DOCKETED	
Docket Number:	25-IEPR-05
Project Title:	Load Shift Goal Update
TN #:	264593
Document Title:	Boaz Ur Comments - Nostromo Energy Comments on Integrated Energy Policy Report for (IEPR) Commissioner Workshop on California's progress toward the
Description:	N/A
Filer:	System
Organization:	Boaz Ur
Submitter Role:	Public
Submission Date:	7/9/2025 3:58:22 PM
Docketed Date:	7/9/2025

Comment Received From: Boaz Ur
Submitted On: 7/9/2025
Docket Number: 25-IEPR-05

Nostromo Energy Comments on Integrated Energy Policy Report for (IEPR) Commissioner Workshop on California's progress toward the

Please see attached a combined document that includes:
1. Nostromo Energy Comments on Integrated Energy Policy Report for (IEPR) Commissioner Workshop on California's progress toward the load shift goal.
2. Dispatchable Load Shift (DLS) and Virtual Power Plants (VPPs): Executive Summary
3. DLS - Dispatchable Load Shift Program Background Presentation.

Note - Please let the IT people know that email address boaz@nostromo.energy is not accepted by this page and should be.

Additional submitted attachment is included below.

NOSTROMO
COOLING GLOBAL WARMING

July 9, 2025

Via efiling

Nostromo Energy Comments on Integrated Energy Policy Report for (IEPR) Commissioner Workshop on California's progress toward the load shift goal.

Nostromo Energy appreciates the opportunity to submit written input on the California Energy Commission's Integrated Energy Policy Report for (IEPR) Commissioner Workshop on California's progress toward the load shift goal.

Introduction to Dispatchable Load Shift (DLS)

DLS is an advanced DR program concept that focuses on shifting existing building loads - including HVAC, thermal systems, and any electric building load - using automated, connected controls linked to energy storage systems. The goal is to align energy consumption with renewable generation and grid constraints, ensuring predictable, reliable and dispatchable load flexibility without compromising customer activities or comfort. Behind-the-Meter (BTM) storage doesn't require developing the distribution or transmission grid and is therefore an ideal tool for quickly deploying load shifting.

Unlike Shed program concepts, DLS manifests Shift DR with its potential to leverage untapped loads. (See LBNL report for full potential of Shift.)

DLS is different from most traditional demand response (DR) or Virtual Power Plants (VPPs) mainly in two ways:

- It emphasizes daily shifting of the resource as a baseload solution. Renewable energy intermittency is a daily challenge, causing the ramp-up of dozens of peaker plants in CA. Shifting loads daily is more cost-efficient and clean than dispatching peakers.
- It emphasizes the development of new resources (like storage) to shift existing loads and flatten their load curve, including commercial and industrial (C&I) loads. Current VPP programs mostly target newly connected residential devices such as thermostats, boilers, or EVs.

The importance of shifting is no longer theoretical - it's become a statewide policy priority. SB 846 specifically calls for the state to increase the use of load-shifting as a grid resource and sets a policy goal to expand Shift DR. The CPUC and CEC have both repeatedly emphasized the need to align customer load with grid needs, especially to better utilize mid-day solar and reduce net peak demand.

However, despite this policy clarity, the tools currently available are outdated and inadequate for this next generation of demand-side solutions. Existing TOU rates, demand response shedding programs, and dynamic pricing constructs were not designed to incentivize daily, structured load shifting. In addition the grid operators as well as LSE are not currently set up to utilize demand side resources daily. Instead, we

Nostromo Energy, Inc.

3333 Michelson Drive, Suite 300, Irvine CA 92612 | (858) Nostromo **storage-as-a-service@nostromo.energy**

are trying to apply old tools to a new challenge - asking programs that use tools like baselines that inherently oppose daily usage and require weeks for verification to deliver daily flexible, dispatchable and measurable in real-time load shapes that require investment, predictability, and operational integration.

DLS changes that. It offers a new framework - one that is purpose-built to support daily, scheduled, and market-aligned shifting of storage loads.

With a modest pilot program and targeted regulatory support, this concept can be tested and proven at scale within 24 months, using real deployments and measurable outcomes. This makes DLS a critical building block in bridging the gap between state-level goals and real-world grid reliability.

Attached is an Executive summary and Presentation of the DLS concept.

Answering Three Core Questions: Where; How to Reduce the Peak; Who Pays for It

In his opening remarks Vice Chair Gunda cited three essential questions from Senator Josh Becker speech at the demand flexibility summit - a framework to guide how California addresses the evolving role of the demand side in ensuring grid reliability:

1. Where is the spare capacity?
2. How can we reduce the peak?
3. Who pays for it?

Dispatchable Load Shift (DLS) offers a compelling, structured answer to each. It is a practical solution that leverages existing building infrastructure and flexible storage technologies to provide grid services at scale - with clear investment pathways and predictable performance.

1. Where is the Spare Capacity?

The "spare" capacity is embedded in existing building loads - across all sectors, including commercial, industrial, and residential. Whether the load is electric or thermal it can be balanced with storage technologies to shift demand in time without reducing comfort or disrupting core operations. These loads remain untapped because our current programs don’t give customers a way to monetize it, provide vendors a reason to build the storage technologies, or technology companies the opportunities to develop new technologies. DLS identifies, controls, and monetizes this spare capacity, turning passive building loads into active grid resources, and providing a framework that enables the building of the storage assets, their dispatch and compensation.

2. How Can We Reduce the Peak?

Throughout the workshop, it was highlighted that current tools like TOU rates, DR shed programs, and baseline-driven participation are insufficient for the complexity of today’s load and supply dynamics. Also, as proven in the last decade, they don’t incentivize the building of BTM storage assets that are dedicated to solving grid needs. What’s needed is daily, predictable, and dispatchable load flexibility.

DLS enables this by charging storage systems during times of excess solar (typically midday) and dispatching them during local or grid-wide peaks - most often in the evening, but capable of responding at any time.

In other words, DLS can "tummy-tuck the duck" - absorbing surplus renewables and flattening the net load curve - while also responding to real-time or forecasted peak events. It's a load resource that behaves like generation, but with more control, more precision, and lower emissions. Most importantly, it doesn't require the building of new generation and transmission.

3. Who Pays for It?

DLS unlocks private and federal investment in behind-the-meter storage by creating a bankable structure - one that separates dispatch from customer energy use, ensures transparent metering, and aligns performance with compensation. The model supports third-party ownership, protects host customers, and enables a clear return on investment through existing regulatory value streams.

The funding structure breaks into two parts:

Capital Expenditures (CapEx)

Upfront investments in thermal or electric storage and control systems can be funded by a combination of **private capital**, which is actively looking to deploy funds into scalable, low-carbon infrastructure and **federal incentives** (e.g., Investment Tax Credit, Energy Community bonus, DOE grants).

However, this capital will only flow if there is a **bankable return pathway**. DLS creates this pathway by providing a stable, measurable dispatch profile with a predictable revenue stream separate from retail energy savings. This allows investors to underwrite the storage system based on market-facing performance, not customer-side savings.

Operating Expenditures (OpEx) & Return

The ongoing operational costs of DLS as well as recovering the CapEx financial obligations including telemetry, dispatch management, and performance validation - are covered by the value that the resource delivers to the grid. These values are already recognized and quantified by California's regulatory framework, including:

- **Avoided Cost Calculator (ACC)** – the state-approved valuation of hourly avoided energy, capacity, and GHGs
- **Resource Adequacy (RA)** – for reliably shifting load off peak
- **CAISO wholesale market revenue** – through Proxy Demand Resource, DSGS Option 3, or future market-integrated programs
- **Local grid services** – through targeted dispatch that supports distribution constraints

Crucially, the ongoing OpEx revenue is designed to also deliver a return on the initial CapEx, ensuring the long-term viability of third-party ownership models. This is what differentiates DLS from legacy DR: it creates a durable revenue model that reflects the real-time value of flexible load, as well as it frequent, daily dispatch - and aligns with how energy infrastructure is financed today.

The new DLS program structure is what unlocks this: it's not just a technology model - it's a market and investment model built for scale.

Lessons from the current state on California's Progress Toward the 7GW Goal

California is not on track to meet its 7 GW daily load shift target by 2030 under business-as-usual (BAU) market conditions.
There is a clear call for near-term strategies to unlock new capacity - especially scalable, daily, behind-the-meter (BTM) flexibility from commercial and industrial (C&I) buildings.
This shortfall strongly supports the case for new DR structures like DLS, which can:

- Tap into underutilized BTM assets using daily dispatch.
- Unlock flexibility that legacy shed or static TOU tools miss.
- Scale with modest regulatory support and private/federal capital.

New IOU efforts (e.g., hourly dynamic rates) may help, but are not sufficient alone to initiate the building of storage-based, performance-driven load shift.
Federal/state incentives (like ITC and Energy Community bonuses) can shift deployment outlook - especially if linked to a market-facing DLS structure that delivers measurable value.

How can California double Load Modifying resources in 5 years?
→ Answer: Deploy DLS as a structured program, activating daily shift potential in BTM systems with transparent dispatch and compensation. Begin with pilot(s), expand via scalable platform.

Should tracking for the 7 GW include alerts (e.g., FlexAlert/CalOES)?
→ DLS focuses on daily measurable, dispatchable, and verifiable resources, distinct from emergency alert behavior, and better suited for grid planning.

What is the long-term plan for Incremental & Emergency DR?
→ DLS provides a non-emergency, daily flexibility layer, reducing reliance on last-minute emergency tools and shifting California toward stable, clean capacity planning.

Summary of Current Barriers in California Impacting Load Flexibility

1. **Limited Daily Dispatch Resources**

   Current policies focus on event-driven "Shed" solutions, neglecting daily dispatch opportunities. DLS addresses this large, untapped potential by providing a framework for developing predictable, daily load-shifting capabilities.

2. **Limited Incentives for Building New Commercial Assets**

   VPP and DR frameworks largely focus on residential assets that customers already buy, overlooking scalable C&I solutions (where each building equates to hundreds of residential devices) and other grid dedicated purpose built assets. Harnessing C&I loads offers an order of magnitude enhancement to the total availability of flexible load.

   SGIP funding, which was critical in developing C&I storage assets is mostly depleted for the large energy storage category, with no clear substitute.

3. **Limited Submetering and Storage Net Metering Policies**

   Existing regulations lack robust and current methodologies for submetering BTM resources, particularly for storage (including thermal energy storage) and load-shifting operations, making it difficult to accurately measure (and reward for) performance independently from the main facility consumption.

4. **Value Streams for shift resource are currently dispersed and not bankable**

   The mechanisms for monetizing daily load-shifting assets are fragmented across different products such as Resource Adequacy (RA), wholesale markets, and bill savings, challenging predictability that is essential for financing these assets. Some of these mechanisms specifically discourage frequent use (such as baseline erosion). DLS bundles these value streams into one program under the utility, enabling bankability for developers while also enhancing regulatory oversight.

5. **Market Participation Complexity**

   The LIP process is complex and not-scalable for individual BTM storage assets. In addition, CAISO and CPUC each have their own rules on how to measure the assets' value. A unified approach will be very helpful to accelerate development of these assets.

6. **Lack of Market Consistency Across Utilities**

   Different utilities impose varied requirements and processes for implementing load flexibility programs, creating complexity for aggregators and developers. The lack of standardization hampers the ability to scale solutions uniformly across the state, delaying broader deployment and reducing certainty and efficiency.

Recommendations

1. **Develop a Program for Daily Load Shifting (DLS)**

   California should create a dedicated program to incentivize daily load-shifting resources. This would reduce the reliance on fossil-fuel peaker plants and improve overall grid efficiency and reliability. DLS describes such a program concept.

We recommend starting with a Pilot Shift Program. Since everything is measurable and verifiable, results will be apparent quickly.

2. **Add a Focus on Building New Commercial Assets**

   While building programs for residential assets is a key play, policies must also prioritize development of purpose-built C&I assets that provide material load flexibility. Incentives should support technologies like BTM thermal energy storage that address large-scale C&I energy needs.

3. **Streamline Market Access for Flexible Resources**

   Simplify participation in RA and capacity markets for Shift resources. Clear, transparent valuation mechanisms would encourage investment and accelerate adoption.

4. **Leverage BTM Solutions to rapidly increase load flexibility and grid utilization and avoid belated interconnection**

   Encourage deployment of BTM storage assets that can be built quickly without years-long interconnection queues. This offers immediate solutions to grid challenges.

Conclusion

Nostromo appreciates the California Energy Commission's (CEC) commitment to advancing grid flexibility and welcomes the opportunity to contribute to this important dialogue. As California pursues its ambitious decarbonization and reliability goals, including the 7,000 MW daily load shift mandate outlined in SB 846, there is broad and growing recognition that *shift* - not just *shed* - is essential. Yet, despite this recognition, practical tools to activate and monetize daily dispatchable load shift remain underdeveloped.

The current reliance on legacy demand response tools such as TOU rates, emergency DR events, and pricing signals is not enough to deliver the type of fast, firm, and reliable flexibility California now needs on a daily basis. These tools were not designed to support the scale and performance required for modern grid needs. Dispatchable Load Shift (DLS) fills this gap.

DLS introduces a structured, scalable, and bankable mechanism for daily load flexibility - leveraging new or upgraded behind-the-meter (BTM) storage, including thermal and electric systems, across any building type, including large C&I and residential. This model enables storage to charge from excess renewables during midday (effectively "tummy-tucking the duck") and dispatch during system or local peaks, with reliable measurement and compensation. It opens the door for significant investment, reduces curtailment, and aligns customer assets with system needs.

By implementing a DLS program structure with targeted support - such as submetering protocols, billing separation, and a pilot framework - California can unlock this resource class within 24 months. The state has the policy vision. DLS provides the implementation tool.

We would welcome the opportunity to provide more detailed feedback on how to structure a near-term pilot or inform ongoing proceedings focused on demand flexibility and storage.

Respectfully submitted,

Boaz Ur,

CBDO, Nostromo

Dispatchable Load Shift (DLS) and Virtual Power Plants (VPPs): Executive Summary

Overview of Dispatchable Load Shift (DLS)

Dispatchable Load Shift (DLS) represents a transformative approach to energy demand management, focusing on shifting energy consumption from peak periods to times when renewable energy is abundant on a **daily basis**. This is achieved using energy storage technologies such as thermal energy storage and batteries. Unlike traditional Demand Response (DR) programs, which rely on curtailing energy usage during few annual events, DLS focuses on predictable, daily, automated energy shifts. Utilizing energy storage, ensures customer operations are unaffected and reliable and predictable load shifting.

Key Benefits of DLS

- **Daily Load Flexibility**: DLS provides a consistent and measurable daily resource for balancing the grid, in contrast to event-driven demand response solutions like traditional Shed DR or pricing programs. This helps flatten the "duck curve" daily.
- **Grid compatibility - a true VPP**: DLS is Dispatchable and provides grid operators with a predictable and reliable load. It also offers real-time visibility into load reductions, allowing grid operators to manage it like any other power plant in their fleet.
- **Increasing grid utilization and Affordability:** With current grid utilization rates averaging 40%, DLS helps avoid costly investments in new transmission and generation capacity by optimizing existing resources. This makes better use of underutilized transmission and reduces grid congestion, addressing one of the state's critical infrastructure challenges.
- **Harnessing Commercial and Industrial Building Loads:** Currently, C&I buildings consume over 50% of the grid's electricity but contribute less than 1% of demand-side storage and flexibility resources. DLS unlocks this untapped potential by integrating behind-the-meter storage into daily dispatchable resources that support the grid.
- **Customer-Benefits**: By leveraging energy storage, DLS eliminates the need for customer intervention, minimizing disruptions to operations. Customer comfort and energy usage remain uninterrupted, while businesses reduce carbon consumption by shifting to cleaner energy periods and cut energy costs through optimized load management.

What is a Virtual Power Plant (VPP)?

A Virtual Power Plant (VPP) is an aggregation of distributed energy resources (DERs), such as batteries, thermal energy storage systems, and solar panels, managed via advanced software to operate as a single, integrated power source. VPPs optimize the collective operation of these resources to deliver energy or grid services on demand.
VPPs leverage real-time data, predictive analytics, and automated control systems to enhance grid stability, reduce costs, and integrate renewable energy effectively. They can provide a range of services, including energy arbitrage, grid frequency regulation, and demand response.

How DLS Enhances VPPs

DLS aligns seamlessly with the VPP model, offering unique advantages that enhance the functionality and value of VPPs:

1. **Predictable and Dispatchable Resource**:

    - DLS provides a reliable, controllable load-shifting mechanism that can be aggregated into a VPP. Each storage system provides a very accurate dispatchable load, and the aggregate load enables the operator even better load prediction.
2. **Decoupling Storage from Customer Loads:**
    - Virtual submetering in DLS allows energy storage systems to operate independently of host facility energy use. This decoupling enables VPP operators to dispatch storage resources for grid services without impacting the primary operations of participating facilities.
3. **Daily and Emergency Applications**:
    - While VPPs typically operate during grid emergencies or times of high prices, DLS adds value by ensuring resources are used daily. This continuous operation enhances the economic return of DLS based VPPs while supporting grid flexibility.
4. **Scalability Across Sectors**:
    - DLS technologies, particularly in commercial and industrial sectors, represent a vast untapped resource for VPP aggregation. These sectors account for nearly 50% of grid consumption but remain underrepresented in storage deployments or VPP participation.

Call to Action: Build Comprehensive DLS Programs to Drive the Future of VPPs

To unlock the full potential of Virtual Power Plants (VPPs) and address California's grid challenges, stakeholders should prioritize the development and deployment of Dispatchable Load Shift (DLS) programs. We call on policymakers, utilities, and industry leaders to take decisive action by:

1. **Develop a DLS Program**: Develop programs that encourage commercial and industrial sectors to adopt energy storage solutions for load shifting, addressing a currently underrepresented yet high-potential market.
2. **Launch Pilot Programs**: Launch pilot programs to demonstrate the operational and financial benefits of DLS in VPP frameworks, paving the way for broader adoption and scalability.
3. **Enhancing Policy Frameworks**: Create mechanisms and streamlined regulatory pathways to incentivize daily load shifting in the commercial and industrial sectors.
4. **Enabling Virtual Submetering**: Implement virtual submetering to decouple energy storage from facility loads, simplifying billing and enabling to unlock the full potential of DLS..

Conclusion: A Transformative Path to Affordability, Grid Resilience and Sustainability

Dispatchable Load Shift (DLS) is not merely a technological innovation but a paradigm shift in energy management. By aligning energy use with renewable generation, DLS ensures reliable, daily load flexibility while maintaining customer comfort and reducing their costs. Its integration into Virtual Power Plants (VPPs) establishes a new standard for how distributed energy resources can be utilized to create a resilient, sustainable, and economically viable energy future.
With its ability to decouple storage operations from customer loads, provide real-time grid visibility, and support daily as well as emergency grid needs, DLS bridges the gap between renewable energy goals and practical grid operations. As California and other regions pursue ambitious decarbonization targets, the adoption of DLS-enabled VPPs will be instrumental in achieving a cleaner, more efficient, and more equitable energy system.

Investing in DLS today is a commitment to a sustainable tomorrow—one where renewable energy potential is fully realized, grid reliability is strengthened, existing infrastructure is used more efficiently, costs are reduced, and customers are empowered to be key contributors to a carbon-neutral future.

A new approach to Demand Side Storage based DR

DLS - Dispatchable Load Shift

Program Background

May 2025 (v18)

WHY do we need a shift program?

Goals:

- Renewable integration:
  - Reduce curtailment
  - Increase the ability to build solar
- Reduce the use of daily peakers.
- Increase grid utilization
- Provide grid resilience at the local / and building level

Opportunity:

- A new class of assets enablles realizing shift potential
- Every residential / commercial / industrial load could be flattened and shifted with Energy storage

Current tools limitations:

- DR is an emergency resource that uses discretionary loads
- Dynamic pricing works for scarcity events

What needs to happen?

- A new “modus operandi” is required.
- The grid needs to use these assets on a daily basis

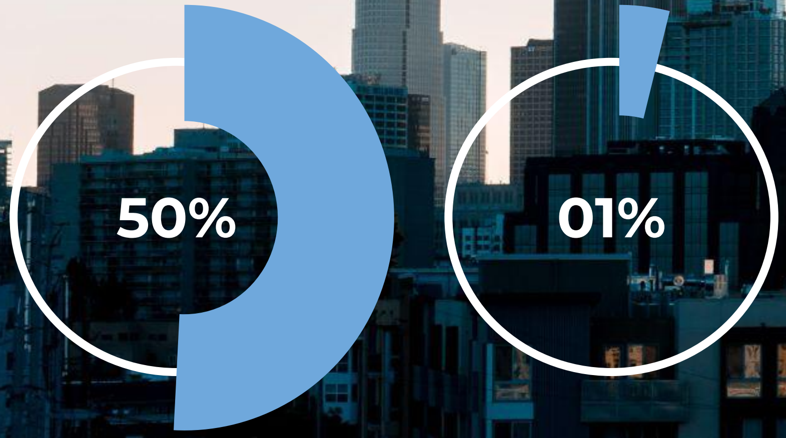
General Background

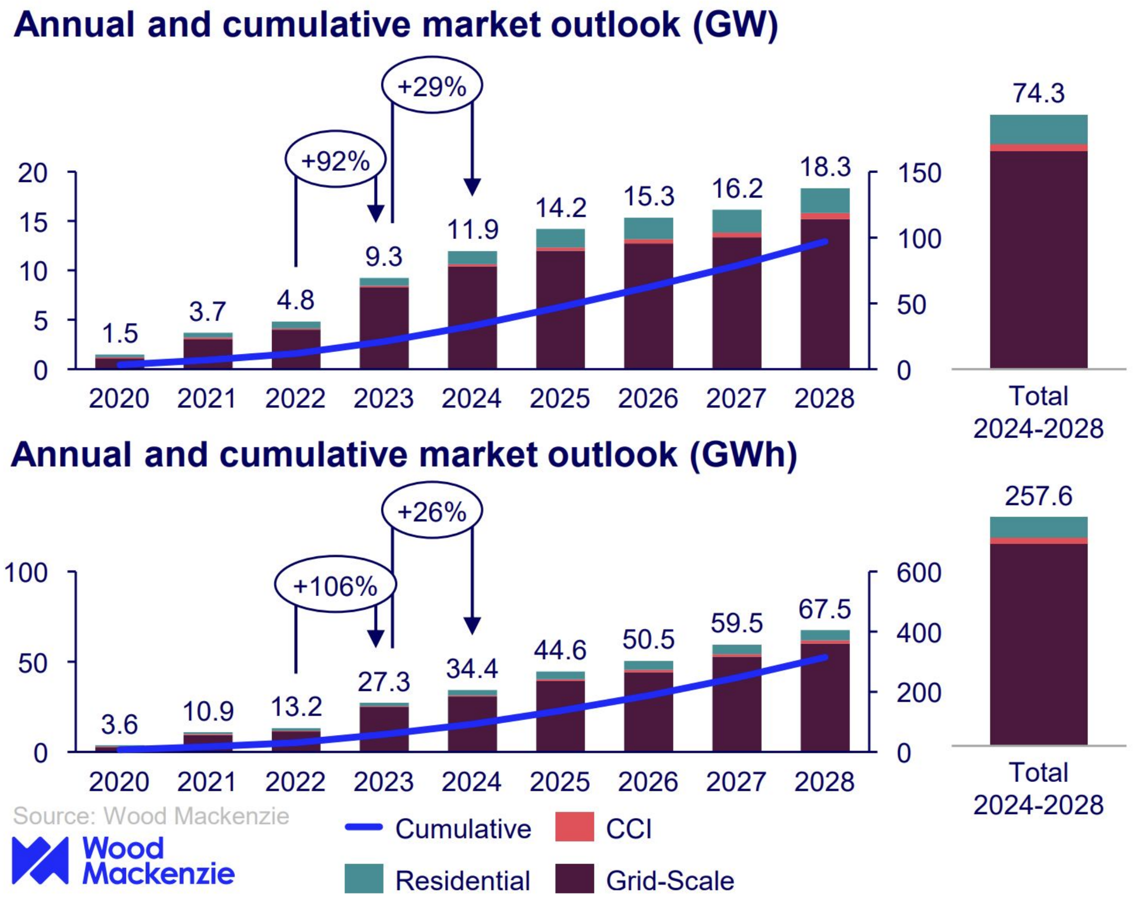
DLS - Program Background

C&I Not participating in Storage

C&I To do their part

Promote environmental justice

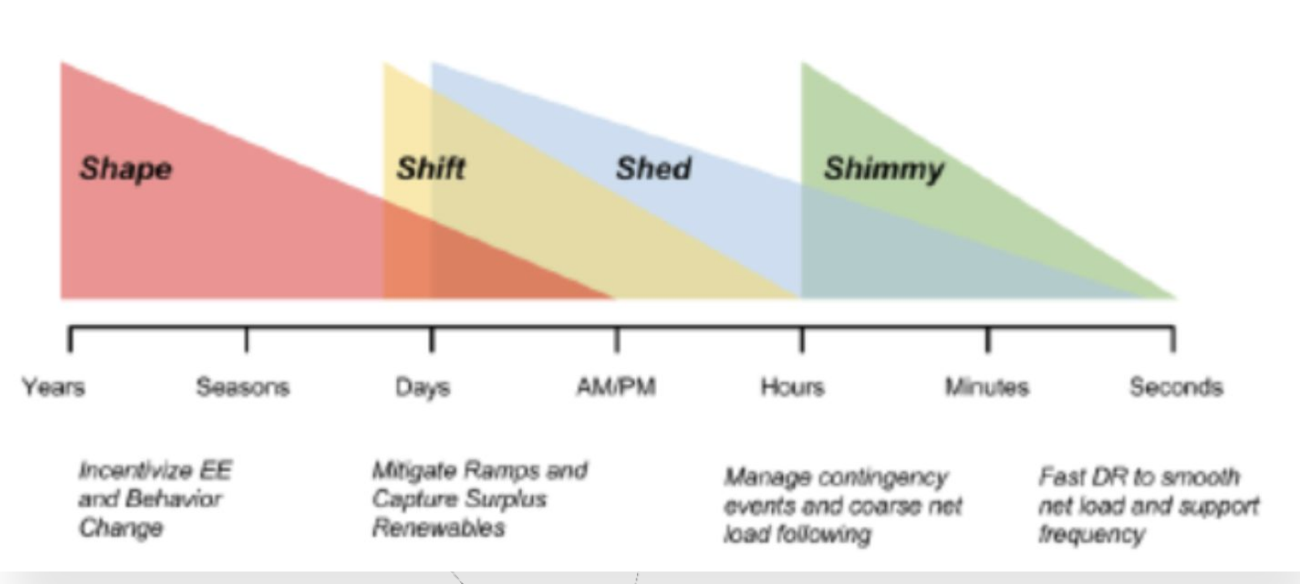




Even though Commercial & Industrial (C&I) are ~50% of the grid (higher than residential), BTM in C&I is expected to be almost insignificant. **Why?**

LBNL Phase 3 - Shift definition

- **Shed** instructs participants to reduce demand at a given time
- **Shift** is a new DR service to address the widespread solar and wind power
- **Shift** instructs participants to change the timing of their energy consumption from one time of day to another.

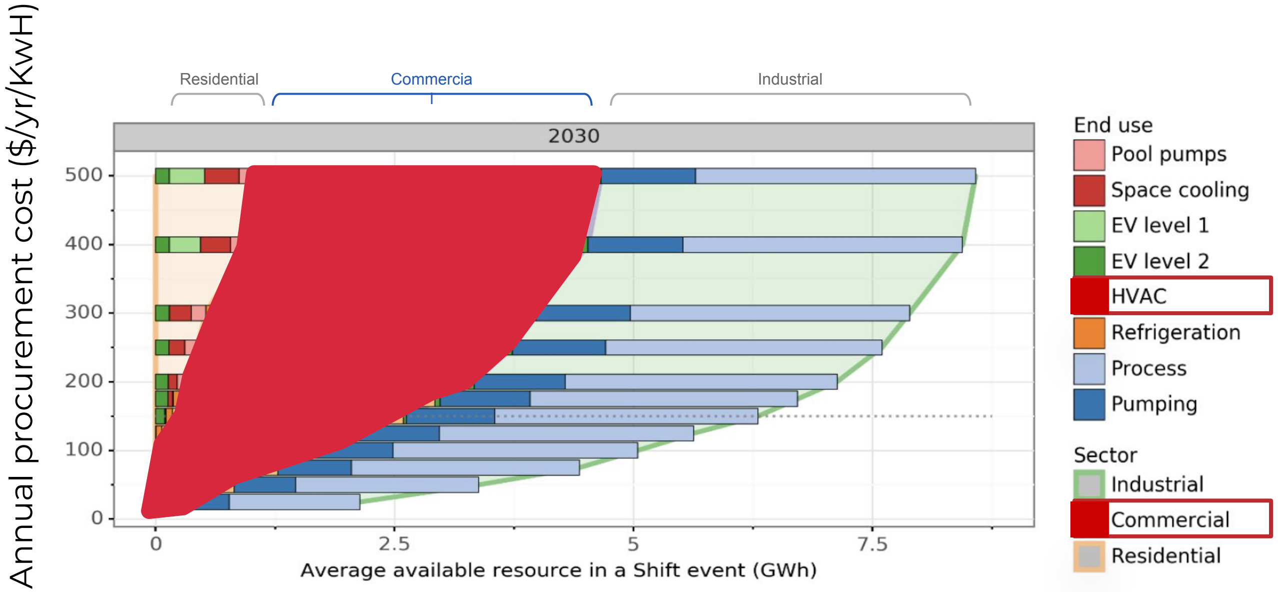


1 LBNL California Demand Response Potential Study, Phase 3 (July 2020)

LBNL Phase 3 - Shift Potential

3 GW potential for Commercial HVAC

California, 2030



Lawrence Berkeley National Laboratory, May 2020
The California Demand Response Potential Study, Phase 3: Final Report on the Shift Resource through 2030.

BERKELEY LAB

Space Cooling accounts for half the load during peak

Commercial A/C (HVAC) alone accounts for **> 1/3 of the total potential** of load shift with **behind the meter** energy storage, and almost **the entire potential in the commercial** sector

SB 846 - 7 GW Shift Goal by 2030

Core Planning

Category	Intervention	2022 Estimate	Goal Setting Potential
Load Modifying	TOU Rates	1,200 MW	3,000 – 4,000 MW
	Dynamic Pricing	30 MW	
	Programs Optimizing Load	7 MW	
Resource Adequacy	Economic Supply-side DR (PDR)	825 MW	3,350 – 4,050 MW
	Reliability Supply-Side DR (RDRR)	740 MW	
Emergency & Incremental	Emergency-Only Programs	800 MW	
	Back-Up Generators*	375 MW*	
Total (nearest hundred)		**3,600 MW**	**6,400 – 8100 MW**

*Diesel Back-up generators are part of the current emergency framework but are not considered true load flexibility. This capacity is not included in load flexibility totals.

- **Current Grid Utilization: ~40%** Nationally – A vast opportunity.
- **Long Interconnection -** New Transmission & Distribution is expensive, slow to build, and highly constrained.
- **Solution: Behind-the-Meter (BTM) Generation & Storage** – The fastest, most cost-effective way to enhance grid capacity and reliability.

What is DR trying to solve / DR Evolution

Shed

Peak reduction ->

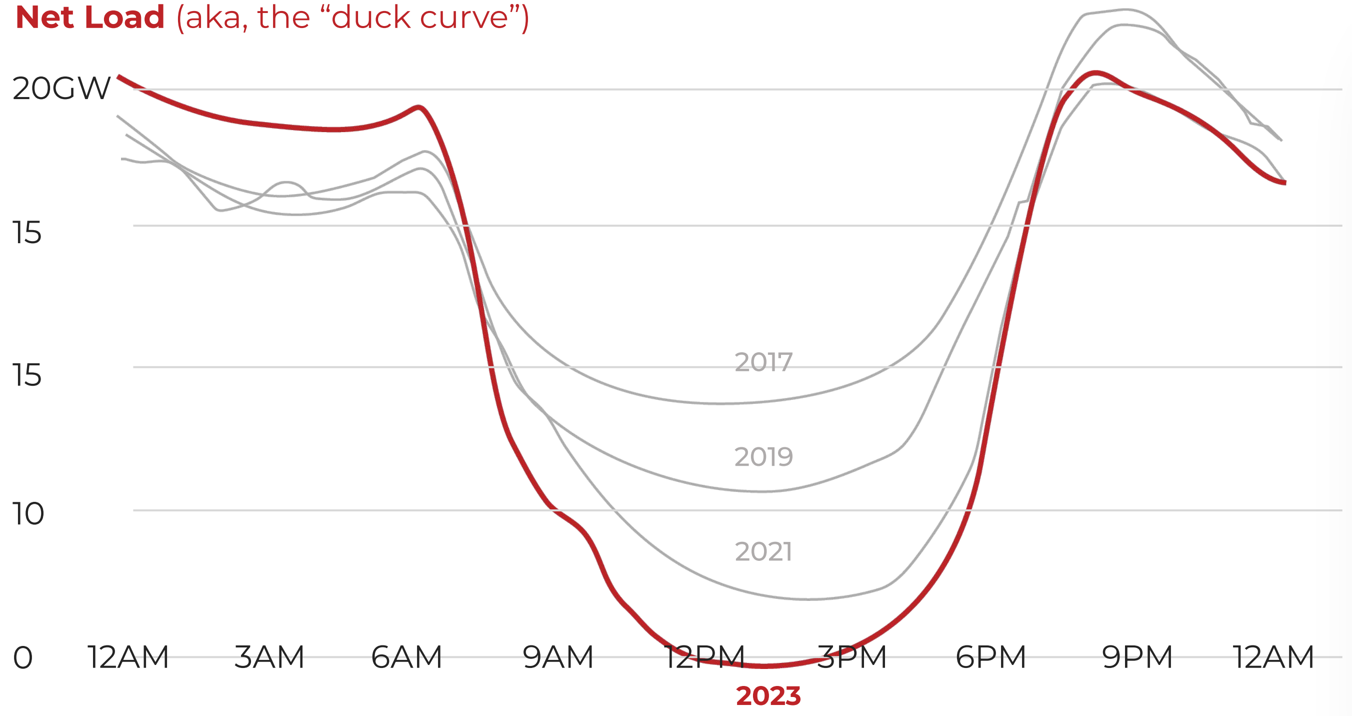
Prevent the building of the marginal plant

Shift

Daily Usage ->

Used everyday to mitigate ramp up, and increase grid utilization and renewable integration

Loading Order impact to the duck curve



Source: CAISO
Net: Net load shown is demand minus utility-scale wind and solar

Typical spring day in California

CALIFORNIA ENERGY COMMISSION

HIGH

- Energy Efficiency
- Demand Response
- Renewable Resources
- Distributed Generation

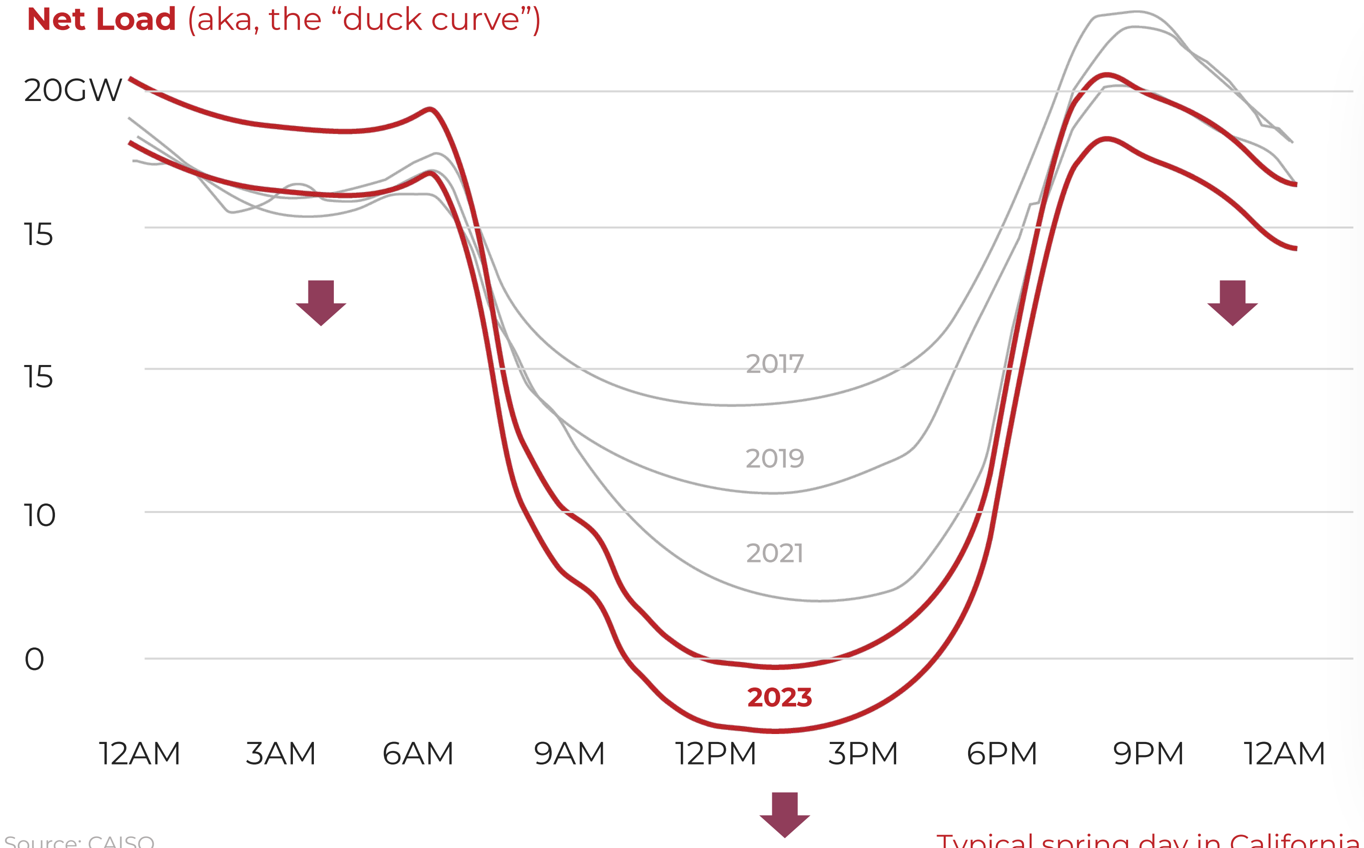
LOW

Loading Order impact to the duck curve

Energy Efficiency

Curve goes down

Net Load (aka, the "duck curve")



Source: CAISO
Net: Net load shown is demand minus utility-scale wind and solar

Typical spring day in California

CALIFORNIA ENERGY COMMISSION

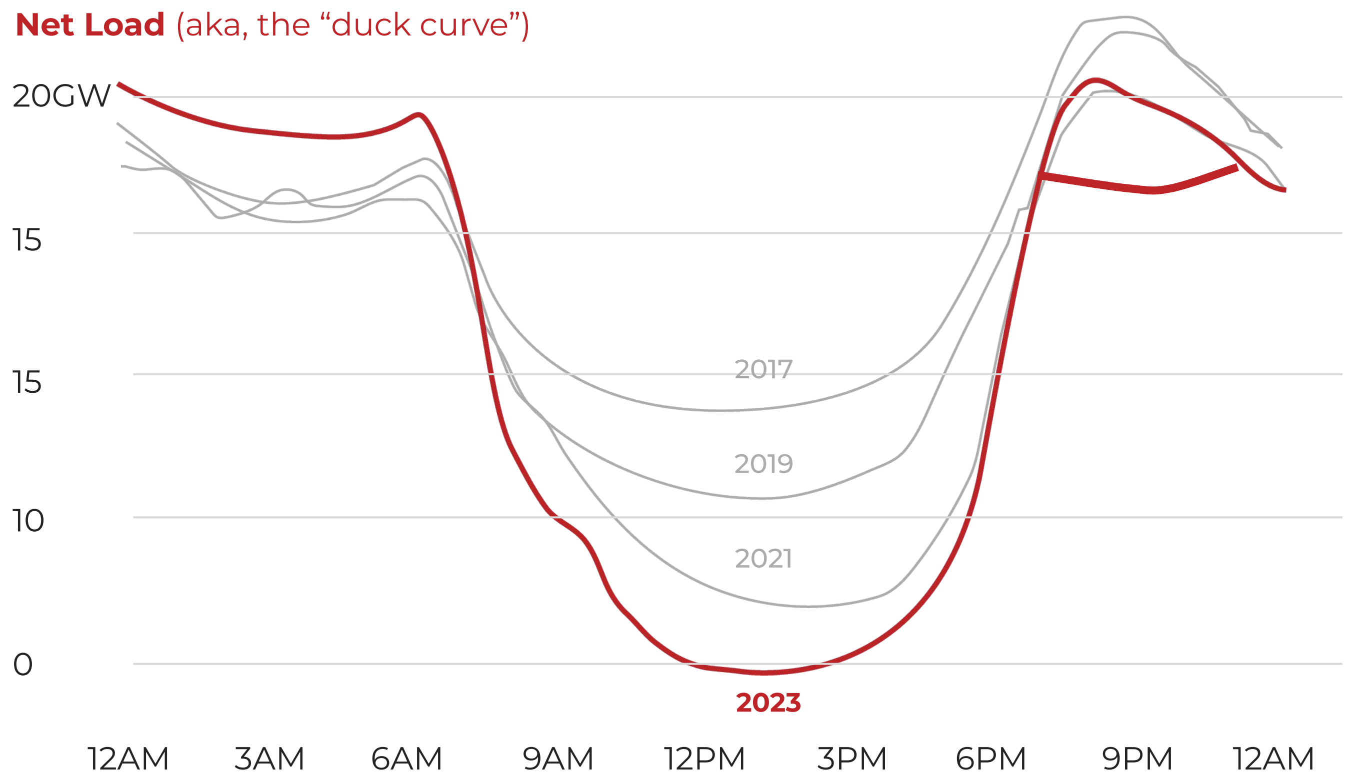
HIGH

- Energy Efficiency
- Demand Response
- Renewable Resources
- Distributed Generation

LOW

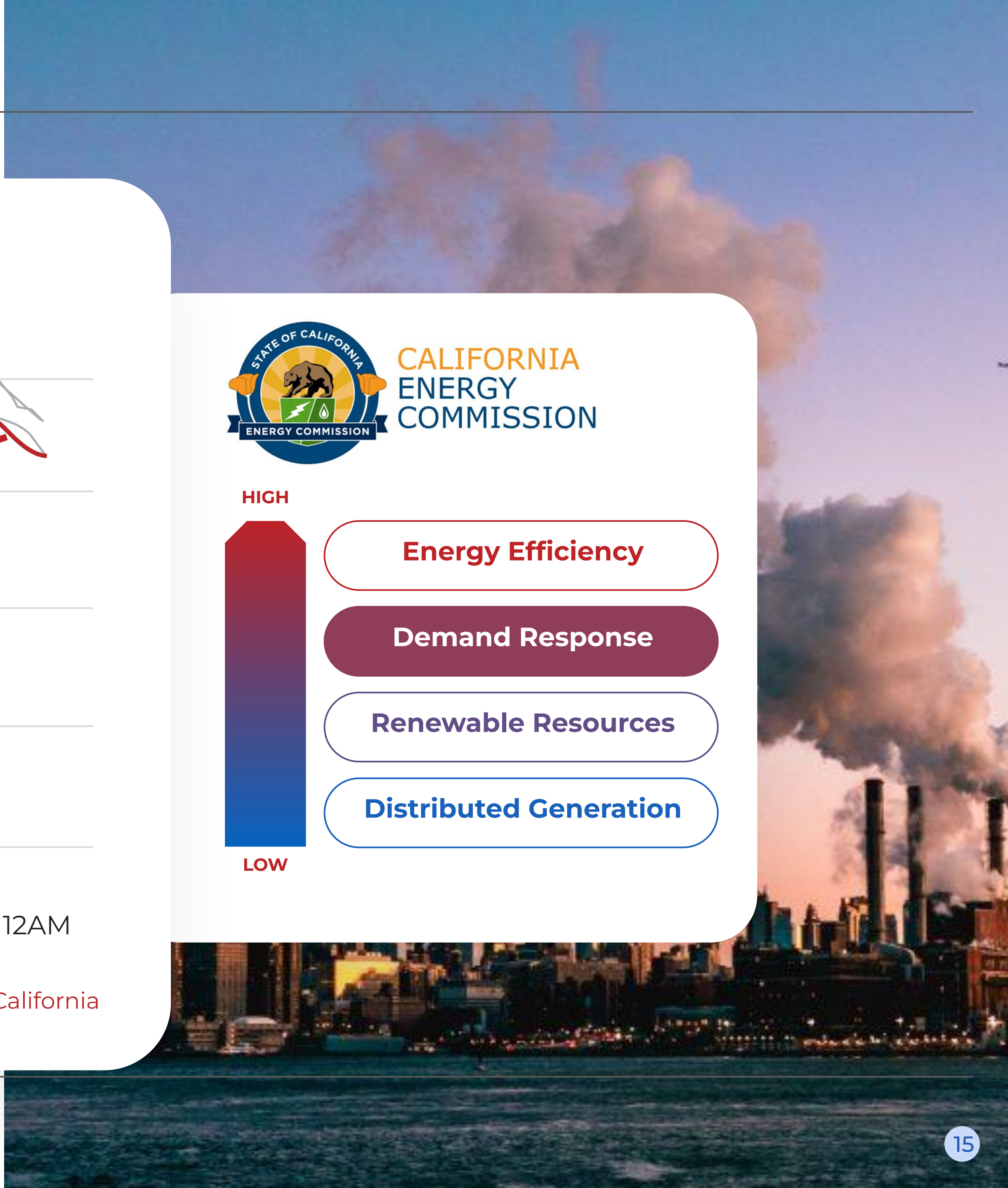
Loading Order impact to the duck curve

DR Flattening peaks a few days a year



Source: CAISO
Net: Net load shown is demand minus utility-scale wind and solar

Typical spring day in California



CALIFORNIA ENERGY COMMISSION

HIGH

- Energy Efficiency
- Demand Response
- Renewable Resources
- Distributed Generation

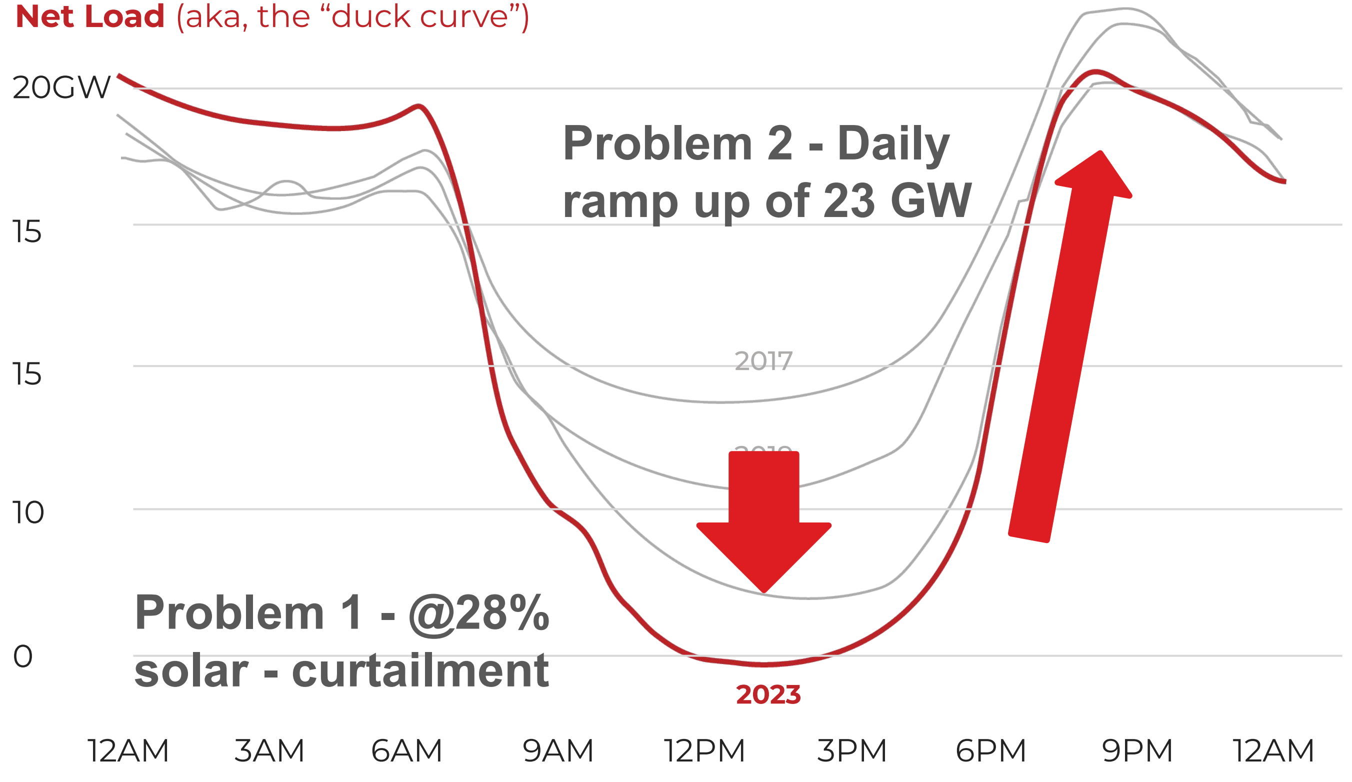
LOW

Loading order impact to the duck curve

Renewables

With solar - Deepening the duck's belly

Net Load (aka, the "duck curve")



Source: CAISO
Net: Net load shown is demand minus utility-scale wind and solar

Typical spring day in California

CALIFORNIA ENERGY COMMISSION

HIGH

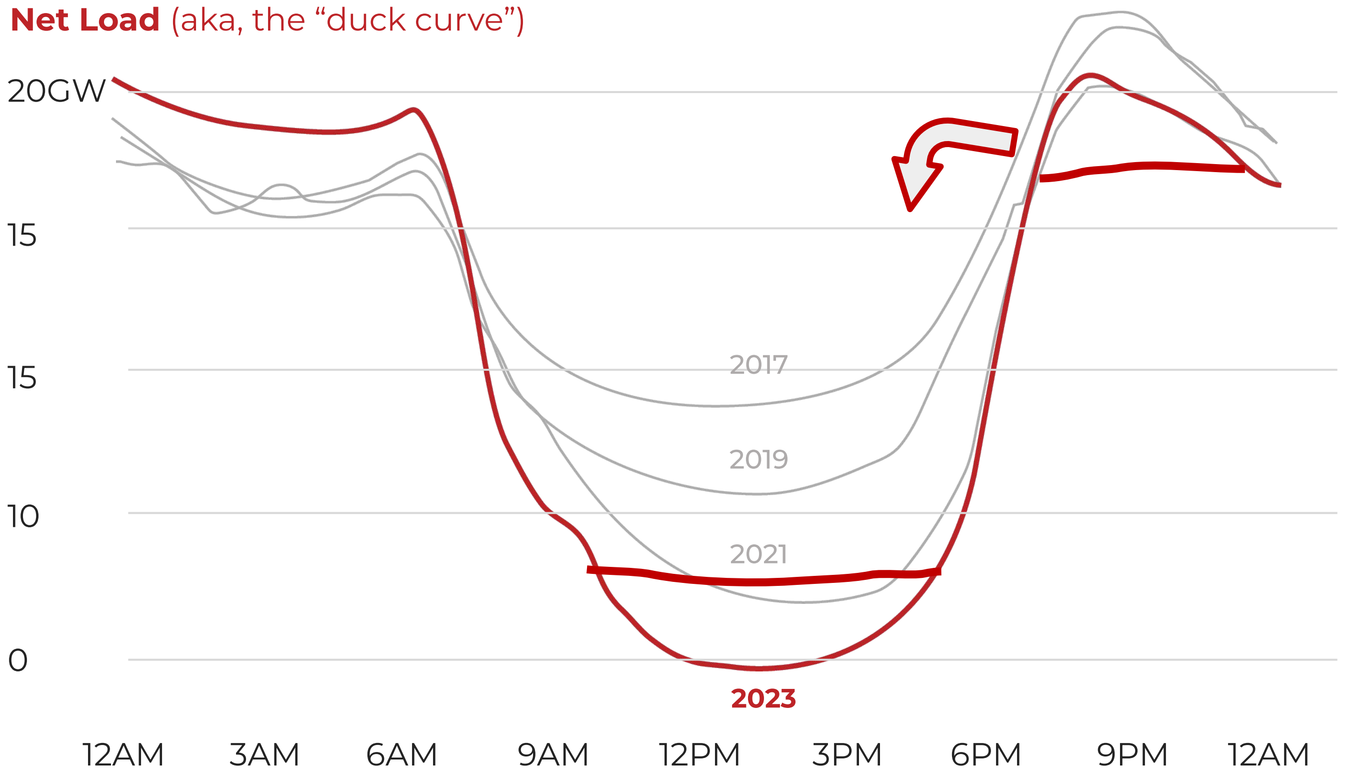
- Energy Efficiency
- Demand Response
- Renewable Resources
- Distributed Generation

LOW

Storage / Shift should be at the top

Energy Storage Flattens curve - Head goes into belly

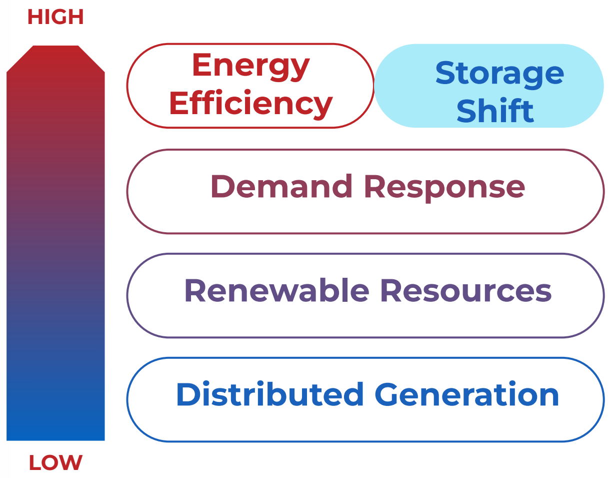
Net Load (aka, the "duck curve")



Source: CAISO
Net: Net load shown is demand minus utility-scale wind and solar

Typical spring day in California

CALIFORNIA
ENERGY
COMMISSION



Shed DR

Traditional DR requires participation

Shed DR has (negative) impact on the customer

- Inconvenience
- Reduced activity

Customer Response

- Facility Managers put on their running shoes
- Snap back / Rebound
- Customer fatigue

→ **Load impacts are not predictable / reliable**

How did we get to this point - Baselines

In the past - Only customer level meters were trusted

It is impossible to directly measure a resource not used

Predicting usage in an unusual event

- Often a DR event is called because of a non-normal event (heat, fire)
- Predicting event day usage by non indicative previous days
- Morning-of adjustments provide some accuracy

→ **Not a good solution for highly variable customers (HVC)**

Baselines will result in <u>Over</u> or <u>Under</u> compensation
Results are often 30-60 days after the event

Incrementality

Predicting usage in an unusual event

- Since the customer is doing something unusual compared to their normal daily behavior, we only compensate for that.
- This is the "Raison d'etre"
- Programs look for incrementality based on normal behavior and baselines.

The Promise of Energy Storage as Shift DR

Dispatchable Load Shift

- ➔ Storage - No impact on the customer.
- ➔ The customer is not involved. They continue to act normally.
- ➔ They get their load / thermal load.
- ➔ The customer doesn't want to control how the load is dispatched.

The keys to the system can be given to a trusted third party

DLS - Storage discharge is directly measured, eliminating the need for baselines.

- ➔ A meter measures the output of the storage.
- ➔ This is by definition, the reduction.

Dispatchable Load Shift - Customer installed the system for the benefit of the Grid

- ➔ A The customer is installing a small demand side generator.
- ➔ A Gas Fired power plant load does not depend on the amount provided in previous days.
- ➔ For a customer side load - Incrementality is not the correct way to think about it.
- ➔ The Storage in its entirety should be measured

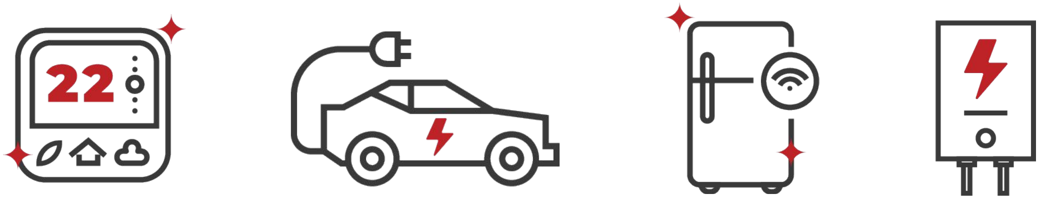
Traditional Shed DR vs Shift DR

	Traditional Shed Dr	Storage based Dispatchable Load Shift
# of times used	2-15 Events Annually	Can be used daily
Predictable Load	No – based on customer commitment and behavior	Yes – performance is forecastable and consistent
Dispatchable	No – may be automated but not directly controlled	Yes – fully dispatchable and operator-controlled
Customer involvement	High – often requires active facility manager	None – system is operated by 3rd party
Customer Impact	The customer operation or comfort is affected	None
Participation measurement	Compared to baselines. Typically calculated after a few weeks. Over or under compensate.	Measured directly, online, in real time—accurate and undisputable.
Potential Load	Discretionary loads. Or bigger loads at specific times	Up to 20-60% of the building load every day (especially in summer)
Building types	Not possible for highly variable loads.	Yes. Including highly variable loads.
Programs	PDP, CBP, BIP, CPP etc.	NA - Needs to be created!

Dynamic Pricing / Rates

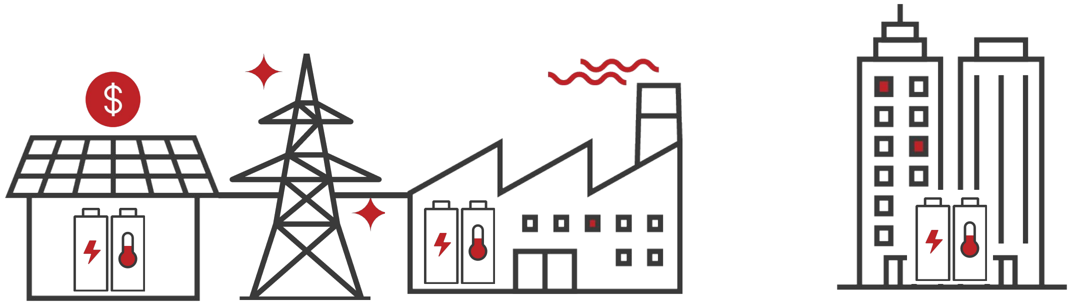
Max VPP capacity - Harness all assets

Assets that customers buy



- Participating in programs / markets is an incremental benefit
- Dynamic pricing could be a great driver

Assets for grid participation



- Provide everyday baseload
- Require predictable income for financing and bankability
- Reliable, measurable in real time, predictable

Dynamic Pricing vs DLS (Potential)

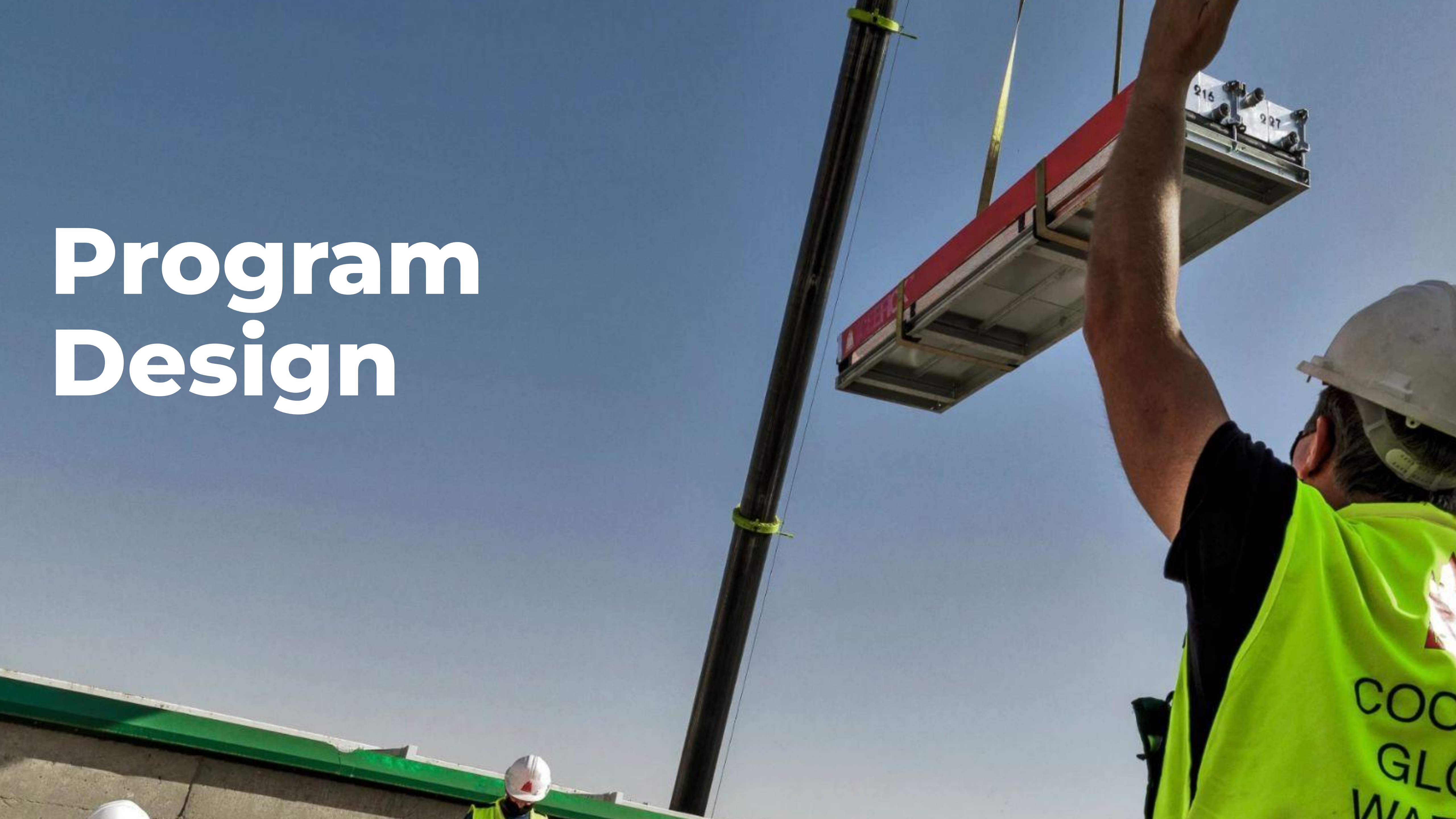
	Dynamic Pricing	Storage - Dispatchable Load Shift
Commitment	None (statistical)	Firm.
Participation	Probable only in high priced times	Every day at dispatched times
Dispatchable	No (Event notification may be automated). Voluntary. Issue with price signal causing unpredictable response (low price, everyone charges)	Yes Potentially, full control over the load.
Encourage building of dedicated assets	Not bankable. Will take 5 years if prices are right (after program is deployed)	Programs will provide certainty and enable quicker deployment.
Customer Impact	The customer operation or comfort is affected and impacts participation quantity.	None
Participation measurement	Depends on the device. Some may require Baselines and expost, statistical calculation.	Measured and verified.
Potential Load	Many devices. Incremental, discretionary participation.	2-5 GW in CA. Completely new loads.

A Version of Dynamic pricing may be used as a the basis for Dispatchable Load shift

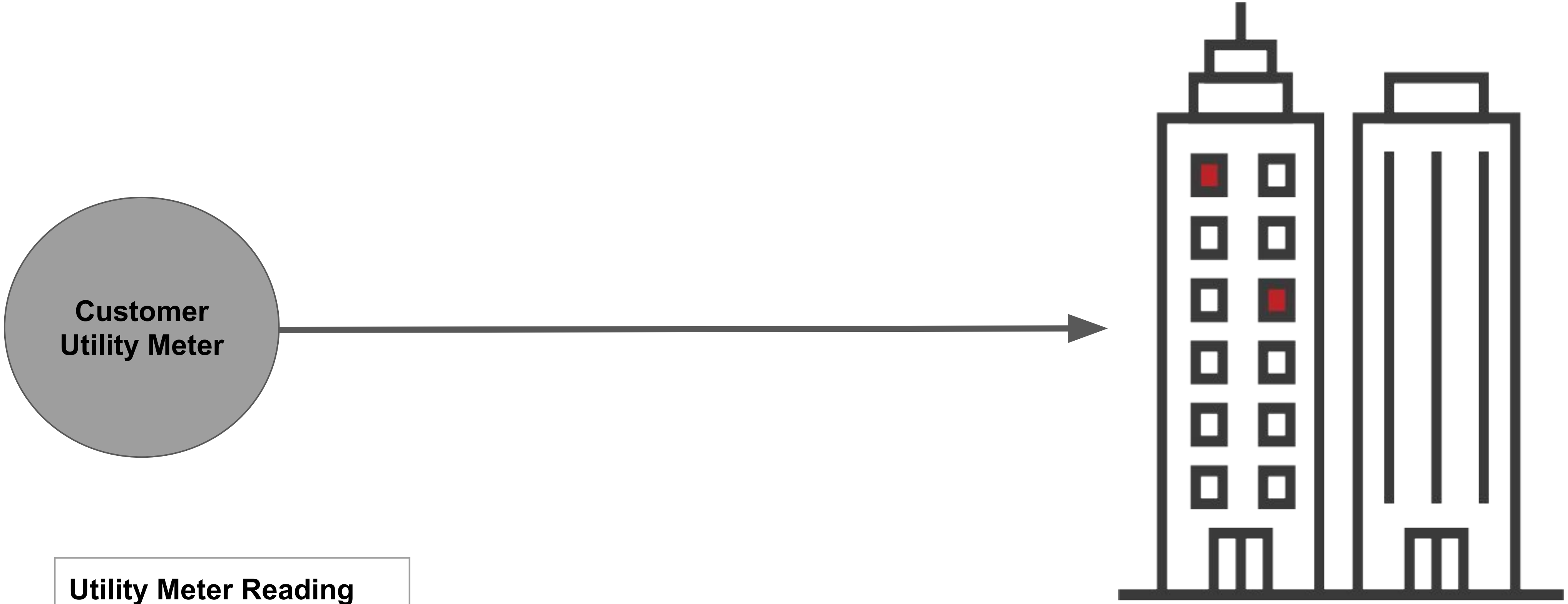
Subscription is not the optimal solution for energy storage

- **Customer loads are not stable**
  - Averaging monthly is inaccurate.
  - Hourly forecasts - excessively complex
  - Loads depend on external factors
- **There is an opportunity to decouple storage from the customer usage**
- **If storage is in the base - Challenging to bill the customer for savings**

Program Design



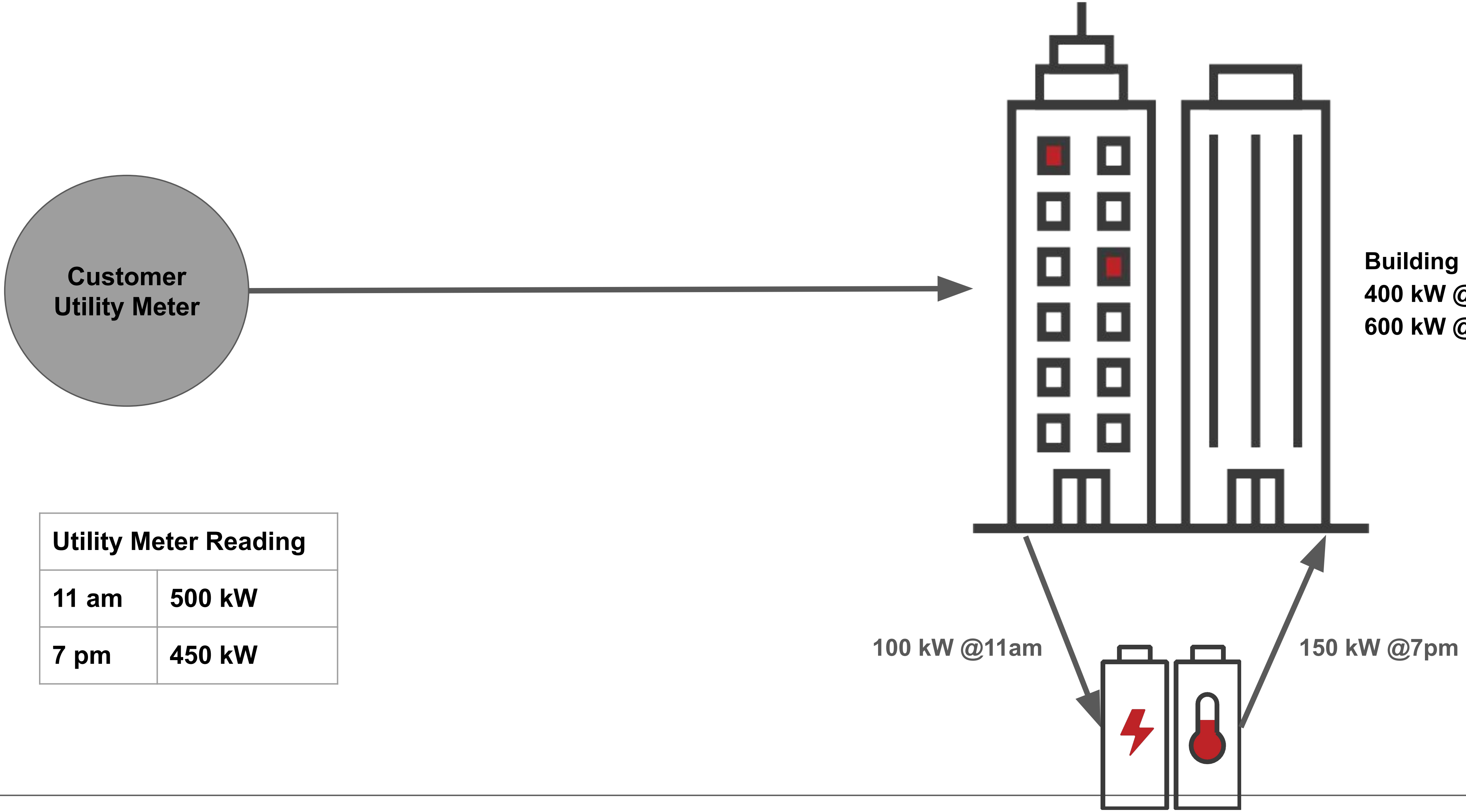
Metering with out storage



Building use:
400 kW @11am
600 kW @7pm

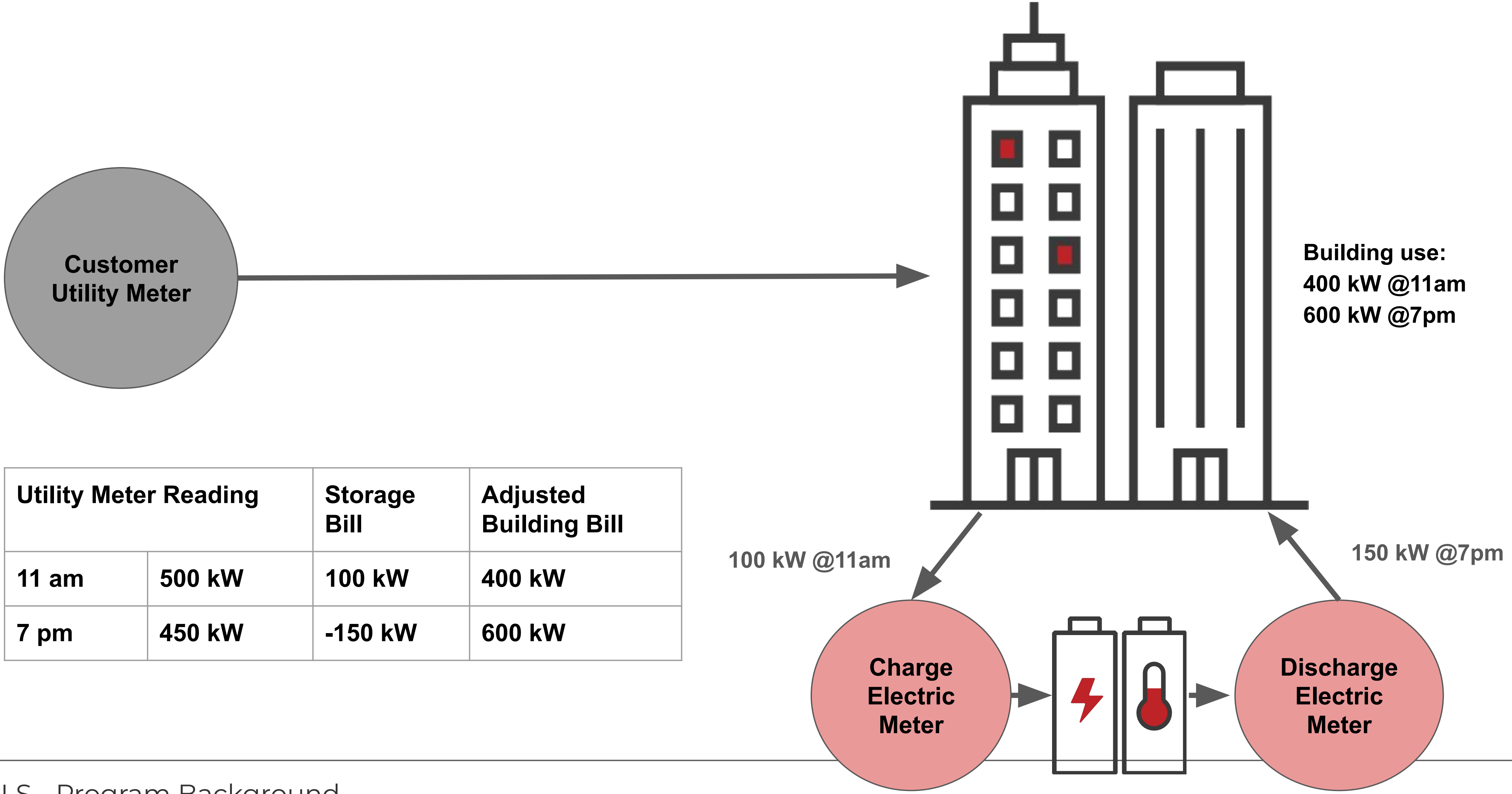
Utility Meter Reading	
11 am	400 kW
7 pm	600 kW

Metering with Storage



Utility Meter Reading	
11 am	500 kW
7 pm	450 kW

Metering with Storage Net Metering (SNM)

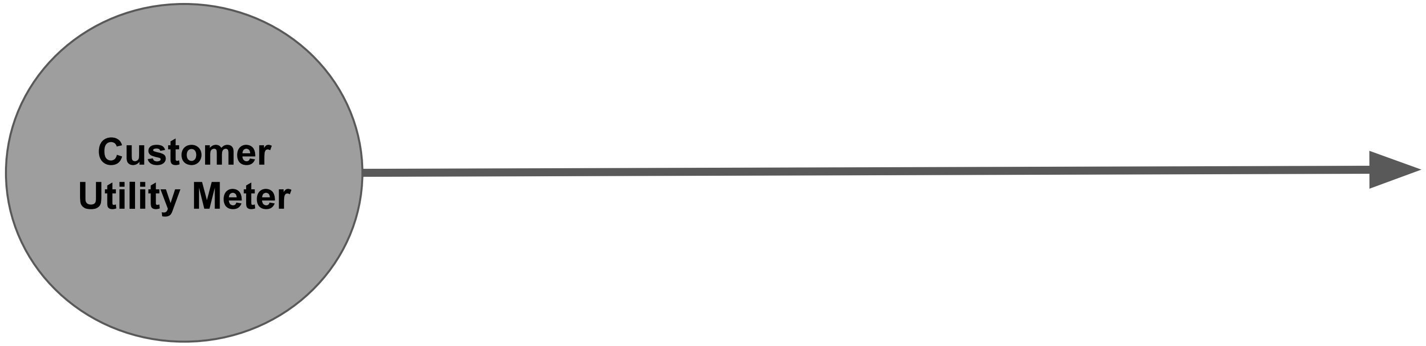


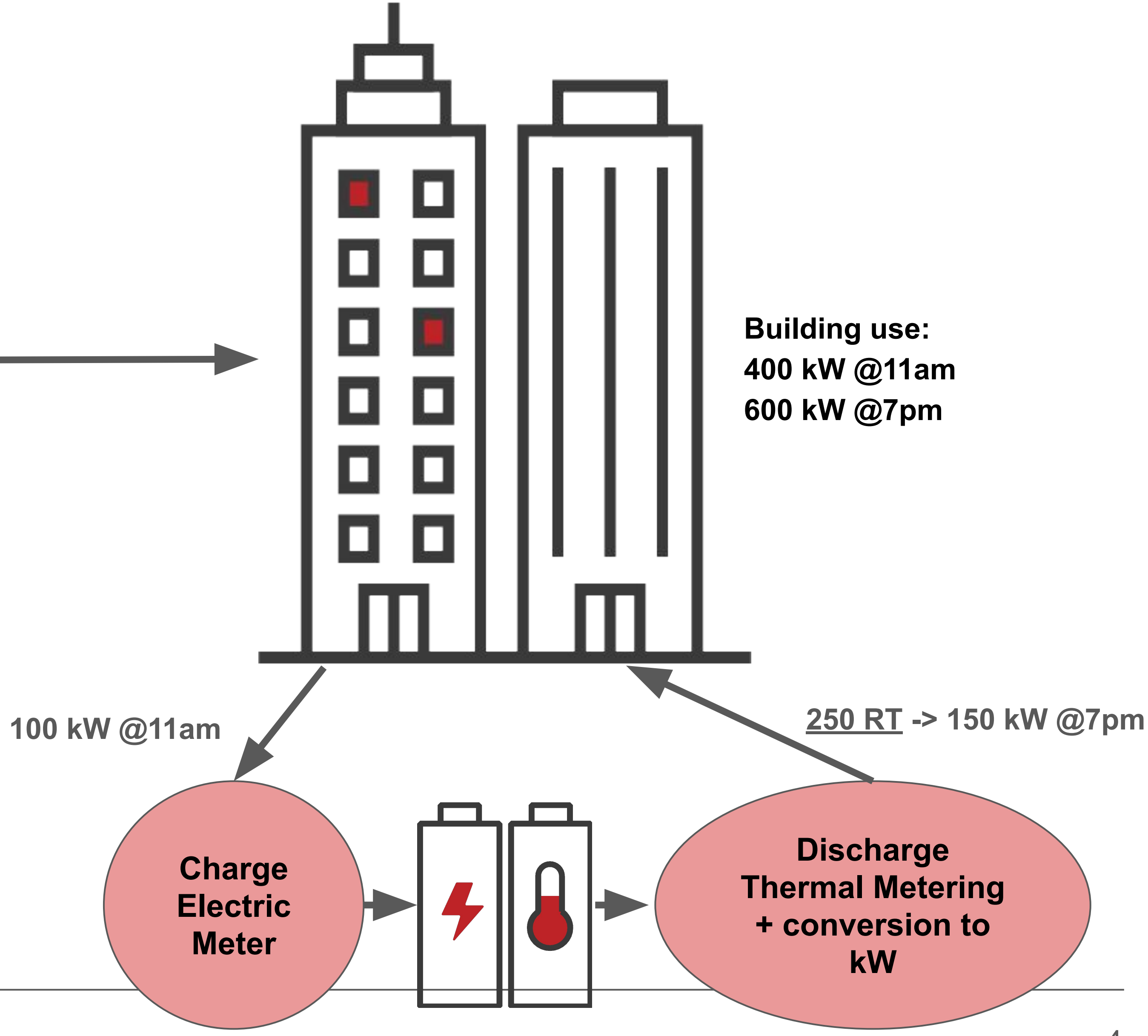
Utility Meter Reading		Storage Bill	Adjusted Building Bill
11 am	500 kW	100 kW	400 kW
7 pm	450 kW	-150 kW	600 kW

SNM Advantages - No incrementality, Attribution or Double Dipping

- ➔ Storage and Customer use are completely decoupled
- ➔ Customer pays regular rate.
  - ◆ As if they don't have the storage installed
  - ◆ Can participate in any program (including DR, Dynamic Pricing)
- ➔ Simple to implement. Utility summarizes two data streams (15 min) and bills the customer.
- ➔ Low risk:
  - ◆ Storage sub metering is utility grade and auditable.
  - ◆ Worse case - A kWh is billed on the other program, but all kWh measured.
- ➔ Storage is paid only if it is responding to a program.
- ➔ CAISO / Utility have real time access to the storage metering.
- ➔ Customer is not paid at all / nor penalized for any of the storage actions.
- ➔ Customer is compensated separately via the agreement with the Vendor (Rent / Revenue sharing)

Metering with Storage Net Metering (SNM) - Thermal



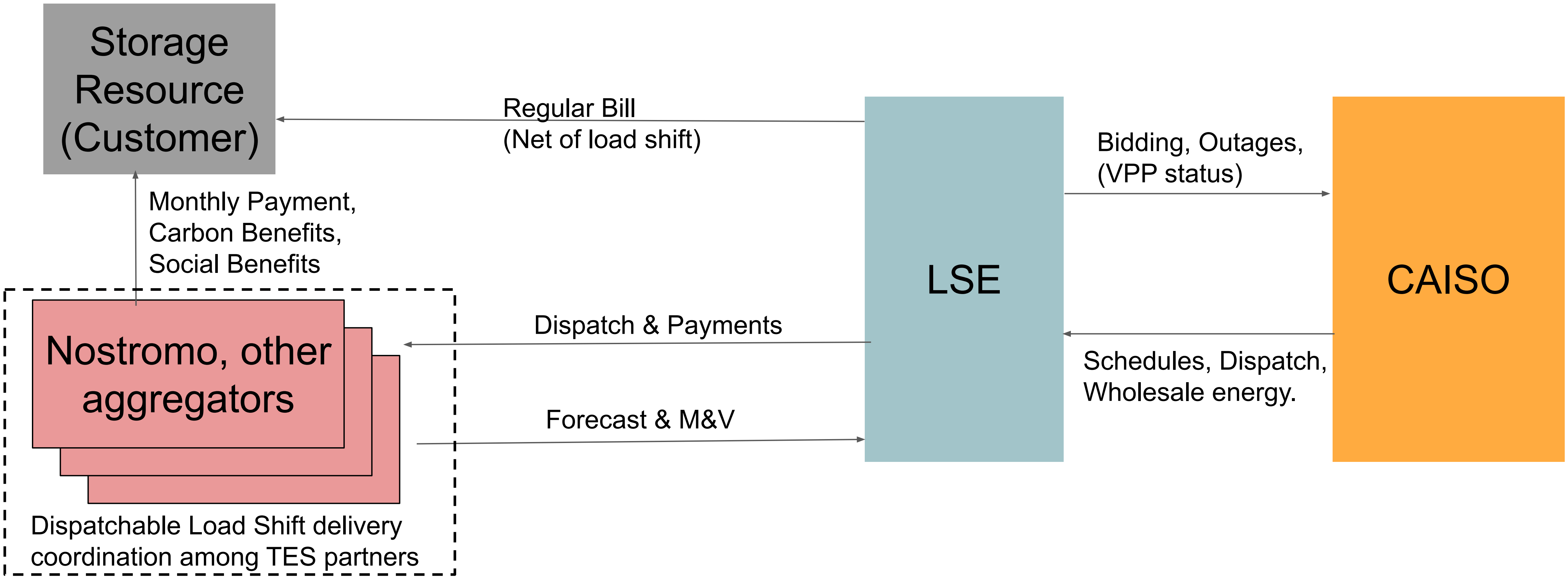


Utility Meter Reading		Storage Bill	Adjusted Building Bill
11 am	500 kW	100 kW	400 kW
7 pm	450 kW	-150 kW	600 kW

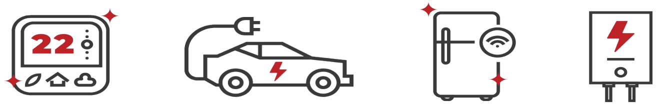
Shift Program Details - A true VPP

- ➔ **Managed by a IOU or a CCA**
- ➔ **Single point of program management**
- ➔ **Dispatched daily, and for emergencies**
- ➔ **Reported to CAISO as a power plant**
- ➔ **Separate sub metering. Decoupling the shift load from the host building**
- ➔ **CAPEX incentive plus ongoing payments.**

Program Structure



Traditional Shed DR - Dynamic Rates - Shift

	Shed DR	Dynamic Rates	Shift
Events	5-10 events a year	Dozens of events	Daily
Typical Trigger	Grid emergency	Scarcity / High Prices	First on the loading order
Devices / Assets	Discretionary loads		
Assets primary use	Their original function	Their original function	Serve the grid
Asset ownership	Customer	Customer	LSE / Aggregator / Developer
Potential Load Growth	Limited - Program participation plateaued	Residential connected devices	Existing commercial and Industrial loads
Measurement	Baselines	Baselines (statistical)	Direct measurement
Existing Programs	CBP, BIP, Etc.	Pricing Pilots	None - Need to be created

Summary

➔ **C&I are not participating in the storage game.**

➔ **A new class of assets allowing for DAILY shift is available.**

➔ **The potential is huge, and can be achieved now.**

- With a pilot program, in 9-24 months, thousands of systems, 100s of MW can be built in parallel.

➔ **The funds exist already, and the ACC supports a program.**

➔ **DR Shed, has plateaued and not a good fit for shift resources.**

➔ **Dynamic rates will not get C&I systems built.**

What can be done

- ➔ **Develop a shift pilot program with a focus on C&I BTM Storage**
- ➔ **Single point of program management**
- ➔ **Many energy storage technologies will emerge, and many developers will enter the market**

If we build a shift program, they will come!