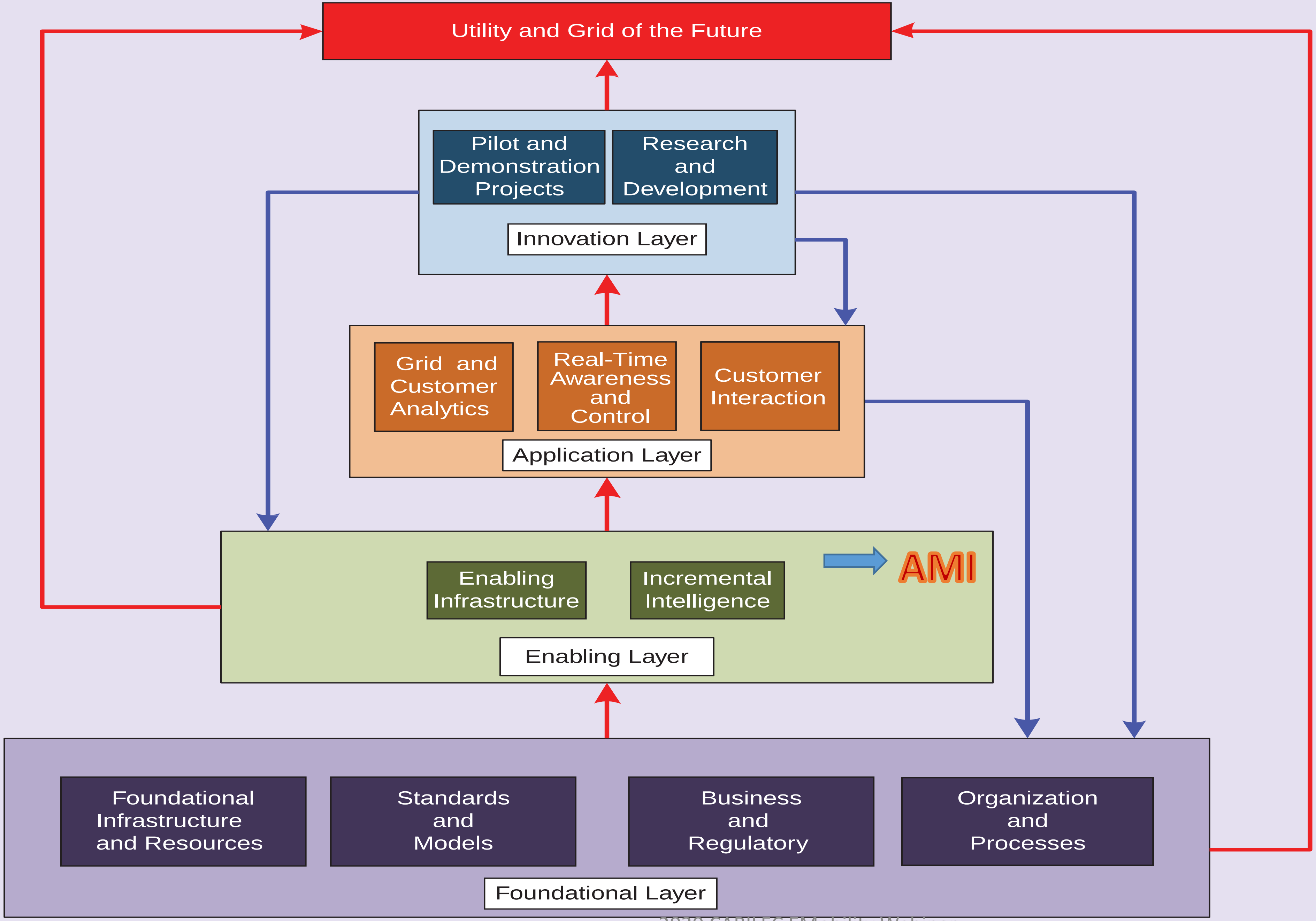

Morning peak
Extra demand of EVs
Evening peak
Flattened curve of demand
Charge on daytime
Energy release on evening



https://www.nissan-global.com/EN/TECHNOLOGY/OVERVIEW/vehicle_to_home.html#:~:text=Household%20power%20can%20be%20supplied,from%20the%20household%20power%20supply.

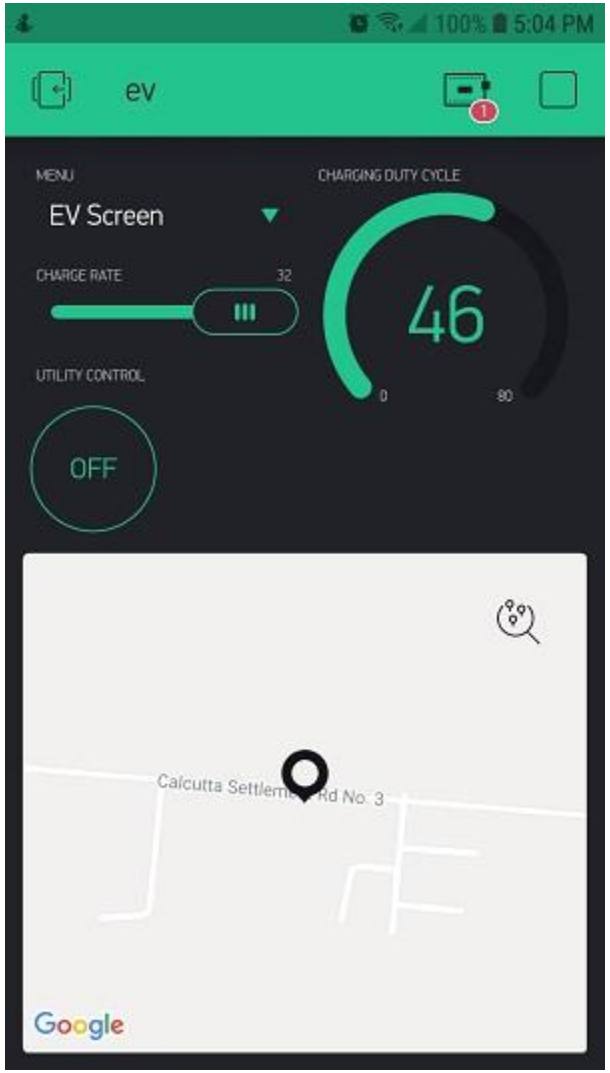

VEHICLE-TO-GRID
The smart integration of electric vehicles in the grid will radically change the energy landscape, allowing each Nissan EV owner to actively contribute to the stability of their national grid and the further penetration of renewable energy sources.
V2G
2 DAYS OF HOUSEHOLD ELECTRICITY
BETTER GRID STABILITY
DAY
SOLAR POWER
GRID
HOME
DAYTIME
During the day solar energy can be used to power the home
POWER TO THE PEOPLE
EVENING
SOLAR POWER
GRID
HOME
DISRUPTION
When an event is disrupting the production of solar energy the Nissan LEAF can help even out peak load and stabilise the frequency to maintain grid stability
NIGHT
SOLAR POWER
GRID
HOME
OFF-PEAK
Lower cost energy can be drawn from the grid to recharge the car, when little energy is needed in the home. The car could put electricity back into the home at peak times to reduce the household energy bill.
MORE STABLE ENERGY
PM
AM
MORE STABLE ENERGY FOR ALL
During high peaks where energy is drawn from the grid en masse, electric vehicles can give back power to support the national infrastructure, stabilising the amount of energy drawn collectively by using the car as a personal power station.

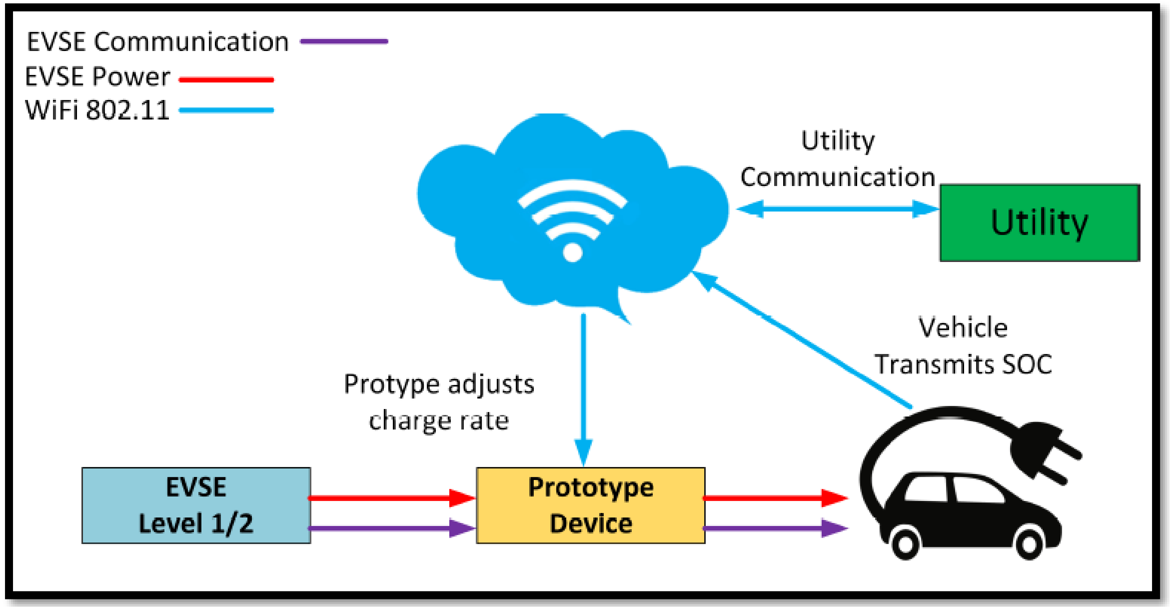

TSO
Electricity grid
Aggregator
Electricity
Information
Chargers
EVs

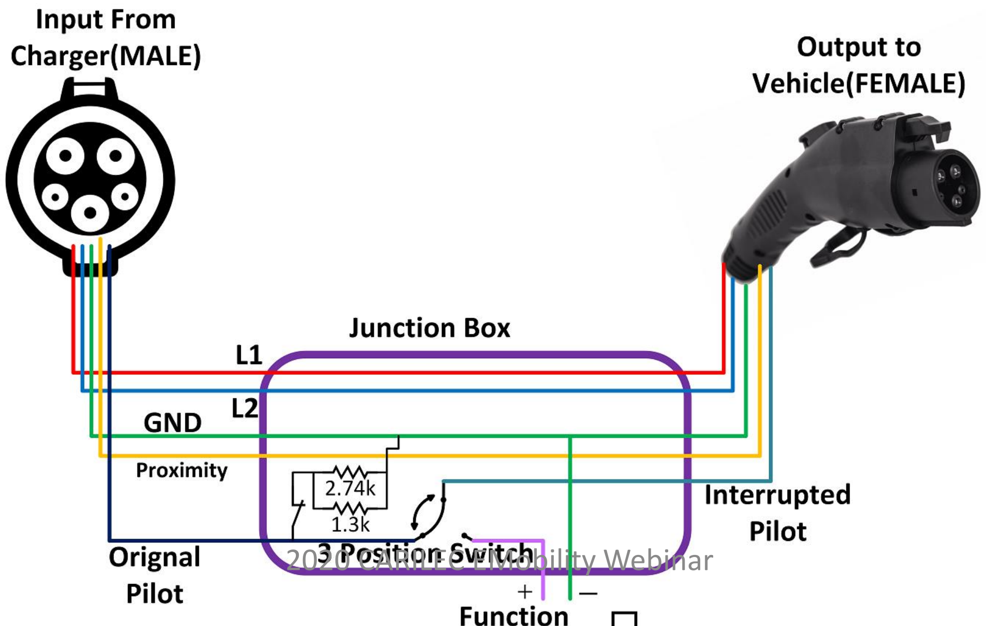

Utility and Grid of the Future
Pilot and Demonstration Projects
Research and Development
Innovation Layer
Grid and Customer Analytics
Real-Time Awareness and Control
Customer Interaction
Application Layer
AMI
Enabling Infrastructure
Incremental Intelligence
Enabling Layer
Foundational Infrastructure and Resources
Standards and Models
Business and Regulatory
Organization and Processes
Foundational Layer

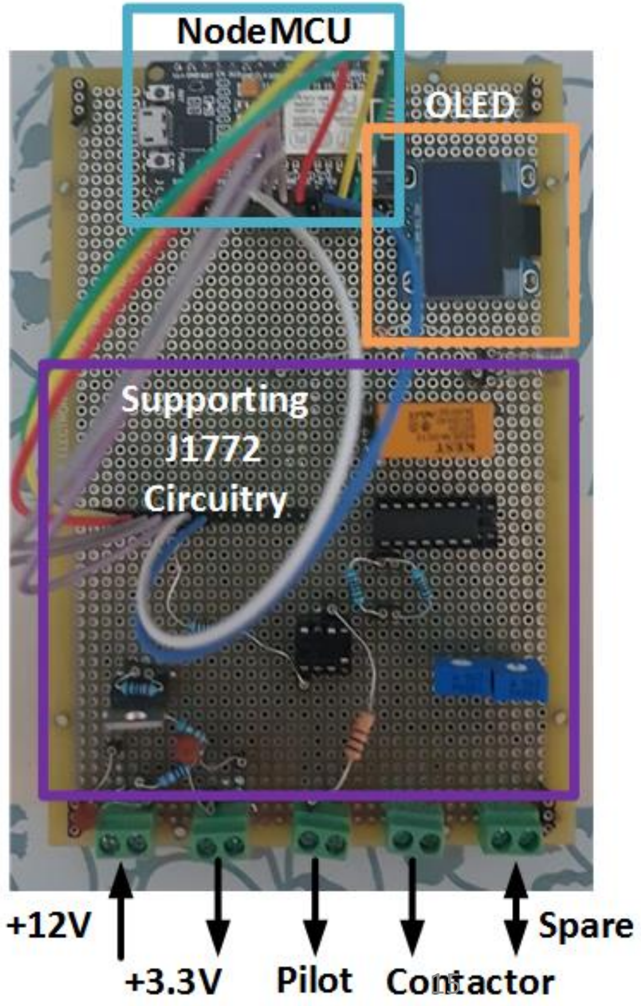
Developed Prototype

UWI







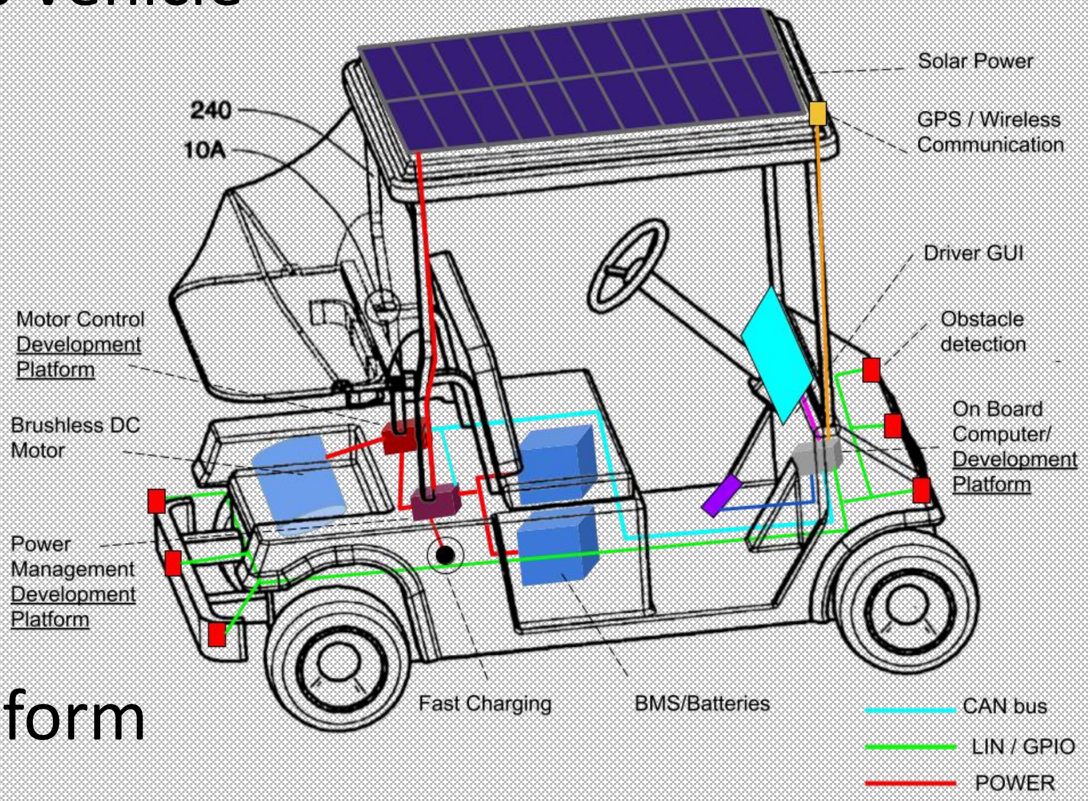


Dynamic Coordination of EV Charging

- Since the time for EV charging can be remotely controlled by the utility then it would be best to spread the charging windows.
- This relaxes the requirement for increased power output from committed generating or committing additional units.
- The utility can incentivize their customers that are EV owners to provide wide window durations where and when possible to yield greater flexibility.

Electric Vehicle Research and Development Platform (EVRDP)

- Develop an operational Light Electric Vehicle
- Plug and play
- Switch & Replace/Upgradable
  - Dashboard
  - Motor Control
  - On Board Computer
  - Power Management
  - Sensors
- Basis of a teaching and research Platform



Thank You

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