lunar energy

Solve California's NEM3 complexity with Lunar AI

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Overview

The 2023 shift to NEM3 in California turned residential batteries into money saving machines. But NEM3's complicated rate plans require advanced software algorithms to capture those savings. Enter Lunar AI, Lunar's proprietary forecasting and optimization software. Lunar AI powers the Lunar System to save homeowners more through continuous, automatic optimization. In 2025, Lunar AI saved customers hundreds of dollars compared to a standard self-consumption battery mode. On average, customers saved $340 through a combination of bill savings and grid export credits that were banked to offset future bills, with one customer saving up to $873. Lunar AI comes standard with every Lunar System and can be activated as a mode in the Lunar App. With 850 million hours of battery control experience on more than 130,000 batteries on Lunar's Gridshare platform, Lunar AI simplifies NEM3 complexity.

Lunar makes it simple for installers and homeowners to navigate NEM2's complex successor — called Net Billing Tariff (NBT), NEM3, or Solar Billing Plan (SBP). We'll call it NEM3 in this document.

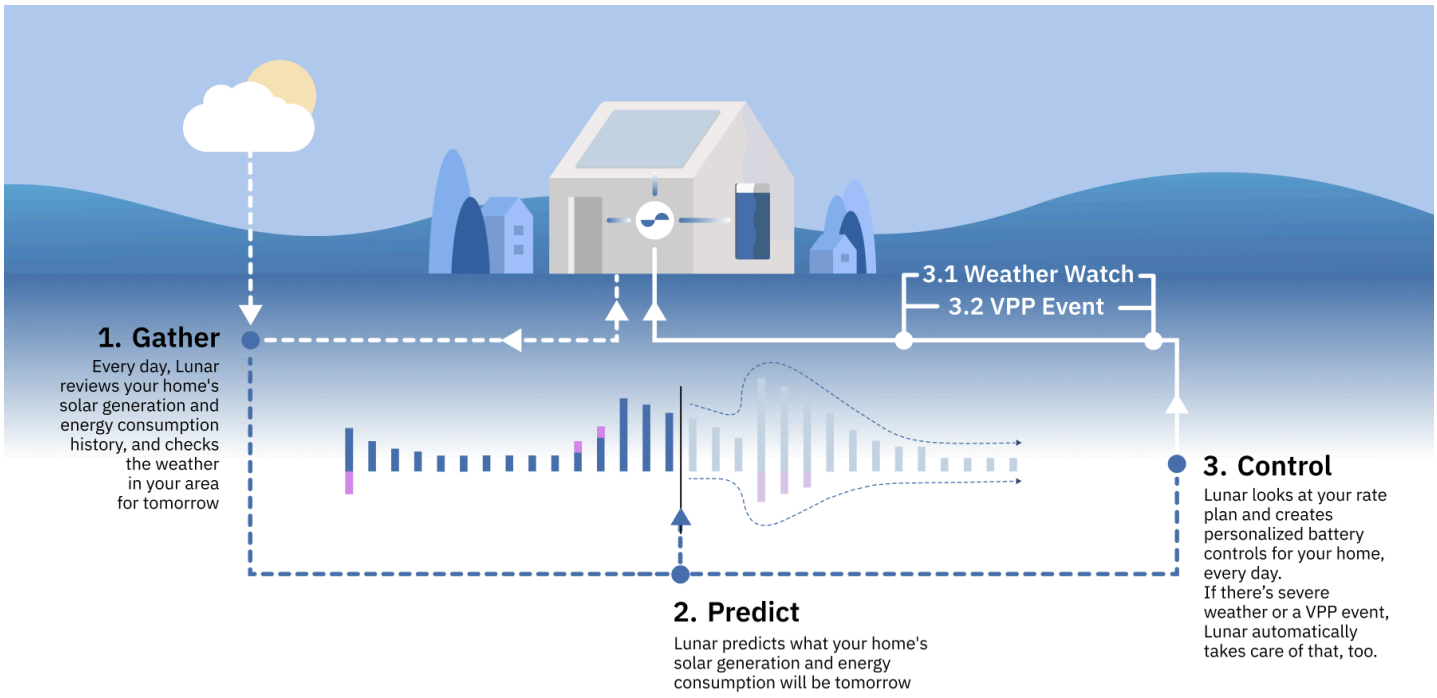


Figure 1. Lunar AI's battery control process

Complexity in import and export rates

Under NEM2, maximizing utility bill savings was simple. Homeowners with solar banked their solar exports over the course of a year, getting credits for export at relatively high, stable rates.

Similar to NEM2, homeowners who are on NEM3 still pay different rates for electricity they take from the grid at different times of the day, and in different seasons. **Figure 2** demonstrates how homes in PG&E, SCE, & SDG&E territory all need to avoid importing electricity from the grid in the late afternoon — particularly in the summer.

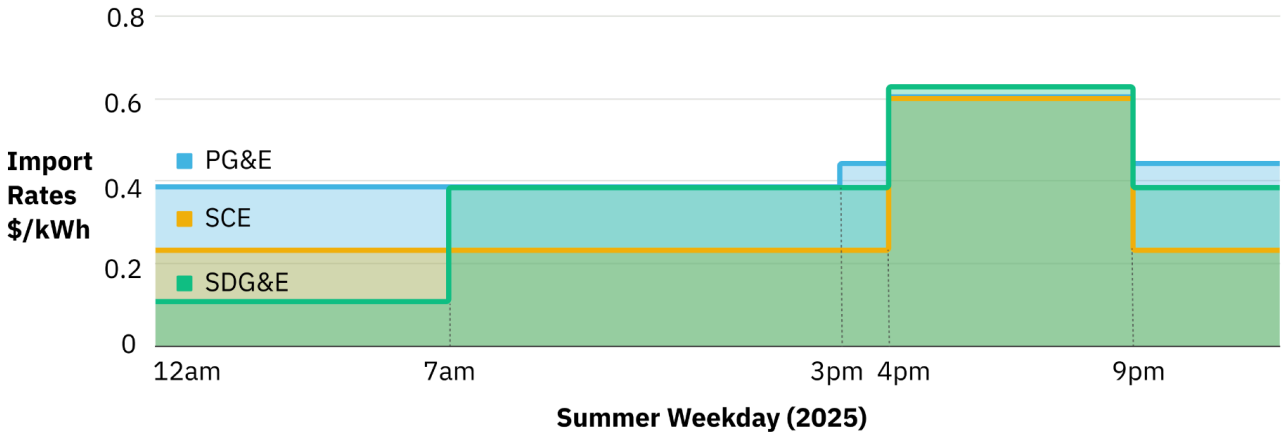


Figure 2. NEM3 time-of-use import rates ($/kWh) for PG&E, SCE and PG&E.

But the most complicated change with NEM3 comes from the way homes are compensated for energy they export back to the grid. Under NEM2, export rates simply mirrored import rates. Under NEM3, export rates bear no relation to the import rates, and there are different export rates for every hour, month and year. For example, **Figure 3** illustrates the weekday export rates for PG&E customers in 2025. Since export rates differ every month – and vary between weekdays and weekends – this means there are 288 different export rates for a given year and those rates change every year. When it is most valuable, and how valuable it is, to export to the grid also varies each month, as shown for PG&E customers for 2025 in **Figure 4**. This complexity makes it difficult — if not impossible — for installers and homeowners to keep track of and optimize for these export rates.

Weekday	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
12am	0.09	0.09	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.09
1am	0.09	0.08	0.07	0.07	0.07	0.07	0.07	0.09	0.09	0.09	0.09	0.09
2am	0.09	0.08	0.07	0.08	0.07	0.07	0.07	0.08	0.09	0.08	0.08	0.08
3am	0.09	0.08	0.07	0.07	0.07	0.08	0.07	0.08	0.08	0.08	0.08	0.08
4am	0.09	0.08	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.08
5am	0.09	0.08	0.07	0.07	0.07	0.08	0.07	0.08	0.08	0.08	0.09	0.09
6am	0.09	0.08	0.07	0.07	0.07	0.08	0.07	0.08	0.08	0.08	0.08	0.09
7am	0.09	0.08	0.07	0.07	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.08
8am	0.07	0.06	0.05	0.02	0.03	0.06	0.06	0.06	0.06	0.06	0.06	0.07
9am	0.06	0.04	0.02	0.01	0.02	0.05	0.05	0.06	0.06	0.06	0.06	0.07
10am	0.06	0.04	0.02	0.01	0.01	0.04	0.05	0.06	0.06	0.06	0.06	0.07
11am	0.06	0.04	0.02	0.01	0.02	0.04	0.05	0.06	0.06	0.06	0.06	0.06
12pm	0.06	0.03	0.02	0.01	0.01	0.04	0.05	0.06	0.06	0.06	0.06	0.06
1pm	0.06	0.03	0.02	0.01	0.01	0.04	0.05	0.06	0.06	0.06	0.06	0.06
2pm	0.06	0.03	0.02	0.00	0.01	0.04	0.05	0.06	0.06	0.06	0.06	0.06
3pm	0.06	0.03	0.02	0.00	0.01	0.04	0.05	0.07	0.06	0.06	0.06	0.07
4pm	0.08	0.06	0.03	0.00	0.01	0.12	0.14	0.16	0.07	0.06	0.09	0.09
5pm	0.10	0.10	0.06	0.01	0.03	0.23	0.32	0.83	0.13	0.09	0.09	0.09
6pm	0.10	0.09	0.08	0.08	0.08	0.27	0.36	0.93	0.37	0.10	0.09	0.09
7pm	0.09	0.08	0.08	0.08	0.08	0.26	0.45	1.03	0.50	0.10	0.08	0.09
8pm	0.09	0.08	0.08	0.07	0.07	0.18	0.28	0.99	0.29	0.09	0.09	0.09
9pm	0.09	0.08	0.08	0.07	0.07	0.08	0.09	0.72	0.14	0.09	0.09	0.09
10pm	0.09	0.09	0.07	0.07	0.07	0.08	0.08	0.70	0.14	0.09	0.09	0.09
11 pm	0.09	0.09	0.07	0.07	0.07	0.07	0.07	0.08	0.09	0.09	0.09	0.09

Figure 3. NEM3 export rates ($/kWh) for PG&E projects with 2025 interconnection applications.

Year	Max Export Rate ($/kWh)	Max Export Rate Time
2025	1.03	August Weekday 7pm
2026	1.19	August Weekend 7pm
2027	1.35	August Weekend 7pm
2028	1.25	August Weekend 7pm
2029	0.63	August Weekday 6pm
2030	0.72	August Weekday 6pm
2031	0.75	August Weekday 6pm
2032	0.75	August Weekday 6pm
2033	0.74	August Weekday 6pm

Figure 4. Varying annual max export rates for PG&E projects with 2025 interconnection applications

A simplistic strategy used by many other battery companies places batteries in self-consumption mode, minimizing sending energy to, and taking it from, the grid at all times. This strategy ignores the opportunity during late summer afternoons and early evenings when customers can receive large credits for exported energy. Some savvy customers (often with the assistance from the installer) might manually create a time of use plan for the months with high export rates. But this requires manual intervention to set the TOU plan, and then change it or turn it off when the high export rates stop. Even when this approach is taken, we have proven that Lunar AI beats these manual TOU plans, resulting in additional savings for customers.

Export rates change every year. That means during the warranty lifetime of a Lunar System, a customer would have to manage 3,600 different export rates — something unrealistic to expect from even the savviest customer. With Lunar AI, customers get savings without having to lift a finger.

To further complicate matters for installers, numbers shown in **Figure 3** and **Figure 4** above are only applicable for customers who applied for interconnection in 2025. Export rates will be refreshed by the utilities such that in 2028, the export rates for a customer with 2025 interconnection applications will be different to those who apply in 2027. Without sophisticated and intelligent software, achieving the best customer savings will require installers to set different TOU plans not only for different times of the year, but for customers with different vintage years. This adds a significant operational cost to installers that could otherwise generate more sales and install more systems.

Lunar AI: making the complex simple

It is clear that the change from NEM2 to NEM3 brings with it huge complexity. To do the right thing for customers, installers need to understand how much energy will be generated by solar, how much energy customers might consume, how much excess can be stored in a battery, and the hourly rates for buying and selling energy. Just one example of the decision making required would be: “It’s the middle of the day, and the import rate is cheap. Later today, the export rate will spike up to $1 USD per kWh. Should the home be powered by the grid and solar saved for later export, or should the Lunar System power the home, or both?” As visualized in **Figure 5**, Lunar AI manages these decisions in real-time. In this example, it prioritizes charging the battery with solar in the middle of the day while importing cheap grid power to cover household consumption. This ensures the battery is fully charged before peak export periods. The system then strategically exports the battery at the

three highest export rate periods. This allows homeowners to maximize savings by capitalizing on high evening export rates.

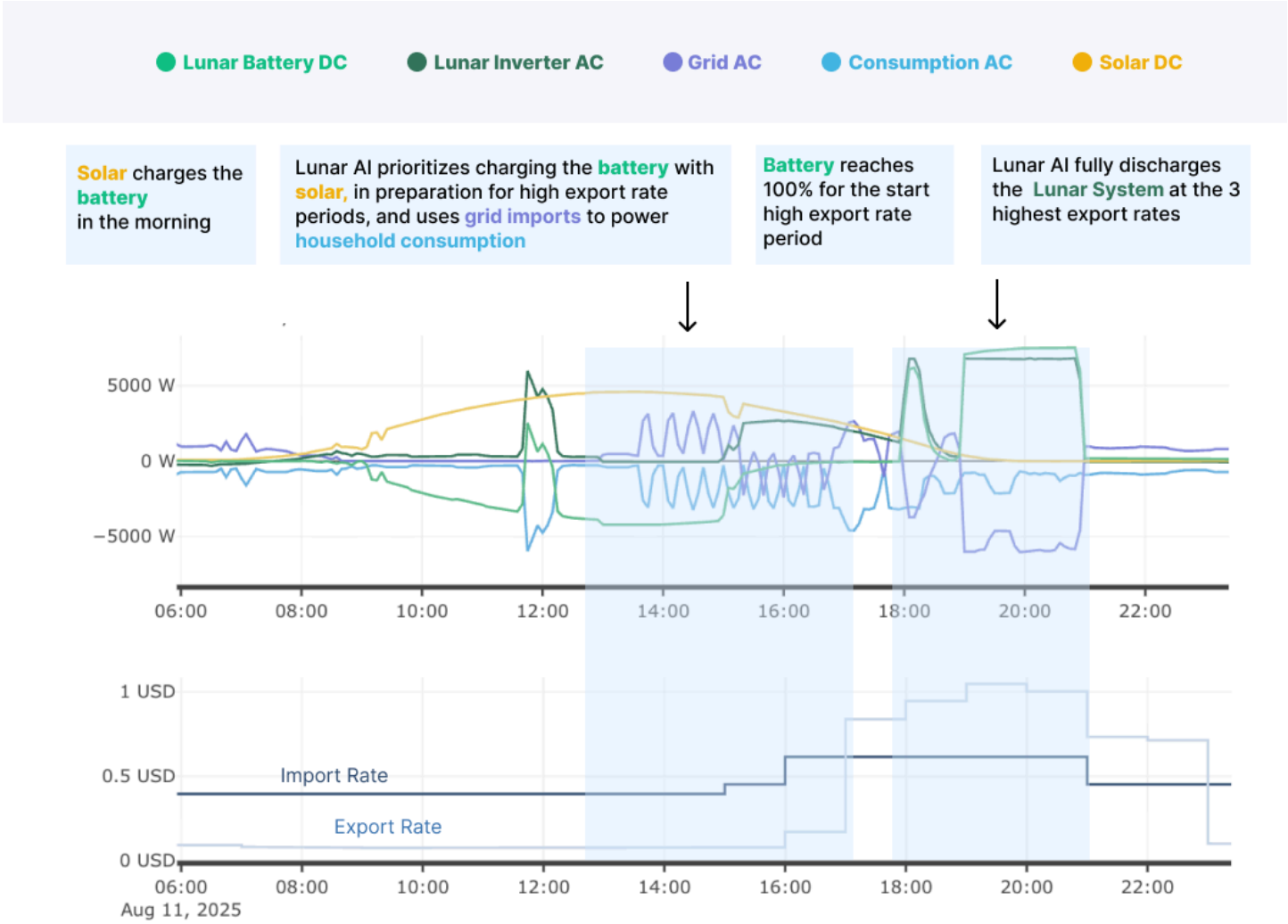


Figure 5. Lunar AI automatically managing battery charge and discharge to maximize customer value

Even if the installer or customer has enough information to answer that optimization question, manually calculating what to do each day for the life of the battery is complex and time consuming. Lunar AI will adjust automatically each day. Take the example below showing two different days in 2025 — September 30 and October 1. On September 30, the battery exported to the grid at a high rate starting at 7pm. The following day, in October, it exported much less. That's because Lunar AI knew the export rate for this site paid nearly $0.5/kWh for exported energy in September, and then paid significantly less in October. There was no need for a customer to keep track of these rates since Lunar AI simply knew the right thing to do and automated the action.

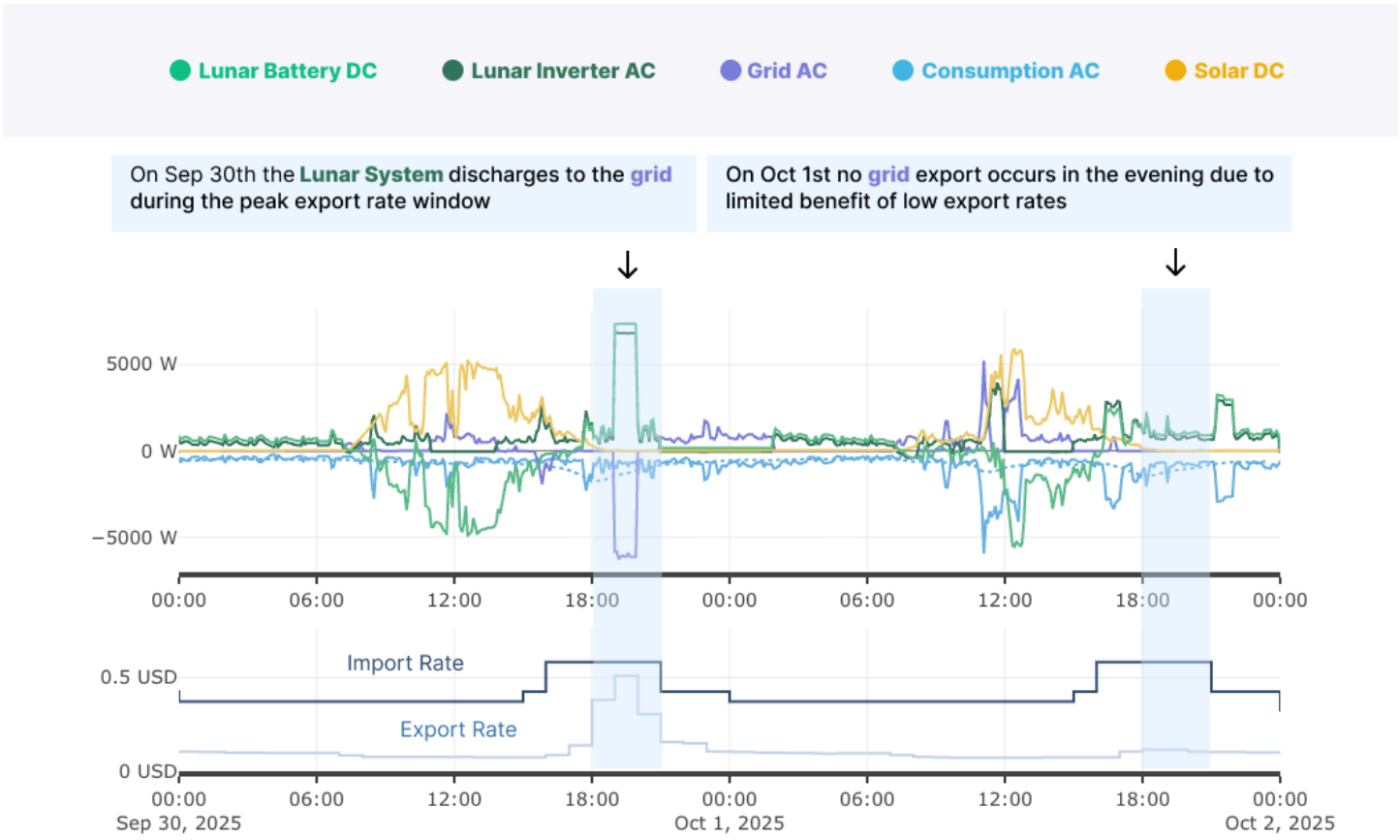


Figure 6. Lunar AI automatically adjusting optimization for changing rates

As shown in **Figure 6**, Lunar AI automatically considers any changes in export rates. It also ensures customers' battery backup reserve is maintained, the system will automatically protect homes against outages if a storm is incoming, electric vehicle usage is predicted and accounted for, and customers are able to participate in Virtual Power Plant programs.

Lunar AI simplifies how installers and homeowners manage ever-changing utility rates, and it's simple to set up. Installers can turn on Lunar AI at the end of commissioning, or customers can choose Lunar AI as a mode in the Lunar App once they have PTO. The Lunar App will ask the customer to confirm their rate plan, or the Installer can set the rate plan in Lunar's Gridshare fleet management UI. After a couple of weeks of learning the home's energy patterns, Lunar AI automatically begins optimizing the system.

The value of predicting the future

Understanding, optimizing, and automating rates is just the beginning. Lunar AI adds critical elements to the optimization — weather data, as well as energy production and consumption predictions.

Lunar's machine learning algorithms can predict that solar generation will be low due to cloudy weather, or that the customer tends to use more energy on Fridays. It can even identify that a particular home with a tree in the backyard has reduced solar generation after 3pm. Lunar AI prioritizes filling the battery from solar on a high consumption day, rather than having the home consume all the solar during the day, to ensure the battery is full by 3pm. In the example in Figure 7, Lunar AI predicts that a household in SCE territories will have very little solar production on December 31st. It then chooses to import from the grid during low import rates and charge the battery with the little solar available during the day. . When evening comes around, the Lunar System has enough stored solar power for the home to use for most of the peak price period. It has made the right decisions to avoid the customer using expensive evening energy, discharging the battery down to the customer's backup reserve during high import rates, resulting in more bill savings.

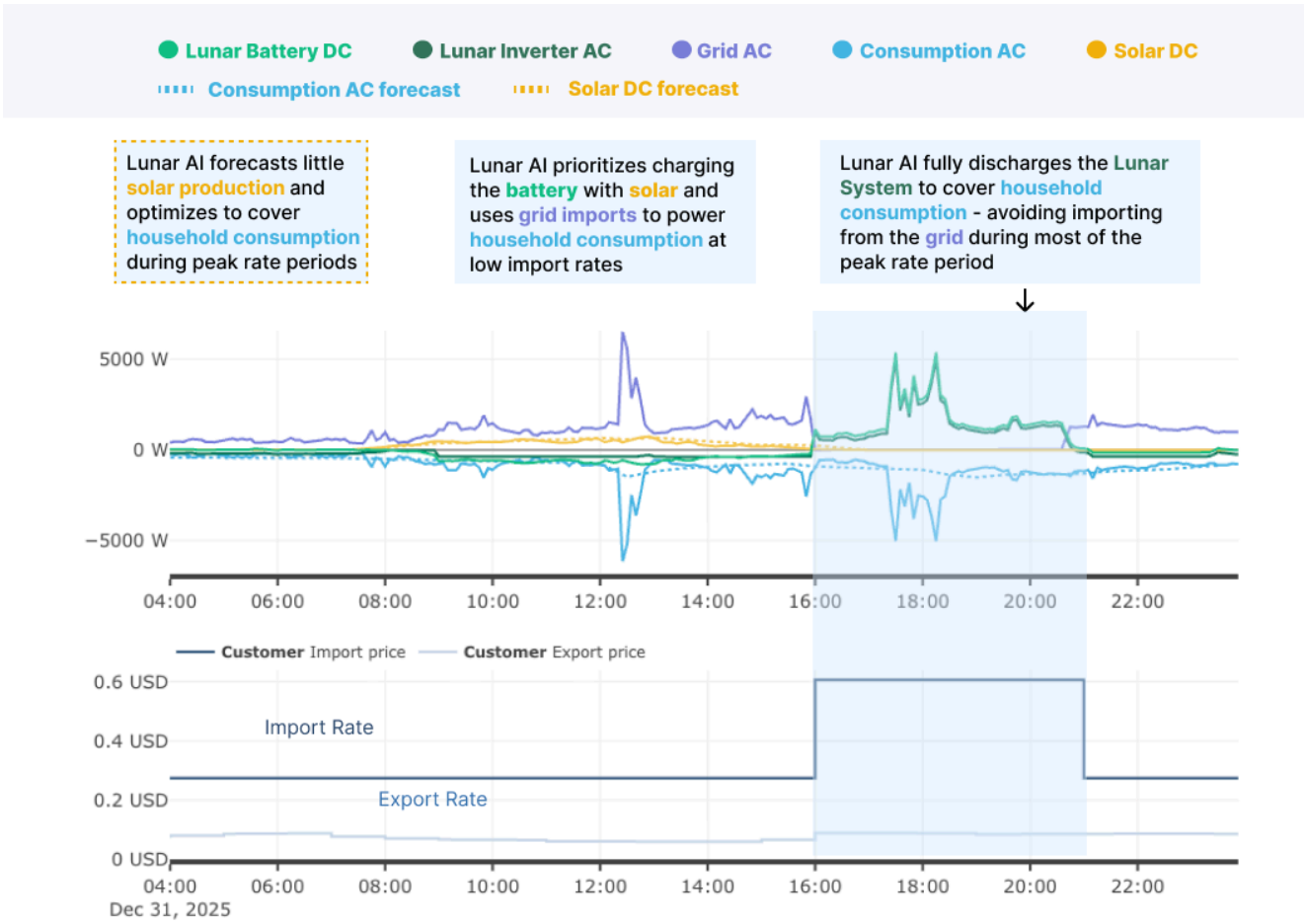


Figure 7. Lunar AI generating additional customer savings in December

Conclusion

Around the world, and now in California, complex utility rates have become the new norm. It used to be easy: turn on an appliance and know how much it will cost to run; generate solar power, and know how much credit a customer will receive. Today, with the rise of electrification, consumers are facing a bewildering array of time-of-use rates and varying hourly export rates that make it hard for them to keep track of. Don't let utility rate complexity leave customers behind. Save time and effort while delivering more customer value and satisfaction with Lunar AI.

References

PG&E Export Rates: https://www.pge.com/eecvalues
SCE Export Rates: https://www.sce.com/business/generating-your-own-power/solar-billing-plan
SDG&E Export Rates: https://www.sdge.com/solar/solar-billing-plan/export-pricing

Revision History

Revision	Description of Change	Effective Date
1	Initial Release	01/31/2025
2	Updates on NBT export rate effective date	03/17/2025
3	2026 Update	07/14/2026