North Bay Energy Storage
Economic Impact on Sonoma County

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Executive Summary

North Bay Energy Storage (NBES) is a proposed 100 megawatt/400 megawatt-hour, grid-connected, battery energy storage system in southern Sonoma County. The facility would provide daily energy reliability from large-scale, rechargeable lithium-ion batteries during normal operations and can also be available to serve the electric grid during power outages, like Public Safety Power Shut-offs (PSPS). Having a large, local, non-emitting and on-demand source of energy can help stabilize the local electricity system and maintain reliability for essential services like heating and cooling, water and internet connectivity while also benefiting overall economic development and improving the quality of daily life for Sonoma County residents. During natural disasters, like wildfires, NBES can mitigate power losses to keep businesses and households functioning. Projects such as NBES also provide social benefits by supporting climate change goals, integrating renewables and enhancing overall energy and grid resilience. This study considers the economic impacts from the construction and operational benefits of a large grid-scale battery energy storage system such as NBES. The study also specifically examines the economic benefits to the region from NBES in providing emergency power when broader electric grid sources are not otherwise available, such as during a PSPS event. Strata Clean Energy, the developers of North Bay Energy Storage, commissioned this study.

NBES' apparent economic impacts on Sonoma County come from construction and operations. The estimated cost of installation is approximately $116.65 million over 8 to 12 months. This level of spending creates another $61 million in business revenues, supporting approximately 92.5 jobs during construction and generating $6.18 million in state and local tax revenues. NBES would also improve land at the former Adobe Creek Golf Course, creating more than $14 million in cumulative, property-tax revenue gains over the 20-year asset life of the batteries. The batteries' purchase and their installation are directly attributable to $1.2 million of the estimated $1.855 million in sales tax revenues from the installation phase. Construction would take place in 2023 or 2024 if approved by the County of Sonoma by the second half of 2022.

NBES provides energy and capacity as well as associated benefits year-round to maintain electric-grid stability during peak demand times, integrate and store energy from renewable sources (geothermal and solar as examples) and can also provide power during transmission-line outages. One of this installation's economic benefits is the circumvention of economic losses during a PSPS episode. Pacific Gas and Electric (PG&E) and other utilities have created PSPS events to reduce the risk of infrastructure failure, during abnormal wind or weather conditions, creating fires. NBES' operations economic impacts come primarily from the offset any commercial losses due to a lack of electricity. These offsets range from restaurants not losing business and inventory (which means more costs after power is back on) to workers not losing wage income to keeping internet services going and keeping communication lines open. To estimate the commerce that NBES can help maintain during prolonged outages, we consider a recent study on Sonoma County and its methodology concerning PSPS episodes. In a 24-hour period, there may be as much as $106 million regained in the Sonoma County economy through NBES providing power. That $106 million across the affected County areas has a total impact of over $181 million per 24-hour equivalent day of power loss, affecting approximately 24,000 workers or about 10 percent of the county workforce. Such changes would reduce state and local tax revenues by over $7.3 million per day of power shutoff. Social benefits also come from the batteries supporting less dependency on fossil-fuel based electricity during peak use times, stabilizing electricity prices

through fixed long-term contracts and reducing electric grid congestion costs.

The size and scope of a PSPS episode may change depending on the number of PG&E customers affected and where those affected customers live versus commercial centers in Sonoma County. However, areas with no power affect those adjacent because of regional economic connections. For that reason and others, these estimates should be viewed as conservative.

1. Introduction

This study considers the economic impacts of a 100 megawatt/400 megawatt-hour, grid-connected, battery energy storage system in southern Sonoma County called North Bay Energy Storage (NBES). NBES has the potential, depending on electrical-use averages, to power up to an equivalent of 111,000 average, single-family homes in southern Sonoma County and northern Marin County. NBES is proposed to be adjacent to the Pacific Gas and Electric (PG&E) Lakeville substation (Lakeville) in eastern Petaluma. Substations throughout Sonoma, Napa and Marin Counties are connected to Lakeville, allowing NBES to serve the region. The battery project can serve 100,000 kilowatt hours of energy for four hours when fully charged and ready for use. Daily operations of NBES includes providing energy and capacity to help stabilize supply, store excess solar, wind and geothermal energy to be used after dark and providing electricity during peak times instead of relying on carbon-emitting power resources. An additional, key benefit of NEBS is powering customers, including commercial customers, during power outages. Estimated, negative economic impacts from public safety power shutoffs (PSPS) episodes can be reduced or potentially eliminated for the covered region if PSPS episodes are coordinated with back-up power sources, like NBES. The battery installation itself also has economic impacts, creating business revenue, local and state tax revenues, and also supporting jobs during the installation/construction phase. Social benefits from renewable energy storage, internet and energy stability on a daily basis, and less dependence on fossil-fuel energy generation during peak demand times adds to NBES' benefits for Sonoma County and the region. Strata Clean Energy, the company developing North Bay Energy Storage, commissioned this study.

Economic Impact Methodology

There are broader effects of building and operating NBES in southern Sonoma County. The construction and operations create ripple effects, like those from throwing a rock into a still pond; the rock is NBES construction and operations, creating broader, additional economic impacts that include supported jobs, annual business revenues and new tax receipts. **Direct** effects include the construction budget and the reduced costs during a power outage, like a PSPS episode. **Indirect** effects come from vendor relationships and broader business and worker spending. For example, NBES may purchase electrician services from a local company. This vendor spending supports some portion of the electrician's company and its employees. This indirect spending then becomes **induced** effects, including the electrician's employees spending their wages on groceries, medical visits, restaurant meals, and various other industries based on the advent of NBES. Figure 1 shows the theoretical ripple or "multiplier" effects of these rounds of new spending.

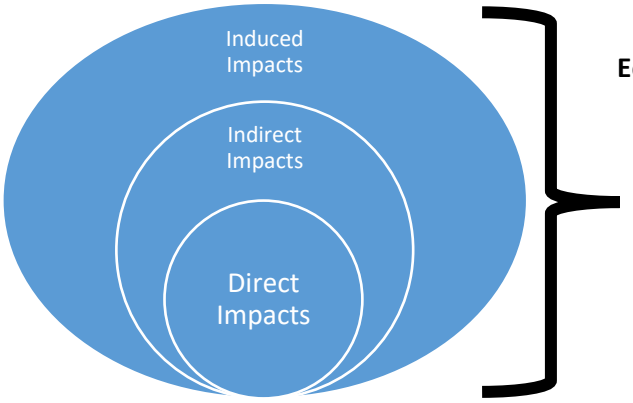

Figure 1: Economic Impacts

This study has four sections. The next, section two (2), describes the battery site and installation costs to

determine assumptions for the installation's economic impacts. Section three (3) summarizes how NBES provides benefits to Sonoma County, including how to consider savings during public safety power shutoffs (PSPS) and providing power to offset potential losses. Section four (4) provides the economic impact estimates for circumventing power losses.

2. The Battery Site and Installation Costs

Any commercial site installation or entry of a business onto a piece of bare land has economic impacts during its construction phase. In this case, NBES is proposed on a portion of the former Adobe Creek Golf Course, east of downtown Petaluma. The site is currently a large, fallow field that is unlikely to bring an increased economic benefit to the county in the future. This investment would transform the property into a public-benefit site that provides jobs, facilitates renewable energy and greenhouse-gas goal achievement while also fitting within the allowable zoning-use as a public utility. In light of the land's restrictive covenants, this battery project is compatible and increases the property's assessed value.

The installation period is estimated from May 2023 to June 2024. The capital expenditures on installation have an estimated cost in 2023 dollars of $116.65 million. These include both "soft" (project management, design and fees) and "hard" (labor and materials) cost estimates, as well as site development costs. The installation budget size dictates the economic impacts' size; the scope of industries affected is based on how such a construction and installation project buys goods and services, hires workers at a certain wage, and how vendors and workers spend their incomes. Figure 2 and 4 (below) use these direct impacts and the Sonoma County model of economic connections among industries to estimate how installation spending generates benefits for other industries and supports jobs and tax revenues.

- Installation Hard costs = $83.65 million;
- Installation Soft costs = $18 million;
- Development Soft costs = $15 million.

Figure 2: Business Revenues from Installation, 2023 Dollars, NBES

Industry	Direct	Indirect	Induced	Totals
Installation	$116,650,000			$116,650,000
Property Income for Rental Owners			$6,660,000	$6,660,000
Architectural, engineering, related services		$2,914,000	$106,600	$3,020,600
Real estate agency		$1,463,700	$1,550,200	$3,013,900
Durable goods merchant wholesalers		$1,896,200	$241,500	$2,137,700
Commercial/industrial machinery rental		$2,013,200	$63,700	$2,076,900
Building and garden and supplies stores		$1,743,800	$221,800	$1,965,600
Hospitals			$1,922,800	$1,922,800
Tenant-occupied housing			$1,576,900	$1,576,900
Full-service restaurants		$102,300	$1,203,000	$1,305,300
Employment services		$757,500	$399,800	$1,157,300
Banks and credit unions		$305,100	$815,800	$1,120,900
Offices of physicians			$993,900	$993,900
Other local government enterprises		$165,200	$815,800	$981,000
All others		$11,000,400	$21,473,900	$32,474,300
Totals	**$116,650,000**	**$22,361,400**	**$38,045,700**	**$177,057,100**

Note: Data on installation costs from Strata Clean Energy

Figure 3: Employment supported During Installation Period, Number of Full-Time Equivalents, NBES

Industry	Direct	Indirect	Induced	Totals
Battery Installation	60.0	0.0	0.0	60.0
Architectural, engineering, and related services	0.0	1.7	0.1	1.8
Full-service restaurants	0.0	0.1	1.5	1.6
Other real estate	0.0	0.7	0.7	1.4
Building material and garden equipment and supplies stores	0.0	1.2	0.2	1.4
Employment services	0.0	0.8	0.4	1.2
Individual and family services	0.0	0.0	1.0	1.0
Limited-service restaurants	0.0	0.0	0.9	0.9
Wholesale - Other durable goods merchant wholesalers	0.0	0.7	0.1	0.8
Hospitals	0.0	0.0	0.8	0.8
Automotive repair and maintenance, except car washes	0.0	0.2	0.5	0.7
All other food and drinking places	0.0	0.1	0.6	0.7
Retail - Food and beverage stores	0.0	0.0	0.6	0.6
All Others	0.0	5.4	14.4	19.8
Totals	**60.0**	**10.9**	**21.8**	**92.7**

Figure 4: State and Local Tax Revenues During Installation Period, 2023 Dollars, NBES

Taxes	Total
Employment Taxes	$264,800
Sales Taxes	$1,929,400
Property Taxes - Commercial	$729,200
Property Taxes - Residential	$67,000
Personal Income	$2,427,800
Other Taxes and Fees	$766,900
Total State and Local Taxes	**$6,185,100**

Summary and Communities

The data above are typical for energy infrastructure projects during construction or installation. Over 92 jobs are supported during the construction period, with 60 jobs on site. The additional $61 million in business revenues support the over $6 million in state and local tax revenues. The land improvements of the blighted site create more property taxes annually for the County of Sonoma, perhaps as much as $14 million in cumulative gains over the 20-year asset life of the batteries. Approximately $1.2 million of the $1.855 million in estimated sales tax revenues during installation is attributable to the purchase of the batteries in Sonoma County.

Once installed, North Bay Energy Storage (NBES) would serve the region with electricity on a daily basis and could be utilized to electrify specific communities as needed when power failed or when power was shut down for public safety reasons. The number and type of customers that can be served by NBES determines the extent of the economic impacts, both commercial and residential. The site location at the PG&E Lakeville substation and the connecting to the 60 kilovolt (kV) grid-system would allow for Petaluma, Cotati, Glenn Ellen, the town of Sonoma, Rohnert Park, and southern Santa Rosa to be the most likely communities using power from NBES. Novato in Marin County may also be able to utilize NBES due to the area's connection with the Lakeville substation. A recent study by Moody's Analytics

provides a way to help determine the direct economic impacts, and ultimately estimate what NBES could save the Sonoma County economy once installed on a per-day basis.

3. The Economic Impacts and Social Benefits of NBES

The installation phase gives way to an operations phase (Sections 3 and 4), providing a broader return on investment to NBES. This battery site installation is unique and is not like a new restaurant or manufacturing space. It is designed for the public good with additional benefits of providing power when not otherwise available from traditional sources, replacing fossil-fuel energy generation during peak-use periods and supporting climate-change goals more generally over the next two decades.

The core benefit of NBES is to provide stable energy in Sonoma County (and northern Marin County) from a rechargeable source. Other benefits include internet resiliency, continuous power reliability, and an ability to isolate power outages to a specific area. NBES is poised to provide energy approximately 300 days a year to help stabilize supply during peak-demand times, and also acts as a back-up source for tens of thousands of electricity customers during outages. As fossil-fuel power stations are slowly de-commissioned, battery installations such as NBES provide regional stability and resilience in times of rising power demand, but also allow for energy storage from excess solar or geothermal power generated in off-peak hours. The agreements with local utilities that will purchase power from NBES for final customers will also provide price stability and consumer savings from a rechargeable, local power source. The analysis below provides a way to consider the economic benefits from operations; the storing of excess energy, primarily from solar and geothermal, and delivering it to the grid when it is needed most has broad social benefits (see more below). NBES revenue, as a business, comes from selling stored energy and having energy available to be called on by electric utilities (there are approximately 300 days a year when the batteries would be used, where other times of the year would be for maintenance and upgrades).

Loss of power and internet to homes and businesses due to widespread power outages can disrupt many aspects of everyday life and commerce. An example concern for Sonoma County is wildfires and how PG&E is reacting to severe weather events (unseasonable wind events during fire season primarily) using public safety power shutoffs or PSPS episodes. As a result of three years of wildfires in Sonoma County, the Sonoma County Economic Development Board (EDB) commissioned a study by Moody's Analytics to estimate the economic impacts of a PSPS on Sonoma County's economy. Planned power outages took place in October 2018 in Sonoma County and then again in 2019 and in 2020 to avoid or reduce fire episodes. Similar to the fire events that led to evacuations, the power outage events resulted in people temporarily leaving the area due to a lack of power and short-term business closures.

Modeling how power outages affect the economy, and how keeping power on and reducing the detrimental economic impacts provides an algorithm for estimating how NBES can support Sonoma County's economy. While circumventing physical damage and minimizing potential fire spread from what was known as the Kincade Fire in 2019, the PSPS episodes created economic costs. Those business and residents without power could not operate per normal or remain in their current homes for reasons that

stretched from safety concerns to lack of internet connectivity. As part of their methodology, Moody's Analytics used surveys to collect data on projected revenue losses from county businesses for the time the power was off. Moody's Analytics' study determined the following:

- Approximately 39 percent of Sonoma County's residents were affected by the power outages (there were four outages in 2019 identified in the Moody's Analytics study);
- The average resident that experienced power loss was affected for 2.5 days;
- For businesses, survey responses suggested the following conclusions and assumptions:
    - Businesses were affected in both power outage areas and in unaffected areas; and
    - Moody's Analytics used seven major industry sectors to aggregate economic impact data:
        - Goods production (primarily construction and manufacturing);
        - Agriculture;
        - Retailers;
        - Leisure and Hospitality (bars, restaurants, hotels)
        - Transportation and warehousing;
        - "Office-using" services industries (remaining industries except government); and
        - Government.

Using these categories and data on annual business income generated in each of these industry sectors, we can estimate the potential lost revenue from a PSPS episode. For our study, estimated economic impacts come from keeping power on and not losing business revenue. One of the challenges of this analysis is to estimate these impacts without double counting, so the industry-level impacts are estimated simultaneously. For example, reduced overnight stays at Sonoma County hotels become fewer restaurant meals sold and lower levels of retail spending. By estimating hotel, restaurant and retail losses separately, as if unconnected, means losses in each sector would double count the economic relationships among these industries. The IMPLAN® model lets us estimate all the losses at the same time and calculates the impacts to eliminate the double counting.

Estimated revenue losses for each of these industries is where we begin. From their survey results of the 2019 PSPS episodes, Moody's Analytics determined the following estimated percentage of affected businesses in Sonoma County. Figure 5 shows these data and includes data on businesses outside the immediate PSPS areas affected by economic connections to PSPS-affected area businesses.

Figure 5: Estimated Percentage Loss

Industry	In Affected Areas	Outside Affected Areas
Goods production (primarily construction and manufacturing);	75%	28%
Agriculture;	78%	25%
Retailers;	75%	45%
Leisure and Hospitality (bars, restaurants, hotels)	77%	38%
Transportation and warehousing;	48%	20%
"Office-using" services industries; and	75%	30%
Government.	0%	5%

Source: Sonoma County Economic Development Board

To estimate the potential gain from North Bay Battery Storage (NBES) operations, we use Figure 5's (above) data and estimate how specific industries may be affected. Converting data in Figure 5 to specific industries (construction, manufacturing, leisure and hospitality as examples), we can then link a percentage of total business income lost during a PSPS to annual estimates of total income from these industries. In 2019, the Sonoma County economy is estimated to have produced approximately $33 billion of gross product, or income retained within the County borders by its businesses, non-profits and government sectors. In Figure 6, we provide assumptions that drive our economic impact estimates for NBES operations. Some assumptions are:

1. NBES stabilizes and maintains power such that no residents or businesses in PSPS-affected areas are forced to adjust and can expect continuous power and internet service;
2. The PSPS does not last any longer than the power available through NBES and take place during normal business hours; and
3. The mix of industries in Sonoma County remains similar over time.

If the third assumption is violated, there are simply shifts of economic impacts from one industry to another. Figure 6 provides the baseline data in terms of potential loss of business revenues in 2021 dollars given the current industrial mix and size of the Sonoma County economy. These data include potential affected and unaffected areas combined based on Figure 5's estimates from the 2020 study by Moody's Analytics.

Figure 6: Direct Economic Impact Data for NBES, One 24-hour day of Commercial Activity

Direct Impact	Link to Figure 5	Estimated Loss
Agriculture	Agriculture	$2,184,600
Natural Resources	Goods production	$466,900
Utilities	Goods production	$862,900
Construction	Goods production	$8,813,300
Manufacturing	Goods production	$22,847,200
Wholesale	Transportation and warehousing;	$6,623,000
Retail	Retailers;	$6,188,500
Transport and Logistics	Transportation and warehousing;	$1,126,100
Information	"Office-using" services industries; and	$3,668,000
Financial Services	"Office-using" services industries	$5,496,300
Real Estate, Rentals and Leasing	"Office-using" services industries	$16,388,400
Professional Services	"Office-using" services industries	$7,340,300
Management of Companies	"Office-using" services industries	$1,174,100
Admin and Waste Services	"Office-using" services industries	$3,699,400
Education	"Office-using" services industries	$568,700
Health Care and Social Assistance	"Office-using" services industries	$9,306,100
Arts, Entertainment, and Recreation	Leisure and Hospitality (bars, restaurants, hotels)	$1,321,700
Accommodation and Food Services	Leisure and Hospitality (bars, restaurants, hotels)	$4,347,700
Other Services	"Office-using" services industries	$3,727,000
Government	Government	$499,500
Totals		**$106,649,700**

Sources: Moody's Analytics, Bureau of Economic Analysis, Author's Calculations

Logic for Direct Economic Impact Data in Figure 6:

- We used 2019 gross regional product levels[1] for each industry category to determine the relative size of each industry in terms of income generated in Sonoma County;
- We used Figure 5's data to determine the potential loss of that income due to PSPS;
  - Affected areas have estimated percentage of income lost based on the 2020 study;
  - Some unaffected areas also face losses due to supply-chain relationships, lack of commerce and tourism generally due to PSPS;
- When an "affected" area has restored power based on the number of customers NBES can serve, the unaffected areas have their losses also reduced.

The data in Figure 6 are the 24-hour equivalent losses during a PSPS. A fraction of a day, for example four hours, would be a similar ratio of these estimates in terms of potential losses to be circumvented by NBES operations. Multiple episodes over various days that last a fraction or multiple of 24 hours can also be considered by adjusting the totals above to match that number of hours.

What Figure 6 does is provide one aspect of estimated losses that are regained or circumvented by NBES operations. Estimated losses of household incomes or assets also come from PSPS episodes. This could be a combination of perishable goods lost at home, products that no longer work or are damaged as a result of the PSPS, or losses of wage and salary income due to the temporary loss of work due to a PSPS. Moody's Analytics did not call out these losses directly. These data are partially captured in Figure 6, as business revenues generated by local businesses that are forced to shut down during a PSPS episode paying wages and salaries of workers. Because lost assets and goods are not included, our estimates in Figures 7 through 9 are likely conservative.

Social Benefits from NBES and Similar Energy Storage Models

Some academic literature exists to estimate the social benefits of having stored energy such as the proposed project, NBES. Social benefits come from reduced greenhouse-gas emissions, specifically consumer payments that are part of electricity fees or costs that subsidize fossil-fuel infrastructure that is de-commissioned or that exist simply to address peak-use electricity needs (during periods when energy demand is greater than supply). With the battery storage such as NBES, these parts of the generation infrastructure are not needed, and thus there is cost savings. Batteries providing storage for excess solar, geothermal and other renewable energy sources increase the social benefits, as these electrons remain available locally for peak-use demand.[2]

Another example study considers battery projects such as NBES and the social benefits versus the costs of the projects when considering public investment.[3] Ongoing benefits are wide in breadth:

- Carbon abatement;

[1] See https://apps.bea.gov/iTable/index_regional.cfm for more.
[2] See https://cdn.ymaws.com/ny-best.org/resource/resmgr/reports/ny-best_lipa_peaker_replacem.pdf for a recent study concerning the use of battery storage versus "peaker plants" on Long Island, NY.
[3] See Sidhua, Arjan S. and Michael G. Pollittb and Karim L. Anayab (2018) A social cost benefit analysis of grid-scale electrical energy storage projects: A case study, *Applied Energy* vol. 212, pp. 881-894 for this study.

- Environmental benefits through lower environmental costs such as water usage and emissions;
- Physical and Cyber security of energy reduced due to available local power source;
    - This includes better certainty of networks and internet systems to reduce power outage possibilities;
- Enhanced frequency response;
- Preservation of short-term operating reserves for both businesses and households;
- Avoided generation costs are a social benefit by using firm capacity to reduce need to procure generation capacity; and
- Reliability & Resiliency.

As more electric power generation shifts away from greenhouse-gas emitting plants in California, projects such as NBES support climate-change goals. While the calculations of such benefits are dynamic, we do not include an estimate of these benefits here except that their existence due to the battery installation suggests the estimated economic impacts are conservative in terms of how Sonoma County benefits from the NBES project.

There are also effects beyond Sonoma County and its affected subareas when workers outside the county (that may or may not be affected by a regional PSPS) lose incomes due to a lack of business or work on the days affected within Sonoma County. The precision on such estimates is difficult to achieve, and we assume Figure 6's estimates capture the direct impacts and large proportion of the incomes, jobs and tax revenues affected. Let's now look at the economic impacts of NBES operations based on the estimated business income saved from power remaining available during a PSPS.

4. Economic Impact Estimates of North Bay Energy Storage

The economic impacts from NBES are driven by the mix of businesses that are potentially affected by planned power outages because NBES keeps the power on for these businesses. Keeping the power on allows commercial and residential activity to remain in place, thus converting potential losses to positive economic impacts due to foregone losses if electricity was not available otherwise. The assumptions above are restricted to the time when the PSPS takes place.

Consider the loss of internet services alone that would come with power outages. During COVID-19, outages would have exacerbated connectivity problems for those working from home and children at school using the internet to connect to teachers. Such outages also reduce productivity in manufacturing, logistics and warehousing, professional and business services, healthcare industries, and many more.

Using the direct, daily economic impacts in Figure 6 (page 8), we now show the estimated economic impacts for a PSPS episode in Sonoma County. Figures 7 to 9 (below) show the business revenues, jobs and state and local tax revenues preserved because power at local employers and residences continue. These estimates are annualized data considered for one 24-hour equivalent day of effects in annual terms countywide business income .

Figure 7: Business Incomes Preserved by NBES, 2021 Dollars, Annualized Data per 24 hours

Industry	Direct	Indirect	Induced	Totals
Real Estate, Rental and Leasing	$23,569,600	$7,142,200	$1,613,700	$32,325,500
Healthcare and Social Assistance	$13,401,600	$0	$1,035,000	$14,436,600
Construction	$12,746,100	$0	$0	$12,746,100
Professional Services	$10,563,300	$811,300	$409,000	$11,783,600
Financial Services	$7,873,200	$157,300	$320,900	$8,351,400
Accommodations	$6,212,300	$1,500	$2,000	$6,215,800
Manufacturing	$5,437,800	$169,500	$631,900	$6,239,200
Administrative and Waste Mgmt. services	$5,411,500	$266,400	$61,100	$5,739,000
Information	$5,373,700	$151,000	$48,000	$5,572,700
Other Services	$3,480,600	$101,700	$336,800	$3,919,100
Agriculture	$3,157,000	$0	$0	$3,157,000
All Others	$9,423,000	$26,934,500	$35,153,500	$71,511,000
Totals	**$106,649,700**	**$35,735,400**	**$39,611,900**	**$181,997,000**

Figure 8: Jobs Supported by NBES

Industry	Direct	Indirect	Induced	Totals
Real Estate, Rental and Leasing	77.2	23.4	5.3	105.9
Construction	59.3	0.0	0.0	59.3
Healthcare and Social Assistance	57.6	0.0	4.5	62.1
Administrative and Waste Mgmt. services	52.5	2.6	0.6	55.7
Professional Services	43.7	3.4	1.7	48.8
Accommodations	40.6	0.0	0.0	40.6
Other Services	30.1	0.9	3.5	34.5
Financial Services	24.5	0.5	1.0	26.0
Arts, Entertainment, and Recreation	24.1	0.6	1.0	25.7
Information	23.4	0.7	0.2	24.3
Retail Services	14.7	0.4	1.4	16.5
All Others	30.7	118.0	142.9	291.6
Totals	**478.4**	**150.5**	**162.1**	**791.0**

Figure 9: State and Local Tax Revenues Preserved by NBES, 2021 Dollars
Annualized Data per 24 hours

Industry	Totals
Employment Taxes	$290,700
Sales Taxes	$2,718,400
Property Taxes - Commercial	$1,027,400
Property Taxes - Residential	$70,000
Personal Income	$2,511,700
Other Taxes and Fees	$688,600
Total State and Local taxes	**$7,306,800**

The 791 estimated jobs supported is a full-time, annualized equivalent value, based on a monthly average. These 791 workers represent approximately 24,000 workers or about 10 percent of the county workforce in 2019 (pre-COVID 19 recession) when there is a general power loss. We assume such a power loss is a temporary shock with very few actual "lost" jobs, just workers temporarily affected.

Summary

We estimate the direct benefits of electricity availability from NBES by considering how potential economic losses are mitigated by energy coming from NBES when there are regional power outages. Such outages are extreme examples, but illustrate how Sonoma County's businesses and residents are supported by this project. The combination of industries affected by a PSPS in southern Sonoma County are estimated in Figures 5 and 6 (pages 7 & 8). Because there are broader impacts when incomes are lost if a PSPS episode causes evacuations, business closures and other economic disruptions, Figures 7 through 9 use Figure 6's estimates of the potential damage caused in one 24-hour period, or four, six-hour episodes.

- A PSPS episode may affect as many as 24,000 workers in Sonoma County;
    - In some cases, disrupted employment becomes lost wages and reduced household spending;
    - We assume such a disruption is inside the lost business income estimated;
- A PSPS episode may have as much as $181 million of business revenues lost per 24-hour period without power based on the 2020 industry mix and incomes levels in Sonoma County;
    - Our estimates here are based on recent history and Sonoma County's experience with power shutdowns;
    - The Sonoma County economy generates approximately $33 billion in gross product per year as of 2019 (pre-COVID 19 levels);
    - The $181 million per equivalent day may rise or fall with changes in the size and scope of Sonoma County economy's, or with different areas affected by a PSPS episode;
- A PSPS episode, due to disrupted business incomes, also affects state and local tax revenues generated by local economic activity;
    - NBES' operations preserve business incomes and income for households such that there is also not a disruption in planned tax revenues such as sales taxes, fees, and other revenues sources;
        - For every $100,000,000 of lost business activity, there is $4 million of lost state and local tax revenues generated in the Sonoma County economy based on the mix of affected businesses shown in Figure 6;
    - PSPS episodes may also impute risk into property holdings, reducing the growth of values such that property tax revenues may suffer due to commercial or residential properties not selling at the price they would but for the PSPS (such an estimate is shown in Figure 9).

These estimates, to remain conservative, do not count lost assets in businesses and homes, such as restaurant or retail inventory of perishable items (food as an example) or similar losses in households. These data also become an algorithm by which estimates can be made for smaller or larger PSPS episodes in terms of equivalent days of power loss to Sonoma County.

5. Conclusions

Battery storage, such as the proposed North Bay Energy Storage (NBES) project, has economic and social benefits based on its daily operations. NBES is proposing a large grid-connected battery installation that has economic impacts from both the installation process and also from daily operations and as a back-up electricity source when power otherwise is not available on the transmission grid. This study considers how a reserve energy source that powers a portion of a PSPS-affected area reduces economic damages from power loss. For example, a loss of power means a loss of internet connectivity, consistency and reliability. Thousands of businesses and tens of thousands of households would be affected by that change alone. Because of recent disasters in California, there continues to be a threat of forced power outages through public safety power shutoffs or PSPS events to reduce the risk of infrastructure failure creating widespread damage. What NBES can do is help to isolate specific areas most likely to be affected during a disaster and keeping power on for other areas to preserve both assets and incomes and minimize the societal cost of such an outage. Everyday operations provide energy stability to Sonoma County, store excess renewable energy for use when needed and support climate-change goals locally and throughout California.

This study estimated economic impacts from both the battery installation and operations. The economic impacts from installation and construction are classic and similar to commercial construction efforts. The estimated cost of installation is $116.65 million over an 18-month period. The spending creates another $58 million in business revenues, supporting approximately 92.5 jobs during construction and $5.95 million in state and local tax revenues, primarily sales tax revenues at the local level. There would also be land improvements creating an increase in property tax valuations on a currently-blighted parcel. There would be approximately $1.2 million in sales tax revenue for Sonoma County from the battery purchase. Construction would likely take place in 2023 or 2024 if the project was approved by the second half of 2022.

The operations impacts are more complex and we provide an algorithm to show how NBES operations offset losses of power (in a sense provide a social benefit by keeping power on), the economic impacts are based on preserved economic activity. Using a recent study by Moody's Analytics concerning the PSPS events in 2019 as a guide, our methodology suggests that as much as $106 million could be preserved versus lost in Sonoma County per 24-hour period for sustained power losses given the size of Sonoma County's economy in 2019. That $106 million across the affected county areas has a total impact of over $181 million per 24 hours of power loss on the county economy, affecting approximately 24,000 workers when power is lost, and reducing state and local tax revenues by over $7.3 million per 24 hours of time without power during times of otherwise normal business operations. This algorithm can be used regardless of power loss cause and varies based on the amount of Sonoma County's economy is affected and for how long by power loss.