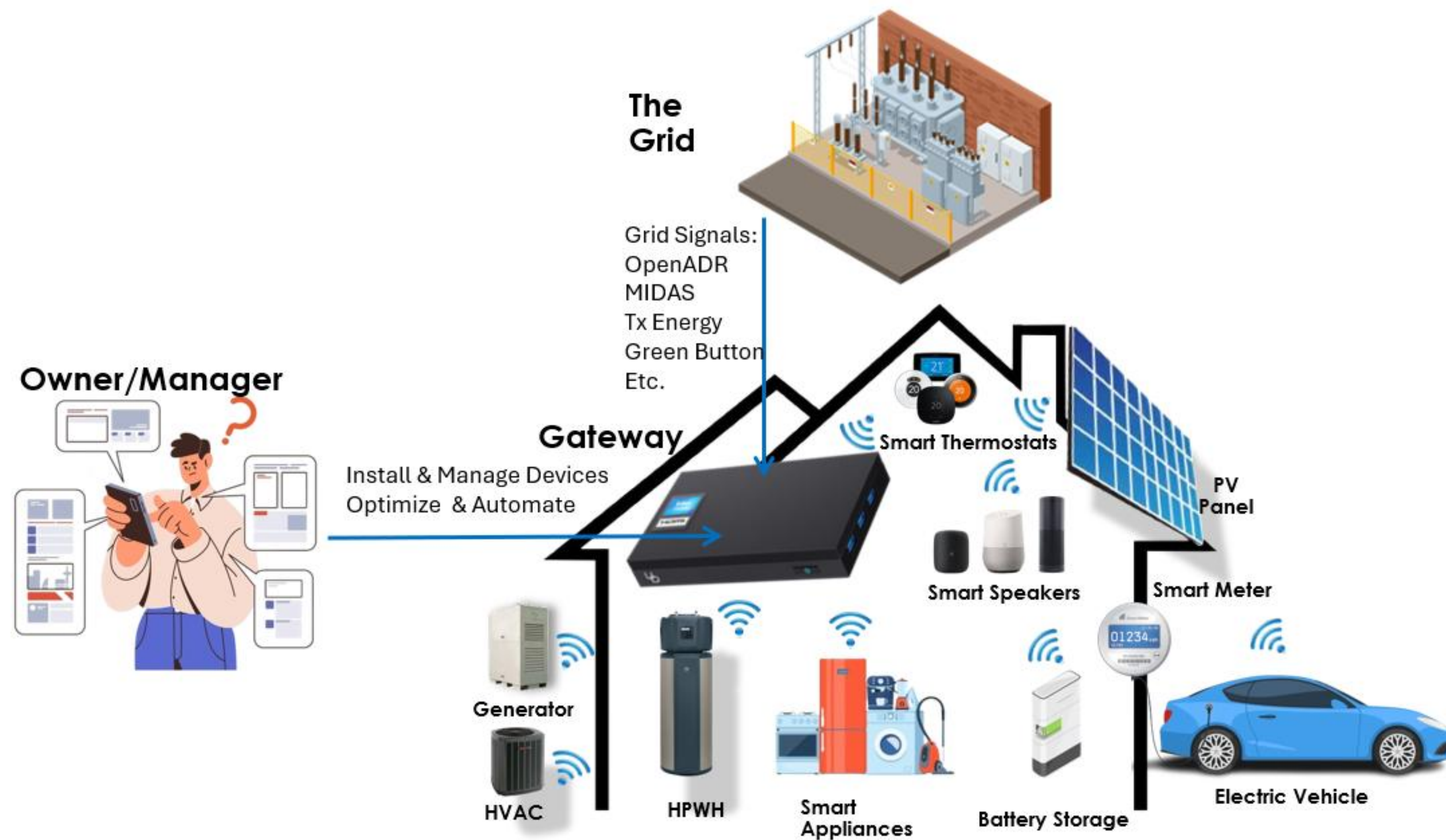


Southern California Edison & Universal Devices Inc. Demand Flexibility Gateway Project

Demonstrating low-cost energy management through price signals and optimized device performance.



Demand Flexibility Gateway Concept

A collaborative project between Southern California Edison and LBNL's CalFlexHub program with technology partner, Universal Devices, Inc.



OBJECTIVES

- 1 Understand barriers and associated costs of internet-based communication of electricity pricing for **customers who lack a regular broadband connection**.
- 2 Demonstrate a complete working system that communicates prices from a utility price server to a local gateway device, modifies those prices, then rebroadcasts them locally - all over OpenADR 3.0.

COMMUNICATION REQUIRED FOR GATEWAY

- ★ **5G cellular radio** for cost-effective integration into the gateway for non-broadband customers.
- ★ **Control of IoT devices** (including electricity loads) communicating within the gateway and (future) price-responsive devices.
- ★ **OpenADR 3.0** implemented in the gateway itself, contributing to the standard and OpenADR Alliance Reference Implementation.

DEVICES TESTED FOR LOAD FLEXIBILITY



GATEWAY METHODOLOGY

1) Assess cellular connectivity options for hardware cost, integration issues, and data subscription costs.

Data Cost Matrix

	Data	Cost	Comments
Verizon	15 GB/month	\$20/month	
ChoiceloT	300 MB/month	\$4.99/month	\$.04 MB above 300 MB
Simplex	250 MB/flat	\$5/flat	\$5 for 250 MB

Hardware Cost Matrix

	Hardware Interface	Cost/Unit	Cost @ 1M
Verizon	NOVATEL USB 730L	\$79	\$45
ChoiceloT	NOVATEL USB 730L	\$79	\$45
Simplex	JACS USB TD191-TAA	\$148	\$55

2) Implement OpenADR 3.0 capabilities in the gateway.



3) Integrate cellular hardware and assemble complete test setup for new gateway.

4) Test complete system to fully exercise all hardware and software features as designed.

FINAL PROJECT RESULTS

- ★ Hardware and software changes to gateway demonstrated end-to-end system from a grid price server, through the gateway, to end-use loads.
- ★ Cellular radio hardware can be integrated into gateway hardware utilizing appropriate data plans at very low cost.
- ★ All three devices operated correctly using simplistic algorithms to show that the complete chain of activity works in practice.

Challenges

- 1) USB connectivity issues.
- 2) No off-the-shelf USB available.
- 3) USB dongle compatibility with SimpleX relies on modules on a chip.
- 4) OpenADR 3.0 inefficiencies required a simplified version for testing.



KEY TAKEAWAYS

- ✓ Low-cost cellular IoT data subscriptions exist.
- ✓ Cellular hardware can be a lower cost option to wi-fi.
- ✓ OpenADR 3.0 software works well as a price messaging protocol.
- ✓ Customer optimization supports price-based flexibility.
- ✓ There are opportunities to simplify messaging.

Note: This project identified inefficiencies with OpenADR 3.0, contributing to improvements to the design of OpenADR 3.1.

