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Document Title:	City of Palo Alto Utilities - Utilities Advisory Commission Report - 2020 Energy Storage Report (AB2514)
Description:	Staff report to City of Palo Alto Utilities Advisory Commission with staff recommendation to not set energy storage targets for Palo Alto in 2020.
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City of Palo Alto (ID # 11357)

Utilities Advisory Commission Staff Report

Report Type: **Meeting Date: 12/2/2020**

Summary Title: Energy Storage AB 2514 Report

Title: Staff Recommendation That the Utilities Advisory Commission Recommend the City Council Decline to Adopt Energy Storage System Targets and Receive the 2020 Energy Storage Report

From: City Manager

Lead Department: Utilities

RECOMMENDATION

Staff recommends that the Utilities Advisory Commission (UAC) recommend that Council decline to adopt energy storage system targets under California Assembly Bill (AB) 2514 at this time, and that Council receive the 2020 City of Palo Alto Utilities Energy Storage Report. The Draft 2020 CPAU Energy Storage Report is linked here.[1] The final report will also be submitted to the California Energy Commission (CEC). Staff also seeks UAC input on future plans regarding energy storage solutions for Palo Alto.

EXECUTIVE SUMMARY

California law AB 2514 (2010, as amended) requires all California publicly owned utilities to investigate whether energy storage systems are cost effective every three years Public Utilities Code § 2836(b)). Most recently in 2017 City of Palo Alto Utilities (CPAU) staff examined energy storage systems,[2] determined that they were not cost effective for CPAU, and therefore declined to set energy storage targets. CPAU will submit the "2020 City of Palo Alto Utilities Energy Storage" to the CEC by the end of December 2020. The draft version of the report is linked here[3] and includes:

1) An overview of customer adoption of Energy Storage Systems (ESS) in Palo Alto;
2) Analysis of the cost-effectiveness of customer-sited ESS within Palo Alto; and
3) Next steps for ESS both within Palo Alto and sited at utility-scale renewable generation.

To investigate if energy storage located in the City of Palo Alto was financially beneficial to all customers, CPAU built an economic battery dispatch model and also worked on a joint analysis with the Smart Energy Power Association (SEPA) and other publicly owned utilities through the Northern California Power Agency (NCPA) and Sacramento Municipal Utility District (SMUD).

[1] Draft 2020 CPAU Energy Storage Report
[2] https://www.cityofpaloalto.org/civicax/filebank/documents/57435
[3] Draft 2020 CPAU Energy Storage Report

The CPAU and SEPA analyses both suggest that for Palo Alto customer-sited energy storage is still not cost-effective from a societal perspective (for the utility and customers in aggregate). Since neither energy storage within the City nor on transmission system was found to be cost effective for the utility or society as a whole, CPAU recommends declining to set energy storage system targets at this time.[4] Instead CPAU will continue to monitor this rapidly maturing space and continue looking for specific projects which by virtue of their location could provide extraordinary resiliency, lower carbon emissions, and/or lower distribution system costs. Staff is also currently evaluating multiple proposals for utility-scale storage colocated with renewable generation and will move forward with competitive projects that complement CPAU's existing supply portfolio.

BACKGROUND

The deployment of ESS in the California electricity sector has grown rapidly in recent years due to declining cost, regulatory mandates for investor owned utilities (IOUs) to procure and/or provide rebates for customer sited ESSs, availability of reliable system manufacturers/installers, federal tax credits, and increased customer awareness of the benefits ESS[5]. IOUs have been authorized to collect over $1B from their customers to be spent on the state-mandated storage program for IOU territory, which is called the Self Generation Incentive Program (SGIP).

On a very basic level, energy storage systems can be used to allow energy generated at one time to be utilized at a later time. This opens up a number of possible value streams as shown in the Draft 2020 CPAU Energy Storage Report linked here. This list of value streams is consistent with other analyses of value streams, such as those shown in the 2017 Rocky Mountain Institute Storage Report.[6]

Despite energy storage systems being able to provide multiple values, the actual installation of batteries in California has not always been economically or environmentally beneficial. A recent evaluation[7] of the Self Generation Incentive Program found that on average commercial storage projects without performance-based incentives increased carbon emissions. This was primarily[8] due to commercial customers using their batteries during the times of cleanest electricity and charging their batteries during the times of dirtier electricity (which is typical for maximizing savings from commercial demand charges).

DISCUSSION

[4] Under state law (PUC 2836(b)), local publicly owned electric utilities like CPAU must analyze the merits of ESS investments periodically and set goals if such investments are cost effective.

[5] It is estimated battery costs have declined by 50% over the past 3 years, with the corresponding battery ESS cost declining by 30%. Under California Public Utilities Commission (CPUC) mandates, the IOU/CCAs were required to contract for 2,485 MW of ESS by 2020. In addition, CPUC requires IOUs to provide cash rebates to customers installing ESS under the Self-Generation Incentive Program (SGIP). The increased wildfire risks and associated public-safety-power-shutoff measures have increased the customer's need for back-up power sources, which ESS are well suited to provide.

[6] https://rmi.org/wp-content/uploads/2017/03/RMI-TheEconomicsOfBatteryEnergyStorage-FullReport-FINAL.pdf

[7] https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/Customer_Gen_and_Storage/2017_SGIP_AES_Impact_Evaluation.pdf

[8] 10% of the emissions increase was due to parasitic losses within the battery, but 90% of the emissions increase was due to the commercial customers operating the batteries to lower their utility demand charges rather than lower carbon or wholesale energy costs.

The CPAU and SEPA analyses both suggest that for Palo Alto, customer-sited energy storage is still not cost-effective from a societal perspective (for the utility and customers in aggregate). Details on the analysis and results are in the Draft CPAU 2020 Energy Storage Report linked here.[9]

Since neither energy storage within the City nor on transmission system were found to be cost effective for the utility or society as a whole, CPAU will not be setting storage goals at this time.[10] Instead CPAU will continue to facilitate customer-funded installations through education and group buy programs, and monitor this rapidly maturing space and continue looking for specific projects which by their location could provide extraordinary resiliency, lower carbon emissions, and/or lower distribution system costs. Staff is also currently evaluating multiple proposals for utility-scale storage located with renewable generation and will move forward with competitive projects that complement our existing supply portfolio.

Areas of Unique Value of Energy Storage to CPAU

Although the current analyses suggest energy storage within CPAU territory is not financially beneficial to all customers, there are a number of factors which could change this in the future. These factors do not currently outweigh the costs of storage, but there is the potential for this to change in the future based on: higher future resiliency value to community, statewide energy supply shortages or interruptions, different structure proposed for transmission charges, and rapid electrification of particular residential neighborhoods.

Factors which would Improve Future Energy Storage Value to CPAU & Customers

1. Increased community value of local resiliency: The recent electricity supply shortages at the state level and potential future disruptions from large-scale regional wildfires could lead the community to elect to pay a premium for local electricity storage.

2. Insufficient distribution system capacity in residential areas: Energy storage could help distribution system costs, in particular for neighborhoods rapidly switching to all electric homes which also have a high penetration of electric vehicles. Where there is not currently enough distribution system capacity batteries may have the potential to be leveraged as “non-wires solutions” if exercised appropriately.

3. Increased wholesale value of flexible resources: The recent supply shortages at the state level could indicate that flexible electricity generation is currently underpriced and undervalued. Flexible resources such as batteries could be worth more in the future if this trend holds, especially as more natural gas generation is retired in California.

4. Reconfiguration of transmission charges: The primary transmission operator of California is considering redistributing transmission charges in a way which would make flattening electricity demand more valuable. This would increase the value of storage as one way to flatten electricity demands, at a City level.

5. CPAU’s Hourly Carbon Neutral Standard: In August 2020 CPAU adopted an hourly carbon neutral accounting standard. This will ensure that the technologies such as energy storage which can store

[9] Draft 2020 Energy Storage Report

[10] Under state-law AB2514, electric utilities like CPAU must analyze the merits of ESS investments periodically and set goals if such investments are cost effective.

the lowest carbon hours and then help the grid during the highest carbon hours are properly valued when making investment decisions.

6. Solar Net Energy Metering Rate: Since Palo Alto compensates new solar customers at the value to the utility for the solar exported to the grid, if the value of electricity continues to decline during the day, the value of local solar exported to the grid may decline as well. If the difference between the retail rate of electricity and the value of local solar electricity exported to the grid increases in the future, this will increase the value of local energy storage to customers.

Key Differences in Energy Storage Value between CPAU and PG&E

Since two separate analyses suggest that energy storage is not currently financially beneficial to CPAU and its customers, it is important to understand why it is considered beneficial for the investor-owned utilities which are required to invest in and subsidize energy storage for their customers. Some of the key differences between CPAU and the IOUs such as PG&E which are required to invest in storage systems via the SGIP are shown below.

1. Distribution System Deferral: Lower value for CPAU than PG&E.
    a. *The City's electric distribution system is not currently constrained* since electricity sales are 30% below historical peak due to aggressive efficiency, high customer adoption of solar, departure of industrial loads, lack of other load growth, and lower summertime temperatures.
    b. Staff will continue to investigate specific locations on the residential side of the distribution system for opportunities for distribution deferral, especially in neighborhoods switching to all electric homes and with high penetration of electric vehicles.

2. Back-up Power for Outages & Power Safety Power Shutoff Events: Lower value for CPAU than PG&E.
    a. *CPAU's territory is mostly urban*, non-mountainous terrain, low-fire risk and fewer distribution miles per customer, therefore limited customers are affected by PSPS.
        CPAU also has relatively few outages.

3. Time-of-Use (TOU) Rate Bill Management: Lower value for CPAU than PG&E.
    a. *There is no Residential TOU rate* as CPAU does not yet have smart meters installed and therefore cannot distinguish when during the day electricity is being used. Price differentials for TOU pilot rates in Palo Alto have historically been small, though this may have changed marginally in recent years.
        i. CPAU expects to have smart meters deployed by 2024.
        ii. Staff is exploring ways to control smart electric vehicle charging, smart building management systems, and smart thermostats to leverage flexible demand response programs. Connected batteries would be eligible in any pilot.
        iii. TOU rate design will be an important topic in a future electric cost of service study.
    b. The price differential in the current CPAU commercial TOU rate is small.
        i. Staff will be evaluating this in the next electric cost of service study as well.

4. Utility-scale Transmission-Connected Energy Storage: Lower value for CPAU than PG&E.
    a. CPAU owns highly flexible load-following hydroelectricity, which provides ~15% of its electric supply.

b. CPAU has already entered into long-term contracts for carbon-free resources that will supply ~110% of its electricity needs through 2024. If CPAU were currently contracting for new renewable resources, the economics of bundling in utility scale storage during construction would be more advantageous.

Comparison of Planned Storage Expenditures between CPAU and PG&E Territory

A comparison between CPAU and the surrounding IOU PG&E on the basis of authorized budget and on key aspects are below.

Customer-sited storage:

- 87% of the total PG&E SGIP funding dedicated to customer-sited energy storage is reserved for high fire risk customers, those who have had multiple PSPS events in the last two to three years, and or low-income customers. CPAU has very few customers with high fire risk and has relatively few customers who are both low income and have high fire risk.
- A comparison of the remainder of the dedicated SGIP funding[11] shows that:
    - An equivalent pro rata amount of funding dedicated to customer-sited energy storage would be $500k in total for CPAU, which would roughly translate to 220 kW / 590 kWh of customer-sited batteries installed in CPAU territory.
    - As of 2020, Palo Alto already has 210 kW / 567 kWh in residential batteries installed and 1,000 kW / 2,020 kWh commercial customer-sited batteries.
- For customer-sited energy storage, CPAU customers appear to be investments on their own, which could call into question whether utility intervention to further stimulate demand is required in this market.

Large-scale or transmission grid-tied:

- An equivalent amount of funding allocated for transmission/wholesale interconnected storage would be about $1.3M and would roughly translate into 1.1 MW / 4.4 MWh of transmission grid-tied batteries installed.
- Palo Alto is evaluating competitive transmission grid-tied projects in the 5 MW / 20 MWh range.

PUBLIC ENGAGEMENT

Resiliency, lowering costs, and lower carbon emissions are core values of CPAU. CPAU will engage the public as needed on the topic of energy storage in the S/CAP process and as part of any other local discussions on resiliency as they relate to energy storage.

NEXT STEPS

CPAU will not be setting any energy storage system targets at this time. Staff is evaluating transmission grid-tied storage located at utility-scale renewables. CPAU will also consider utility scale and behind-the-meter storage as supply portfolio options in the 2024 Electric Integrated Resource Plan. Staff will also continue evaluating specific local projects which due to their location could provide extraordinary resiliency, lower carbon emissions, or distribution system value.

There are six key areas that staff will continue to explore as these will have the highest value to CPAU and its customers:

[11] This includes funds not already made available, but earmarked for SGIP through authorized collections.

1. Examine using flexible loads to avoid or minimize future rotating outages: Flexible loads have many of the benefits of energy storage but are much less expensive than purchasing standalone batteries or other energy storage. The recent electricity supply shortages at the state level indicate that flexible electricity loads such as storage, flexible EV charging, flexible building management systems, smart thermostats and smart heat-pump water heaters may currently be undervalued. Staff will be examining ways to use flexible electricity loads to minimize the risk and severity of rotating outages in the future. This could be configured as an Automatic Demand Response program or a Virtual Power Plant. It is important to note that flexible loads like these programs reduce the likelihood and magnitude of future rotating outages, but if Palo Alto is called upon to shed load for the reliability of the statewide grid, CPAU will have to initiate the outages mandated.

2. Examine investing in flexible electrification to create distributed thermal energy storage: Electrification of space and water heating has the potential to decrease carbon emissions even more if these systems use electricity during the cleanest hours of the day and coast through the highest emission hours of the day, since heat-pump water heaters and buildings can pre-heat when residents are not home and then maintain their temperatures with excellent insulation. CPAU is already incentivizing electrification of space and water heating and could add extra incentives to those systems which can be dispatched to follow the cleanest hours on the grid.

3. Evaluate local energy storage at existing local solar for resiliency: Explore partnering with emergency services to add storage to existing local solar sites at City facilities. Storage could be used to mitigate the risk and severity of potential supply shortages in addition to catastrophic emergencies. The combination of solar plus storage may also be able to contribute to resiliency needs in a highly electrified environment, such as would result if the City's Sustainability and Climate Action Plan (S/CAP) goals were achieved.

4. Continue to evaluate competitive proposals for energy storage at utility-scale renewable generation: CPAU is currently evaluating multiple proposals for energy storage sited at utility-scale renewable generation and will move forward with any proposals that are found to be economic and a good fit for the electric supply portfolio.

5. Continue to evaluate financial and physical integration of storage and flexible loads: CPAU is evaluating both the physical impacts of energy storage and flexible loads on utility distribution system operations as well as the costs and benefits to the utility's financial position and other ratepayers. In particular, as the industry evolves, staff will evaluate the impact of storage and flexible loads on cost of service rate design and make adjustments if needed.

6. Evaluate the potential resiliency needs of an electrified community (one in which the Sustainability and Climate Action Plan goals are fully implemented) and the role energy storage may need to play: CPAU continues to evaluate current and future resiliency needs, including the potential role of energy storage.

RESOURCE IMPACTS

The pace of the projects outlined above will be dictated by staffing availability. The staff resources needed for an Automatic Demand Response program would be anticipated to be 0.5 FTE.

POLICY IMPLICATIONS

Energy storage is a key technology to enable increased penetration of renewable energy in California and, when installed in customer premises, reduce their utility use. These two aspects conform to Utilities Strategic Plan objectives and Council policy on environmentally sustainable

ENVIRONMENTAL REVIEW

The UAC's recommendation that Council decline to adopt energy storage system targets under California Assembly Bill (AB) 2514 at this time, and that Council receive the 2020 City of Palo Alto Utilities Energy Storage report is not a project requiring environmental review for the purpose of the California Environmental Quality Act, because these are administrative activities of government that will not result in direct or indirect physical changes in the environment (Cal. Code Regs. Tit. 14 Sec. 15378(b)(5)).

Attachments:

- Attachment A: Presentation

Attachment A

CITY OF PALO ALTO UTILITIES

Energy Storage Report

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December 2, 2020: Utilities Advisory Commission

cityofpaloalto.org/utilities

Outline: 2020 Energy Storage Report

1. Why storage?
2. Key takeaways
   - Interpreting results
3. What next?
4. Recommended UAC motion

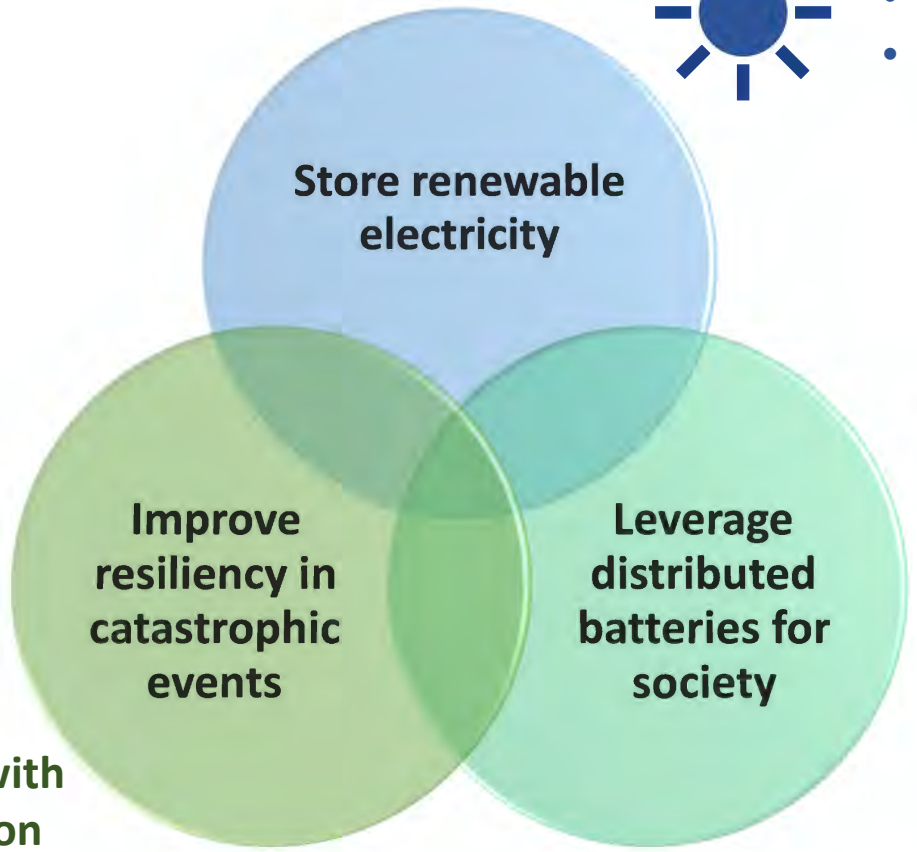
Batteries surging & can lower CO_2 emissions

1. Battery installations surging & costs decreasing
2. CPAU required to investigate energy storage
3. CPAU did not set energy storage targets in 2011, 2014, or 2017
4. 2020 CPAU & SEPA analyses showed energy storage not yet cost effective, therefore:
    - CPAU will not set energy storage targets in 2020, but will continue to look for opportunities & align incentives

Want to lower CO_2 & empower consumers

But… batteries still costly & uses cases compete

- Curtailment is less costly
- Carbon price is too low

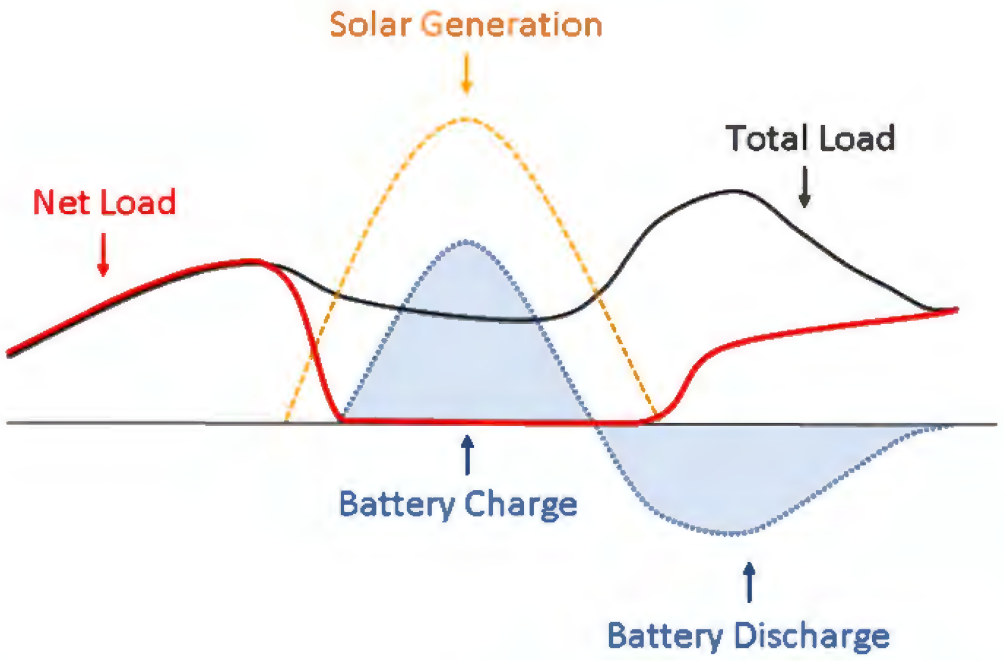


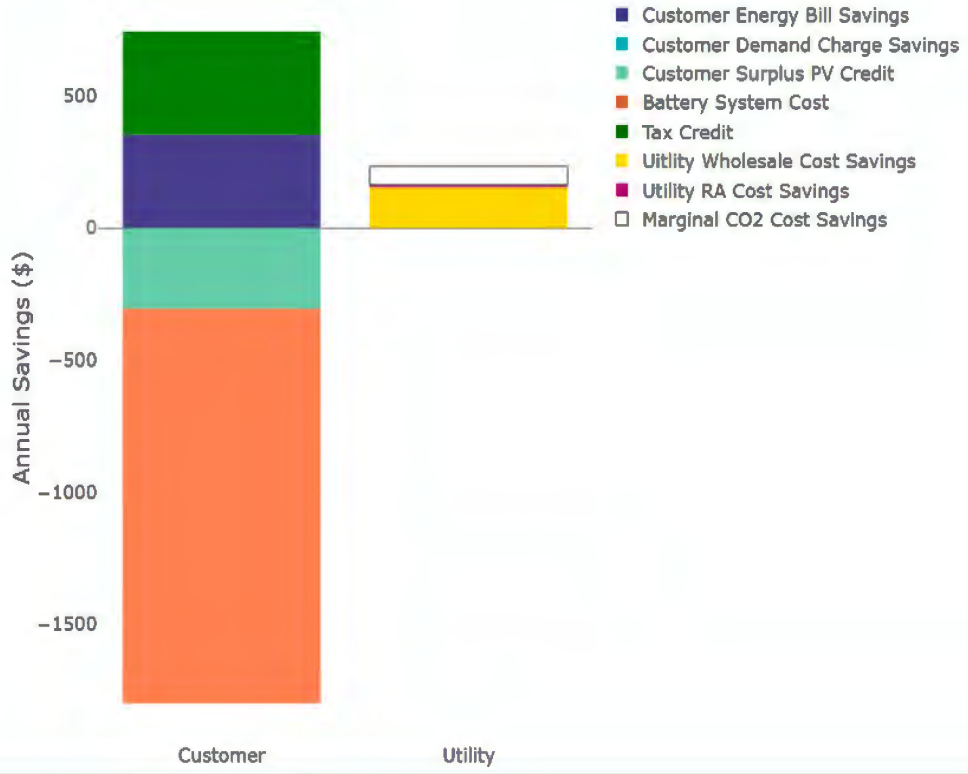
Could work with critical location

- Must align incentives
- Use cases currently compete

Interpreting modeling results for Residential battery

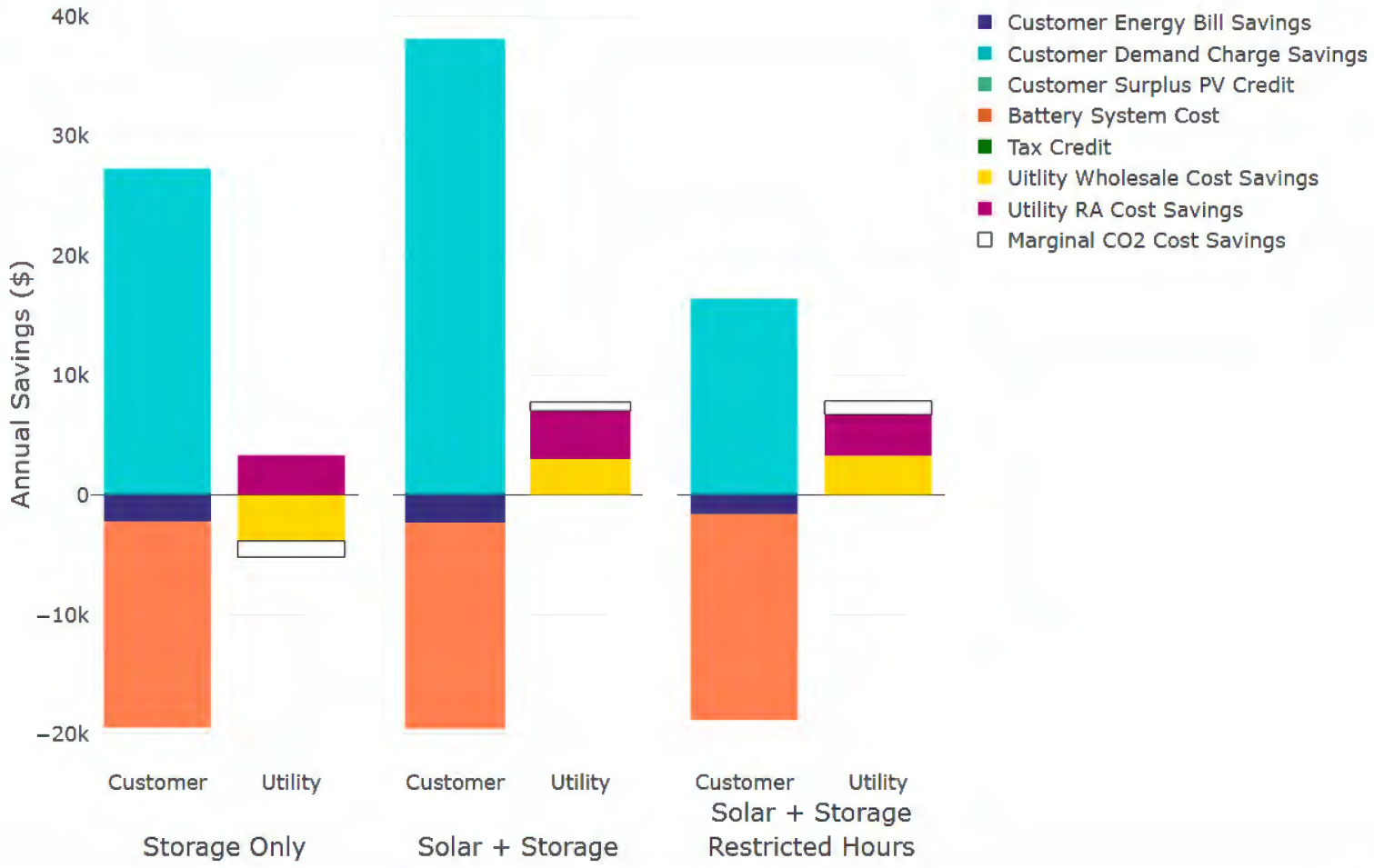
- Batteries don’t save money for homeowner with solar (excluding resiliency benefits)
- Batteries are still an expensive way to save small amount of carbon





Interpreting modeling results for Commercial battery

- Commercial customers peak earlier than the City load or the CA grid
- Could consider revised TOU or use other tool to align incentives



Next Steps

1. Recommendation from UAC
2. Submit findings of investigation to CEC & Council
3. Investigate more specific cases for resiliency
4. Work to align incentives as prices continue to decrease
5. Consider to pilot electric heat-pumps as distributed thermal storage as less expensive alternative

Recommended Motion

Staff recommends that the Utilities Advisory Commission (UAC) recommend that the Council accept staff recommendation to adopt no energy storage targets in 2020 under AB2514.

CITY OF PALO ALTO UTILITIES

End of Presentation

Questions: Lena.Perkins@CityOfPaloAlto.org