Solar

From Concept to Reality

An Industry Dialogue

- CTA Fall Conference
- Concurrent Educational Session
- November 9, 2017
- Moderator Fred Silver- VP CALSTART

Agenda

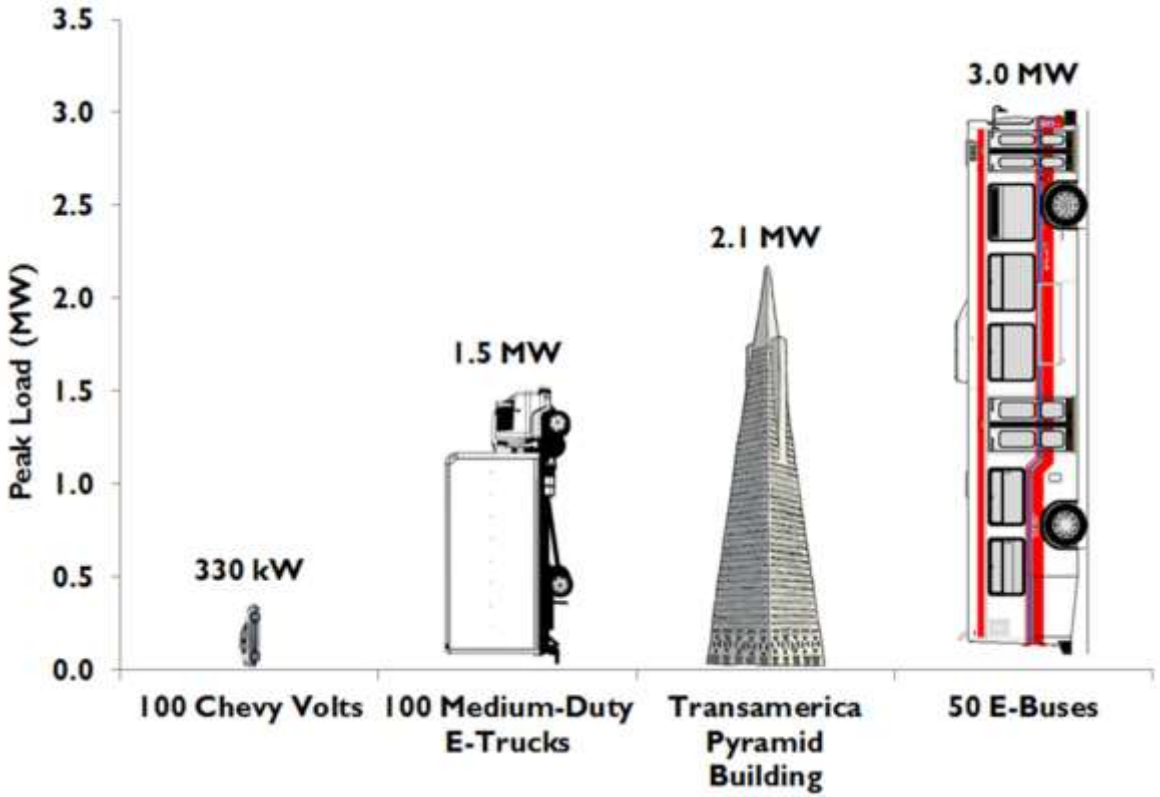
- **Use of Solar and Grid Upgrade driven by growth of battery Electric bus deployments**
- **Type of Solar System Options Available to Transit and their Benefits**
- **Examples of Solar Systems and Energy Storage Operated by Transit**
- **Panel Discussion**

Growth of ZEB Deployments- From 1-5 to 10 -20 to 50 BEBs

- **Individual fleet sizes of some California properties approaching 20- 50 BEB's with some committing to fleet size of more than 100 by 2018/19**

- **More than Sixty Fleets nationwide demonstrating or deploying ZEBS**
  - **With cumulative orders of 850 there are more than 200 Battery electric buses deployed**

Peak loads for Various Electric Vehicle Fleets (without mitigating grid impacts)



Assumptions: the Chevy Volt charging rate is 3.3 kW, the medium-duty E-Truck charging rate is 15 kW and the E-Bus charging rate is 60 kW.

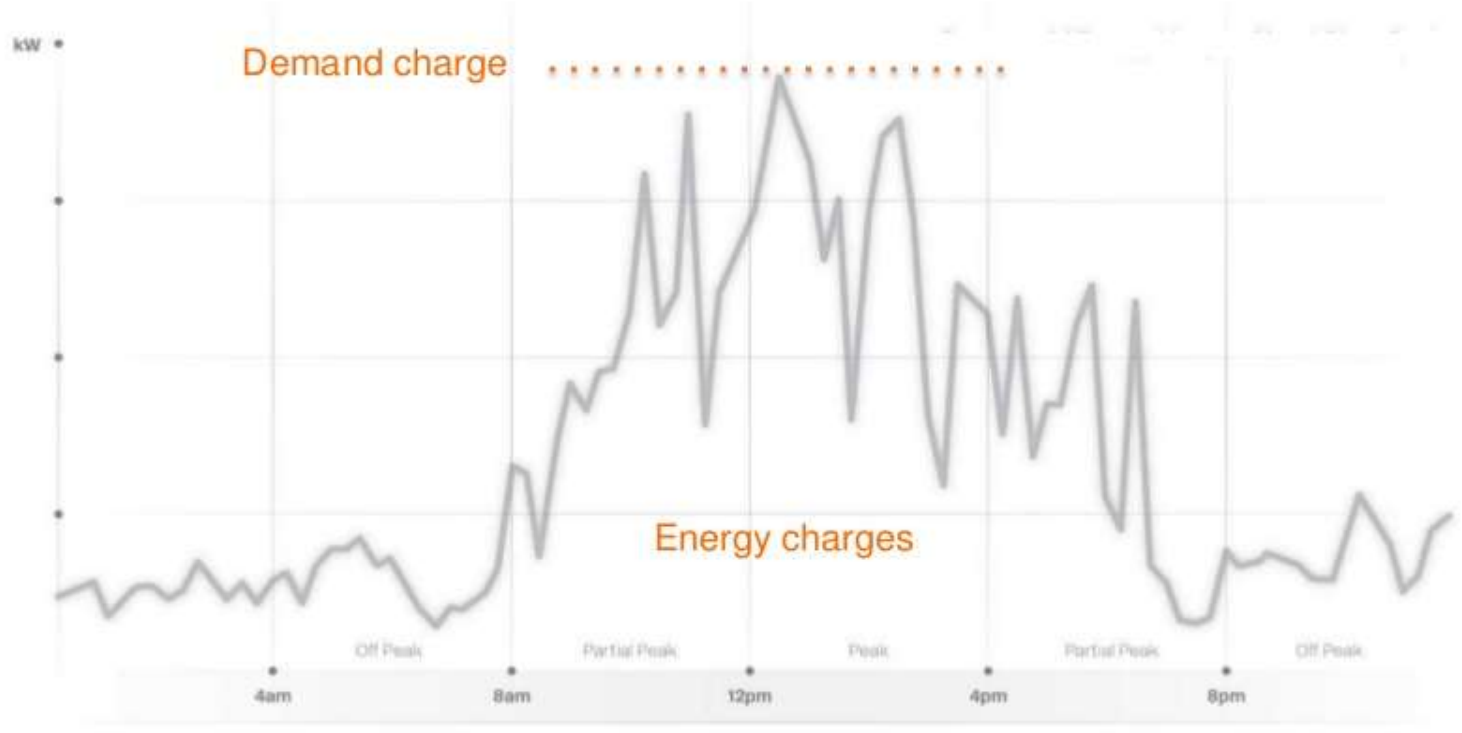
Two Parts of Your Utility Bill
Energy and Demand

1 Energy charges

Total amount of energy used

2 Demand charge

Highest 15-minute peak each month



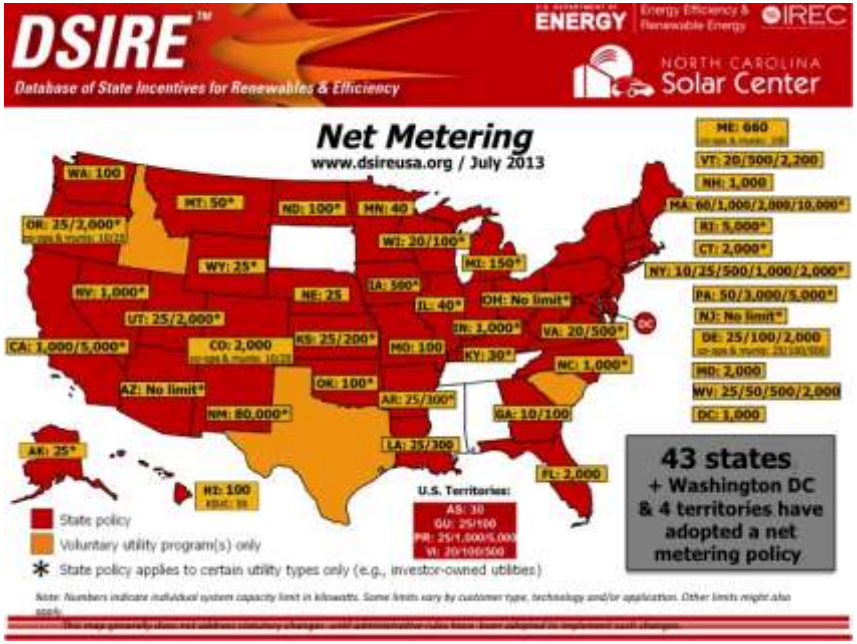
PG&E Presentation on Demand Charges

Solar Options

- Solar and Net Metering
- Solar and Battery Energy Storage
- A Solar System within a Microgrid

The Value of Solar Systems

- 43 States have adopted net metering
- Net metering is a billing mechanism that credits solar energy system owners for the electricity they add to the grid
- A bi-directional meter measure energy use and energy produced
- Solar will reduce the Part A energy cost of your utility bill



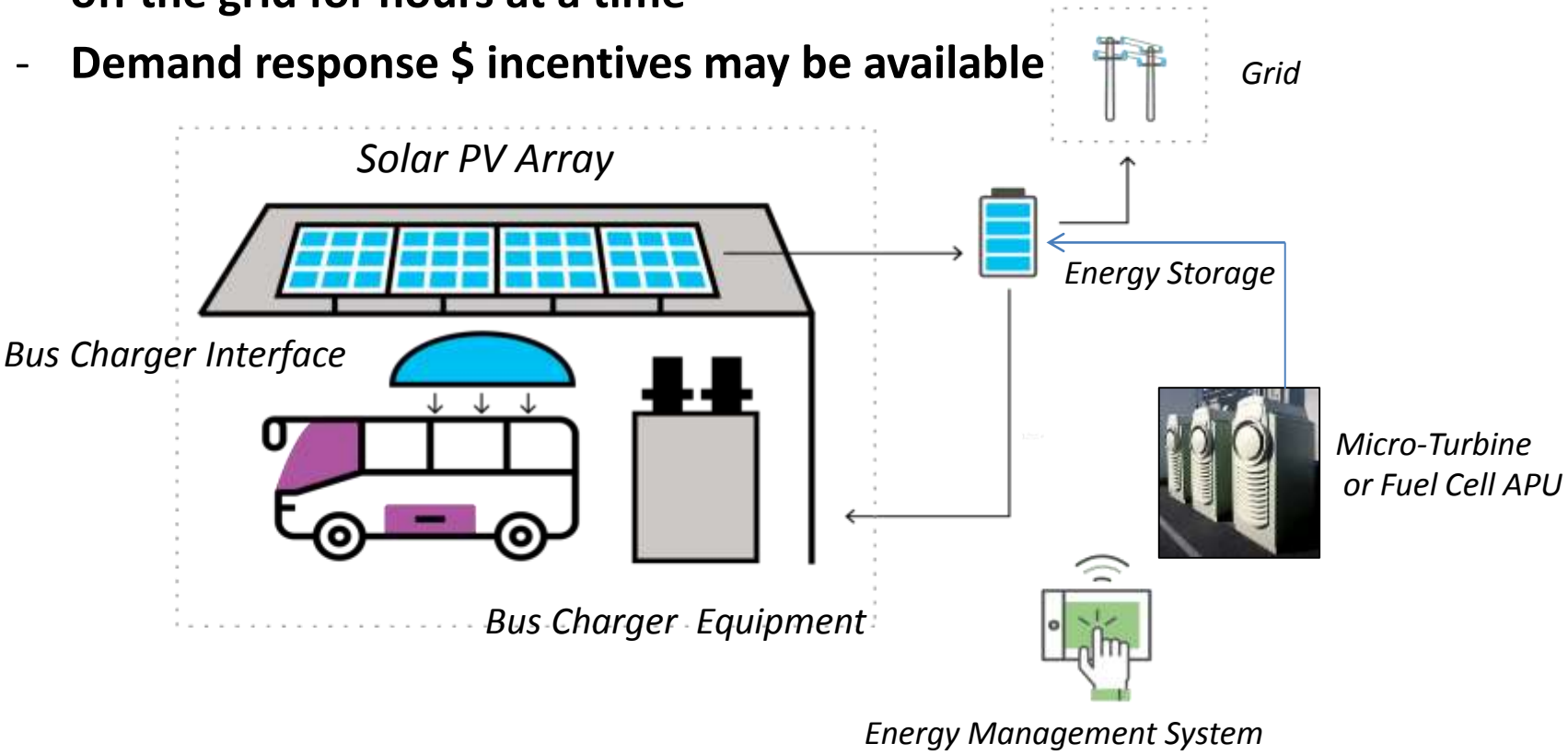
The Value of Energy Storage

- **Energy storage systems using batteries, ultra-capacitors, or flywheels can act as a buffer between the grid and charger to smooth out peak loads**
- **The ABB TOSA bus charging system in Switzerland uses ultra-capacitors to decrease the demand on the grid from 400 kW to 40 kW while maintaining the benefits of on-route fast**

	Grid to Charger	Charger to Bus
Maximum charging power	40kW	400kW
Charging duration	2.5 Minutes	15 Seconds
Energy transferred	1.7kWh	1.7kWh

Micro-grid

- Definition: a small network of electricity users with a local source of supply that is usually **attached to a centralized national grid but is able to function independently**
  - **Can address grid resiliency allowing the system to island and operate off the grid for hours at a time**
  - **Demand response $ incentives may be available**



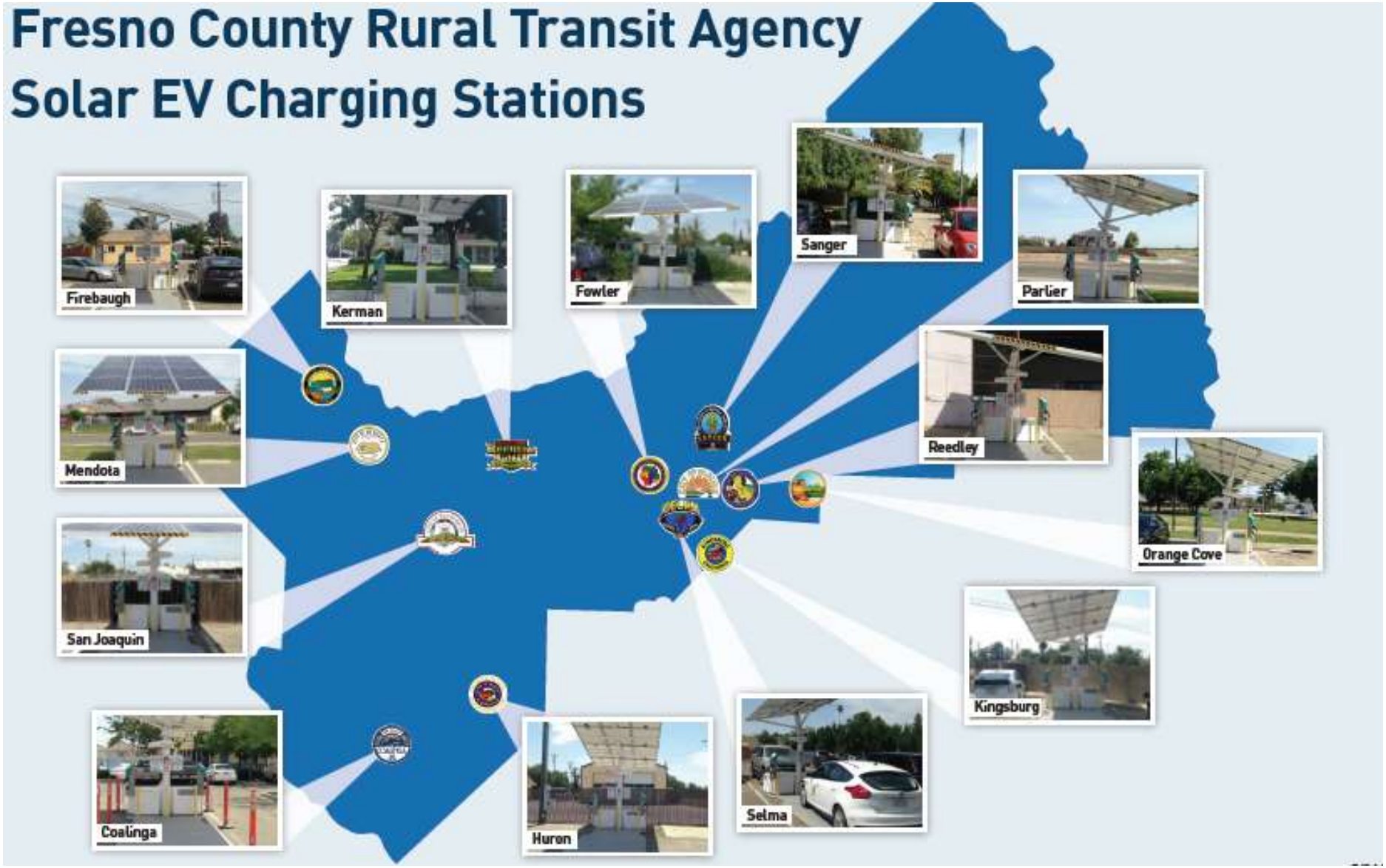
Example of Transit Projects

- **Advanced Transit Bus VGI Project at Santa Clara Valley Transit (VTA) in California- Funded by the CEC/FTA**
- **Leveraging VTA's plans to purchase up to 35 all-electric buses towards electrification of its near 500-bus fleet**
  - **Includes Vehicle to Grid and Vehicle to Building functions**
  - **CALSTART Selected to develop Best Practices**
  - **Targeting a reduction of $220K per year in demand charges**

CALSTART Fresno Rural Envision Solar Midday Bus Charger

- **Fresno Rural Trans and CALSTART deploying 2 BEBs on express routes between Fresno and Clovis**
- **Envision Solar Umbrella provides an integrated, and stand alone**
  - **Tracking solar array**
  - **Energy storage system**
  - **Charger**
- **Due to the demanding range requirements, the buses will be charged in Fresno – Mid-day avoiding extending the range and avoiding peak time premium costs**

CALSTART and FCRTA Supporting EV Car Charging in 13 Rural Cities



Our Panel Discussion

Paul Stith- Black and Veatch

Len Engel – Antelope Valley Transit Authority

Michael Liu- Build Your Dreams (BYD)