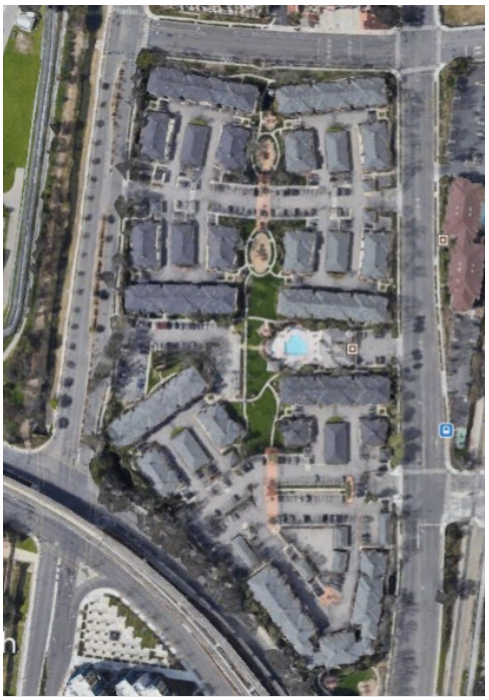
Case Studies

Case Study 1: Montevista Apartments, Milpitas

Montevista Apartments is a 306-unit gated, garden-style property in Milpitas, CA. Constructed in 1998, Montevista Apartments is owned and operated by Bridge Housing. 203 of the 306 units (66%) are affordable housing dedicated to low-income households. Each unit has access to one garage, an assigned parking space for a second vehicle, and free, shared parking spaces for residents and guests.



Management's Operational Preferences for Charging

At the time of the initial site assessment, Montevista management reported that residents with EVs were charging with 120-v outlets in garages. Charging in garages presented two problems for the management:

1. The 120-v outlets in resident garages were on the same 20-amp circuit branch as garage door openers and garage lights for four garages. EV charging at 16 amps together with a lighting and garage door opening load of more than 4 amps will overload the circuit and trip the breaker. If two residents tried to charge their EVs by plugging into 120-v outlets on the same circuit branch, the circuit would also overload and trip the circuit breaker, creating a safety and electrical code violation issue. The installation of dedicated 20-amp circuits for L1 EV charging to individual garages was cost prohibitive.
2. Power supplied to the garages was provided by the house meter and the facility's common electrical power, not associated with the residents' electrical meters. Facilities staff were sealing off 120-v electrical outlets in garages to prevent increases in Montevista's energy costs incurred from residents' EV charging.

Bridge Housing decided to participate in the pilot project due to the demand for EV charging by one tenant and EV owner, and to prepare the property for future adoption of electric vehicles by tenants. Bridge Housing was interested in an EV charging solution that would fulfill the following objectives:

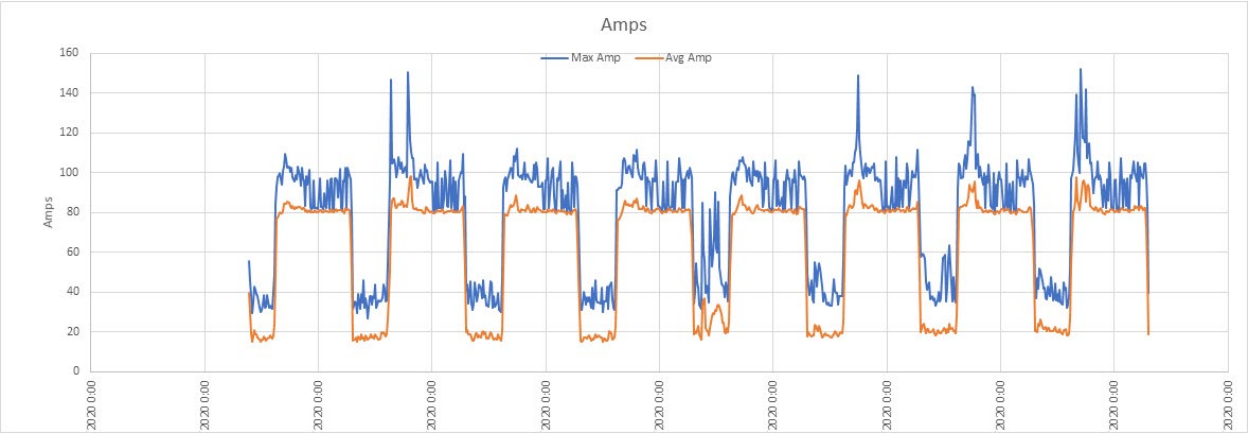
- Require no capital investment or cost chare.
- Allow the property to be reimbursed by residents for the cost of electricity and other fees associated with EV charging.
- Avoid placing on management and facilities staff the burden of managing shared EV charging or resolving problems of non-functional charging stations.
- Minimize the O&M costs associated with broken charging cords and vandalism.

House Panel Electrical Load Capacity

The Montevista property's electrical service included several single-phase 100-amp house panels, each feeding three sub-panels through 50 or 60 circuit breakers for site lights, fire alarms, and garages. In order to permit and install one 16-amp L1 EV charging unit per building area, we needed to confirm that at least 20 amps (2,400 kW) was available at a house panel adjacent to a parking space.

In October 2021, a seven-day power meter study of a representative 100-amp house sub-panel showed that energy use was highest (average peak demand of 92 amps, or 22.241 kW) between 4 p.m. and 7 a.m., and consistently dropped to just 20 amps between 7 a.m. and 4 p.m. (see graph below).

Figure 1: Seven-Day Load Study at Montevista Apartment House Panel



We suspected that site lights on timers were a major energy user, and the facility manager confirmed that the site lights turned on from 4 p.m. to 7 a.m. The October power study showed that 125% of the existing load plus the new load from the EV charging unit would exceed the ampacity of the main house panel (100 amps). [10] Fortunately, Bridge Housing had planned an LED site-lighting retrofit within the pilot's timeframe.

After the Montevista LED site-lighting retrofit was complete, Ecology Action and GRID Alternatives installed another DENT power meter on the same house panel to determine whether the LED site lighting retrofit had lowered power demand sufficiently to allow the installation of L1 EVSE on the house sub-panels. The results of the second power study showed a peak demand reduction of 69%. If it weren't for this scheduled energy efficiency upgrade, we would not have been able to justify the new L1 loads on each house sub-panel in a permit application to the city of Milpitas.

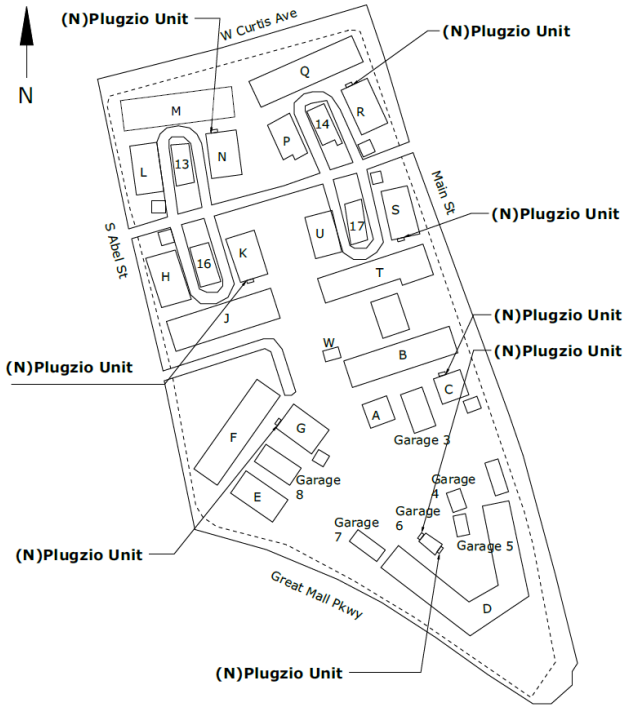
Load Study Date	Average Peak Demand
October 2020, before LED site-lighting retrofit	22.241 kW
March 2021, after LED site-lighting retrofit	6.950 kW
Total average peak demand [11] load reduction	**15.291 kW, or 69%**

[10] NEC 220.87 (2) states that the maximum demand at 125% plus the new load does not exceed the ampacity of the feeder or the rating of the service.

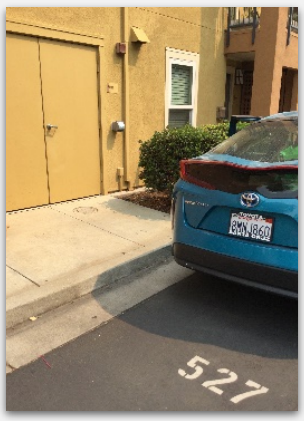
[11] Peak demand is defined as the maximum load recorded in a 15-minute interval.

Montevista Low-Power EV Charging Solution

Figure 2: Locations of Plugzio units at Montevista Apartments



The L1 EV charging solution selected for the Montevista Apartments was a function of the limited panel capacity at house sub-panels observed during the initial October 2020 power study and the pilot's limited budget. Assuming that the LED site-lighting upgrade would free up available power at each house sub-panel, Ecology Action designed a decentralized EV charging solution in which one 16-amp (1.92-kW) Plugzio integrated charging unit was installed near a parking space on the exterior wall of a utility room or garage at each building cluster. A total of eight networked Plugzio EV charging units were installed throughout the property by our installation partner, GRID Alternatives. This decentralized approach to assigned charging ensured that resident EV drivers would not have to park and walk far from their homes to charge. At each sub-panel, the simple installation required installing a new 20-amp circuit breaker and running conduit and conductors through the exterior wall of the utility room. Plugzio units were mounted to an exterior wall of each utility room, avoiding the need for costly trenching through concrete sidewalks. If additional funding becomes available, then given existing loads, Montevista will be able to install six additional 16-amp L1 smart outlets or easily convert existing smart outlets into shared L2 EVSE (32- or 40-amp) by increasing circuit breaker size and utilizing the number-8 AWG wire installed. The charging configuration was designed so that when the number of EV drivers exceeds the number of assigned EV charging spaces and a shared charging solution is needed, Montevista may opt to convert the two parking spaces adjacent to Garage 6 into ADA-compliant charging stations, as required by the CA building code for shared charging.



Management reassigned resident's second parking space in order to accommodate the new assigned EV charging parking space.

The Plugzio unit is activated by cellular connection on resident's smart phone

Plugzio unit mounted to exterior wall of a utility room. Labeling recognizes SVCE as the funder.

Montevista Apartments EV Charging Installation Costs	
Electrical Permit Fees, City of Milpitas	$2,254.20
Labor and Make-Ready Materials	$4,412.99
8 Networked Plugzio Charging Units *($550 each)*	$4,400
Cellular and Software Fees	Included for 1 year in the cost of each Plugzio unit. Afterwards, $9/month per Plugzio unit.
Parking Signage	None required, as Plugzio units are assigned to residents by unit and parking space number.
TOTAL PROJECT COST	**$11,067.19**
Cost per EV Charging Port	**$1,383.40**
Property Owner Cost-Share	0%
Cost of EV Charging for Residents*	$0.12/kWh

**Based on summer/winter blended SVCE/PG&E rate schedule for Montevista common area meters.*

Key Lessons of the Montevista Pilot Site [12]

- Decentralized, low-power EV charging solutions in larger apartment complexes can cost less than $1,500/port when trenching and concrete cuts can be avoided by mounting the charging units to existing structures.
- Energy-efficiency projects associated with reducing loads to the common or house panel can make EV charging installation possible if initial electrical load assessments find insufficient power to permit additional loads from EV charging.
- The duration of the Montevista project was more than one year from initial site assessment to construction permit signoff, with no cost-share required. Aside from waiting for energy-efficiency retrofits to be completed before EV charging can be installed, property operators with larger project teams and more decision makers require more time to review and approve projects.
- A direct-installation program should budget and buffer for higher permitting costs in some jurisdictions. In the case of Montevista, the permit was 20% of the total project cost, whereas we had initially budgeted 10%.

[12] See the "Key Lessons" section for a more detailed discussion.