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Economic Assessment of Solar and BESS Resource Development under an Amended Williamson Act Solar Use Easement Statute

Technical Report

Prepared for: Large-Scale Solar Association

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Executive Summary

This study assesses the economic and fiscal impacts of solar development in the San Joaquin Valley (SJV) under an amended solar use easement statute that would be more permissive of solar development on prime soils while suspending Williamson Act (WA) status for the duration of solar and battery energy storage system (BESS) resource projects. This legislation would allow for the development of fallowed agricultural land into solar energy generation without requiring the cancellation of WA contracts and is anticipated to lead to more agricultural producers voluntarily converting land impacted by water supply changes to solar energy production, leading to significant positive impacts for landowners impacted by the Sustainable Groundwater Management Act (SGMA) and more broadly, positive impacts in the regional economy.

SGMA aims to achieve groundwater sustainability, leading to significant reductions in groundwater availability for irrigation. This study projects that SGMA will result in the fallowing of approximately 870,000 acres of irrigated agricultural land by 2040, representing up to a 32% reduction in some counties. This reduction poses a substantial challenge for farmers, many of whom are bound by WA contracts that restrict their ability to diversify land use for alternative economic activities such as solar and BESS resource development, that could vary landowner income streams, stabilizing existing agricultural operations and the larger economy.

SGMA is estimated to result in the fallowing of approximately 870,000 acres of irrigated agricultural land in the SJV Region by 2040.

The study focuses on the intersection of solar energy development and agricultural land use, particularly in light of groundwater sustainability under SGMA. The transition to groundwater sustainability through SGMA is anticipated to lead to irrigation water curtailments for farmers, and ultimately, the significant fallowing of agricultural land in the SJV. Solar development has the potential to ease the burden of SGMA on local farmers and the entire regional economy.

The geographic scope of this analysis includes eight counties in the SJV: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare. These counties were selected based on their significant threat of water curtailments under SGMA, availability of solar-suitable lands, economies focused on agricultural production, and high rates of agricultural landowners under WA contracts. The analysis covers economic, fiscal, and environmental aspects of solar and Battery Energy Storage System (BESS) resource development, providing a comprehensive view of the potential benefits and challenges.

Supply and Demand of Solar Resource Development Land

The future demand for solar and BESS resource development in the SJV Region is modeled using the California Public Utility Commission's (CPUC) 20-year outlook for substation capacity, with anticipated demand for solar of 32,139 MW and anticipated demand for BESS resources of 18,178 MW by 2045.[1] This projection is modelled as a linear increase in substation capacity demand from 2024 to 2045. This simplifying assumption is used since actual increases will be subject to various market and regulatory factors. The land use requirements for solar development are estimated at 10 acres per MW to accommodate BESS and other infrastructure.

An amended solar use easement statute can increase opportunities for landowners to diversify income streams on SGMA impacted land, stabilizing existing agricultural operations, creating jobs and income for local residents, and providing revenue for local taxing districts, all while safeguarding the larger regional economy in the wake of SGMA.

The estimation of land availability for solar development in the San Joaquin Valley (SJV) region utilized a geospatial analysis, leveraging various data sources to determine results. Two scenarios are analyzed as part of this work: a 'With Policy' scenario and a 'Without Policy' or baseline scenario.

The methodology to estimate the supply of solar suitable development land involves intersecting relevant land type layers to estimate policy eligible and baseline eligible acres for solar development. For policy eligible acres, solar suitability was overlaid with irrigated agricultural land, WA contract land, county boundaries, and SGMA sub-basins. These were constrained by the 2045 substation capacity resource outlook and projected SGMA impacts. Baseline eligible acres were determined by overlaying solar suitability with dryland agricultural land[2], irrigated agricultural land in SGMA sub-basins, and non-contract WA and FSZ parcels. Under the baseline scenario, no WA contracts were assumed to be removed for solar development, and FSZ land was assumed to remain under contract.

Policy Scenario Definition

The proposed policy would amend the WA solar use easement statute to suspend WA status for the duration of solar and BESS projects.[3] This change would enable agricultural producers to convert fallowed land impacted by water supply changes into solar energy production without canceling WA contracts. The expected outcome is an

[1] CPUC. (2023). "Methodology for Resource-to-Busbar Mapping for the Annual TPP". https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2022-irp-cycle-events-and-materials/2023-2024-tpp-portfolios-and-modeling-assumptions/mapping_methodology_v10_05_23_ruling.pdf

[2] This analysis identified almost no dryland agricultural land suitable for solar development in the baseline case.

[3] The amended statute would also eliminate soil requirements for siting solar and BESS projects on irrigated agricultural land impacted by SGMA.

anticipated increase in voluntary conversion of such lands, leading to positive economic impacts for affected landowners and the broader regional economy.

The "Without policy" scenario assumes solar and BESS resource development will occur on baseline eligible acres only. The "With Policy Scenario" assumes development will first occur on baseline eligible acres followed by development on policy eligible acres. This pattern of development generates conservative estimates of buildout due to an amended solar use easement statute since buildout will likely occur on both policy and baseline acres in the "With Policy Scenario".

Based on this analysis, the 2045 substation capacity resource outlook of 32,132 MW requires 321,393 acres of solar suitable development land for full build out. Across the SJV Region, the total supply of agricultural solar suitable land is 1,796,607 acres when unconstrained by other factors. The 'Without Policy Scenario' provides 165,003 acres when constrained geospatially by solar demand and SGMA impacts, corresponding to 16,500 MW of solar resource development potential and 9,179 MW of BESS resource development potential. Conversely, the policy scenario provides 256,574 acres when constrained geospatially by solar demand and SGMA impacts. In total, the supply of solar suitable development acres in the 'With Policy Scenario' totals 285,957 acres, corresponding to 28,596 MW of solar resource development potential and 16,109 MW of accompanying BESS resource development potential. These figures are presented in ES Figure 1.

ES Figure 1. Projected Solar and BESS Resource Development, 2024-2045

Economic and Fiscal Impacts Analysis

The economic impacts of solar and BESS development are analyzed in terms of construction and operations phases. Construction impacts are expected to generate significant economic activity in the region. Once operational, solar and BESS projects will continue to provide economic benefits through job creation, income generation, and increased economic output. The analysis estimates these impacts based on conservative assumptions to ensure realistic projections. While the model estimates impacts through 2045, such impacts would continue well beyond this period, generating significant additional impacts of solar and BESS resource development under an amended solar use easement statute, but these additional impacts are not estimated as part of this work.

EMPLOYMENT AND LABOR INCOME SUPPORTED IN THE SJV REGION ECONOMY

The amended solar use easement statute is estimated to create an annual average of 9,800 construction jobs for solar and BESS resource development (including direct, indirect, and induced jobs) over the construction period and support $717.8 million in annual labor income. Cumulatively, over the period from 2024 to 2045, this scenario is expected to support approximately 205,200 FTE jobs and $15.1 billion in labor income. Due to the ongoing nature of solar and BESS resource development in the SJV Region as modelled in this analysis, annual construction jobs may more closely resemble permanent jobs over the duration of resource development as opposed to traditional temporary construction jobs.

Economic impacts of solar and BESS resource operations under an amended solar use easement statute will increase throughout the construction period as additional solar and BESS resources are developed and become operational. Solar and BESS resources are assumed to be fully developed in 2045. Annual economic impacts of solar and BESS resource operations will continue at the full build out magnitude assuming consistent energy production. In 2045, operations at full build out resulting from an amended solar use easement statute are expected to support 1,800 jobs (including direct, indirect and induced jobs), with an associated labor income of $183.6 million annually. Cumulatively between 2024 and 2045, operational impacts of an amended solar use easement statute are anticipated to create 19,300 jobs and $2.0 billion in labor income.

TOTAL VALUE ADDED CONTRIBUTED TO THE SJV REGION ECONOMY

Value added, in general terms, refers to the extra worth that is created in the production process. In other words, value added is the increase in value that a business creates by taking raw materials and transforming them into finished goods or services that are worth more to customers. Different than total economic output, value added presents the dollar amount that is added to the Gross Regional Product (GRP) of an economy.

The construction solar and BESS resources under an amended solar use easement statute would support an estimated $1.2 billion in annual value added, or $25.8 billion cumulatively over 2024 through 2045. The operational total value added at full build out, is estimated to be $575.3 million. Cumulatively between 2024 and 2045, operations are estimated to support a total of $6.4 billion in value added. These figures are presented in **ES Table 1**.

PROPERTY AND SALES TAXES GENERATED IN THE SJV ECONOMY

Solar and BESS resource development is anticipated to generate significant property tax revenue for local governments beginning in 2027 with the sunsetting of the renewable tax exemption. An amended solar use easement statute is anticipated to generate $119.2 million annually in revenue for local governments following the sunsetting of the renewable tax exemption. Over the analytical period of 2024-2045, solar use easements are anticipated to generate a cumulative $2.3 billion in fiscal revenue for local governments.

The materials and equipment needed for construction and operations will be subject to sales tax. County and state sales tax revenue generated from the construction and operations of solar and BESS resources under an amended solar use easement statute would generate a cumulative $826.8 million and $238.5 million for construction and operation, respectively. State and county level sales tax revenue generation during operations would total $22.9 million on annual basis in 2045 and beyond. Fiscal and economic impact estimates of an amended solar use easement statute are presented in **ES Table 1**.

ES Table 1. Economic and Fiscal Impact of Amended Solar Use Easement Statute 2024-45

	Construction	Operation
Property Tax Impacts		
Average Annual		$119,200,000
Cumulative 2024-2045		$2,264,420,000
Sales Tax Impacts		
Average Annual	$39,370,000	$22,900,000
Cumulative 2024-2045	$826,820,000	$238,490,000
Economic Impacts: Jobs		
Average Annual	9,800	1,800
Cumulative 2024-2045	205,200	19,300
Economic Impacts: Income		
Average Annual	$717,810,000	$183,570,000
Cumulative 2024-2045	$15,073,930,000	$2,019,220,000
Economic Impacts: Value Added		
Average Annual	$1,230,090,000	$575,320,000
Cumulative 2024-2045	$25,831,830,000	$6,353,390,000
Economic Impacts: Output		
Average Annual	$1,954,700,000	$963,710,000
Cumulative 2024-2045	$41,048,610,000	$10,625,660,000

Note: Annual average economic impacts for operations are presented at full build out in 2045. These impacts will continue at this magnitude as long as energy production continues at the same amount. All monetary values in 2023 dollars.
Source; ECOnorthwest analysis

Conclusion

Solar and BESS resource development is one way to increase opportunities for landowners to generate new income streams on SGMA impacted lands, diversifying economic activities that could stabilize existing agricultural operations and the larger regional economy in the face of groundwater sustainability. More permissive solar use easements have the potential to increase the supply of solar suitable development land, increasing solar and BESS resource development in the SJV Region by 73 percent over development without an amendment to solar use easements. Under this statute, this development would occur on land that is fallowed due to SGMA, potentially easing the burden of groundwater sustainability on local farmers and the regional economy.

An amended solar use easement statute has the potential to increase solar and BESS resource development by 73 percent in the SJV Region

The potential reduction in agricultural production due to SGMA induced land fallowing are anticipated to occur regardless of a change in the solar use easement statute. Thus, any adverse economic impacts related to the potential reduction in production are attributable to SGMA, not solar and BESS resource development, and as such, fall outside of this model.

California's increased reliance on renewable energy generates additional benefits to Californians, which would increase under an amended solar use easement statute that would suspend WA status for the duration of solar and BESS resource projects, thereby increasing solar and BESS resource development in California's SJV Region. Such benefits include domestic energy reliance, which can safeguard Americans from changing geopolitical and international market conditions that impact energy availability and markets. BESS resource development can support the local grid creating local benefits in the form of increased energy reliability for residents. Carbon-free energy production reduces greenhouse gases, creating significant benefits to the environment, climate, and human health. While these and more benefits of the transition to renewable energy are anticipated to be significant and vitally important to our changing climate and economy, they are outside the scope of this analysis.

Technical Report

This study assesses the economic and fiscal impacts of solar development in the San Joaquin Valley under an amended solar use easement statute that would be more permissive of siting solar on prime soils and would suspend Williamson Act status for the duration of solar and BESS resource projects.[4] This legislation would allow for the development of fallowed agricultural land into solar energy generation without requiring the cancellation of Williamson Act contracts and is anticipated to lead to more agricultural producers voluntarily converting land impacted by water supply changes to solar energy production, leading to significant positive impacts for landowners impacted by SGMA and more broadly, positive impacts in the regional economy.

Methodology, Key Inputs, and Data Sources

Following the geographic area the Bill would affect, the geographic scope of this analysis is a region containing eight San Joaquin Valley counties including Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties (SJV Region) (Figure 1). These counties are the subject of this legislation because they face significant threat of water curtailments due to groundwater sustainability, have significant solar suitable lands (defined by the California Energy Commission), and have high rates of agricultural landowners under Williamson Act contract.

Figure 1: The San Joaquin Valley Region Study Area

Over 6 million acres of land is enrolled in the in the Williamson Act within the SJV Region. The Williamson Act is a policy that was enacted in 1965 to keep agricultural land in farming. Williamson Act (WA) contracts are voluntary agreements between landowners and local governments to restrict development rights on land. In turn, landowners receive a reduced property tax liability. These contracts automatically renew annually, essentially creating indefinite contracts. Landowners wishing to remove property from WA contract have two paths: contract non-

[4] The amended statute would also eliminate soil requirements for siting solar and BESS projects on irrigated agricultural land impacted by SGMA.

renewal and contract cancellation. Contract non-renewal requires nine years with annually escalating property tax assessments over the duration of that time period. Contract cancellation requires a comprehensive review and approval process by the local jurisdiction and financial penalty.[5] Landowners facing water curtailments may be unable to diversify economic activities on WA contracted land through alternative income streams such as solar and BESS resource development based on the current structure of WA contracts.

The timeframe of this analysis runs through 2045, which corresponds to anticipated build-out of renewable energy projects to meet California's Renewable Portfolio Standard under SB 100, requiring the transition to carbon-free energy generation by 2045. This study focuses on quantifying the economic impacts associated with build-out. **The positive economic impacts associated with ongoing project operation as estimated in this study will continue to occur beyond 2045, which means this study underestimates the lifetime cumulative benefits of the policy adoption**. Wherever possible, conservative assumptions and estimates are used in this analysis to ensure the findings of this study represent a conservative estimate of the potential impacts of amended solar use easements.

Demand for Substation Capacity and Solar Development Land

The demand for solar development is analyzed based on existing and projected substation capacity. Existing utility-scale solar and BESS substation capacity in the SJV Region represent base development in this analysis, which equates to 1,319 MW and 919 MW, respectively.[6] This analysis uses individual county level substation capacity based on substation location and aggregates results to the SJV Region geography (see Table 1). The 20-year substation capacity outlook for solar and BESS resources as estimated by the California Public Utility Commission (CPUC) represents anticipated demand for solar development in 2045, which equates to 32,139 MW and 18,178 MW, respectively.[7]

[5] California Department of Conservation. (Accessed 2024). "Williamson Act Program Overview". https://www.conservation.ca.gov/dlrp/wa/Pages/wa_overview.aspx

[6] CPUC. (2023). "Methodology for Resource-to-Busbar Mapping for the Annual TPP". https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2022-irp-cycle-events-and-materials/2023-2024-tpp-portfolios-and-modeling-assumptions/mapping_methodology_v10_05_23_ruling.pdf

[7] Ibid

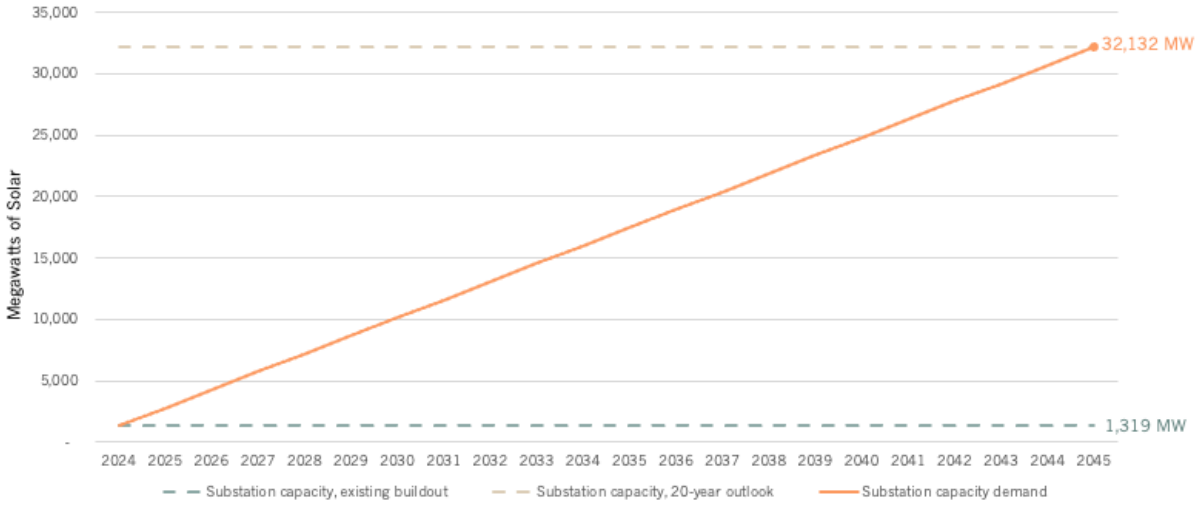
Table 1: Substation Capacity Existing and 20-Year Outlook Resources in Megawatts

	Base Scenario: Current 2024 Build Out		20-Yr Substation Capacity: 2045	
	Solar MW	BESS MW	Solar MW	BESS MW
Fresno	410	132	10,927	6,111
Kern	616	572	12,584	7,345
Kings	237	215	1,538	991
Madera	-	-	1,100	501
Merced	-	-	1,240	472
San Joaquin	-	-	1,600	1,014
Stanislaus	-	-	550	350
Tulare	56	-	2,600	1,393
SJV Region Total	**1,319**	**919**	**32,139**	**18,178**

Source: CPUC, 2024

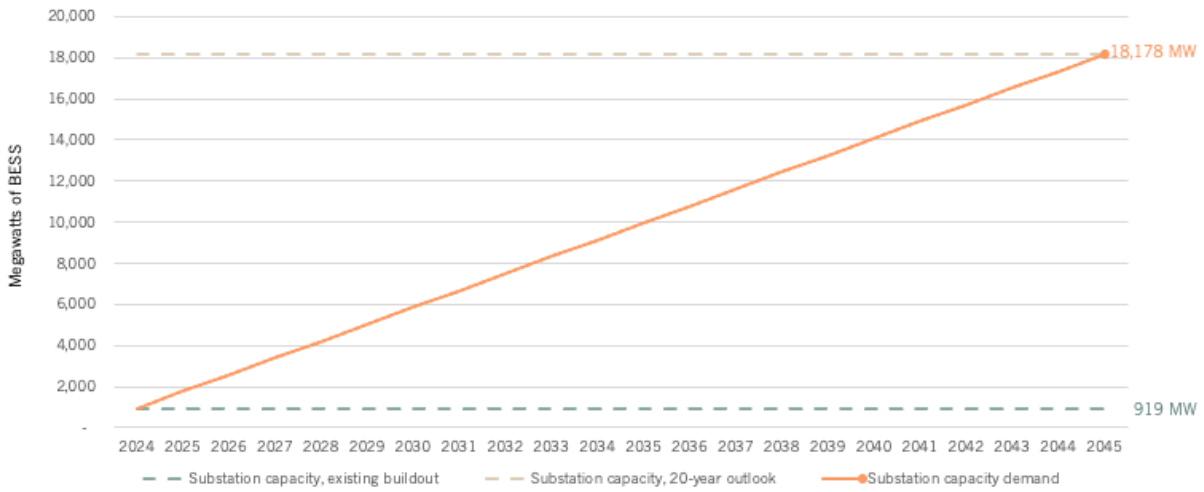
This analysis models the growing demand for substation capacity as a linear increase between the base resource development in 2024 and the 20-year substation capacity outlook for solar and BESS resources in 2045. The actual pace of development will depend on multiple market and regulatory factors that are highly likely to evolve over the next twenty years and look substantially different from recent historical trends. The increase in substation capacity demand for solar resource development and BESS resource development are depicted in Figure 2 and Figure 3, respectively.

Figure 2. Substation Capacity Demand for Solar Resource Development (2024-2045)



Source: CPUC, 2024

Figure 3. Substation Capacity Demand for BESS Resource Development (2024-2045)



Source: CPUC, 2024

The geographic relevance of solar development requires an estimation of the relationship between resource development in MWs and land use in acres. This analysis assumes 10 acres of land per MW of solar development, which is larger than minimum land requirements for solar development used in published studies (e.g. up to 8 acres/MW[8]), to account for accompanying BESS and other related infrastructure including roads and other components that accompany solar development. The conservative estimate of land use requirements for solar development also factors additional limiting constraints on solar suitable development land that is not modelled in this analysis. Such limiting constraints include mineral leases, landowner willingness, and other factors that may limit the development of solar suitable parcels into solar and BESS resources. Table 2 presents the total demand for solar suitable development land to accommodate the 20-year substation capacity outlook for solar and BESS resources. This analysis estimates that 321,393 acres of solar suitable development land will be required to meet the 20-year substation capacity outlook for solar and BESS resources development targets by 2045.

[8] Ayres, Andres, Annabelle Rosser, Ellen Hanak, Alvar Escriva-Bou, Darcy Wheeles, Mitchelle De Leon, Curtis Seymour, and Abigail Hart. (October 2022). "Solar Energy and Groundwater in the San Joaquin Valley." Public Policy Institute of California. https://www.ppic.org/?show-pdf=true&docraptor=true&url=https%3A%2F%2Fwww.ppic.org%2Fpublication%2Fsolar-energy-and-groundwater-in-the-san-joaquin-valley%2F

Table 2. Substation Capacity Demand for Solar and BESS Resources in MW and Acres

	20-Yr Substation Capacity: 2045		
	Acres	Solar MW	BESS MW
Fresno	109,270	10,927	6,111
Kern	125,840	12,584	7,345
Kings	15,375	1,538	991
Madera	11,000	1,100	501
Merced	12,401	1,240	472
San Joaquin	16,004	1,600	1,014
Stanislaus	5,500	550	350
Tulare	26,003	2,600	1,393
SJV Region Total	**321,393**	**32,139**	**18,178**

Source: CPUC, 2024; ECOnorthwest Analysis

Supply of Solar Suitable Development Land

The estimated supply of solar suitable development land is analyzed in a multi-phased approach expanding upon existing published studies and utilizing GIS analytical software. The first phase of the analysis estimates the anticipated supply of fallowed land over the analytical timeframe related to the Sustainable Groundwater Management Act (SGMA). The following analysis estimates the supply of solar suitable development land for three scenarios, a 'Without Policy Scenario', a 'With Policy Scenario', and a 'Net Policy Scenario' where policy refers to an amended solar use easement statute that would suspend WA status for the duration of solar and BESS resource projects.

IMPACTS OF SGMA ON IRRIGATED AGRICULTURE IN THE SJV REGION

SGMA was passed in 2014 to help provide long-term protection to groundwater resources in California. The goal of SGMA is to manage groundwater sustainably for long-term reliability and for multiple benefits to both current and future uses. Under SGMA, California's groundwater basins have been characterized into four prioritization categories: very low, low, medium, and high. Under SGMA, for high and medium priority basins, local agencies form groundwater sustainability agencies (GSA). Groundwater Sustainability Plans (GSPs) are developed and implemented by GSAs 'to avoid undesirable results' and mitigate overdraft within 20 years leading to reduced groundwater use.[9]

The Public Policy Institute of California (PPIC) analyzed the anticipated impacts of SGMA in terms of acre-feet of reduced water availability across the San Joaquin Valley in a 2023 policy brief.[10] The PPIC analysis relied on data from GSPs and hydrologic models, along with other

[9] California Department of Water Resources. (May, 2020). "Sustainable Groundwater Management Act 2019 Basin Prioritization Process and Results." https://data.cnra.ca.gov/dataset/13ebd2d3-4e62-4fee-9342-d7c3ef3e0079/resource/ffafd27b-5e7e-4db3-b846-e7b3cb5c614c/download/sgma_bp_process_document.pdf

[10] Cole, Spencer and Alvar Escriva-Bou. (2023). PPIC Water Supply Constraints at the Local Scale in the San Joaquin Valley. Public Policy Institute of California. https://www.ppic.org/data-set/ppic-water-supply-constraints-at-the-local-scale-in-the-san-joaquin-valley/

data sources to estimate the reduction in San Joaquin groundwater supplies for the Valley's 15 groundwater basins disaggregated into 49 sub-units.[11]

Intersecting the PPIC groundwater sub-unit reduction analysis with county boundaries, ECO's analysis proportioned the groundwater reductions from the sub-unit level to the county-level by proportion of irrigated agriculture across the sub-basin. To do this, the share of total sub-unit irrigated agricultural land within a county is calculated as the total irrigated agricultural acres that fall within a county-sub-unit intersection divided by the total irrigated agricultural acres overlaying the sub-unit as a whole.

The sub-unit statistics are quantified by multiplying the quantity of SGMA groundwater reduction (in acre-feet) by the share of agricultural land in each sub-unit. This sub-unit level reduction in water supplies is then summarized to the county-sub-basin level by identifying the intersections in each county-sub-basin and summing them together, generating the reduction in groundwater availability due to SGMA for each county-sub-basin geography. The sub-basin reductions in groundwater due to SGMA are then aggregated to the basin level across each county (see Table 3). This proportional groundwater reduction across sub-unit approach is utilized since the geographic impact of SGMA on a micro scale is not yet well understood, and this analysis does not intend to provide a prescriptive approach to land fallowing in the wake of SGMA.

The arithmetic logic behind the analysis is as follows:

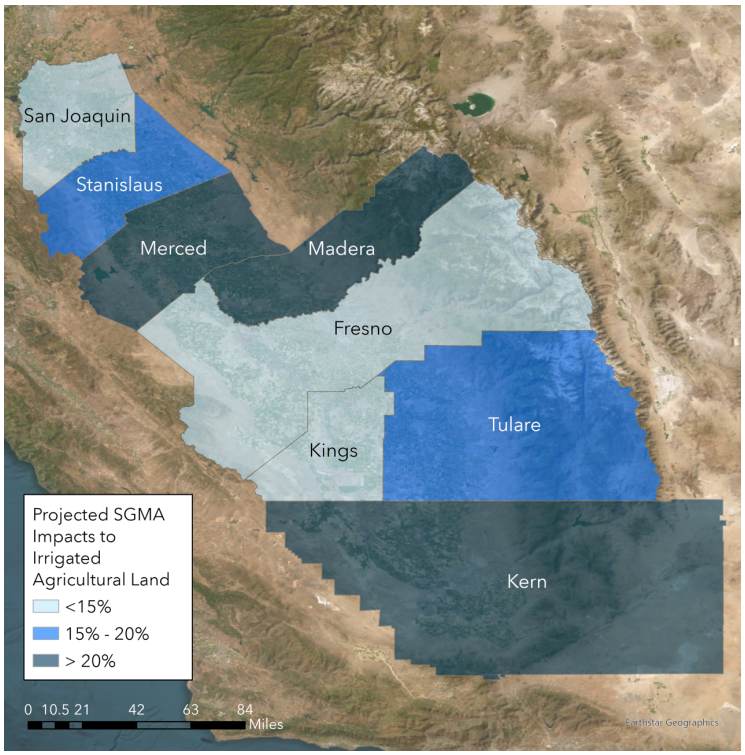
$$\Delta GroundWater_c = \sum_{s=1}^{n} \Delta GroundWater_s \times \frac{Agricultural\ Acres_{sc}}{Agricultural\ Acres_s}$$

Where *c* represents a county, *s* represents a sub-unit, *n* represents the total sub-unit intersections that underlay the county. It should be noted that county-sub-unit intersections with fewer than 100 acre-feet of water supplies are assumed to be geospatial polygon sliver cases and dropped accordingly.

[11] The PPIC analysis includes a range of potential reductions to groundwater based on various scenarios. This ECO study utilizes the low estimate, SGMA only impacts (assuming no increases in groundwater availability due to SGMA) to ensure conservative results.

The transition to groundwater sustainability through SGMA is anticipated to lead to irrigation water curtailments for farmers, and ultimately, the significant fallowing of agricultural land in the San Joaquin Valley. Since the specific crop types that will be impacted by SGMA reductions is not known, this analysis utilizes a SJV Region average applied water rate of roughly 3.5 acre-feet per acre[12] to project the quantity of irrigated agricultural land that may be fallowed due to SGMA (see Table 3). As is consistent with the high-level nature of this study, technological advances in irrigation efficiency and deficit irrigation of irrigated agricultural land are not considered in this analysis.

Figure 4. Projected Impacts of SGMA (2040)



Source: PPIC, 2023; DWR, 2022; ECOnorthwest Analysis

This analysis estimates groundwater availability in the SJV Region to be reduced by 3 million acre-feet annually by 2040 with a corresponding reduction to irrigated acres of 871,000 acres (see Table 3). These figures equate to a county level reduction in irrigated agricultural land of up to 32 percent. This analysis assumes a linear annual progression towards groundwater sustainability with reductions occurring linearly between 2024 and 2040, when sustainability compliance is required. The impacts do not incorporate climate change and environment regulations, so should be considered a minimum potential impact of SGMA on groundwater availability.

[12] California Department of Natural Resources. (2024). "Agricultural Water Use Data 2011-2015". https://data.cnra.ca.gov/dataset/land-water-use-by-2011-2015

Table 3. Projected Annual Impacts of SGMA by Groundwater Basin and County (2040)

	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare	Total
Projected Reduction in Groundwater Availability due to SGMA, in Acre-Feet									
Chowchilla	-	-	-	126,067	9,380	-	-	-	135,448
Delta Mendota	87,315	-	-	69,885	22,264	4,141	48,612	-	232,216
Eastern San Joaq	-	-	-	-	-	158,817	11,072	-	169,889
Kaweah	-	-	39,044	-	-	-	-	175,639	214,683
Kern County	-	721,805	28	-	-	-	-	-	721,833
Kings	401,978	-	13,319	72	-	-	-	18,996	434,364
Madera	-	-	-	185,458	-	-	-	-	185,458
Merced	-	-	-	52	230,157	-	-	-	230,210
Modesto	-	-	-	-	-	-	68,008	-	68,008
Tracy	-	-	-	-	-	10,421	-	-	10,421
Tulare Lake	19	-	129,744	-	-	-	-	1,585	131,349
Tule	-	1,614	-	-	-	-	-	209,074	210,689
Turlock	-	-	-	-	142,200	-	91,890	-	234,090
Westside	31,091	-	4,474	-	-	-	-	-	35,565
White Wolf	-	6,486	-	-	-	-	-	-	6,486
COUNTY TOTAL	**520,402**	**729,905**	**186,609**	**381,534**	**404,001**	**173,378**	**219,582**	**405,295**	**3,020,707**
Projected Irrigated Agricture Curtailed due to SGMA, in Acres									
Chowchilla	-	-	-	36,344	2,704	-	-	-	39,048
Delta Mendota	25,172	-	-	20,147	6,418	1,194	14,014	-	66,945
Eastern San Joaq	-	-	-	-	-	45,785	3,192	-	48,977
Kaweah	-	-	11,256	-	-	-	-	50,635	61,891
Kern County	-	208,088	8	-	-	-	-	-	208,096
Kings	115,885	-	3,840	21	-	-	-	5,476	125,222
Madera	-	-	-	53,465	-	-	-	-	53,465
Merced	-	-	-	15	66,352	-	-	-	66,367
Modesto	-	-	-	-	-	-	19,606	-	19,606
Tracy	-	-	-	-	-	3,004	-	-	3,004
Tulare Lake	5	-	37,404	-	-	-	-	457	37,866
Tule	-	465	-	-	-	-	-	60,274	60,739
Turlock	-	-	-	-	40,995	-	26,491	-	67,485
Westside	8,963	-	1,290	-	-	-	-	-	10,253
White Wolf	-	1,870	-	-	-	-	-	-	1,870
COUNTY TOTAL	**150,026**	**210,423**	**53,797**	**109,992**	**116,469**	**49,983**	**63,303**	**116,842**	**870,835**

Note: The Projected Irrigated Agriculture Curtailed due to SGMA is estimated using the multi-year average applied water rate across the relevant counties of roughly 3.5 AF per acre[13].

Source: PPIC, 2023; DWR, 2022; ECOnorthwest Analysis

ANALYSIS OF SUPPLY OF POTENTIAL SOLAR DEVELOPMENT LAND

The estimation of land availability for solar development was analyzed geospatially utilizing the sub-basin groundwater reductions due to SGMA as described above. Solar development is assumed to occur on agricultural land due to existing land use policies. In fact, almost 95 percent of existing renewable energy development in the western United States with identified land use types is on agricultural land.[14] Two analyses were conducted to understand the supply of potential solar development land under the 'With Policy Scenario' and the 'Without Policy Scenario'. These analyses utilize the estimated sub-basin groundwater reductions due to SGMA as described above and the following data sources:

[13] California Department of Natural Resources. (2024). "Agricultural Water Use Data 2011-2015". https://data.cnra.ca.gov/dataset/land-water-use-by-2011-2015

[14] ERS. (May 2024). "Utility-Scale Solar and Wind Development in Rural Areas: Land Cover Change (2009–20)". https://www.ers.usda.gov/webdocs/publications/109209/err-330.pdf?v=4514.8

- **Solar suitability SensSolar**[15]: This layer represents the technical resource potential within California for utility-scale solar and wind. It uses criteria from the 2023 California Energy Commission (CEC) Senate Bill (SB) 100 Climate Resilience Land-Use Screen to assign technical resource potential across the state of California. The SB 100 Climate Resilience Land Use Screen uses basic land use exclusions, biological planning priorities, landscape intactness, and cropland to determine solar potential. In addition, it uses terrestrial climate resilience as a further filtering criterion, making it more stringent than the CEC's Core Land Use Screen alone.
- **Agricultural Land**[16]: The California Department of Water Resources collects land use data based on digital satellite imagery, aerial photography, and other tools to generate a remotely sensed land use database. The 2021 and 2022 Statewide Crop Maps is used to generate estimates of agricultural land for our policy and baseline scenario methodologies. The 2022 dataset is available provisionally and was used in conjunction with the 2021 dataset in this analysis.
- **Williamson Act**[17]: The California Department of Conservation publishes an annual GIS data layer containing Williamson Act enrollment acreage and Farmland Security Zone (FSZ) enrollment acreage within participating counties. The most current published year for the spatial data layer is 2023.[18] There is uncertainty around the frequency of data reporting in the Williamson Act layer at the county level, which is self-reported by counties to the State.
- **SGMA sub-basins**: The State Water Resources Control Board of California provides spatial data for California's groundwater basins and sub-basins. These geometries were used to understand the geospatial context of SGMA impacts in this analysis.

As part of this analysis, ECO geospatially intersected the relevant land type layers to estimate the supply of policy only eligible acres for solar suitable development and the supply of baseline eligible acres for solar suitable development. For the supply of policy only eligible acres for solar suitable development, solar suitability was overlaid with irrigated agricultural land, WA contract land, county boundaries, and groundwater subbasins in the SJV Region. Policy only eligible acres are then constrained by the 2045 substation capacity resource outlook and projected SGMA impacted acres in each sub-basin, assuming complete transferability of SGMA impacts across groundwater sub-basin and ensuring no double counting of SGMA impacts across sub-basin county groups.

To estimate the supply of baseline eligible acres for solar suitable development, solar suitability was overlaid with dryland agricultural land within each county, irrigated agricultural land in SGMA sub-basins, and non-contract WA and FSZ parcels in the SJV Region counties.

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[15] California Energy Commission. (2023). "Technical Resource Potential Maps for 2023 Land-Use Screens". https://caenergy.maps.arcgis.com/home/item.html?id=ee8a0be864174866aecfd223a51aa19e

[16] California Department of Water Resources. (2022). "Statewide Crop Mapping". https://data.cnra.ca.gov/dataset/statewide-crop-mapping

[17] California Department of Conservation. (2023). "California Williamson Act Enrollment 2023". https://gis.conservation.ca.gov/portal/home/item.html?id=949ac015919145a2baadc032f0e855ac

[18] California Department of Conservation. (2024). "California Williamson Act Enrollment 2023." https://gis.conservation.ca.gov/portal/home/item.html?id=949ac015919145a2baadc032f0e855ac. Accessed on May 6th, 2024.

Baseline eligible acres are then constrained by the 2045 substation capacity resource outlook and projected SGMA impacted acres in each sub-basin, assuming complete transferability of SGMA impacts across sub-basin and ensuring no double counting of SGMA impacts across sub-basin county groups.[19] Under baseline, no WA contracts are assumed to be voluntarily removed for solar and BESS resource development during the analysis period. Land governed under the FSZ is anticipated to remain under contract and thus, is not available for development.

To estimate the supply of 'with policy eligible acres', or the total baseline and policy only eligible acres suitable for solar development, the baseline and policy only eligible acres are summed and constrained by the required solar suitable development land to accommodate the 20-year substation capacity outlook for solar and BESS resources. Baseline and policy only solar suitable acres are mutually exclusive in this analysis, so the 'with policy eligible acres' is the total supply of baseline and policy solar suitable development land under an amended solar use easement statute that would suspend WA status for the duration of solar and BESS resource projects.

The result of this analysis estimating baseline eligible acres and policy eligible acres are presented in Table 4. The total projected agricultural acres that will be fallowed by 2040 due to SGMA is presented as the 'curtailment acres (SGMA)'. The 2045 substation capacity resource outlook is estimated to demand 321,393 acres of solar suitable development acres. Across the SJV Region, the total supply of agricultural solar suitable acres is 1,796,607 acres. The total supply of baseline acres is 295,646 acres, which when constrained by the demand for solar suitable acres in each SJV Region county and projected SGMA impacted acres in each sub-basin, is estimated at 165,003 acres. Conversely, the total supply of policy acres is 613,790 across the SJV Region, which when constrained by the demand for solar suitable acres in each SJV Region county and projected SGMA impacted acres in each sub-basin, is estimated at 256,574 acres (Policy Only Eligible Acres in Table 4). The 'With Policy Eligible Acres' of 285,957 acres is the total supply of solar suitable acres under an amended solar use easement statute that would suspend WA status for the duration of solar and BESS resource projects.

[19] ECO's analysis found almost all baseline eligible acres in the SJV Region are irrigated, and thus, applied the SGMA constraint across the baseline analysis.

Table 4. Baseline Eligible and Policy Eligible Acres (2045)

County	Curtailment Acres (SGMA)	2045 Substation Capacity Resource Outlook	Solar Suitable Acres	Total Supply of Baseline Acres	Total Supply of Policy Acres	Baseline Eligible Acres	Policy Only Eligible Acres	With Policy Eligible Acres
Fresno	150,026	109,270	435,019	111,852	223,484	51,591	109,270	109,270
Kern	210,423	125,840	434,638	30,168	63,923	29,383	61,021	90,404
Kings	53,797	15,375	323,456	27,538	61,926	15,375	15,375	15,375
Madera	109,992	11,000	109,540	23,952	36,362	11,000	11,000	11,000
Merced	116,469	12,401	124,050	45,136	38,514	12,401	12,401	12,401
San Joaquin	49,983	16,004	70,432	13,750	26,055	13,750	16,004	16,004
Stanislaus	63,303	5,500	73,008	8,102	38,280	5,500	5,500	5,500
Tulare	116,842	26,003	226,465	35,147	125,244	26,003	26,003	26,003
SJV Region Total	**870,835**	**321,393**	**1,796,607**	**295,646**	**613,790**	**165,003**	**256,574**	**285,957**

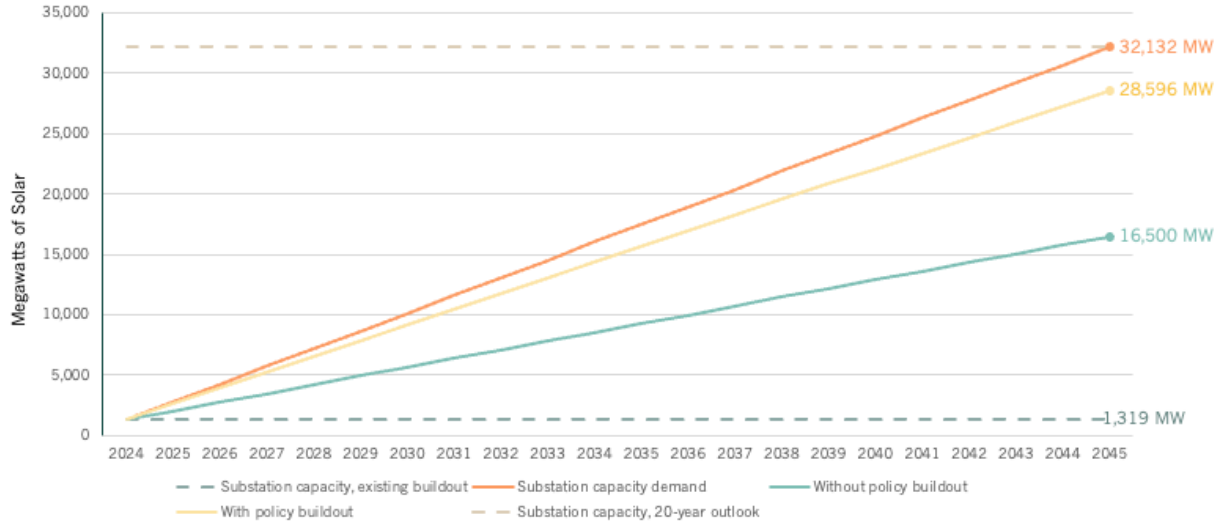
Source: PPIC, 2023; DWR, 2022; CEC, 2023; CPUC, 2024; ECOnorthwest Analysis

This analysis finds that the 321,393 acres demanded by the 20-year substation capacity resource outlook is not met by the total supply of 'with policy eligible acres' of 285,957 acres. This constraint is driven by Kern County, the only county in which the supply of policy eligible acres is less than the demand for solar development acres by the 20-year substation capacity resource outlook. The results of this analysis suggest that the 20-year solar substation resource outlook will not be met in Kern County. These results are sensitive to the relationship between solar and BESS resource development land requirements, which are modelled at 10 acres per solar MW in this analysis. If a more conservative estimate of 7 acres per MW is modelled to represent the relationship between solar and BESS resource development land requirements, Kern County would be able to accommodate 100 percent of the 20-year solar substation resource outlook.

POLICY SCENARIO DEFINITION

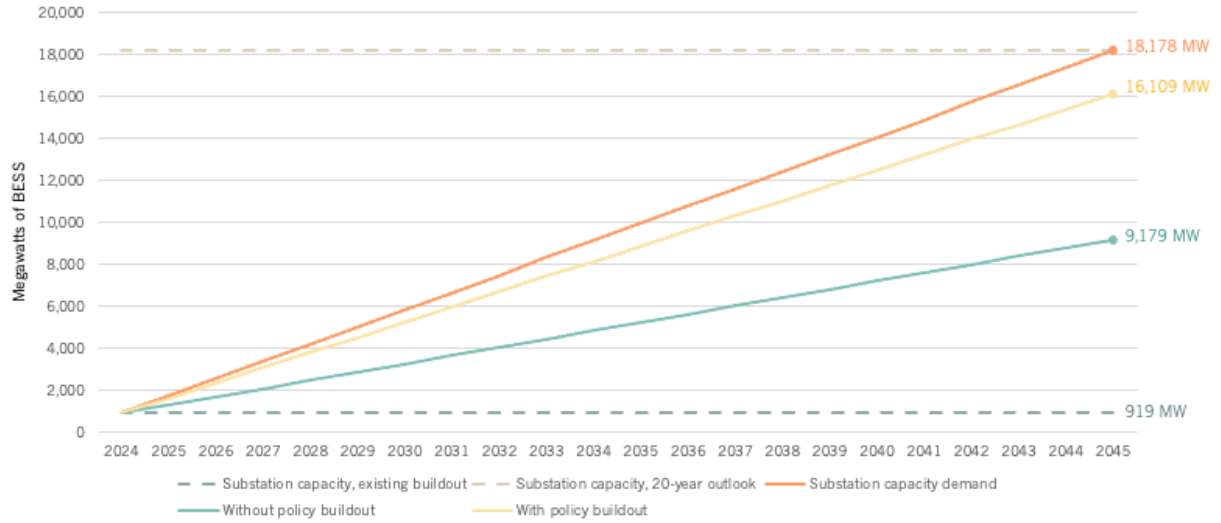
The "Without policy" scenario assumes solar and BESS resource development will occur on baseline eligible acres only. The "With Policy Scenario" assumes development will first occur on baseline eligible acres followed by development on policy eligible acres (the supply of 'with policy eligible acres' presented in Table 4). This pattern of development generates conservative estimates of buildout due to an amendment to the solar use easement statute since buildout will likely occur on both policy and baseline acres in the "With Policy Scenario". Figure 5 and Figure 6 present the projected solar and BESS resource development with and without policy between 2024 and 2045.

Figure 5. Projected Solar Resource Development with and Without Policy, 2024-2045



Source: CPUC, 2024; ECOnorthwest Analysis

Figure 6. Projected BESS Resource Development with and Without Policy, 2024-2045



Source: CPUC, 2024; ECOnorthwest Analysis

The supply of potential solar development land in the 'Without Policy Scenario' is 165,003 acres, while the supply of potential solar development land in the 'With Policy Scenario' is 285,957 acres (see Table 5). The supply of potential solar development land due to an amendment to the solar use easement statute is the supply of potential solar development land in 'Net Policy Scenario' or the difference between the 'With Policy Scenario' and the 'Without Policy Scenario', equating to 120,954 acres of solar suitable development land. *The 'net policy' figure represents the additional quantity of land available for solar and BESS resource developed due to an amendment to the solar use easement statute.*

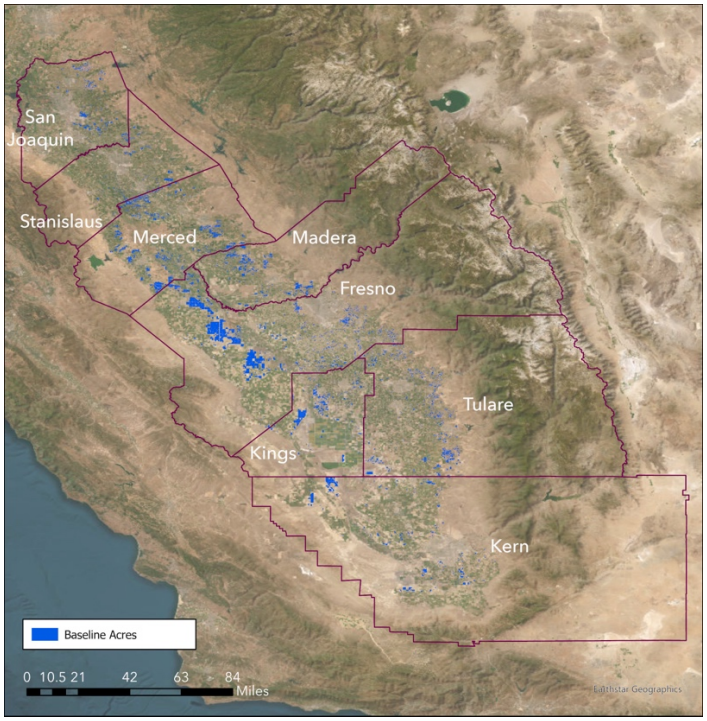
Table 5 Supply Solar Suitable Development Land under Policy Scenarios, in Acres (2045)

County	Without Policy Scenario			With Policy Scenario			Net Policy Scenario		
	Acres	Solar MW	BESS MW	Acres	Solar MW	BESS MW	Acres	Solar MW	BESS MW
Fresno	51,591	5,159	2,885	109,270	10,927	6,111	57,679	5,768	3,226
Kern	29,383	2,938	1,715	90,404	9,040	5,277	61,021	6,102	3,562
Kings	15,375	1,538	991	15,375	1,538	991	-	-	-
Madera	11,000	1,100	501	11,000	1,100	501	-	-	-
Merced	12,401	1,240	472	12,401	1,240	472	-	-	-
San Joaquin	13,750	1,375	871	16,004	1,600	1,014	2,254	225	143
Stanislaus	5,500	550	350	5,500	550	350	-	-	-
Tulare	26,003	2,600	1,393	26,003	2,600	1,393	-	-	-
SJV Region Total	**165,003**	**16,500**	**9,179**	**285,957**	**28,596**	**16,109**	**120,954**	**12,095**	**6,930**

Source: ECOnorthwest Analysis

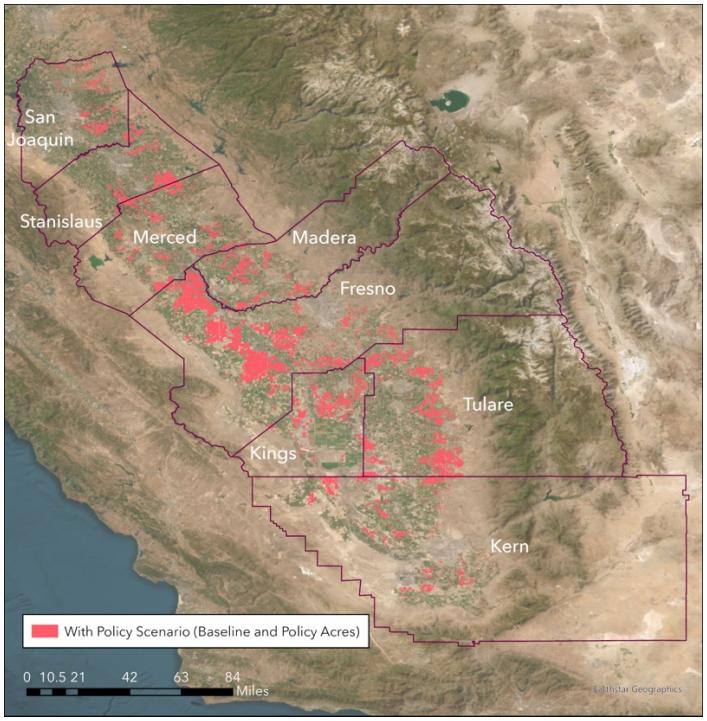
The geographic extent of the 'Without Policy Scenario' and the 'With Policy Scenario' is presented in Figure 7. This figure presents the supply of solar and BESS resource development land and does not constrain the results by the demand for solar resource development land or projected SGMA impacts. Thus, this figure represents the total supply of baseline acres and the total supply of policy acres as identified in Table 4. While these limitations are built into the analysis, this analysis takes a high-level approach and does not geospatially identify the specific parcels that will potentially be fallowed due to SGMA or be developed into solar resources. Such micro-level analysis is beyond the scope of this analysis and is not relevant to the policy analysis.

Figure 7. Supply of Solar and BESS Resource Development Land, With and Without Policy



WITHOUT POLICY SCENARIO

If the solar use easement statute is not modified to facilitate siting solar on Williamson Act contract land, solar development is anticipated to occur on non-contract solar suitable land under existing dryland agricultural production and irrigated agricultural land that is projected to be fallowed due to SGMA. Note that almost the entirety of baseline land in this analysis is currently irrigated. Land available for solar development in the 'without policy' scenario is highlighted in blue.



WITH POLICY SCENARIO

If the solar use easement statute is modified to facilitate siting solar on Williamson Act contract land, solar development is anticipated to occur as described in the 'Without Policy Scenario' above AND on solar suitable, irrigated agricultural land under Williamson Act contract that is projected to be fallowed due to SGMA. Land available for solar development in the 'with policy' scenario is highlighted in red.

Note: Since this is not a prescriptive analysis regarding SGMA related fallowing, SGMA impacts are assumed to be completely transferable within sub-basin and will constrain the amount of land identified for solar development within each sub-basin under both the With Policy and Without Policy Scenarios.

Economic Impacts Analysis

DATA INPUTS

This analysis estimates the impacts that solar and BESS resource development spending would have on the regional economy, as measured through changes in employment, income, value added, and economic output. This analysis estimates impacts across two dimensions: 1) impacts arising from spending during construction; 2) impacts arising from spending during ongoing operations. Construction impacts are measured annually from 2024 through 2045. Construction is expected to be completed in 2044 to ensure the 20-year substation capacity outlook for solar and BESS resources development targets are completely operational in 2045. Operations impacts are measured from 2024 through 2045 but are anticipated to continue past the timeframe of this analysis. Operations impacts increase each year as more projects are completed and become operational.

The modeled construction and operations costs were derived from the National Renewable Energy Laboratory's (NREL) 2023 Q1 Cost Benchmarks.[20] The Modeled Market Price (MMP)

[20] NREL. (2023). U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2023. Accessed at: https://www.nrel.gov/docs/fy23osti/87303.pdf

costs are based on national averages and are utilized in this study.[21] Costs were converted to a per MW basis and scaled to the built and operational MWs of the estimated solar and BESS resource development for each year of analysis. Based on NREL costs, ECO estimates the per MW construction cost of solar PV to be $1.51 million[22] and the per MW construction cost of BESS to be $1.23 million[23]. For operations, the annual cost per MW is estimated as $21,560 per MW of solar[24] and $45,890 per MW of BESS[25]. Adjustments were made to these costs for the Fiscal Impact Analysis, including the removal of the NREL estimate of property and sales tax and replacement with regionally specific estimates. Due to the counteracting forces of inflation (i.e. a general increase in prices through time) and the anticipated technological advances and decrease in pricing of solar technology through time, this analysis does not model adjustments in costs through time and presents values in 2023 dollars. Additionally, solar and BESS resources are anticipated to be operational over the project timeline.

Economic impacts are assessed using the IMPLAN model and software at the 8-county region level. Construction and operation of the project would support economic activity in the region by employing people to work on the project and purchasing materials and services to build and maintain the project. This analysis utilizes IMPLAN's baseline assumptions for the share of costs purchased within the region, based on the current supply and demand of goods.

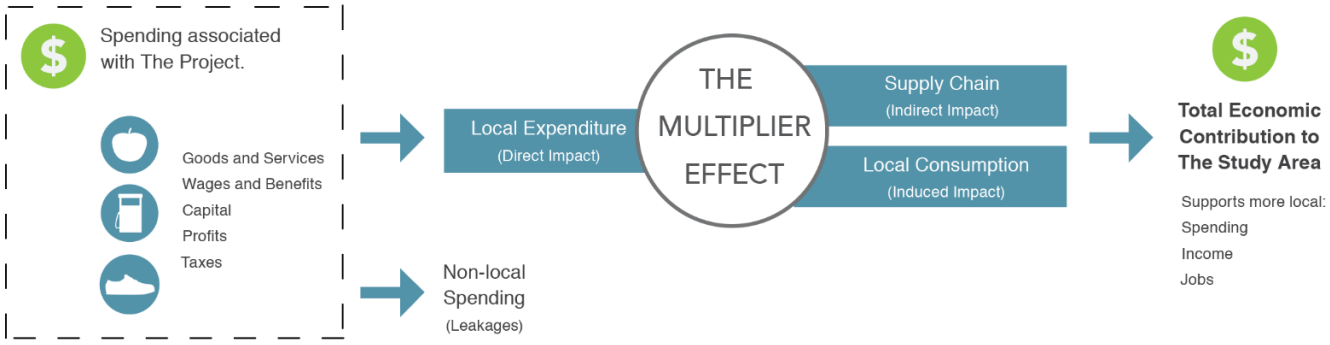
METHOLODY

IMPLAN is a regional input-output (I/O) model widely used to assess the economic impacts of renewable energy developments and many other types of projects. The IMPLAN model divides the economy into 546 sectors, including government, households, farms, and other industries, and models the linkages between the various sectors. Using national industry and county-level economic data from the U.S. Bureau of Economic Analysis, U.S. Census, and other government sources, IMPLAN models how spending in one sector of the economy is spent and re-spent in other sectors of the economy. The linkages are modeled through I/O tables that account for all dollar flows between different sectors of the economy. The most current IMPLAN model data available at the time of the analysis was 2022.

The economic relationships modeled by IMPLAN allow the user to estimate the overall change in the economy that would result from construction and operation of a proposed project (see Figure 8). The dollars spent on project construction and operation within the selected geography are analyzed to determine the total economic impact within that geography. The direct investments in project construction and operation trigger successive rounds of spending that result in an overall increase in employment, labor income, and value added in the local economy. The summation of these impacts is referred to as the economic output.

[21] NREL defines Modeled Market Prices as: "MMP benchmarks maintain continuity with previous benchmark reports by capturing macroeconomic factors and the impact of market trends, reflecting typical national system cash costs experienced by U.S. installers and passed on to U.S. consumers within the analysis period."
[22] The original figure of $1.2 million per MWdc has been updated to MWac using a 1.3 Wdc to 1 Wac conversion.
[23] The original figure of $945,000 per MWdc has been updated to MWac using a 1.3 Wdc to 1 Wac conversion.
[24] The original figure of $16,580 per MWdc has been updated to MWac using a 1.3 Wdc to 1 Wac conversion.
[25] The original figure of $35,300 per MWdc has been updated to MWac using a 1.3 Wdc to 1 Wac conversion.

Figure 8. Overview of Economic Impact Analysis Framework



Source: ECOnorthwest, 2024

IMPACT TYPES

Economic multipliers derived from the model are used to estimate total economic impacts. Total economic impacts consist of three components: direct, indirect, and induced impacts.

- **Direct impacts** consist of expenditures made specifically for the proposed project, such as construction labor and materials. These direct impacts generate economic activity elsewhere in the local economy through the multiplier effect, as initial changes in demand "ripple" through the local economy and generate indirect and induced impacts.
- **Indirect impacts** are generated by expenditures on goods and services by suppliers who provide goods and services to the construction project. Indirect effects are often referred to as "supply-chain" impacts because they involve interactions among businesses.
- **Induced impacts** are generated by the spending of households associated either directly or indirectly with the proposed project. Workers employed during construction, for example, will use their income to purchase groceries and other household goods and services. Workers at businesses that supply the project during construction or operation will do the same. Induced effects are also referred to as "consumption-driven" impacts.

CONTRIBUTION MEASURES

Impacts are assessed using the following measures that are reported by the IMPLAN model:

- **Jobs** are measured as the average number of employees engaged in full- or part-time work. Model outputs are adjusted to full-time equivalents (FTEs) using coefficients provided by IMPLAN.
- **Personal income (or labor income)** is expressed as the sum of employee compensation and proprietary income.

- **Employee compensation (wages)** includes workers' wages and salaries, as well as other benefits such as health, disability, and life insurance; retirement payments; and non-cash compensation; expressed as total cost to the employer.
- **Proprietary income (business income**) represents the payments received by small-business owners or self-employed workers.
- **Value added** represents the value of all final goods and services produced (i.e. the sum of intermediate stages of production). Value added is a subset of Output and accounts for the increase in value that the producer adds to the inputs because of the production process.
- **Output** is the total value of an industry's production and includes all components of the production function: labor income, taxes, profit, and intermediate inputs. This is similar in concept to a measure of gross domestic product (GDP).

IMPACT VERSUS CONTRIBUTIONS

This analysis measures the net impact of an amendment to the solar use easement statute. To arrive at the net impact, the economic contributions of the With and Without Policy Scenario had to be calculated. The net impact of an amendment to the solar use easement statute is the economic contribution of the With Policy Scenario less the economic contributions of the Without Policy Scenario.

An economic contributions analysis measures the gross change in economic activity associated with the With Policy Scenario and Without Policy Scenario. In addition, the economic contribution of a Max Build Out scenario where the full solar and BESS resource demand is met is analyzed. It is a descriptive analysis that simply tracks the gross economic activity of the given policy as the dollars cycle through the region's economy. In other words, it's a 'just the facts' type of analysis that is based on exploring the revealed preference of how people spend their money. On the other hand, the economic impact analysis measures the net change in economic activity associated with an amendment to the solar use easement statute. In other words, it's an estimation of the net changes to the economic base of a region that can be attributed to an amendment in the solar use easement statute, and we refer to it here as the *Net Policy Scenario*.

LIMITATIONS OF INPUT-OUTPUT MODELS

I/O models are static models used to measure an economy's inputs and outputs based on data that represents the relationships within an economy at a specific point in time. The model then estimates how specific changes in inputs to an economy result in changes throughout the economy. This approach—known as a "partial equilibrium analysis" works well when the modeled changes don't radically reshape the relationships within an economy or effect the fundamental characteristics of labor markets, prices, or property values.

Analysis and Results

Economic Impacts Analysis

The economic impact analysis of an amendment in the solar use easement statute estimates the impacts of solar and BESS resource development on the economy. This analysis looks at two stages of resource development, construction and operation, which are presented in the following sections.

CONSTRUCTION

The estimated economic impacts of construction-related expenditures are summarized for the SJV Region in Table 6. These estimates are one-time economic activities that would occur over the anticipated construction period. Job estimates are presented in FTEs, with each identified job representing a full-time job over 12 months (or 2,080 hours) of employment. Due to the ongoing nature of solar and BESS resource development construction jobs in the SJV Region, these jobs may more closely resemble permanent jobs as opposed to traditional temporary construction jobs.

To consider the net impact of an amended solar use easement statute, the solar and BESS resource build-out With and Without the Policy Scenario is estimated. The discussion of economic impacts focuses only on these net impacts.

Solar and BESS resource development under the Policy Scenario, on net, would support an annual average of 9,800 FTE jobs (including direct, indirect, and induced jobs) over the construction period with an associated $717.8 million in labor income. Cumulatively over the construction period, this equates to 253,000 FTE and $15.1 billion in labor income. The value added annually to the SJV Regional economy due to solar and BESS resource construction under an amended solar use easement statute is $1.23 billion annually or $25.8 between 2024 to 2045, cumulatively.

The total economic output of the Net Policy Scenario, which includes fiscal contributions (see Fiscal Impact Analysis)[26], is estimated to be $2.0 billion annually during the construction period. Cumulatively, over 2024 to 2045, $41.1 billion in total economic output is supported by the Net Policy Scenario.

Under Max Build Out scenario where the 20-year substation capacity demand is met, resource construction would generate 24,700 jobs annually or 518,900 FTE jobs over the construction period. The annual total value added under the Max Build Out Scenario would be $3.0 billion, or $62.8 billion cumulatively. The total economic output is estimated to be $4.8 billion annually during the construction period, or $101.3 billion cumulatively.

[26] The Sales Tax Scenario was incorporated into the economic results.

Table 6. Solar and BESS Construction Impacts (2024-2045)

	Total Construction Jobs (FTE)	Total Construction Labor Income	Total Construction Value Added	Total Construction Output
With Policy Scenario				
Average Annual	21,800	$1,604,310,000	$2,640,650,000	$4,260,160,000
Cumulative 2024-2045	458,500	$33,690,530,000	$55,453,550,000	$89,463,350,000
Without Policy Scenario				
Average Annual	12,100	$886,510,000	$1,410,560,000	$2,305,460,000
Cumulative 2024-2045	253,200	$18,616,610,000	$29,621,720,000	$48,414,740,000
Net Policy Scenario				
Average Annual	9,800	$717,810,000	$1,230,090,000	$1,954,700,000
Cumulative 2024-2045	205,200	$15,073,930,000	$25,831,830,000	$41,048,610,000
Max Build Out				
Average Annual	24,700	$1,815,860,000	$2,988,860,000	$4,821,930,000
Cumulative 2024-2045	518,900	$38,133,060,000	$62,766,010,000	$101,260,440,000

Note: Full-time equivalent (FTE) employment equates to 2,080 hours of labor. Construction impacts are assumed to be $0 in 2045 because full build out is anticipated to occur in 2044 to reach operational RPS targets in 2045. All monetary values in 2023 dollars.

Source: IMPLAN, 2022; NREL, 2023; ECOnorthwest analysis

OPERATIONS

The estimated economic impacts of operations-related expenditures and jobs are summarized for the SJV Region in Table 7. These estimates are continuous economic activities that would occur as solar and BESS development projects come online between 2024 and 2045. Impacts are anticipated to continue beyond the timeline of analysis as long as energy production takes place. Job estimates are presented in FTEs, with each identified job representing a full-time job over 12 months (or 2,080 hours) of employment. The estimated economic impacts include the sales tax estimate as described in the Fiscal Impact Analysis section.

To consider the net impact of an amended solar use easement statute, we estimate the MW build-out With and Without the Policy Scenario. The discussion of economic impacts focuses only on the net impact (i.e. With Policy Scenario minus Without Policy Scenario).

Solar and BESS resource development under the Policy Scenario, on net, would support an annual average of 1,800 total jobs (direct, indirect, and induced), in 2045 and in the following operational years. The associated labor income would total $183.6 million per year. The Net Policy Scenario is estimated to contribute $575.3 million in total value added per year to the SJV Regional economy, or $6.4 billion over 2024 to 2045, cumulatively.

The total economic output of the Net Policy Scenario, which includes fiscal contributions (see Fiscal Impact Analysis)[27], is estimated to be $963.7 million annually in 2045 at full build out. Cumulatively, over 2024 to 2045, $10.6 billion in total economic output is supported by the Net Policy Scenario.

Max Build Out would support 4,600 total jobs in 2045, resulting in $484.3 million in total labor income. The total value added under Max Build Out would be $1.5 billion in 2045, or

[27] The Sales Tax Scenario was incorporated into the economic results.

$17.0 billion cumulatively (2024 to 2045). The total economic output is estimated to be $2.5 billion in 2045 and after, and $28.8 billion, cumulatively, over 2024 to 2045.

Table 7. Solar and BESS Operations Impacts (2024-2045)

	Total Operations Jobs (FTE)	Total Operations Labor Income	Total Operations Value Added	Total Operations Output
With Policy Scenario				
Annual at Full Build Out	4,100	$429,910,000	$1,326,310,000	$2,235,720,000
Cumulative 2024-2045	47,500	$4,975,720,000	$15,134,030,000	$25,660,820,000
Without Policy Scenario				
Annual at Full Build Out	2,400	$246,340,000	$750,990,000	$1,272,020,000
Cumulative 2024-2045	28,200	$2,956,500,000	$8,780,640,000	$15,035,160,000
Net Policy Scenario (Impacts of Solar Use Easement)				
Annual at Full Build Out	1,800	$183,570,000	$575,320,000	$963,710,000
Cumulative 2024-2045	19,300	$2,019,220,000	$6,353,390,000	$10,625,660,000
Max Build Out				
Annual at Full Build Out	4,600	$484,250,000	$1,496,320,000	$2,520,740,000
Cumulative 2024-2045	53,200	$5,573,490,000	$17,011,710,000	$28,803,540,000

Note: Full-time equivalent (FTE) employment equates to 2,080 hours of labor. Operations impacts will increase while more MWs come online between 2024 and 2044, then at 2045 when build-out is reached, operations impacts will continue past 2045. All monetary values in 2023 dollars.

Source: IMPLAN, 2022; NREL, 2023; ECOnorthwest analysis

As this study highlights, SGMA is anticipated to lead to the retirement of a significant proportion of the irrigated acres in the SJV Region by 2040. A reduction in agricultural production would have an adverse impact on the agricultural economy of the region. **Any economic impacts associated with this loss of agricultural production under SGMA would occur independent of potential solar development, and as such, is not relevant to the economic impact analysis of solar and BESS resource development under an amended solar use easement statute that would suspend Williamson Act status for the duration of solar and BESS resource projects**

Fiscal Impacts Analysis

The fiscal impact analysis estimates state and local government revenues generated through solar and BESS resource development. Two types of tax revenue are evaluated as part of this analysis: property taxes and sales taxes.

PROPERTY TAX IMPACT ANALYSIS

Property taxes are analyzed for solar and BESS resource development. The state of California does not levy taxes on Solar and BESS resources in accordance with Section 73 of the California property tax statue. The statute has been extended repeatedly, most recently in 2022 by Governor Gavin Newsom, and is currently set to sunset in 2026.[28] Solar and BESS resources that are operational before 2027 will not face property taxes,

Beginning in 2027, new solar and BESS resources that become operational will have property taxes levied upon them generating significant annual income for counties and other local

[28] California Board of Equalization (Accessed 2024). "Active Solar Energy System Exclusion". https://www.boe.ca.gov/proptaxes/active-solar-energy-system.htm

taxing districts beginning. These impacts are modeled to begin the first year of operation beginning in 2027 and last the entire duration of facility operation. This analysis only estimates impacts through 2045, but it is important to acknowledge that impacts will continue past this analysis timeframe.

Renewable energy assets are modeled using construction costs derived from the National Renewable Energy Laboratory's (NREL) 2023 Q1 Cost Benchmarks as is discussed in the Economic Impact Analysis section.[29] The assessed value of solar and BESS resources for taxing purposes is classified as industrial equipment for property tax depreciation purposes.[30] The property tax rate is modeled as an average over the eight SJV Region counties, or 1.16 percent.[31] This analysis does not consider variation in property tax rates across time.

The property tax impact analysis estimates the local government revenues generated by solar and BESS resource development and are presented in Table 8. The annual average property tax revenue over 2027-2045 is estimated at $147.5 million in the Without Policy Scenario and $266.7 million in the With Policy Scenario. The Net Policy Scenario analysis finds that an amendment in the solar use easement statute is anticipated to generate $119.2 million annually on average in local government revenue. Between 2027 and 2045, an amendment in the solar use easement statute is anticipated to generate a cumulative $2.3 billion in property tax revenue for local governments. Maximum build out of solar and BESS resources in the SJV Region would generate $5.7 billion in cumulative property tax revenue for local governments by 2045. Following this period, fiscal impacts would continue to occur and generate revenue for local governments but these impacts are not estimated as part of this work.

[29] NREL. (2023). U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2023. Accessed at: https://www.nrel.gov/docs/fy23osti/87303.pdf
[30] California Association of realtors. (2023). "Business Assessment Factors, CAA Position Paper 23-001".
[31] California Board of Equalization. (Accessed 2024). "Property Tax Allocations" https://www.boe.ca.gov/dataportal/dataset.htm?url=PropTaxGenPropTaxLevies

Table 8. Property Tax Impacts of Solar and BESS Resource Development

	Estimated Property Tax Revenue
With Policy Scenario	
Annual Average	$266,700,000
Cumulative 2024-2045	$5,066,910,000
Without Policy Scenario	
Annual Average	$147,500,000
Cumulative 2024-2045	$2,802,490,000
Net Policy Scenario (Impacts of Solar Use Easements)	
Annual Average	$119,200,000
Cumulative 2024-2045	$2,264,420,000
Max Build Out	
Annual Average	$301,800,000
Cumulative 2024-2045	$5,733,760,000

Note: Annual average is estimated for the period 2027-2045, which corresponds to the sunset of the property tax exemption.
Source: ECOnorthwest analysis

SALES TAX IMPACT ANALYSIS

As stated in the Economic Impacts Methodology section, the NREL construction and operations costs include estimated sales tax. However, the NREL estimates do not consider the regional tax policy context. This analysis utilizes the share of total construction and operations costs that sales tax comprises and applies the estimated sales tax rate to that share of total costs. The California statewide sales tax is 7.25 percent[32] while the sales tax rates across the SJV Region are a bit higher, averaging 7.67 percent (see Table 9).[33][34] This analysis does not consider potential variations in the sales tax rates through time.

California provides a sales tax exemption for purchases related to utility-scale solar project construction and operations, the partial exemption would equate to a sales tax rate of 3.31 percent.[35] The partial exemption is currently set to expired 2030, thus, this analysis estimates economic impacts utilizing the partial exemption through 2030. However, it is possible that the exemption will be renewed and continue through the entire analysis period. Two estimates of total sales tax revenue are presented 1) Sales Tax Estimate in which the exemption covers construction and operations through 2030 and then reverts to the non-exempt tax rate, and 2) Alternative Sales Tax Estimate in which the exemption does not sunset, and construction

[32] California Department of Tax and Fee Administration. (2024). Sales & Use Taxes. Accessed at: https://www.cdtfa.ca.gov/taxes-and-fees/sutprograms.htm
[33] California Department of Tax and Fee Administration. (2024). Sales & Use Taxes by County. Accessed at: https://www.cdtfa.ca.gov/taxes-and-fees/rates.aspx
[34] We do not estimate city sales and use tax due to uncertainty surrounding the exact purchase location of construction and operations material.
[35] California Department of Tax and Fee Administration. (2024). "Manufacturing and Research & Development Exemption Tax Guide". https://www.cdtfa.ca.gov/formspubs/pub541.pdf

and operations are subject to the sales tax exemption through 2045. The local portion of sales tax revenue does not change between the sales tax scenarios due to no local exemption.

Table 9. Sales and Use Tax Rates by County, 2024

COUNTY	SALES TAX RATE
Fresno County	7.98%
Kern County	7.25%
Kings County	7.25%
Madera County	7.75%
Merced County	7.75%
San Joaquin County	7.75%
Stanislaus County	7.88%
Tulare County	7.75%
Average	**7.67%**

Source: California Department of Tax and Fee Administration, 2024

Under the Sales Tax Scenario for the Net Policy Scenario, the average annual state and local sales tax revenue generated from construction activity is estimated to be $39.4 million during the construction period, or $826.8 million cumulatively. For operations, the annual sales tax revenue generated in 2045 and beyond totals $22.9 million. Under the Alternative Sales Tax Scenario (with partial exemption), the anticipated average annual state and local sales tax revenue of the Net Policy Scenario would total $23.4 million for construction and $11.2 million for operations. Results are presented in Table 10.

The local portion[36] (averaged across the 8-county region) of the sales tax revenue would total $55.4 million cumulatively over the construction period, or $2.6 million annually. For operations, the local sales tax revenue over the analysis period (2024 to 2045) would total $13.8 million and the annual sales tax revenue for operations in 2045 and beyond is estimated to be $1.3 million.

At Max Build Out, state and local sales tax revenue for construction ranges between $1.2 billion (Alternative Sales Tax Scenario) and $2.1 billion (Sales Tax Scenario), cumulatively. Max Build Out operations, in 2045 and beyond, is anticipated to generate between $29.3 million and $60.2 million annually.

[36] Local sales tax revenue does not include sub-county sales tax rates.

Table 10. Fiscal Impacts: Sales Tax Estimates (2024-2045)

	Construction (2024-2044)		Operation (2024-2045)	
	Alternative Sales Tax Scenario	Sales Tax Scenario	Alternative Sales Tax Scenario	Sales Tax Scenario
With Policy Scenario				
Average Annual	$52,370,000	$87,950,000	$25,990,000	$53,400,000
Cumulative 2024-2045	$1,099,770,000	$1,847,030,000	$301,510,000	$578,930,000
Without Policy Scenario				
Average Annual	$28,930,000	$48,580,000	$14,840,000	$30,500,000
Cumulative 2024-2045	$607,460,000	$1,020,210,000	$178,960,000	$340,440,000
Net Policy Scenario				
Average Annual	$23,440,000	$39,370,000	$11,150,000	$22,900,000
Cumulative 2024-2045	$492,310,000	$826,820,000	$122,550,000	$238,490,000
Net Policy Scenario Local Portion				
Average Annual	$2,638,000	$2,638,000	$1,254,000	$1,254,000
Cumulative 2024-2045	$55,398,000	$55,398,000	$13,790,000	$13,790,000
Max Build Out				
Average Annual	$59,280,000	$99,560,000	$29,300,000	$60,210,000
Cumulative 2024-2045	$1,244,910,000	$2,090,800,000	$337,950,000	$649,840,000

Notes:

1) Operations Sales Tax Estimates are at full build out (2045).

2) Assumes establishment of a local point of sale.

3) The Alternative Scenario assumes a tax rate of 3.31% over the analysis period while the Sales Tax Scenario assumes the CA statewide, plus local sales tax, 7.67% from 2030 to 2045.

Source: ECOnorthwest analysis

TOTAL FISCAL IMPACTS OF AN AMENDMENT IN THE SOLAR USE EASEMENT STATUTE

Fiscal impacts of solar and BESS resource development include property and sales tax impacts. These impacts are estimate for solar and BESS development under an amended solar use easement statute (the Net Policy Scenario) in Table 11 for the annual average and cumulative impacts for the Sales Tax Scenario. Cumulatively, the SJV Region will receive $2.3 billion in property tax revenue, $826.8 million in construction sales tax revenue, and $238.5 million in operations sales tax income due to solar and BESS resource development under an amended solar use easement statute. Impacts will continue beyond the analysis period but are not estimated as part of this work.

Table 12 presents the local portion of the sales tax impact under the Net Policy Scenario construction and operations for the Sales Tax Scenario. The average annual construction-related sales tax revenue to the SJV counties is $2.6 under the Net Policy Scenario. Cumulatively, over 2024 to 2045, the construction-related sales tax revenue would total $55.4 million. For operations, in 2045 and beyond, the estimates annual sales tax revenue to SJV Region is estimated to be $1.3 million. Additional sales tax revenue will likely be generated for specific cities and special districts.

Although not modeled in this analysis, cities and counties will also realize a potential increase in lodging tax revenue. Many construction workers may have to be temporarily relocated to housing for the duration of construction projects. The use of temporary lodging (hotels,

motels, vacation rentals, camping or RV sites) that is subject to lodging tax would generate additional revenue for localities.

Table 11. Fiscal Impacts of an Amendment in the Solar Use Easement Statute, 2024 - 2045

	Net Policy Scenario Impacts
Property Tax Impacts	
Average Annual	$119,200,000
Cumulative 2024-2045	$2,264,420,000
Construction Sales Tax Impacts	
Average Annual	$39,370,000
Cumulative 2024-2044	$826,820,000
Operation Sales Tax Impacts	
Average Annual	$22,900,000
Cumulative 2024-2045	$238,490,000

Source: ECOnorthwest analysis

Table 12. Local Portion of Sales Taxes, 2024 - 2045

	Net Policy Scenario Impacts
Local Portion Construction Sales Tax Impacts	
Average Annual	$2,638,000
Cumulative 2024-2044	$55,398,000
Local Portion Operation Sales Tax Impacts	
Average Annual	$1,254,000
Cumulative 2024-2045	$13,790,000

Source: ECOnorthwest analysis

Conclusion

Solar and BESS resource development is one way to increase opportunities for landowners to generate new income streams on SGMA impacted lands, diversifying economic activities that could stabilize existing agricultural operations and the larger regional economy in the face of groundwater sustainability. An amendment in the solar use easement statute has the potential to increase the supply of solar suitable development land, increasing solar and BESS resource development in the San Joaquin Region by 73 percent over development without an amendment in the solar use easement statute. Under a more permissive, amended statute, this development would occur on land that is fallowed due to SGMA, potentially easing the burden of groundwater sustainability on local farmers and the regional economy.

An amendment to the solar use easement statute has the potential to increase solar and BESS resource development by 73 percent in the SJV Region

The fiscal and economic impacts of modified solar use easements are presented in Table 13. The impacts include an annual average of 9,800 jobs and $717.8 million in labor income for solar and BESS resource construction and an annual average 1,800 jobs and $183.6 million in labor income for operations at full solar and BESS resource build out. Cumulatively over the analytical timeframe of 2024-2045, modified solar use easements would support $15.1 billion in construction and $2.1 billion in operations labor income on solar and BESS resources.

The total value added to the SJV regional economy due to an amendment in the solar use easement statute is close to $25.8 billion for construction of solar and BESS resources and $6.4 billion for operation of solar and BESS resources. The total output related to solar and BESS resource development due to solar use is $41.1 billion for construction of solar and BESS resources and $10.6 billion for operation of solar and BESS resources.

Fiscal impacts of solar and BESS resource development due to an amendment in the solar use easement statute includes over $2.3 billion in property tax revenue for SJV Region counties, $826.8 million in construction spending sales tax and $238.5 million in operation spending sales tax on solar and BESS resources by 2045. It is important to note that the economic and fiscal impacts presented here will continue to occur outside of the analytical timeframe but are not modeled as part of this work.

The potential reduction in agricultural production due to SGMA induced land fallowing are anticipated to occur regardless of an amended solar use easement statute. Thus, any adverse economic impacts related to the potential reduction in production are attributable to SGMA, not solar and BESS resource development, and as such, fall outside of this model.

Table 13: Economic and Fiscal Impacts of an Amended Solar Use Easement Statute on the SJV Region

	Construction	Operation
Property Tax Impacts		
Average Annual		$119,200,000
Cumulative 2024-2045		$2,264,420,000
Sales Tax Impacts		
Average Annual	$39,370,000	$22,900,000
Cumulative 2024-2045	$826,820,000	$238,490,000
Economic Impacts: Jobs		
Average Annual	9,800	1,800
Cumulative 2024-2045	205,200	19,300
Economic Impacts: Income		
Average Annual	$717,810,000	$183,570,000
Cumulative 2024-2045	$15,073,930,000	$2,019,220,000
Economic Impacts: Value Added		
Average Annual	$1,230,090,000	$575,320,000
Cumulative 2024-2045	$25,831,830,000	$6,353,390,000
Economic Impacts: Output		
Average Annual	$1,954,700,000	$963,710,000
Cumulative 2024-2045	$41,048,610,000	$10,625,660,000

Note: Annual average economic impacts for operations are at full build out in 2045. These impacts will continue at this magnitude as long as energy production continues at the same amount. All monetary values in 2023 dollars.

Source; ECOnorthwest analysis

An increasing reliance on renewable energy generates additional benefits to Californians, which would increase under an amended solar use easement statute that would suspend Williamson Act status for the duration of solar and BESS resource projects, thereby increasing solar and BESS resource development in California's SJV Region. Such benefits include domestic energy reliance, which can safeguard Americans from changing geopolitical and international market conditions that impact energy availability and markets. BESS resource development can support the local grid creating local benefits in the form of increased energy reliability for residents. Carbon-free energy production reduces greenhouse gases, creating significant benefits to the environment, climate, and human health. While these and more benefits of the transition to renewable energy are anticipated to be significant and vitally important to our changing climate and economy, they are not analyzed as part of this work.

Appendix: Detailed Report Tables

Economic Impact Results Detailed

Table 14. Detailed Solar and BESS Construction Impacts, Average Annual 2024 – 2044

	Average Annual Construction Jobs (FTE)	Average Annual Construction Labor Income	Average Annual Construction Value Added	Average Annual Construction Output
With Policy Scenario				
Direct	14,100	$1,126,460,000	$1,740,730,000	$2,694,340,000
Indirect	2,400	$167,520,000	$321,960,000	$604,730,000
Induced	4,300	$237,410,000	$457,920,000	$767,450,000
Without Policy Scenario				
Direct	7,800	$622,460,000	$961,870,000	$1,488,810,000
Indirect	1,300	$92,570,000	$85,430,000	$334,160,000
Induced	2,400	$131,180,000	$253,040,000	$424,070,000
Net Policy Scenario (Impacts of Solar Use Easement)				
Direct	6,300	$504,000,000	$778,860,000	$1,205,530,000
Indirect	1,100	$74,950,000	$236,530,000	$270,570,000
Induced	1,900	$106,230,000	$204,880,000	$343,380,000
Max Build Out				
Direct	16,000	$1,275,000,000	$1,970,270,000	$3,049,630,000
Indirect	2,700	$189,610,000	$364,420,000	$684,470,000
Induced	4,900	$268,710,000	$518,310,000	$868,640,000

Note: Full-time Equivalent (FTE) employment equates to 2.080 hours of labor. All monetary values in 2023 dollars.

Source: ECOnorthwest analysis

Table 15. Detailed Solar and BESS Construction Impacts, Cumulative, 2024 - 2044

	Cumulative Construction Jobs (FTE)	Cumulative Construction Labor Income	Cumulative Construction Value Added	Cumulative Construction Output
With Policy Scenario				
Direct	310,800	$24,782,170,000	$38,296,020,000	$59,275,470,000
Indirect	53,000	$3,685,450,000	$7,083,210,000	$13,304,090,000
Induced	94,700	$5,222,910,000	$10,074,310,000	$16,883,790,000
Without Policy Scenario				
Direct	171,700	$13,694,050,000	$21,161,070,000	$32,753,830,000
Indirect	29,300	$2,036,490,000	$3,914,020,000	$7,351,530,000
Induced	52,300	$2,886,060,000	$5,566,830,000	$9,329,590,000
Net Policy Scenario (Impacts of Solar Use Easement)				
Direct	139,100	$11,088,120,000	$17,134,950,000	$26,521,640,000
Indirect	23,700	$1,648,960,000	$3,169,190,000	$5,952,560,000
Induced	42,400	$2,336,850,000	$4,507,480,000	$7,554,200,000
Max Build Out				
Direct	351,800	$28,050,020,000	$43,346,040,000	$67,091,900,000
Indirect	60,000	$4,171,420,000	$8,017,220,000	$15,058,410,000
Induced	107,100	$5,911,620,000	$11,402,740,000	$19,110,130,000

Note: Full-time Equivalent (FTE) employment equates to 2.080 hours of labor. All monetary values in 2023 dollars.

Source: ECOnorthwest analysis

Table 16. Detailed Solar and BESS Operations Impacts in 2045 and Beyond

	Average Annual Operations Jobs (FTE)	Average Annual Operations Labor Income	Average Annual Operations Value Added	Average Annual Operations Output
With Policy Scenario				
Direct	1,800	$246,770,000	$1,018,060,000	$1,612,330,000
Indirect	1,000	$97,510,000	$191,020,000	$394,990,000
Induced	1,400	$85,620,000	$164,290,000	$275,470,000
Without Policy Scenario				
Direct	1,000	$141,350,000	$574,250,000	$914,640,000
Indirect	600	$55,850,000	$109,410,000	$226,240,000
Induced	800	$49,140,000	$94,290,000	$158,090,000
Net Policy Scenario (Impacts of Solar Use Easement)				
Direct	800	$105,420,000	$443,810,000	$697,690,000
Indirect	400	$41,660,000	$81,610,000	$168,750,000
Induced	600	$36,480,000	$70,000,000	$117,380,000
Max Build Out				
Direct	2,000	$278,000,000	$1,149,180,000	$1,818,650,000
Indirect	1,100	$109,850,000	$215,190,000	$444,970,000
Induced	1,500	$96,400,000	$184,970,000	$310,140,000

Note: Full-time Equivalent (FTE) employment equates to 2.080 hours of labor. All monetary values in 2023 dollars.

Annual average economic impacts for operations are at full build out in 2045. These impacts will continue at this magnitude as long as energy production continues at the same amount.

Source: ECOnorthwest analysis

Table 17. Detailed Solar and BESS Operations Impacts, Cumulative, 2024 - 2045

	Cumulative Operations Jobs (FTE)	Cumulative Operations Labor Income	Cumulative Operations Value Added	Cumulative Operations Output
With Policy Scenario				
Direct	20,400	$2,857,060,000	$11,568,240,000	$18,448,450,000
Indirect	11,400	$1,128,940,000	$2,211,520,000	$4,573,010,000
Induced	15,600	$989,720,000	$1,899,090,000	$3,184,180,000
Without Policy Scenario				
Direct	12,100	$1,697,390,000	$6,661,420,000	$10,748,960,000
Indirect	6,800	$670,710,000	$1,313,870,000	$2,716,840,000
Induced	9,300	$588,410,000	$1,129,040,000	$1,893,040,000
Net Policy Scenario (Impacts of Solar Use Easement)				
Direct	8,300	$1,159,670,000	$4,906,820,000	$7,699,490,000
Indirect	4,600	$458,230,000	$897,650,000	$1,856,170,000
Induced	6,300	$401,310,000	$770,050,000	$1,291,140,000
Max Build Out				
Direct	22,900	$3,200,570,000	$13,018,080,000	$20,725,500,000
Indirect	12,800	$1,264,670,000	$2,477,410,000	$5,122,830,000
Induced	17,500	$1,108,250,000	$2,126,530,000	$3,565,530,000

Note: Full-time Equivalent (FTE) employment equates to 2.080 hours of labor. All monetary values in 2023 dollars.

Source: ECOnorthwest analysis