DOCKETED

Docket Number:	20-MISC-01
Project Title:	2020 Miscellaneous Proceedings.
TN #:	234863
Document Title:	AB 2514 City of Vernon 2020 Energy Storage Report and Resolution
Description:	N/A
Filer:	Efrain Sandoval
Organization:	City of Vernon
Submitter Role:	Public Agency
Submission Date:	9/22/2020 9:02:56 AM
Docketed Date:	9/22/2020

RESOLUTION NO. 2020-30

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF VERNON ESTABLISHING ENERGY PROCUREMENT TARGETS OF ZERO MEGAWATT HOURS

SECTION 1. Recitals.

A. The City of Vernon ("City") is a chartered municipal corporation of the State of California that owns and operates a system for the generation, purchase, transmission, distribution and sale of electric capacity and energy.

B. The energy storage law in California, Assembly Bill AB 2514 ("AB 2514"), codified as Public Utilities Code Section 2835 et. seq., adopted in 2010, and subsequently revised, mandates the governing board of each publicly-owned utility (POU) to "determine appropriate targets, if any, for the utility to procure viable and cost-effective energy storage systems."

C. AB 2514, adopted in 2010, requires that the City reevaluate this determination regarding the viability to procure an energy storage target every three (3) years. However, Public Utilities Code Section 9621(d)(1)(B), effective as of 2018, encompasses the requirements of AB 2514, and only requires reevaluation every five (5) years as part of the Integrated Resource Plan.

D. On September 5, 2017, the City Council of the City of Vernon adopted Resolution No. 2017-47 establishing energy procurement targets of zero megawatt hours.

E. By memorandum dated September 15, 2020, the General Manager of Public Utilities has recommended that the City continue its policy of no energy procurement targets on the grounds that procurement of energy systems is not cost-effective at this time for reasons set forth within the City of Vernon Public Utilities Energy Storage Evaluation Report (Attachment 2 to the memorandum), incorporated herein by reference.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF VERNON AS FOLLOWS:

SECTION 2. The City Council of the City of Vernon hereby finds and determines that the above recitals are true and correct.

SECTION 3. The City Council of the City of Vernon hereby establishes energy procurement targets of zero megawatt hours.

SECTION 4. The City Council of the City of Vernon hereby further finds and determines that procurement of energy storage systems is not cost-effective.

SECTION 5. The City Clerk shall certify the passage and adoption of this resolution and enter it into the book of original resolutions.

APPROVED AND ADOPTED this 15th day of September, 2020.

LETICIA LOPEZ, Mayor

ATTEST:

LISA POPE, City Clerk
(seal)

APPROVED AS TO FORM:

ARNOLD M. ALVAREZ-GLASMAN,
Interim City Attorney

I CERTIFY THAT THE FOREGOING RESOLUTION NO. 2020-30 was passed and adopted by the City Council of the City of Vernon at the regular meeting on September 15, 2020 by the following vote:

AYES:	5	Council Members: Davis, Gonzales, Menke, Ybarra, Lopez
NOES:	0	
ABSENT:	0	
ABSTAIN:	0	

LISA POPE, City Clerk
(seal)

City Council Agenda Item Report

Agenda Item No. COV-323-2020
Submitted by: Efrain Sandoval
Submitting Department: Public Utilities
Meeting Date: September 15, 2020

SUBJECT
Energy Procurement Targets of Zero Megawatt Hours

Recommendation:
Adopt Resolution No. 2020-30 establishing energy procurement targets of zero megawatt hours.

Background:
Public Utilities Code Section 2835 et seq. (Assembly Bill 2514) requires the Council to determine targets for Vernon Public Utilities (VPU) for the procurement of viable and cost-effective energy storage systems. The California Energy Commission (CEC) reviews the procurement targets and policies and reports the progress to the Legislature.

The law requires VPU to evaluate the cost-effectiveness and viability of energy storage systems and consider various policies to encourage the cost-effective deployment of energy storage systems. The initial evaluation was due on October 1, 2014. Additionally, VPU was authorized to determine "cost-effective and viable" energy systems. When the energy storage evaluation was completed in 2014 and 2017, the City Council adopted Resolution Nos. 2014-56 and 2017-47 respectively, which established that a target to procure energy storage systems was not appropriate since there were no cost-effective opportunities.

AB 2514 required that the City evaluate energy storage options every three years and determine whether or not to establish a goal for energy storage. Therefore, no later than October 1, 2020, the governing body is required to adopt a target for the amount of appropriate energy storage that VPU will procure by December 31, 2021. However, Public Utilities Code Section 9621(d)(1)(B), effective as of 2018, encompasses the requirements of AB 2514, and only requires reevaluation every five (5) years as part of the Integrated Resource Plan. Accordingly, the next reevaluation will be conducted as a part of VPU's IRP.

VPU staff, through its Integrated Resource Plan (IRP) analysis, evaluated the costs and associated benefits of energy storage (Attachment 2). The analysis determined that the costs of utility-owned and operated technologies exceed the value of the benefits, and hence, do not provide cost-effective, viable opportunities for VPU at this time. Nevertheless, VPU will continue to perform due diligence of energy storage systems as it is moving from research and development to the production realm, and as the potential benefits of these systems begin to clearly outweigh the costs and become feasible to utility operations.

To meet the City's obligation, staff proposes to establish energy storage procurement targets of zero megawatt hours. VPU will, nevertheless, encourage customers to consider this emerging technology where it is cost-effective, as it is the belief of staff that in the long term, energy storage is expected to have substantial impact in the overarching electric system.

Fiscal Impact:
There is no fiscal impact associated with this report.

Attachments:

1. Resolution No. 2020-30
2. Public Utilities Energy Storage Evaluation Report

City of Vernon Public Utilities Energy Storage Evaluation Report

Recommendation

Vernon Public Utilities (VPU) staff recommends that the City Council adopt a resolution that a target to procure energy storage systems is not appropriate at this time. This recommendation comes from the Integrated Resource Plan (IRP) analysis which determined that battery storage is not feasible at this time. This recommendation, however, does not inhibit VPU from evaluating and pursuing cost-effective energy storage solutions that strengthen utility operations in the future. VPU staff will continue to perform its due diligence in the analysis of energy storage systems as they continue to move from research and development realm to the production realm, and as the potential benefits of these systems begin to clearly outweigh the costs and become feasible to utility operations. VPU will seek opportunities to establish strategic partnerships with customers and developers to advance energy storage opportunities for the City.

Executive Summary

Assembly Bill (AB) 2514 (Public Utilities Code 2835 et seq.), the energy storage law in California, requires the governing board of each publicly-owned utility (POU) to "determine appropriate targets, if any, for the utility to procure viable and cost-effective energy storage systems..." The California Energy Commission (CEC) was given the responsibility to review the procurement targets and policies that are developed and adopted by POUs to ensure that the targets and policies include the procurement of cost-effective and viable energy storage systems. The CEC then reports to the Legislature regarding the progress made by each local POU serving end-use customers in meeting the requirements of AB 2514.

The law establishes definitive deadlines for POU compliance within the statute as follows:

1) A POU has the responsibility to evaluate the cost-effectiveness and viability of energy storage systems in their respective electric systems. Additionally, a POU may also consider various policies to encourage the cost-effective deployment of energy storage systems. The initial evaluation was due on October 1, 2014.
2) A POU also possesses the authority to deem any, all or no energy system(s) that are evaluated as being "cost-effective and viable". Taking into account the significant differences between respective POU electric system requirements, the cost-

effectiveness and viability of energy storage technology options may vary greatly for each POU.

When the energy storage evaluation was completed in 2014 and 2017, the City Council adopted a resolution that a target to procure energy storage systems was not appropriate since there were no cost-effective opportunities. In accordance with State law, the City must evaluate storage options and determine whether or not to establish a goal for energy storage every three years. Therefore, no later than October 1, 2020, the government body is required to adopt a target for the amount of appropriate energy storage the POU will procure by December 31, 2021. Policies to encourage the cost-effective deployment of energy storage systems may also be considered by the Governing body.

VPU completed its Integrated Resource Plan (IRP) in November of 2018. The IRP analysis included an evaluation of energy storage. The IRP storage evaluation concluded that energy storage was not cost-effective until 2023. The conclusion embraced a "wait and see" strategy for procuring small amounts of energy storage beginning in 2023 and delaying procurement of larger amounts of energy storage. Energy storage costs are expected to decrease over time and future advances in energy storage technology will likely materialize. VPU performed a sensitivity analysis on energy storage costs to evaluate the impact on the resource plan if energy storage costs were to substantially decline.

VPU's staff endorses the approach recommended by the IRP that currently there is no reasonable justification to procure energy storage systems within the City of Vernon for applications of Ancillary Services, outage mitigation, renewable integration, deferral of transmission and distribution upgrades, load leveling, grid operational support or grid stabilization at this time.

Introduction

In September 2017, after examining a detailed analysis from VPU staff, the City Council found a lack of cost-effective energy storage applications in City of Vernon. This analysis and determination was prompted by State law under AB 2514 that required the governing board of each publicly-owned utility (POU) such as VPU to "determine appropriate targets, if any, for the utility to procure viable and cost-effective energy storage systems." The law also required "reevaluation of energy storage target determinations not less than every three years."

The Energy Storage valuation was developed in response to the requirements of the bill. It provides the findings from the VPU's research on applications and viability of energy storage on the City's electric system. For this evaluation, staff used the analysis from its 2018 IRP to determine the viability of energy storage. The conclusion of this evaluation will serve to identify whether VPU should pursue establishing targeted levels of investment for energy storage.

Energy Storage Background

The purpose of energy storage systems is to absorb energy, store it for a period of time with minimal loss, and then release it when appropriate. When deployed in the electric power system, energy storage provides flexibility that facilitates the real-time balance between electric supply and demand. Maintaining this balance becomes more challenging as the contribution of electricity supplied by intermittent renewable resources expands.

Typically the balance between supply and demand is achieved by keeping some generating capacity in reserve to ensure sufficient supply at all times and by adjusting the output of fast-responding resources such as hydropower. Energy storage systems, however, have the potential to perform this role more efficiently.

Rechargeable batteries are the most familiar form of energy storage technology. Large battery energy storage systems can be connected to the transmission grid to absorb excess wind or solar power when demand for electricity is low and, in turn, release the power when demand is high.

Energy storage also offers a variety of other services such as voltage support, distribution upgrade deferral, regulation of electricity and more, that can benefit the electricity system. Overarching these specific purposes is the intent of AB 2514 bill outlined in the findings and declarations. Energy systems are expected to:

- Integrate intermittent generation from eligible renewable energy resources into the reliable operation of the electric system.
- Allow intermittent generation from eligible renewable energy resources to operate at or near full capacity.
- Reduce the need for new fossil-fuel powered peaking generation facilities by using stored electricity to meet peak demand.
- Reduce purchases of electricity generation sources with higher emissions of greenhouse gases.
- Eliminate or reduce transmission and distribution losses, including increased losses during periods of congestion on the grid.
- Reduce the demand for electricity during peak periods and achieve permanent load-shifting by using thermal storage to meet air-conditioning needs.

- Avoid or delay investments in distribution system upgrades.
- Use energy storage systems to provide the ancillary services otherwise provided by fossil-fueled generating facilities.

Energy Storage Technologies

There are numerous energy storage technologies with varying performance ranges suitable for key electrical applications. It is, therefore, important to understand the different technologies in order to identify the type of storage device that would be appropriate for the use and specific application. The preceding is a brief description of the most notable technologies in this developing industry.

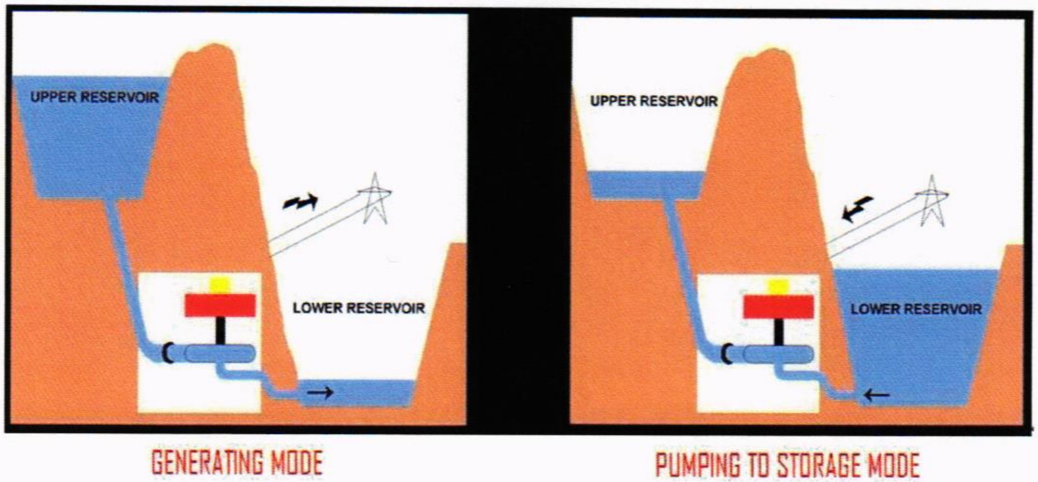
Pumped Hydro

Pumped hydroelectric energy storage is a mature, commercial utility-scale technology that is currently in operation at many locations throughout the country. Pumped hydro draws off-peak electricity to pump water from a lower reservoir to a reservoir located at a higher elevation. When demand for electricity is high, water is released from the upper reservoir, run through a hydroelectric turbine and deposited once again in the lower reservoir in order to generate electricity. Pumped hydro requires sufficient raw land, often hundreds of acres, to create two reservoirs at different elevations. This application has the highest capacity of the energy storage technologies that were studied. The output is only limited by the volume of the upper reservoir.

Projects can be sized up to 4000 MW and operate at approximately 76%–85% efficiency. Pumped hydro plants can have a service life of 50 years, yielding rapid response times that warrant participation in voltage and frequency regulation, spinning and non-spinning reserve markets, arbitrage and system capacity support.

While the siting, permitting, and associated environmental impact processes can take many years, there is growing interest in re-examining opportunities in pumped hydro.

Figure 1 Pumped Storage Hydro

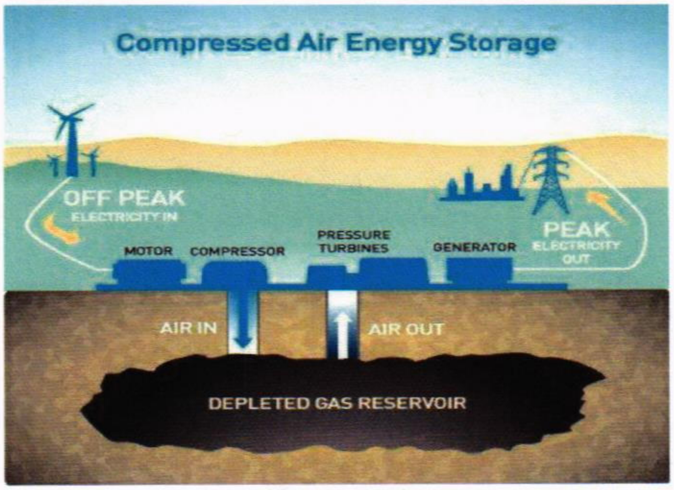


(Source: ClimateTechWiki)

Compressed Air Energy Storage (CAES)

CAES uses off-peak electricity to compress air and store it in an underground reservoir or in above ground pipes. When demand for electricity is high, the compressed air is heated, expanded, and directed through a conventional turbine-generator to produce electricity. Underground CAES storage systems are most cost-effective with storage capacities up to 400 MW and discharge times of between 8 and 26 hours. Siting CAES plants requires locating and verifying the air storage integrity of an appropriate geologic formation within a service territory of a given utility. CAES plants employing aboveground air storage would typically be smaller capacity plants on the order of 3 to 15 MW with discharge times of between 2 and 4 hours. Aboveground CAES plants are easier to site but more expensive to build. CAES systems, which have been around for over 18 years, are the other mature bulk energy storage systems available other than pumped hydro; however, because of the geologic conditions required, few have been developed.

Figure 2 Compressed Air Energy Storage

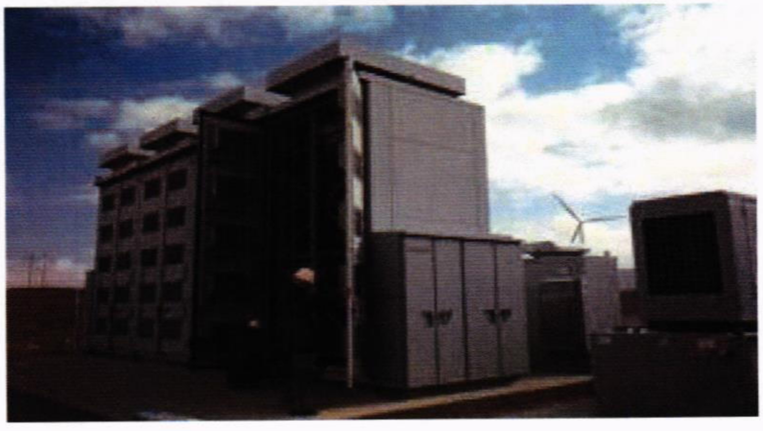


(Source: PGE)

Lead-Acid Batteries

Lead-acid is the most commercially mature rechargeable battery technology in the world. Valve regulated lead-acid (VRLA) batteries are used in a variety of applications, including automotive, marine, telecommunications, and UPS systems. Transmission and distribution applications are rare for these batteries due to their relatively heavy weight, large bulk, cycle-life limitations and maintenance requirements. Serviceable life can vary greatly depending on the application, discharge rate, and the number of deep discharge cycles. Battery price can be influenced by the cost of lead, which is a commodity. Finally, very limited data is available regarding the operation and maintenance costs of lead-acid based storage systems for grid support.

Figure 3 Lead-Acid Battery Storage



(Source: Energy Source Publishing)

Flow Battery

Vanadium redox batteries are the most mature type of flow battery systems available. In flow batteries, energy is stored as charged ions in two separate tanks of electrolytes, one of which stores electrolyte for positive electrode reaction while the other stores electrolyte for negative electrode reaction. Vanadium redox systems are unique in that they can be repeatedly discharged and recharged. Like other flow batteries, many variations of power capacity and energy storage are possible depending on the size of the electrolyte tanks.

Vanadium redox systems can be designed to provide energy for 2 to 8 hours depending on the application. The lifespan of flow-type batteries is not significantly impacted by cycling. Suppliers of vanadium redox systems estimate the lifespan of cell stacks to be 15 or more years.

Figure 4 Flow Batteries

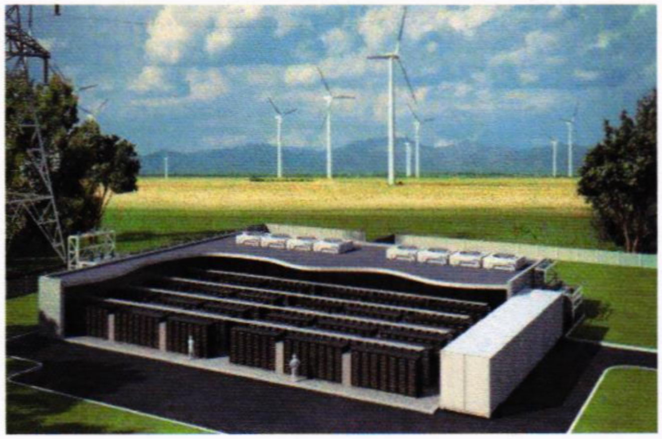
(Source: Construction21.eu)

Lithium-Ion (Li-ion)

Rechargeable Li-ion batteries are commonly found in consumer electronic products, which make up most of the worldwide production volume of 10 to 12 GWh per year. A mature technology for consumer electronic applications, Li-ion is positioned as the leading platform for plug-in hybrid electric vehicle (PHEV) and electric vehicles (EV).

Given their attractive cycle life and compact nature, in addition to high efficiency ranging from 85%–90%, Li-ion batteries are being considered for utility grid-support applications such as distributed energy storage, transportable systems for grid-support, commercial end-user energy management, home back-up energy management systems, frequency regulation, and wind and photovoltaic smoothing.

Figure 5 Lithium Ion Battery



(Source: Clean Technica)

Flywheels

Flywheels are shorter energy duration systems that are not generally attractive for large-scale grid support applications that require many kilowatt-hours or megawatt-hours of energy storage. They operate by storing kinetic energy in a spinning rotor made of advanced high-strength materials, charged and discharged through a generator.

Flywheels charge by drawing off-peak electricity from the grid to increase rotational speed, and discharge when demand is high by generating electricity as the wheel rotation slows. Flywheels enjoy a very fast response time of 4 milliseconds or less, can be sized between 100 kW and 1650 kW and may be used for short durations of up to 1 hour. Flywheels possess very high efficiencies of about 93% with a lifetime estimated at 20 years.

Because flywheel systems are quick to respond and very efficient, they are being positioned to provide frequency regulation services. Flywheels are currently being tested to provide ISOs with frequency-regulation services in the northeast.

While there are several installed flywheel applications, their long-term life and performance characteristics are still uncertain, particularly at a utility scale. Like other technologies, flywheels need to mature for grid-scale applications but would be a viable technology for smaller, customer sited applications. Flywheels are still costly and have not yet been fully vetted at a distribution scale.

Figure 6 Flywheels

(Source: Beacon Power)

Energy Storage Assessment-IRP Analysis

Energy Storage Systems

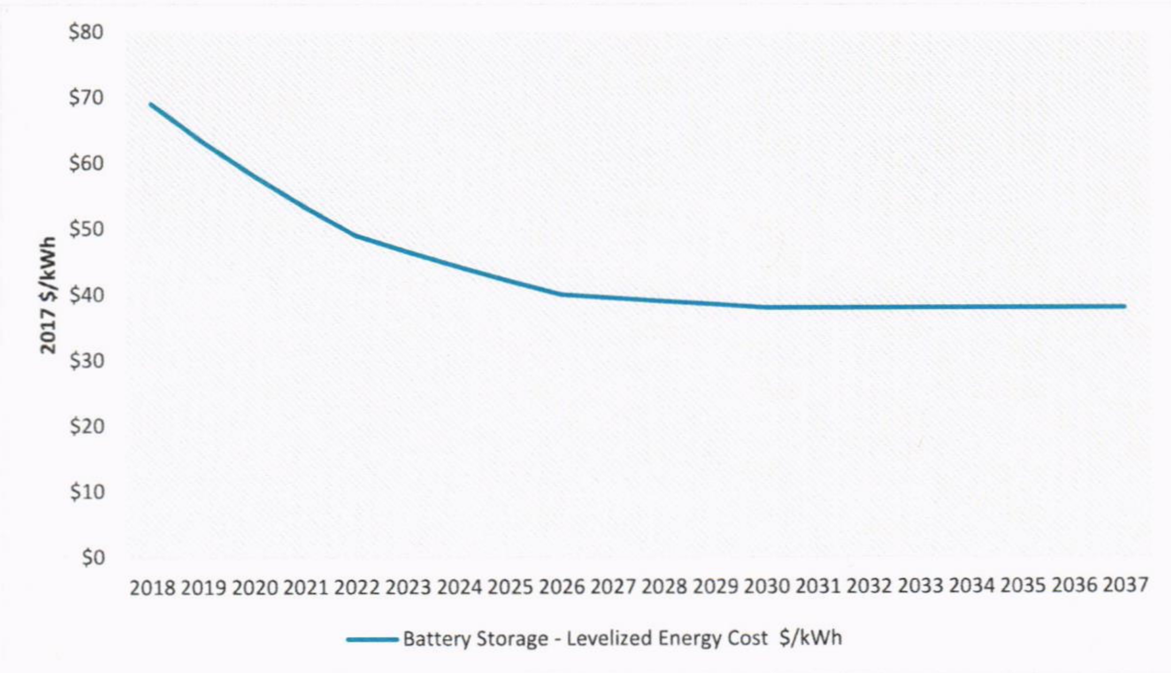
Lithium ion battery energy storage systems (BESS) were included as a possible future resource to provide flexible capacity, reduce solar over-generation, and replace the capacity provided by MGS when the PPA expires in 2028. The capital costs for BESS are typically broken down into two main components:

- Power Component (MW) – Represents the cost of the non-storage parts of the battery including interconnection, EPC, installation, and balance of plant (BOP). A 20-year book life was assumed.

- Energy Component (MWh) – Represents the cost of the lithium-ion energy storage component of the plant. Assumptions for this component include a 10-year book life before full degradation, battery cells are replaced after 10 years and the cost of replacement is included in the energy component.

Figure shows the energy component levelized cost of a Li-Ion BESS assuming a 20-year life including battery cell replacement after 10 years. Between 2018 and 2030 BESS costs are expected to decrease by almost 50%.

Figure 7: BESS Energy Component Levelized Cost



Source: CPUC IRP – Sept 2017

The projected future cost of BESS is uncertain, therefore, VPU used a conservative estimate of future BESS cost declines. Efforts to electrify the transportation sector will have a significant bearing on how fast BESS technology costs decline over the long term. The demand for Li-ION is much greater in the transportation sector compared to the electric sector. Higher adoption rates of electric vehicles would likely lead to lower cost for stationary storage technology. The cost assumptions for energy storage technology will be reviewed in future IRP updates.

Utility-scale energy storage in the form of a BESS can provide many system benefits including energy arbitrage, RA, reduction of solar over-generation, as well as providing ancillary services. The IRP analysis shows how the cost of battery storage is not feasible until 2023. VPU performed a sensitivity analysis on the cost of energy storage, which is discussed in the risk analysis section.

Risk Analysis

The resource technology that appears to be the best solution today may not be the most viable option ten years from now. Before solar PV gained market share as the dominant solar technology, solar thermal appeared to be the best technology. As much as the cost of solar technology has decreased in the past several years, the recent development of bi-facial (two-sided) solar panels could result in even further costs declines. Similarly, lithium ion (Li-ION) based battery technology appears to be the dominant energy storage resource, but a competing technology such as flow batteries may experience a manufacturing breakthrough and overtake Li-ION in the future.

To mitigate the technology risk VPU intends to avoid, if possible, being the early adopter of new technologies until they become commercially proven and costs stabilizes. As such, the IRP recommends a gradual phasing in of energy storage beginning in 2023. Energy storage could be in the form of behind-the-meter or in front of the meter. Should another energy storage technology experience breakthrough in costs, VPU will still have the flexibility to evaluate other energy storage resources in addition to Li-ION.

Battery Storage Sensitivity

The projected future cost of energy storage is a major uncertainty that can have a large impact on future resource decisions. Reaching the 100% carbon-free goal by 2045 may require replacement of existing natural gas-fired resources with energy storage technology. VPU will be faced with such a resource decision when the existing MGS PPA expires in 2028. Energy storage sited locally could be a direct replacement for MGS if energy storage cost decrease at a rate faster than expected. The base case levelized cost of energy (LCOE) for the energy component (storage) of a battery was $38/kWh in 2030. To test the risk associated with acquiring battery storage, VPU completed a sensitivity analysis that varied the cost of battery storage. The assumptions used in the energy storage cost sensitivity analysis are listed below:

Battery Energy Storage Assumptions

- 100 MW
- 85% Efficiency
- 100% Depth of Discharge(DOD)/100% State of Charge (SOC)
- Operate daily for 4 hours a day for 350 days/year
- 2030 Levelized Cost of Power =$28/kW
- 2030 Levelized Cost of Energy =$38/kWh
- Low Sensitivity - 2030 Levelized Cost of Power =$17/kW
- Low Sensitivity – 2030 Levelized Cost of Energy =$16/kWh
- 140,000 MWh annual generation
- Charging cost is equal to LCOE of solar

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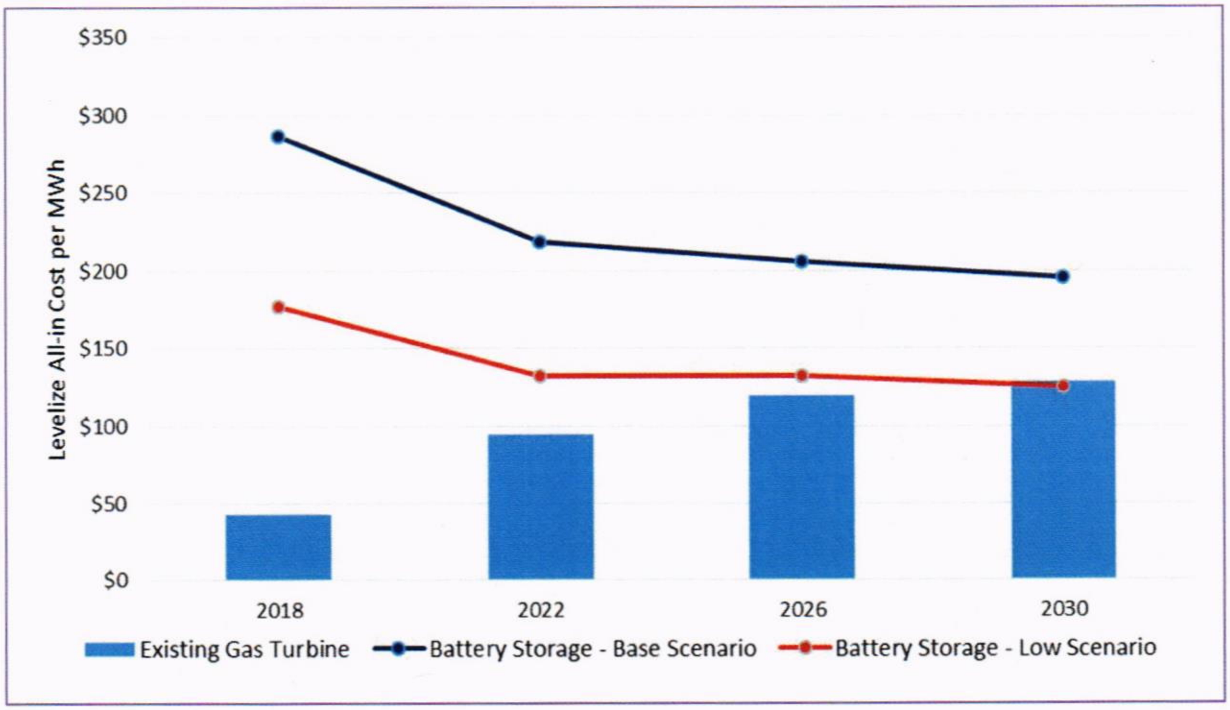
Natural Gas Turbine Assumptions

- 100 MW
- 2030 Levelized capital cost Existing Natural Gas Plant = $88/kW-yr
- 2030 Levelized capital cost New Natural Gas Plant = $197/kW-yr
- Heat Rate 10,000 Btu/kWh
- Variable O&M $3.65/MWh
- Operate daily for 4 hours a day for 350 days/year
- 2030 Natural Gas Prices = $4.28/MMBtu
- 2030 GHG Price = $39/metric ton
- 140,000 MWh annual generation

Under a low energy storage cost sensitivity, the all-in-cost of energy storage appears to be cost-competitive with natural gas-fired generation in future years. The all-in-cost is defined as the levelized capacity, storage, fuel, variable operating costs divided by the total annual generation.

Figure 8 below shows the economic comparison between energy storage and an existing natural gas resource.

Figure 8: Low Energy Storage Cost Comparison with Natural Gas



The cost of operating natural gas-fired generation increases over time due to increasing capacity, fuel, and emission costs. The cost of energy storage is expected to decline over time due to decreasing capital costs. The cost of energy storage intersects with the cost of natural gas-fired generation in 2030 under the low energy storage cost sensitivity case. This high level sensitivity analysis was performed by VPU to stress test how energy storage costs could impact resource decisions. Faster declines in battery energy storage technology costs between now and 2028 could make replacing MGS with energy storage a viable resource option.

Conclusion

VPU staff performed an evaluation of the cost and associated benefit of energy storage in its IRP. Over ten or twenty years of storage actual life, the costs of utility-owned and operated energy storage technologies exceed the value of the benefits, and hence, do not provide cost-effective, viable opportunities for VPU. More specifically, VPU staff endorses the approach that currently there is no reasonable justification to procure energy storage systems.

Nevertheless, VPU will continue to perform its due diligence in the analysis of energy storage systems as they continue to move from research and development realm to the production realm, and as the potential benefits of these systems begin to clearly outweigh the costs and become feasible to utility operations. VPU will also seek opportunities to establish strategic partnerships with customers and developers to advance energy storage opportunities for the City. VPU will consider to participate in pilot programs such as working with local technology providers to install energy storage solutions in utility premises.

It is the belief of the VPU staff that in the long term, energy storage is expected to have an impactful role in the overarching electric power system. Staff will monitor energy storage systems and evaluate its cost effectiveness and feasibility to the utilities operations. To meet the City's obligation under AB 2514 while adhering to VPU's IRP, staff proposes that energy storage procurement targets are not adopted by virtue that energy storage is not cost-effective, and therefore inappropriate for the City at this time.