

There is no better  
time than now to be  
an intelligent power  
management  
company.

**EAT•N**  
Powering Business Worldwide

SAESA & Solar  
Power Africa  
Nov 5<sup>th</sup>, 2021



# Headquarters and key locations



- Chairman & CEO – Craig Arnold
- Ranked 3rd among our 18 peer companies in total shareholder return in 2020
- Two-thirds of our Board of Directors are women or U.S. minorities

**Electrical Sector:**  
2020 Sales \$11.4 B

**Industrial Sector:**  
2020 Sales \$6.5 B

**Total sales:**  
\$17.9 Billion USD

**Net income:**  
\$1.4 Billion USD



# The electrification of our economies

The electrification of our economy is the most efficient way to decarbonize the World, but this increases power demand and risk of grid congestion.



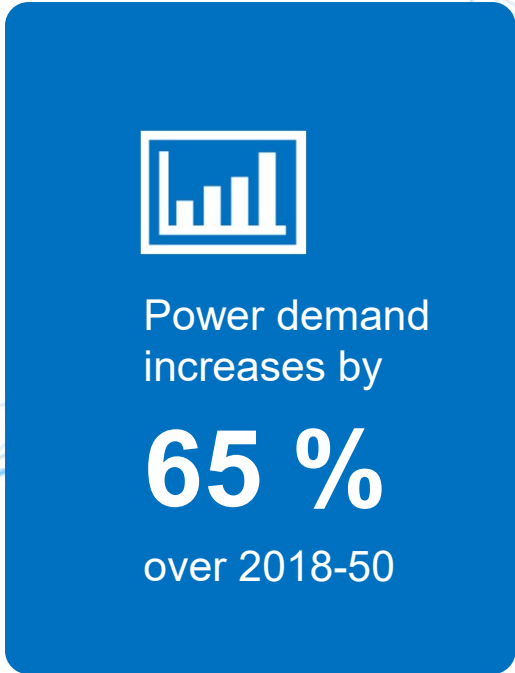
**Transport**



**Buildings**



**Industry**



BloombergNEF Sector coupling study

# Flexible energy systems will power the future.

Through our **EVERYTHING AS A GRID** approach, advancing technologies and digital intelligence, we are increasing and optimizing the energy the world relies on.



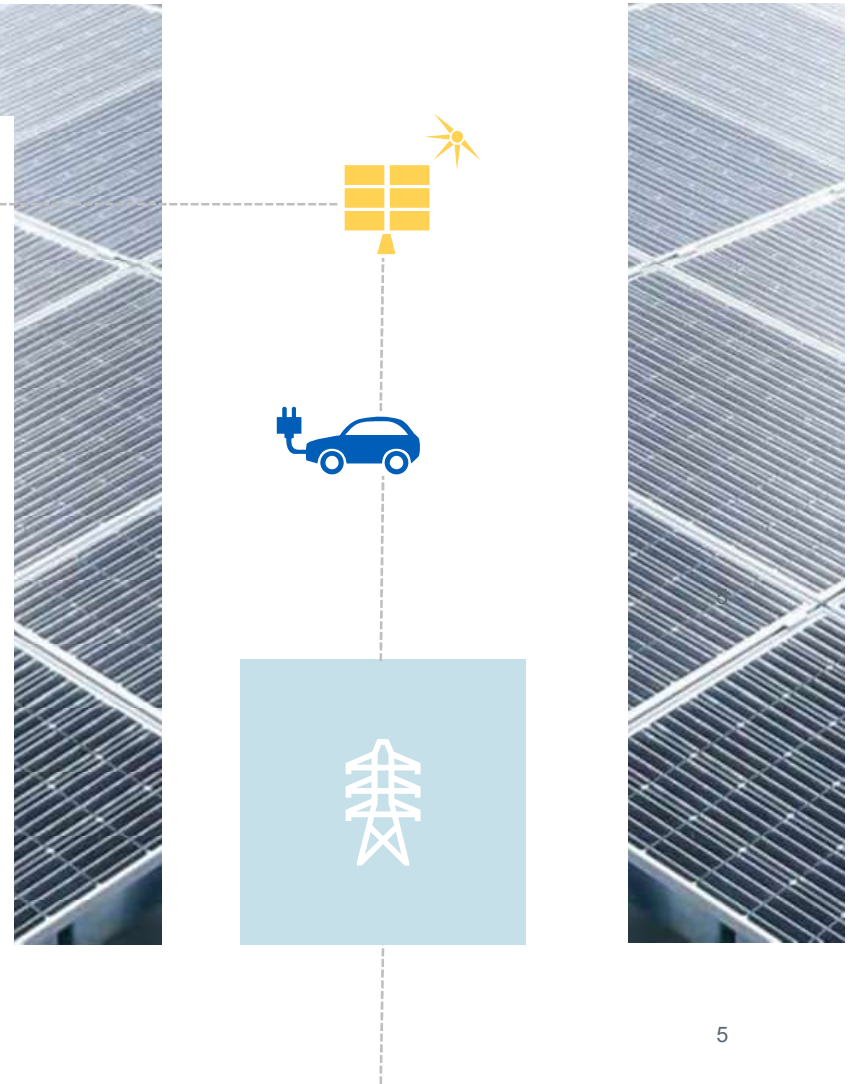


# Buildings as a Grid

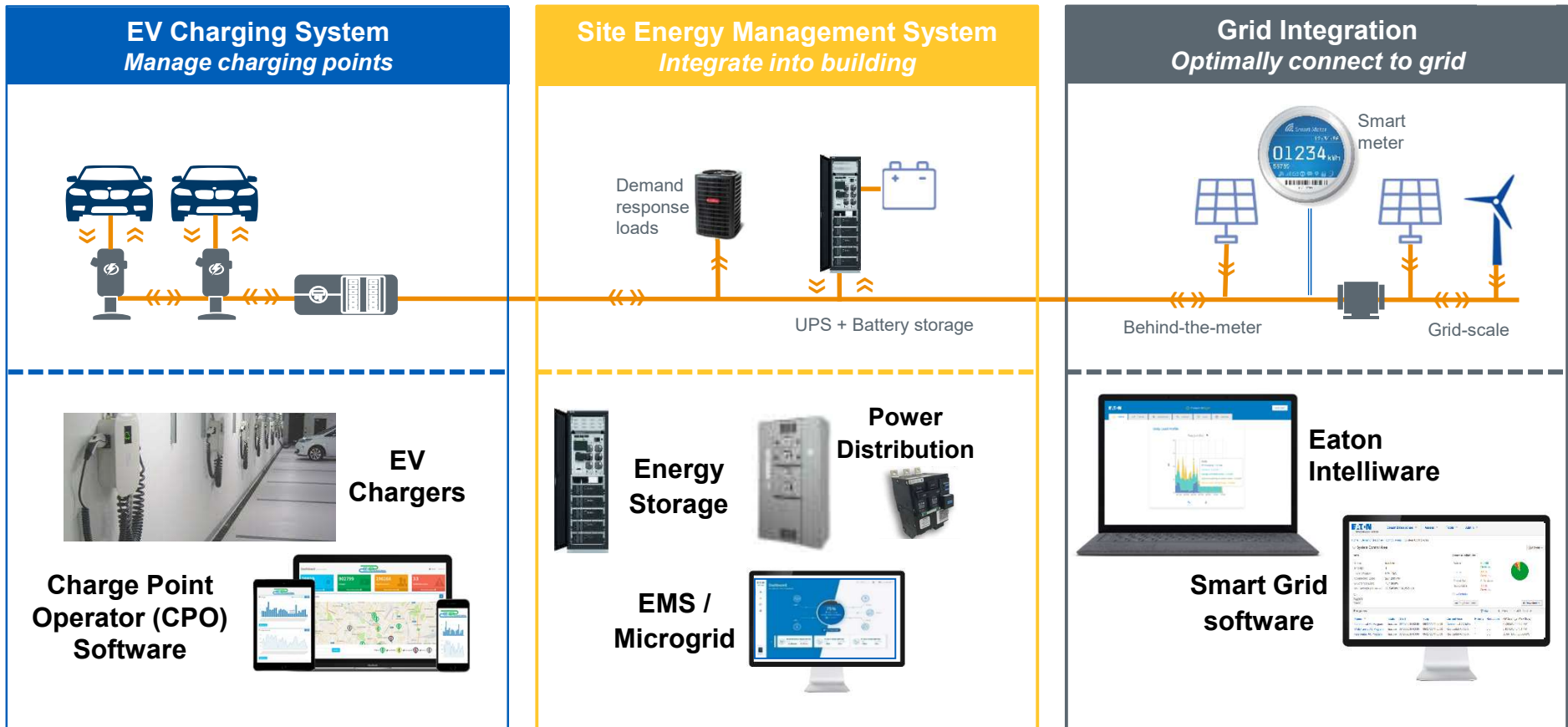
Buildings are becoming **energy hubs**. You need to be prepared for the future - integrate EV chargers or leverage renewable energy produced on site while managing the energy flows and planning power capacity.

## We enable our customers to:

- Get a future-proof electrical infrastructure
- Reduce carbon footprint
- Improve resiliency
- Safely and securely adapt to fast changing standards and regulations



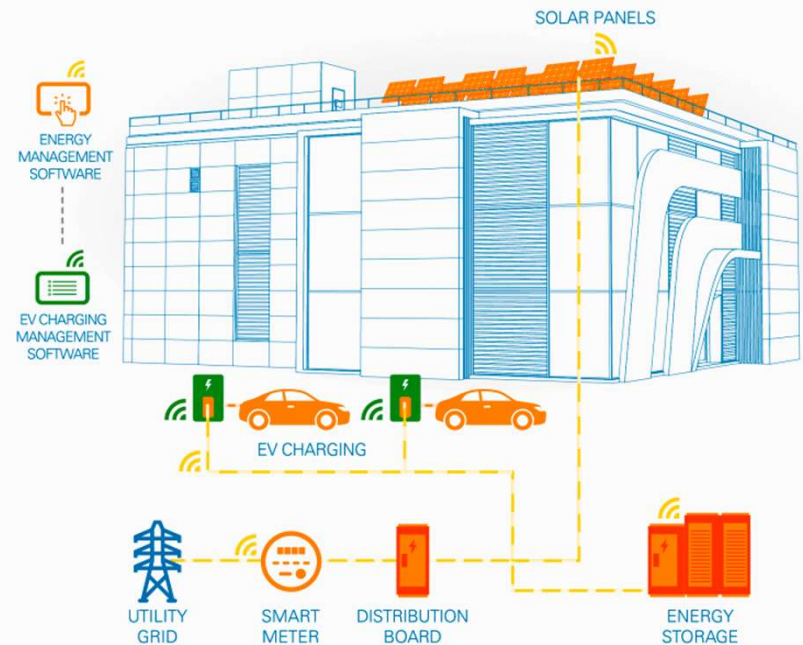
# EVCI is a central component of energy transition in buildings and enables a complete packaged electrical solution



# Building energy management software

All-in-one software management system to manage the energy flows in your building

- Monitoring of the connected devices (energy storage, PV production, EV charging infrastructure, electrical meters)
- Optimization (Maximize solar self-consumption, time of use, peak shaving, load shifting, EV Charging power limitation)
- PV production forecast
- Firmware update management
- Alert notifications



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# Dashboard

Welcome back, Fabrice Roudet

All connections active

Dashboard

Charts

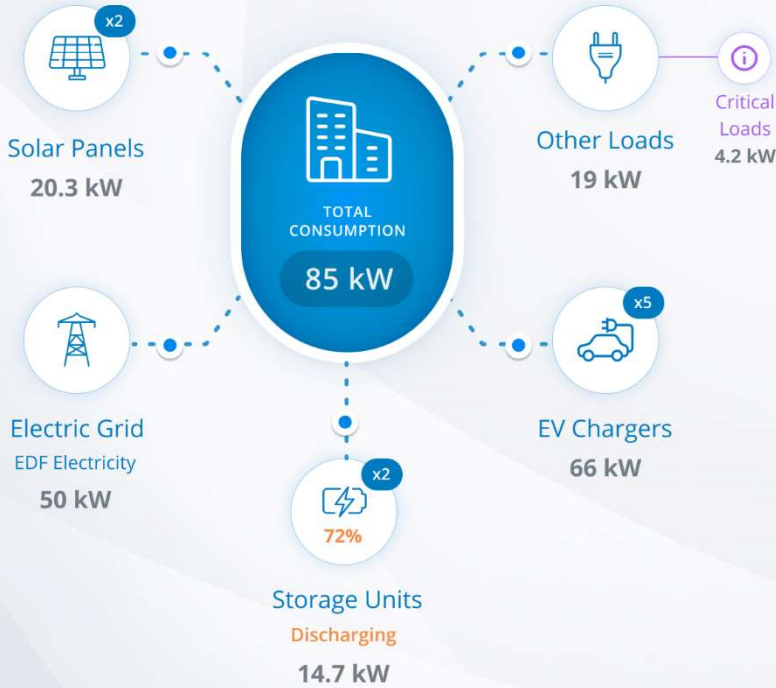
Assets

Users and Permissions

Routine Scheduler

Settings

Office 5 >





# User benefits



## Maximize earnings

Give greater control over energy supply and self-consumption of PV  
Help avoid peak charges  
Reduce the reliance on expensive fuels like diesel



## Continuity of supply

Give continuity of supply  
Enable grid stability and efficiency



## Sustainability

Facilitate the wider adoption and deployment of renewable power generation



## Customer Service

Safe technology  
Customer Service

We help customers integrate EV chargers, leverage renewable energy produced on site while managing the energy flows and planning power capacity.

# Impacting 6 sustainable development goals



<http://www.un.org/sustainabledevelopment/>

# Food for thoughts in African context

- Cost of EV and infrastructure
- Legislation and Regulation / Common standards
- Urban planning
- End of life and disposal of batteries

**EATON**

*Powering Business Worldwide*



# An International Perspective on V2G The Big Picture

South Africa Energy Storage Association Webinar on Vehicle-to-Grid (V2G)

November 5, 2021

\* V2G in this presentation means bi-directional energy transfer from/to plug-in electric vehicles.

Source: Ed Hawkins; Temperatures 1850-2017

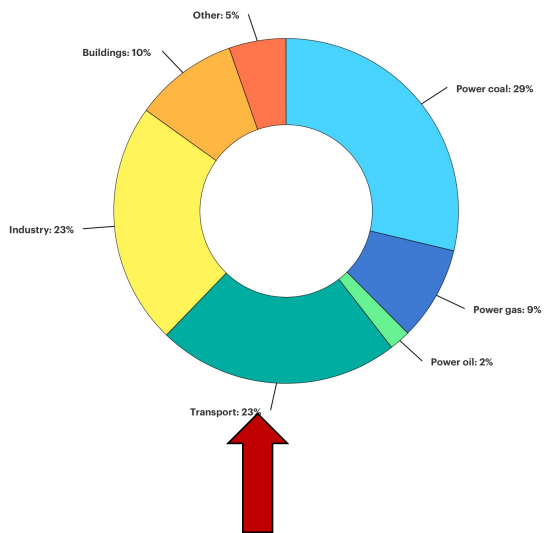
We have a Climate Emergency  
and  
An Energy Crisis  
and  
An Air Pollution Crisis



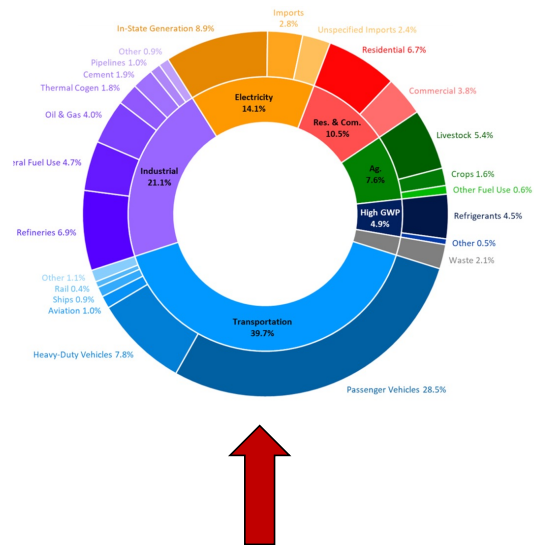
# Transportation is a large CO<sub>2</sub> emitter

## Greenhouse gases by economic sector

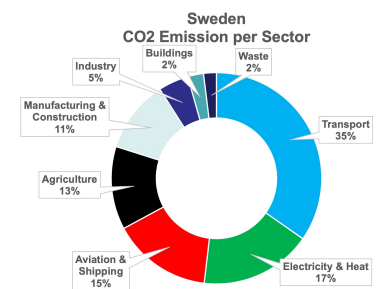
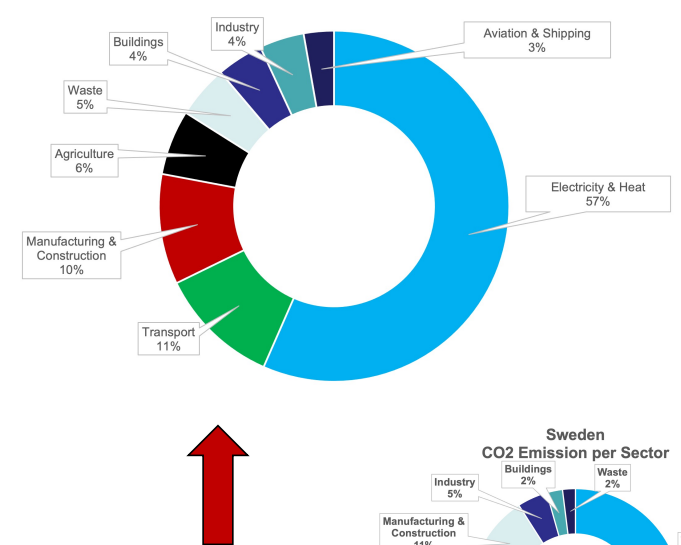
World 2020



California 2019



South Africa 2016

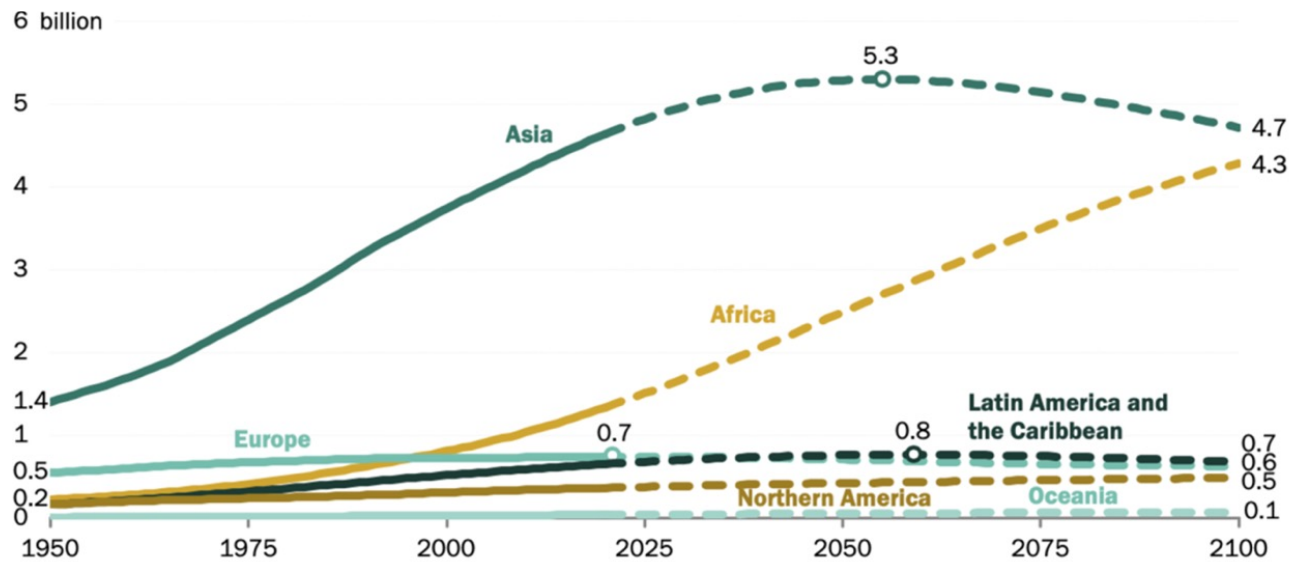


Source: CARB; IEA; Our World in Data

November 5, 2021

South Africa Energy Storage Association Webinar on Vehicle-to-Grid (V2G)

Leave no one behind - We must include the emerging countries  
 Africa Population is world's fastest growing continent, and they will want (e)-mobility



Source: PEW RESEARCH CENTER



A sunset over an industrial landscape. The sun is a large, bright yellow circle in the upper left, casting a warm orange glow across the sky. In the foreground, the silhouettes of power lines and industrial structures are visible against the bright background. A single bird is captured in flight in the center of the frame. The overall scene is hazy and atmospheric.

## V2G can help

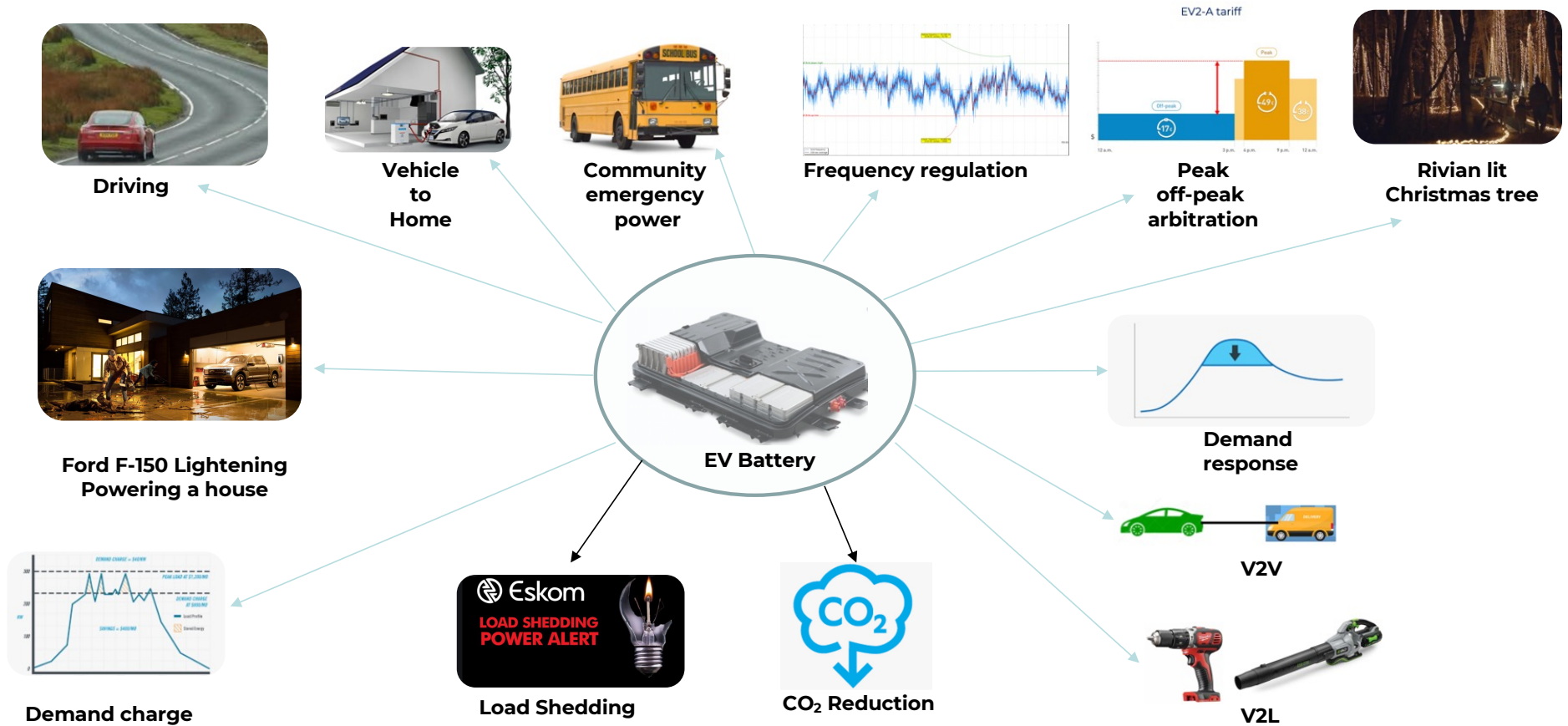
Ensure energy resilience, reduce CO<sub>2</sub> emission and air pollution  
and  
Make E-Mobility more affordable

# Batteries can be used for many applications



# EV batteries can support a multitude of energy apps

All EVs are born with bi-directional power flow



## Example: Potential V2G impact in California in 2030

If all 5 million ZEVs in 2030 were bi-directional (V2G)

- Assuming an EV cost of \$25,000 (please Mr. Musk and VW)
- 60-kWh battery
- 10 kW charger

This would result in:

- 300 GWh additional storage capacity (Today appr. 4.2 GWh energy storage is procured in CA and 11 GWh needed by 2030 (source: CESA))
- 50 GW potential extra peak power (Average CA peak power in summer around 38 GW \*)
- \$125 billion invested by the EV owners **at no cost to CA** (grid owners, ratepayers)
- Up to 23,000,000 tons\*\* of CO2 saved yearly

\* If connected at same time.. Highest peak reached in 2006 = 50 GW

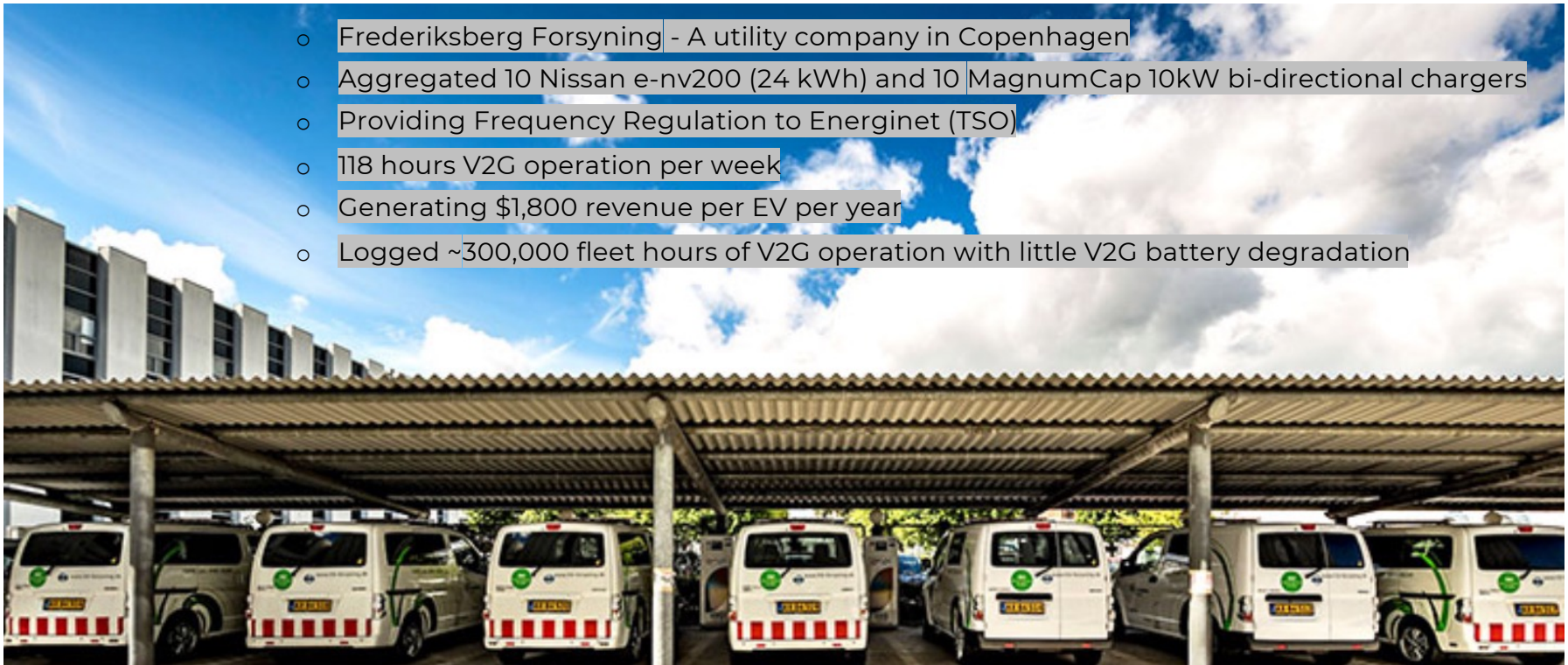
\*\* If charged with 100% renewable electricity



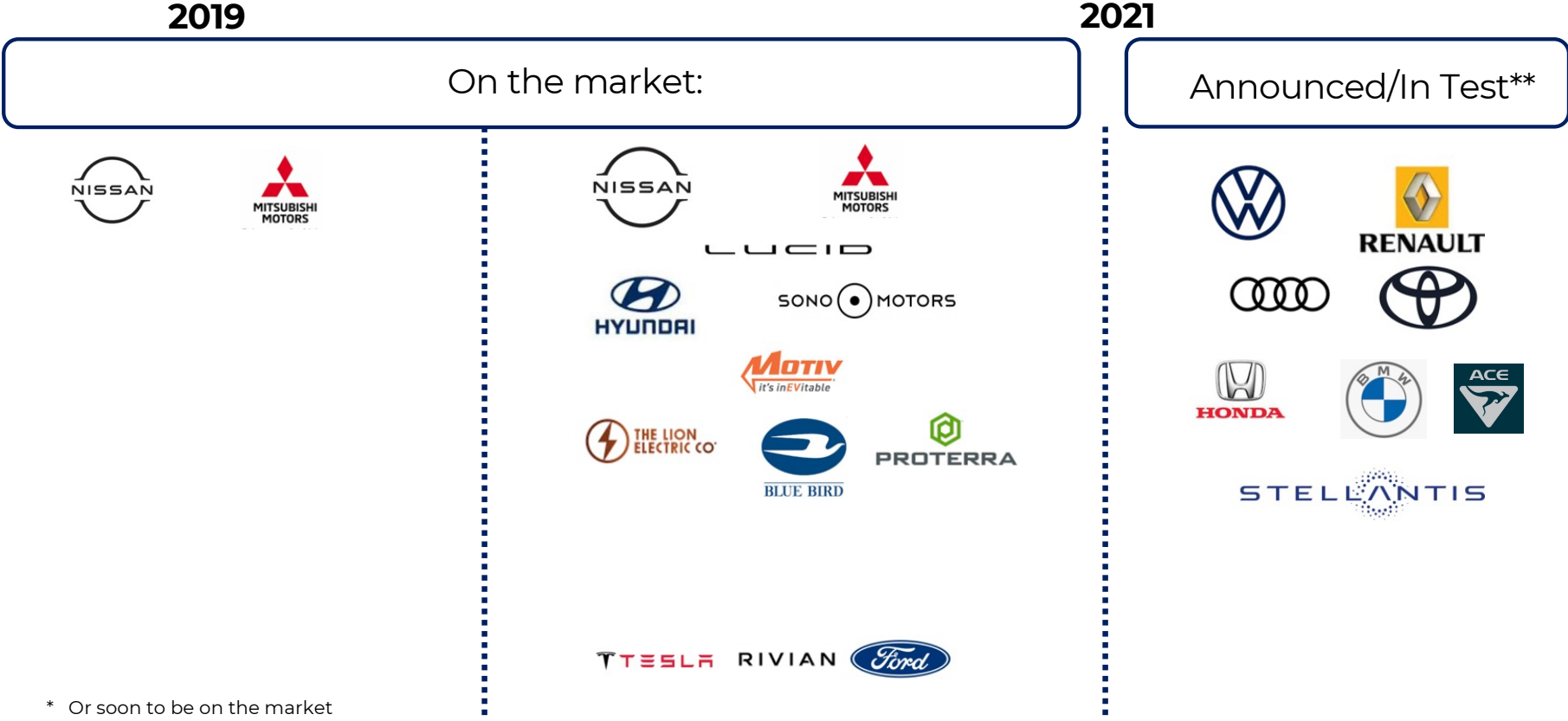
## V2G a well proven technology

300,000 V2G fleet hours – Deployment in Denmark – September 6, 2016 – Now

- Frederiksberg Forsyning - A utility company in Copenhagen
- Aggregated 10 Nissan e-nv200 (24 kWh) and 10 MagnumCap 10kW bi-directional chargers
- Providing Frequency Regulation to Energinet (TSO)
- 118 hours V2G operation per week
- Generating \$1,800 revenue per EV per year
- Logged ~300,000 fleet hours of V2G operation with little V2G battery degradation



# Bi-directional EV supply chain gaining momentum



\* Or soon to be on the market  
 \*\* Or announced V2G capabilities

# Bi-directional EVSE supply chain gaining momentum

And coming down in price

2019

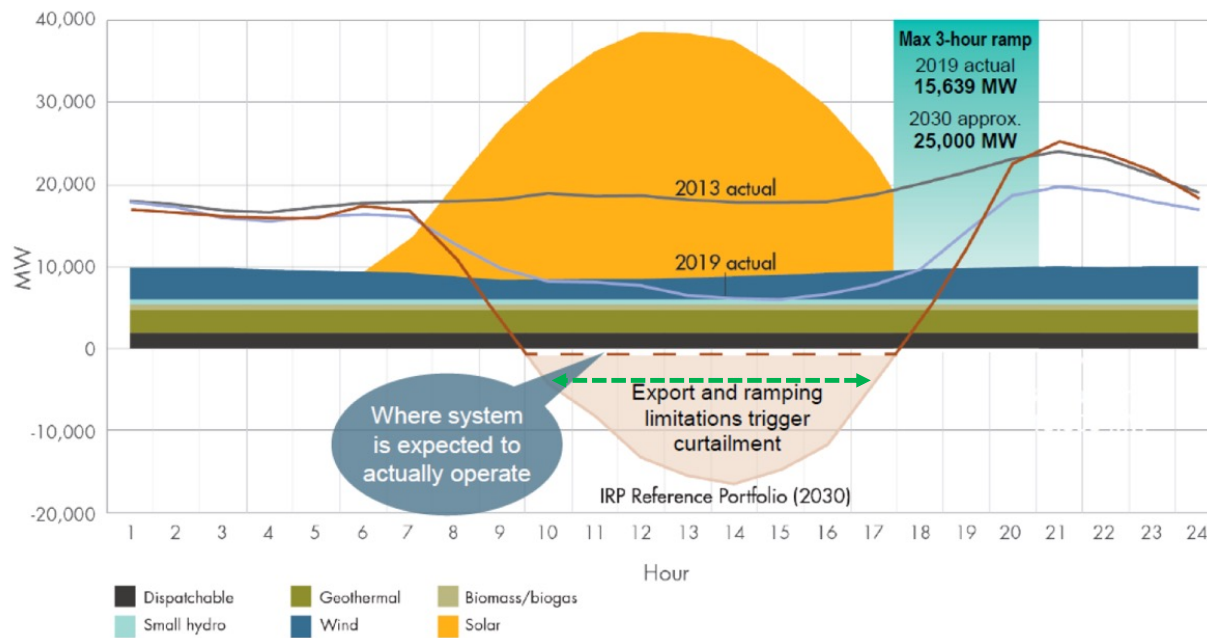
On the market:

2021

On the market:

# V2G can really make a difference

If 5 million ZEVs were added to California and all V2G capable (+- 10kW)



**Discharge**  
 Reduce expensive  
 And dirty energy use  
 Peak-cutting potential

17 GW/h over 3 hours  
 @310 g CO<sub>2</sub>/kWh  
 = 16 M tons CO<sub>2</sub> saved

**Charge**  
 Soak up inexpensive  
 solar energy, avoid  
 curtailment

17 GW/h over 3 hours  
 @161 g CO<sub>2</sub>/kWh  
 = 2.7 M tons CO<sub>2</sub> emitted

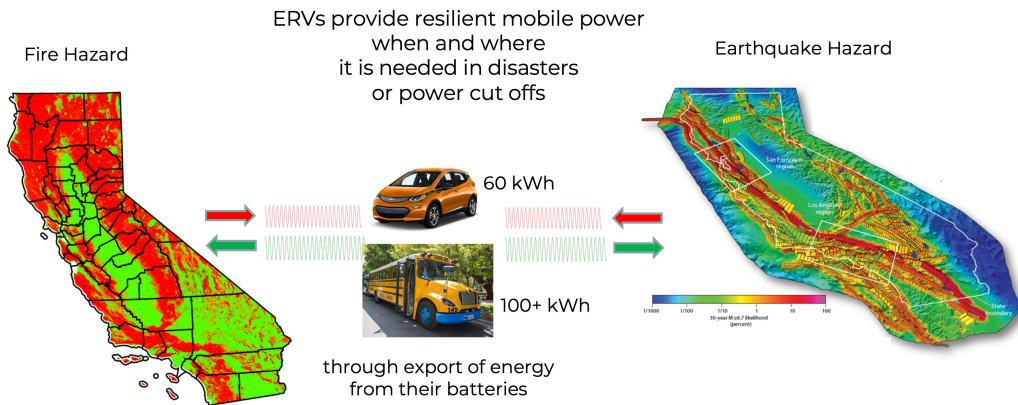
**CO<sub>2</sub> savings per day**  
**13.3 M tons**

Source: Delphine Hou, Director, California Regulatory Affairs SB 100 Modeling Inputs and Assumptions Workshop  
 February 24, 2020

# V2G “Silver Bullet” use cases

## The Energy Resilient Vehicle (ERV)

### California PSPS Events



### South Africa Load Shedding

Static monthly version - This schedule would apply each month. For 30 day month just drop day 31 and for Feb drop days 29 to 31.

| Day of the month | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 01:00 - 03:30    |    |    |    |    | 2  | 3  | 4  | 1  |    |    | 7  | 8  | 5  | 6  |    |    |    |    |    |    | 1  | 2  | 3  | 4  |    |    |    |    |    |    |    |
| 03:30 - 05:30    |    |    | 2  | 3  | 4  | 1  | 6  | 7  | 8  | 5  |    |    |    |    |    |    |    |    |    | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |    |    |    |    |
| 05:30 - 07:30    |    |    | 6  | 7  | 8  | 5  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Province         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Mpumalanga       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| City/Munic       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Thaba Chweu      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Suburb/Town      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Lydenburg        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 15:00 - 17:30    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 17:00 - 19:30    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 19:00 - 21:30    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 21:00 - 23:30    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 23:00 - 01:30    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

Please note that all shaded areas will be times when the power will be off. Schedules are cumulative, i.e. stage 3 will include the times as scheduled for the preceding stages 1 and 2.

| STAGES |   |   |   |   |   |   |   |
|--------|---|---|---|---|---|---|---|
| 1      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1      | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|        | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
|        |   | 3 | 3 | 3 | 3 | 3 | 3 |
|        |   |   | 4 | 4 | 4 | 4 | 4 |
|        |   |   |   | 5 | 5 | 5 | 5 |
|        |   |   |   |   | 6 | 6 | 6 |
|        |   |   |   |   |   | 7 | 7 |
|        |   |   |   |   |   |   | 8 |



# UYLIO - Africa's first V2G installation in 2017



# Africa's second V2G installation - 2019

## UNDP project at HQ in Namibia



# V2G Integration with PV solar - 2019

## UNDP project at HQ in Namibia





Questions?

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+1 408-802-0707





Hosted by:  
**NELSON MANDELA**  
UNIVERSITY

An initiative of:



## Vehicle to Grid Webinar

Friday 5 November 2021

**Hiten Parmar**

Director: uYilo eMobility Programme

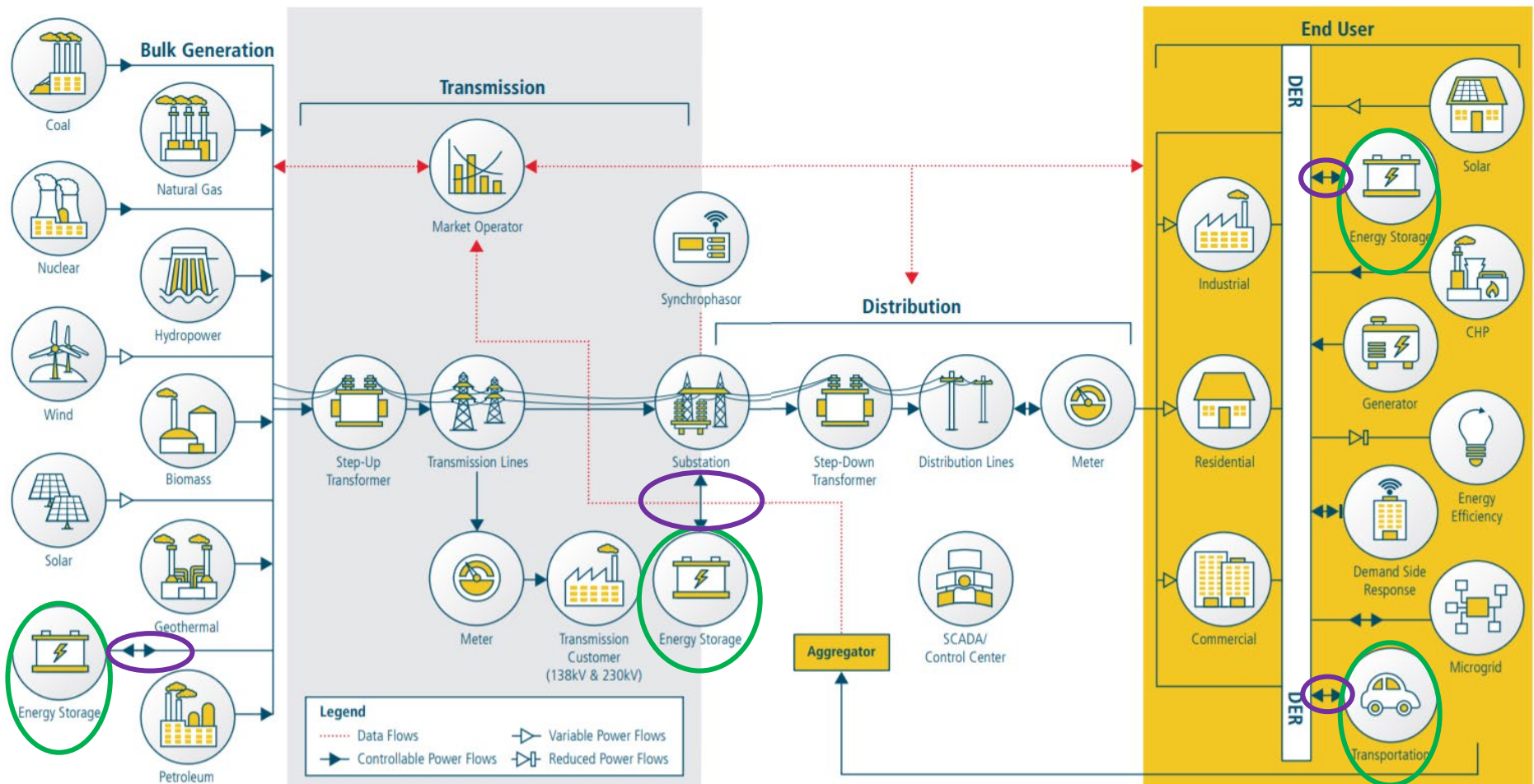
[info@uYilo.org.za](mailto:info@uYilo.org.za)

[www.uYilo.org.za](http://www.uYilo.org.za)

Get connected with us on   



# Energy Landscape Common Denominator: 'Storage'



Source: DOE Quadrennial Energy Review Report

# Battery Storage Services along the Value Chain

| Bulk energy services                   | Ancillary services                               | Transmission infrastructure services | Distribution infrastructure services | Customer energy management services    | Off-grid                                   | Transport sector   |
|--|--|--------------------------------------|--------------------------------------|--|--|--|
| Electric energy time shift (arbitrage) | Regulation                                       | Transmission upgrade deferral        | Distribution upgrade deferral        | Power quality                          | Solar home systems                         | Electric 2/3 wheelers, buses, cars and commercial vehicles |
| Electric supply capacity               | Spinning, non-spinning and supplemental reserves | Transmission congestion relief       | Voltage support                      | Power reliability                      | Mini-grids: System stability services      |  |
|  | Voltage support                                  |                                      |                                      | Retail electric energy time shift      | Mini-grids: Facilitating high share of VRE |  |
|  | Black start                                      |                                      |                                      | Demand charge management               |  |  |
|  |  |                                      |                                      | Increased self-consumption of solar PV |  |  |

Boxes in red: Energy storage services directly supporting the integration of variable renewable energy

Source: IRENA

# Vehicle-to-Everything (V2X)

QUICKCHARGING AND BEYOND  
CHAdeMO V2X products in market

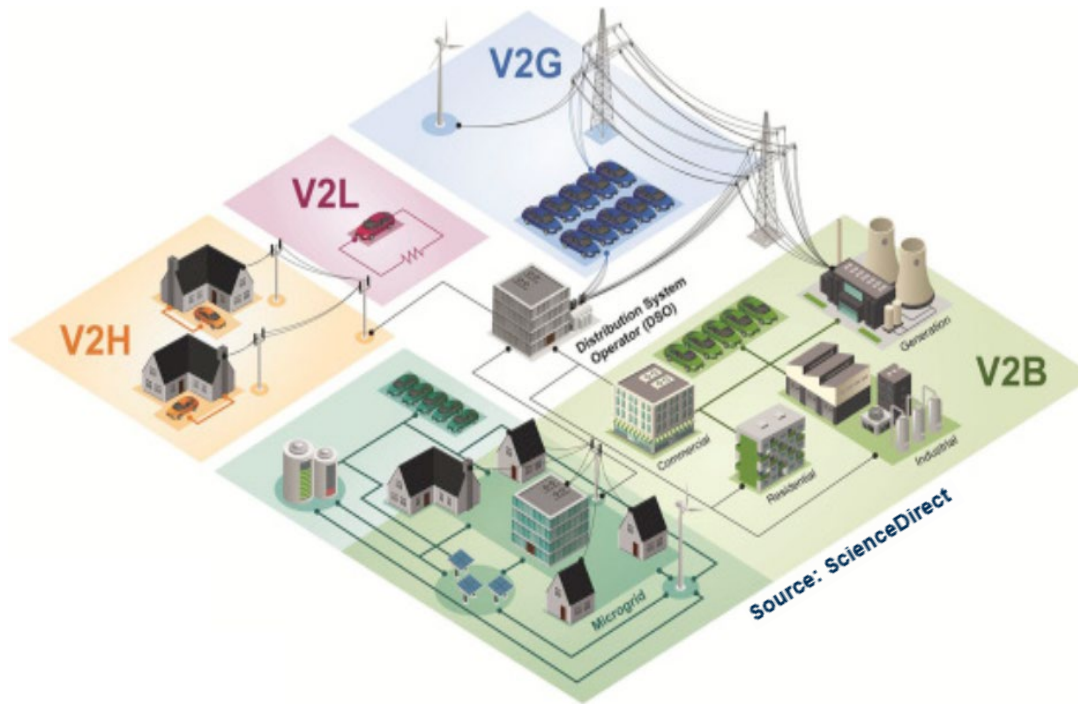


**V2L**  
(Load)

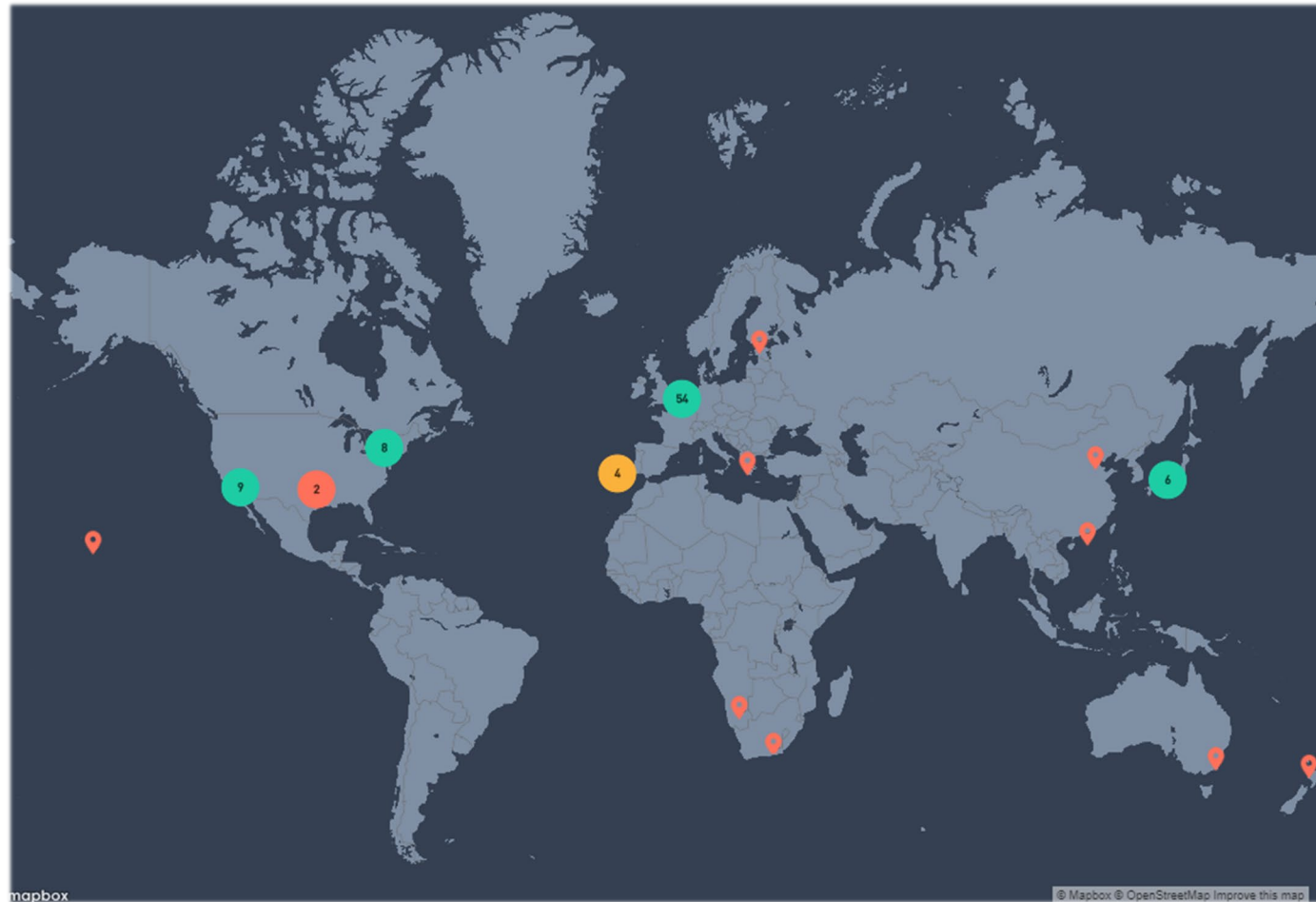
**V2H**  
(Home)

**V2B**  
(Building)

**V2G**  
(Grid)



# Vehicle-2-Everything (V2X) Projects Worldwide



Source: V2Ghub





Battery Recycling



Energy Generation



Smart Grids



Charging Infrastructure



Battery Second Life



Service



**Enabling, Facilitating  
and Mobilising the  
Electric Mobility  
EcoSystem  
since 2013**

Standards



Apps



**EcoSystem  
since 2013**

Battery Technology



Connectivity



Mobility Options



Electric Vehicles



Components

