

Sustainable Fleet Electrification

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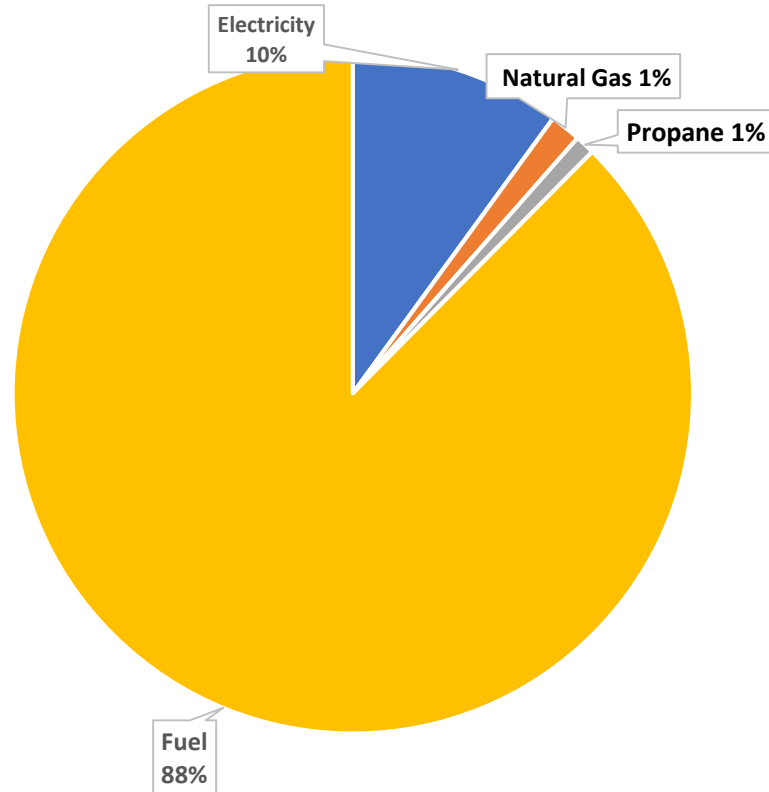
Santa Clara Valley
Transportation Authority



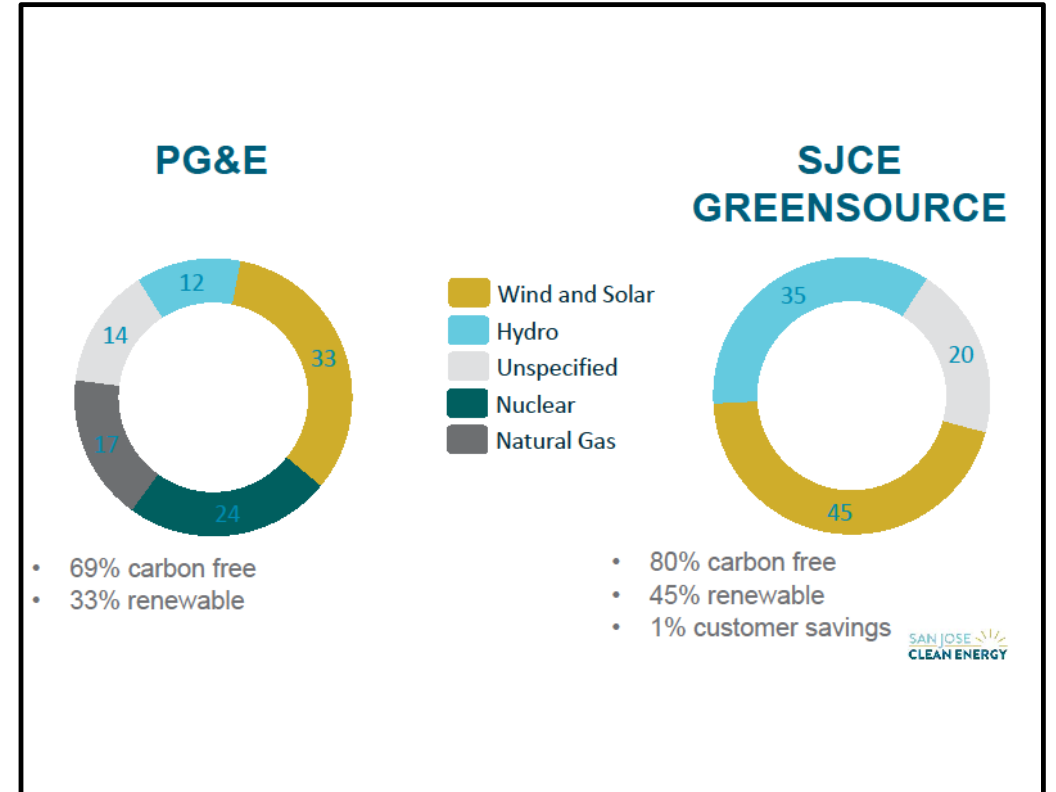
Santa Clara Valley Transportation Authority (VTA)



Why Zero Emission by 2040?



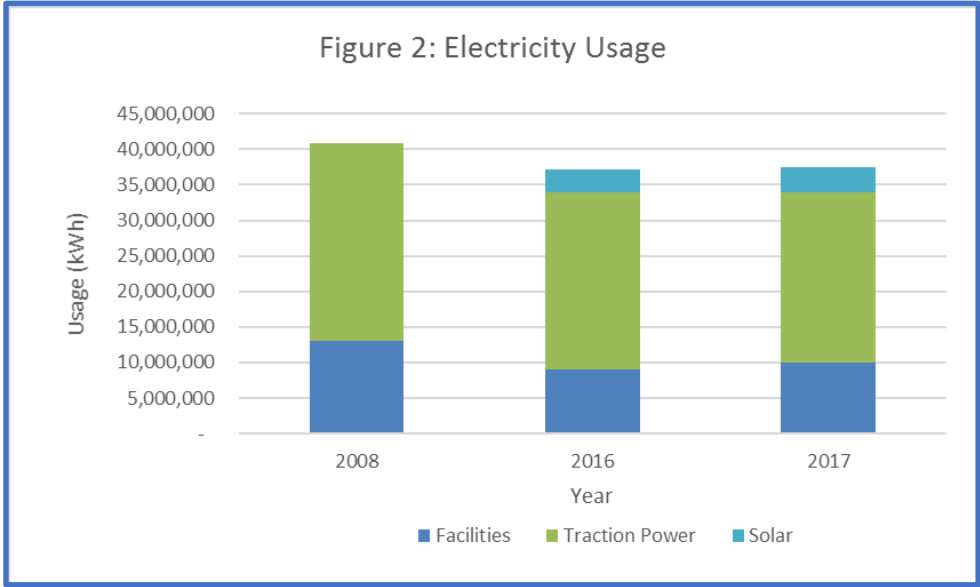
2017 GHG Inventory



California Air Resources Board Innovative Clean Transit Rule

Adopted December 2018

- 01/2023: 25% of new bus purchases are ZEB
- 01/2026: 50% of new bus purchases are ZEB
- 01/2029: 100% of new bus purchases are ZEB
- 01/2040: All transit buses are 100% ZEB



Solutions that move you

VTA Public Charging Stations





Solutions That Move You



VTA's Current and Proposed Fleet Electrification Plans

- **Began operating five Zero Emission Buses (ZEB) in July 2018**
- **Started with six 50 kW chargers that have just been upgraded to 120 kW**
- **Planning to procure at least 30 additional ZEB's over the next 5 years**
- **Preparing ZEB Rollout Plan for 100% ZEB by 2040**



VTA Cerone Yard

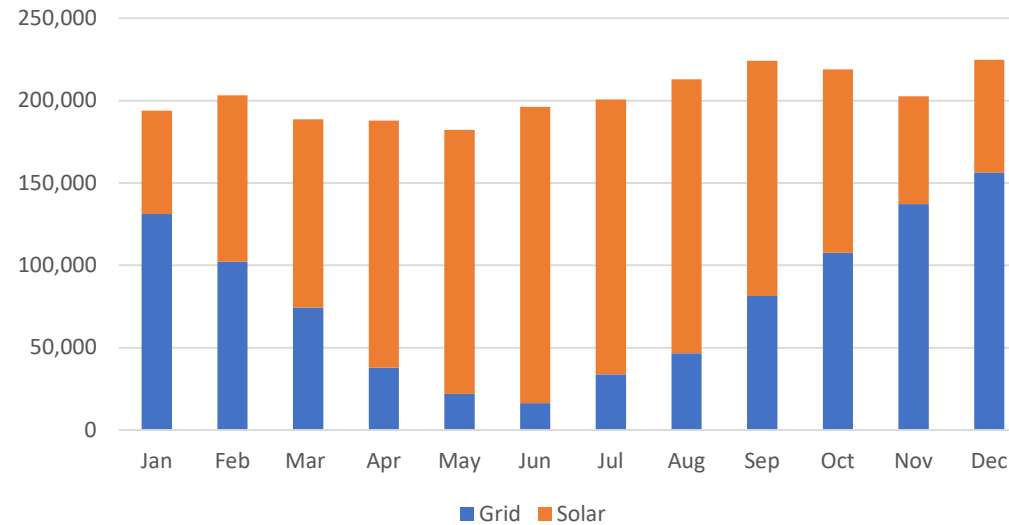
Averaging \$450K per year
For electricity



675 kWh Generator
650 KWh Generator



Cerone Bus Division - 2018 Electricity Usage



960 KW Solar

6 Smart Chargers

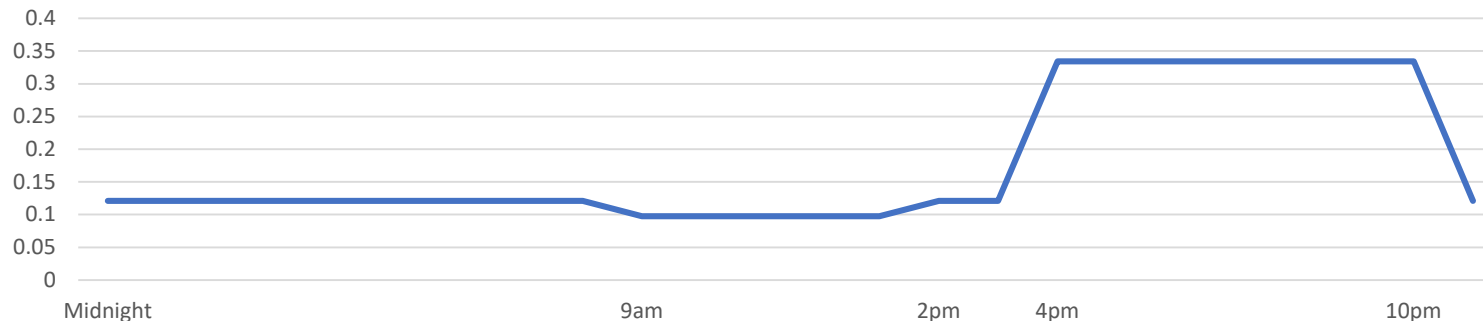
Maintenance

Mid Life Overhaul

Operations/Dispatch

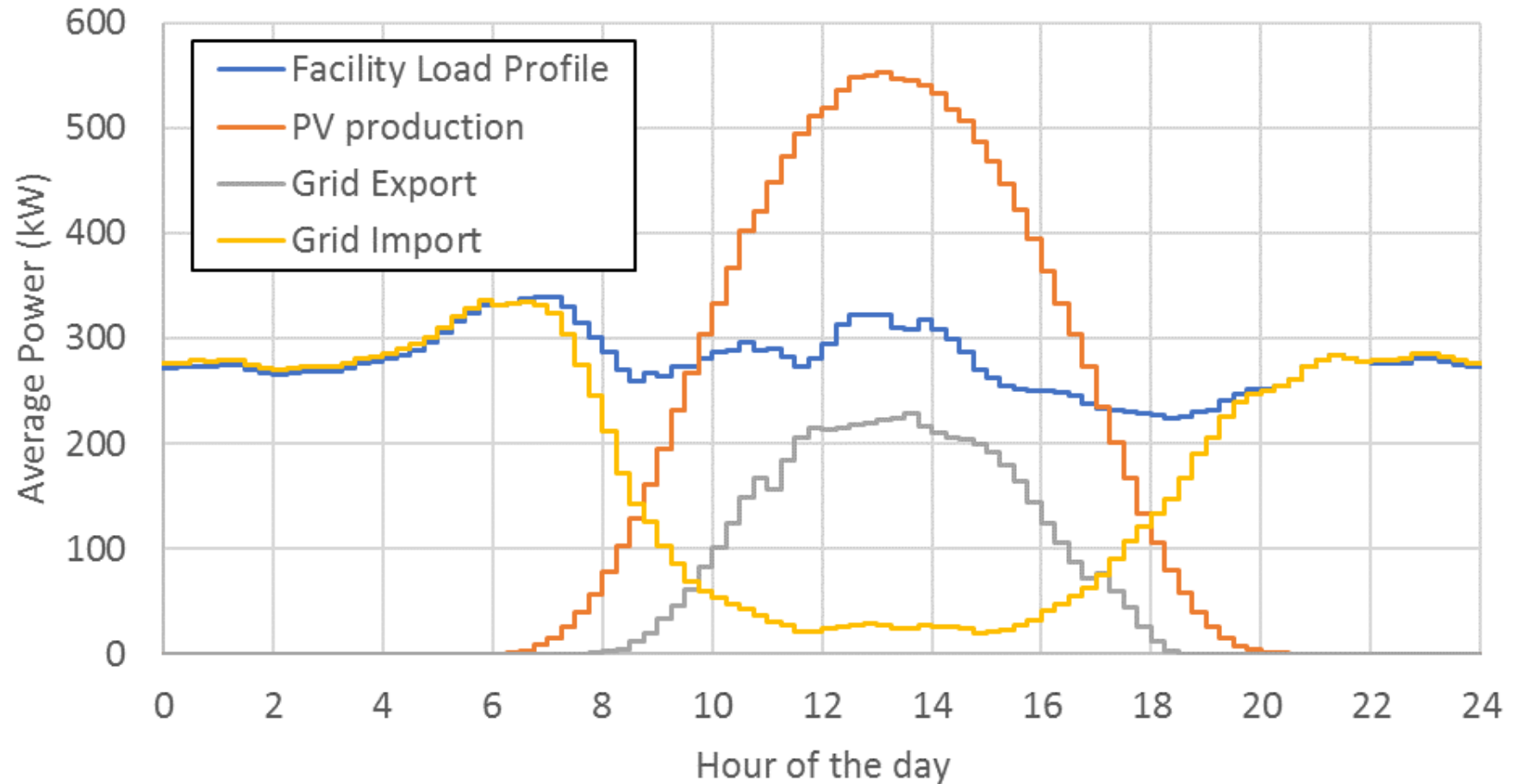


Proposed New Commercial Electric Vehicle Rate - Energy Charges

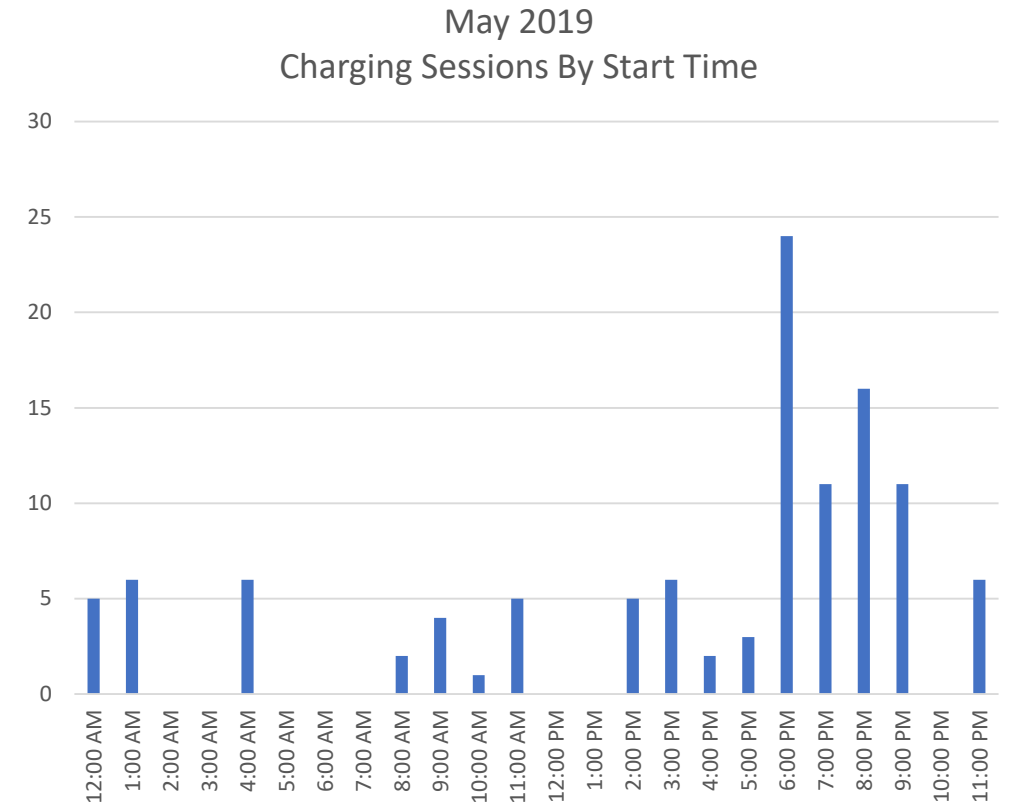
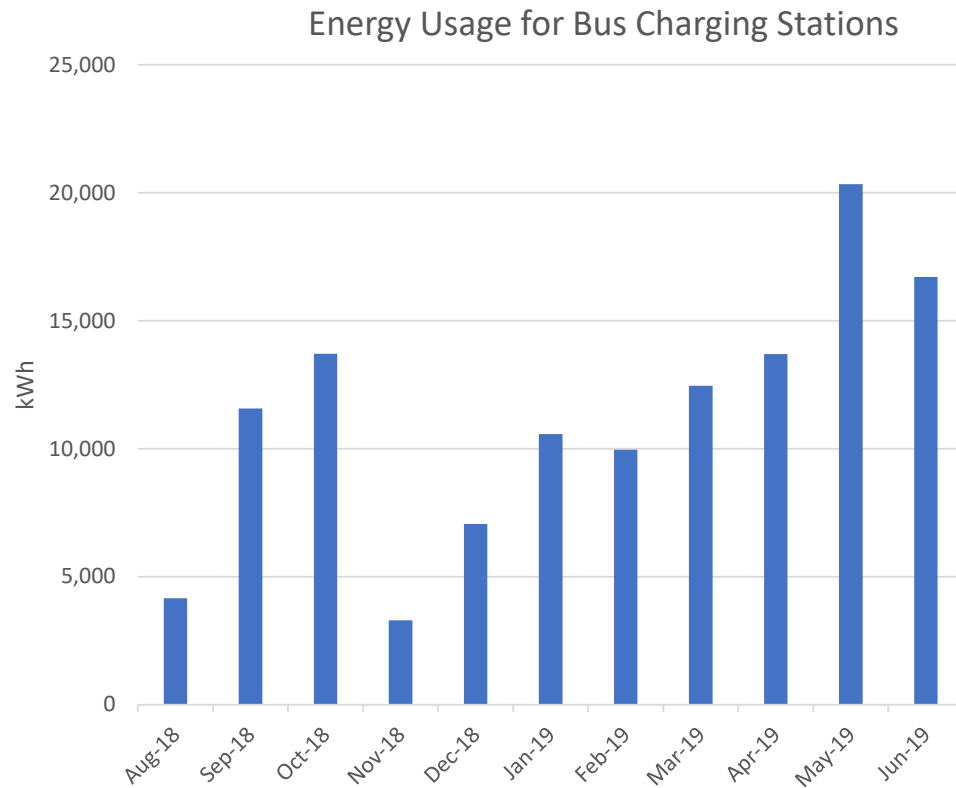


Look at PV Production and Usage at VTA Cerone Bus Yard

- Solar power almost completely covers the afternoon energy consumption, resulting in significant amount of export to grid.



Bus Charging Analytics



Vehicle to Grid Integration (VGI) Collaboration: PARTNERS

VTA working with Prospect Silicon Valley, and Bay Area tech companies to pilot a cutting-edge system that will manage charging and energy consumption on electric buses while reducing the impact on the state's electricity grid.

Funding from the California Energy Commission will serve as a major case study for transit agencies throughout the country

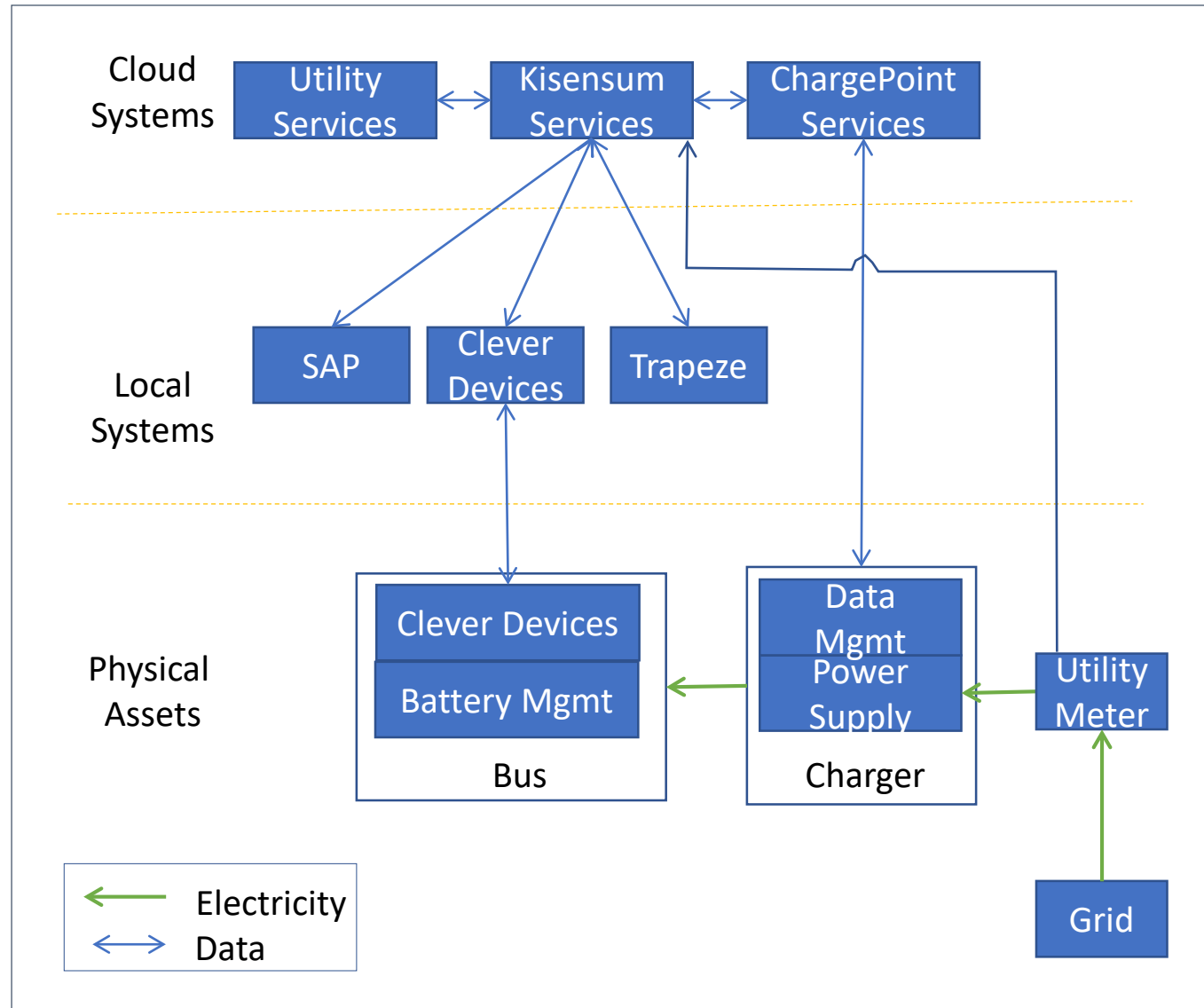
Connected & Making Real Time Decisions



Solutions that move you

Primary Goals of the VGI Solution

1. Ensure buses are charged and ready to go before pullout time
2. Provide visibility into charging process
3. Send alerts when issues in the charging process or during daily operation need to be addressed
4. Support the assignment of bus to block process
5. Minimize PG&E utility bill
6. Simulate Grid interactions with system
7. Simulate New Block & Charging Options



What Are The Major Innovations?

- Creating charge plans that support more buses than charge stations
- Energy Management Platform that interoperates with VTA and grid systems
- Dashboard and alerting system supporting vehicle charging & operations
- Realtime cost minimization process through demand leveling and time of use aware charging
- Performing grid service simulations while not jeopardizing the bus charging operations

VTA Dashboard

Chargers
Buses
Alerts
Reporting

Charger Details

All Available Charging

Charger	Bus #	Status	Estimated Completion	Power (kW)	SOC	Target SOC	Range	Target Range	Block	Next Bus
#0	0	charging	07:40 PM	8	58	63	97	14	841	146
#1	11	charging	07:21 PM	13	62	72	66	24	852	78
#10	-	error	-	-	-	-	-	-	-	-
#11	11	charging	05:36 PM	14	-	-	-	-	852	78
#12	12	charging	07:29 PM	11	-	-	-	-	853	112
#13	-	available	-	-	-	-	-	-	-	-
#14	-	available	-	-	-	-	-	-	-	-
#15	-	offline	-	-	-	-	-	-	-	-
#16	16	charging	06:24 PM	8	-	-	-	-	857	83
#17	17	charging	07:01 PM	7	-	-	-	-	858	114
#18	8	charging	04:58 PM	11	-	-	-	-	849	128
#19	19	charging	05:52 PM	10	-	-	-	-	860	46
#2	2	charging	05:01 PM	10	-	-	-	-	843	67
#20	10	charging	06:04 PM	5	-	-	-	-	851	94
#21	-	offline	-	-	-	-	-	-	-	-
#22	2	charging	05:46 PM	15	88	38	96	3	843	67
#23	-	available	-	-	-	-	-	-	-	-
			06:55 PM	10	13	86	83	27	845	64

127.0.0.1:8000/chargers/#chargingchargers

Dashboard: Charger Status



Expanded Solar



Smart Microgrid +
Second Life Li-Ion
Energy Storage



Key Takeaways

- Going zero emission will dramatically reduce an agency's carbon footprint and improve air quality
- Sustainability Programs can help ensure that electricity is used as efficiency as possible and is as clean as possible
- Sustainable fleet electrification will require managing electricity usage and cost on a regular basis