



CDTFA
CALIFORNIA DEPARTMENT OF
TAX AND FEE ADMINISTRATION

California Lithium Extraction Tax Study

Pursuant to Senate Bill 125
(Chapter 63, Statutes of 2022)

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Authored by the Research and Statistics Section

Executive Summary



The Salton Sea, California's largest inland body of water, contains some of the world's largest reserves of the precious mineral lithium, most commonly known for use in battery manufacturing.¹ Senate Bill 125 (SB 125, Chapter 63, Statutes of 2022) was signed into law on June 30, 2022, by Governor Gavin Newsom, effectively creating a new volume-based tax structure for lithium extraction in California. This extraction tax was designed to leverage the state's lithium resources into a vital revenue source for the Salton Sea and its surrounding areas. SB 125 included a requirement for the California Department of Tax and Fee Administration (CDTFA) to prepare a study on replacing the current volume-based tax with an equivalent tax based on gross receipts.

Specifically, SB 125 requires CDTFA to evaluate the following:

- The administrative feasibility and considerations for the Department of converting a volume-based tax on lithium extraction to an equivalent tax based on gross receipts.
- The revenue stability of a tax based on gross receipts compared to a volume-based tax.
- Potential impacts on the tax burdens of in-state lithium producers.
- An analysis of the reliability of gross receipts data in terms of providing a meaningful measure of the value of lithium production within a particular time period, including, but not limited to, the characteristics and structure of lithium-extracting firms, types, and frequency of sales by producers, price-setting mechanisms, and market volatility.
- Considerations on how to define gross receipts to capture the value of in-state production of lithium.
- An evaluation of alternatives to a volume-based tax structure that may protect lithium producers if the lithium price declines.

Summary of Findings

- **Administrative Feasibility.** Compared to a gross receipts tax, a volume-based tax would likely be easier to administer, as it is only based on the volume of lithium carbonate equivalent (LCE) extracted and does not require any price verification. However, the difference in administrative costs associated with a volume-based tax compared to a gross receipts tax would not be significant.
- **Revenue Stability.** If extraction volume does not fluctuate widely, the volume-based tax system could be slightly more stable than a gross receipts tax system due to its potential to generate a relatively steady and predictable source of revenue from year to year. However, since total worldwide volume is also typically correlated with price, fluctuating prices will likely cause production volume to fluctuate. While price volatility will lead to some revenue instability with either tax system, a gross receipts tax relies on price and will necessarily magnify any volatility of volume. The tiered structure of the volume-based tax also offers stability and an initial lower tax burden for producers who are likely to incur many upfront costs early in the extraction process.

¹Water Education Foundation. 2021. "Long troubled Salton Sea may finally be getting what it most needs: Action – and Money." www.watereducation.org/western-water/long-troubled-salton-sea-may-finally-be-getting-what-it-most-needs-action-and-money.

- **Reliability.** A gross receipts tax could more reliably measure the most up-to-date value of lithium production, accurately keeping pace with changing trends in lithium spot prices. However, actual production prices would most likely be unknown as they would be set by private contracts and not by public markets. Furthermore, battery manufacturers that purchase or enter into joint ventures with mining operations would have no market transactions associated with their mining activity.

Spot prices are the only available indicator of current and recent lithium prices. Chinese spot prices (measured in Chinese Yuan) have been primarily used as the LCE price reference since no individual price index has been accepted as the current industry standard. The average Chinese spot price has been extremely volatile over the past year, rising to \$80,000 (in U.S. dollar equivalent) in late 2022, then declining to \$15,000 by the end of November 2023, and averaging approximately \$40,000 in 2023 year-to-date. Prices included in negotiated contracts are typically lower than spot prices. Accordingly, without actual production prices, we cannot determine if a gross receipts tax would be more or less reliable than a volume-based tax.

- **Tax Burden Impacts.** To quantify and compare the estimated tax burden from the current volume-based tax system and a gross receipts tax system, CDTFA analyzed multiple scenarios using hypothetical estimates for extraction volume, average price. Findings are as follows:
 - 1) For producers starting with a low initial extraction volume at the Tier 1 volume-tax rate of \$400, the tax burden is relatively minimal under either tax system. However, most producers will likely reach the Tier 3 rate of \$800 per metric ton (some sooner than others), which in turn increases the tax burden from the volume-based tax.
 - 2) Once the Tier 3 threshold is met, the tax burden from the volume tax can grow significantly higher than a gross receipts tax, depending on price and gross receipts tax rate. For example, if the average LCE price dropped to \$10,000 per metric ton, the tax burden under the volume tax would rise to 8% of gross receipts, which is significantly higher than the tax burden under a tax rate of 1-3% of gross receipts.
 - 3) At high extraction volumes, such as 300,000 metric tons, the tax dollar impact becomes magnified significantly compared to a gross receipts tax. For example, at a price of \$10,000, a producer could potentially pay \$180,000,000 more in tax compared to a 2% gross receipts tax and \$150,000,000 in tax more compared to a 3% gross receipts tax.
- **How to Define Gross Receipts.** The definition of “sales price” under California Sales and Use Tax Law serves as a model to define gross receipts for purposes of a gross receipts tax on lithium extraction.
- **Alternatives to a Volume-Based Tax Structure.** The only practical alternative to a volume-based tax structure is a tax based on gross receipts. A gross receipts tax, as discussed in this study, would likely be more straightforward than a net receipts tax, since it would avoid the complex deductions that accompany a net receipts tax. In addition, the current volume-based tax structure potentially could be modified to make it more adaptable to any volatile pricing shifts.
- **Conclusion.** A traditional market has many buyers, sellers, and arms-length transactions, while providing accurate, verifiable prices. However, research indicates that average lithium prices are rather opaque, with the vast majority of prices set by private contracts rather than by a traditional market. This creates current limitations for making concrete conclusions regarding impacts of a volume-based tax compared to a gross receipts tax.

Introduction and Background

The Salton Sea is California's largest inland body of water with 325 miles of surface area, making it almost twice the size of Lake Tahoe.¹ It is also home to one of the world's largest reserves of lithium, the mineral integral to producing the batteries that power electric vehicles and many other electronics. With emerging worldwide demand for lithium, the Salton Sea presents a valuable opportunity to extract lithium from brines already being produced by geothermal power plants in the Salton Sea region, and potentially in a more environmentally friendly manner than traditional extraction methods used in other parts of the world.²

On June 30, 2022, Governor Gavin Newsom signed into law Senate Bill 125 (SB 125, Chapter 63, Statutes of 2022). Among other provisions, SB 125 established a three-tiered, volume-based lithium extraction tax to take effect on January 1, 2023, with 80% of tax revenue distributed to the counties where extraction occurs and the other 20% to Salton Sea restoration. Under the SB 125 volume-based tax, lifetime cumulative metric tons of LCE extracted by a producer are subject to the following rates:

- \$400 per metric ton for the first 20,000 tons of LCE extracted,
- \$600 per metric ton extracted from over 20,000 up to 30,000 metric tons, and
- \$800 per metric ton for LCE extracted over 30,000 metric tons.

In addition to establishing the volume-based extraction tax, SB 125 requires CDTFA on or before December 31, 2023, to prepare a study of replacing the current volume-based tax with an equivalent tax based on gross receipts.

Specifically, SB 125 requires CDTFA to evaluate the following:

- The administrative feasibility and considerations for the Department of converting a volume-based tax on lithium extraction to an equivalent tax based on gross receipts.
- The revenue stability of a tax based on gross receipts in comparison to a volume-based tax.
- An analysis of the reliability of gross receipts data in terms of providing a meaningful measure of the value of lithium production within a particular time period, including, but not limited to, the characteristics and structure of lithium-extracting firms, types, and frequency of sales by producers, price-setting mechanisms, and market volatility.
- Potential impacts on the tax burdens of in-state lithium producers.
- Considerations on how to define gross receipts to capture the value of in-state production of lithium.
- An evaluation of alternatives to a volume-based tax structure that may provide protections to lithium producers if the price of lithium declines.

This study provides an objective comparison and analysis regarding applicable tax structures. Any advantages and disadvantages mentioned in this study will be discussed with respect to state and local governments as a reflection of the general societal good, not the special interests of the lithium mining industry.

² Lithium Valley Commission. 2022. "Report of the Blue Ribbon Commission on Lithium Extraction in California." efiling.energy.ca.gov/GetDocument.aspx?tn=247861.

I. Lithium Taxation Around the World

While the United States (U.S.) was once one of the world's largest producers of lithium, today, nearly all the world's lithium supply is mined in Argentina, Australia, Chile, and China. Only a small percentage of lithium is being extracted in the U.S., all from a single mining operation located in Silver Peak, Nevada. In 2021, 96% of the world's mined lithium supply came from the four aforementioned countries, in contrast, only one percent came from the U.S.³ Australia is currently the world's largest lithium producer, followed by Chile, China, and Argentina. Although Bolivia has some of the largest lithium reserves in the world, technical hurdles and a lack of infrastructure have long delayed the lithium extraction there.⁴ With the rapidly increasing global demand for raw lithium, lithium producers and the automotive industry are now also looking to other locations such as Africa and Canada as new sources for future lithium extraction.⁵

CDTFA Review. CDTFA research staff reviewed available literature on how lithium mining is taxed in the top four countries that currently dominate lithium supply, in addition to the one active U.S. mining operation. Each country's current lithium tax or royalty rates are shown in Table 1 and discussed in more detail in the subsections below.

Table 1
Lithium Mining Taxes and Royalties (in order of global market share)

Country	Tax or Royalty Rate	Description and Notes
Australia (52%)	5%	5% state royalty based on the realized revenue from spodumene concentrate.
Chile (25%)	6.8% - 40%	Sliding royalties that range from 6.8% to 40% of the lithium export sale price.
China (13%)	Unknown	China's lithium resources are still highly dependent on foreign entities.
Argentina (6%)	3%	Maximum royalty of 3% on the pithead value of extracted lithium.
Nevada (U.S.)	5%	5% state tax on net lithium sales.

Sources:

Lithium Production in Chile and Argentina_Inverted Roles, Wilson Center, 2023,
[Lithium Production in Chile and Argentina_Inverted Roles_JAN 2023.pdf](https://www.wilsoncenter.org/publication/lithium-production-in-chile-and-argentina-inverted-roles-jan-2023) (wilsoncenter.org)

New lithium royalty regime commences in Western Australia, MinterEllison, 2020,
New lithium royalty regime commences in Western Australia - Technical update - MinterEllison

³ World Economic Forum. 2023. "This chart shows which countries produce the most lithium."
www.weforum.org/agenda/2023/01/chart-countries-produce-lithium-world/.

⁴ The Meghalayan. 2023. "China controls 70% of global lithium production; that's a worry for the world."
<https://themeghalayan.com/china-controls-70-of-global-lithium-production-thats-a-worry-for-the-world/>.

⁵ Bloomberg. 2023. "China Jumps Ahead in the Rush to Secure Lithium From Africa."
www.bloomberg.com/news/articles/2023-07-03/china-jumps-ahead-in-the-rush-to-secure-lithium-from-africa
and Cision PR Newswire, 2023. "Ford and Nemaska Lithium enter long-term lithium hydroxide supply agreement."
www.prnewswire.com/news-releases/ford-and-nemaska-lithium-enter-long-term-lithium-hydroxide-supply-agreement-301830326.html.

Argentina

As one-third of the “Lithium Triangle” along with its South American neighbors Chile and Bolivia, Argentina is home to sizeable reserves of lithium-rich continental brine deposits. While mining companies in Argentina are now exploring alternative technologies for extracting lithium, the traditional extraction method in South America involves pumping lithium-rich brine underground from salt flats (also called “salars”) and then moving the brine to expansive evaporation ponds. Over a period of time (up to two years) under arid conditions, the ponds evaporate, and lithium is separated from the salty brines and precipitated as lithium carbonate. As a result of a complex purification process, only about 30% of the lithium in the original brine gets exported to the lithium marketplace.⁶

Argentina’s rise as a major player in the lithium mining industry is relatively recent. Although it was the world’s fourth largest producer of lithium in 2021, JP Morgan forecast in August 2022 that Argentina’s growing lithium production would increase from 6% of the world’s supply in 2021 to 16% by 2030 and would overtake Chile as the second highest lithium producer in the world by 2027.⁷ Argentina has been the largest source of U.S. lithium imports in recent years, representing 54% of total U.S. lithium imports from 2017-2020.⁸

Compared to its lithium-rich neighbors Chile and Bolivia, Argentina has a reputation of inviting foreign investment with its generous mining policies and low royalty rates.⁸ Argentina’s government regulates lithium like any other ore, providing no special designation or status for lithium.⁹ Miners pay a 3% royalty on the pithead value of the mineral extracted; in other words, what is extracted in the first stage of production. Argentina also locks in tax rates in mining contracts for 30 years, does not levy a tax on capital goods, and allows companies to deduct double the amount spent on exploration from their taxes. Concessions do not expire, annual extraction is not limited, and companies only need to make annual tax payments.⁸

Australia

Australia’s lithium mining industry is primarily concentrated in Western Australia, where lithium is extracted from pegmatite deposits via a mining process known as hard rock mining. Through this process, ore is extracted from large mines containing a raw lithium-rich hard rock mineral called spodumene, which is crushed to form a concentrate.⁹ The spodumene concentrate is then usually sold and shipped to conversion plants where it is used as feedstock to produce lithium chemicals such as lithium concentrate or lithium hydroxide.¹⁰ The combined output from Australia’s mines produced just over half the world’s lithium supply in 2021.¹¹

⁶ The Economist. 2022. “Two new ways of extracting lithium from brine.” www.economist.com/science-and-technology/two-new-ways-of-extracting-lithium-from-brine/21807823.

⁷ S&P Global Market Intelligence. 2023. “Argentina’s lithium incentives push industry prospects above neighbors.” [Argentina’s lithium incentives push industry prospects above neighbors | S&P Global Market Intelligence \(spglobal.com\)](https://www.spglobal.com/marketintelligence/insights/argentina-lithium-incentives-push-industry-prospects-above-neighbors).

⁸ Wilson Center. 2023. “Lithium Production in Chile and Argentina: Inverted Roles.” www.wilsoncenter.org/publication/lithium-production-chile-and-argentina-inverted-roles.

⁹ Fast Markets. 2020. “Western Australia spodumene producers welcome tax reprieve scheme.” www.fastmarkets.com/insights/western-australia-spodumene-producers-welcome-tax-reprieve-scheme.

¹⁰ S&P Global Market Intelligence. 2019. “Essential Insights: Lithium Costs & Margins.” <https://pages.marketintelligence.spglobal.com/Lithium-brine-vs-hard-rock-demo-confirmation-MJ-ad.html>.

¹¹ BBC. 2022. “How Australia became the world’s greatest lithium supplier.” www.bbc.com/future/article/20221110-how-australia-became-the-worlds-greatest-lithium-supplier.

On March 27, 2020, the Western Australian government amended Regulation 86 of its official Mining Regulations 1981 to update its royalty structure for lithium minerals.¹² Per the updated regulation, spodumene producers in Western Australia pay a 5% state royalty based on the realized revenue of spodumene concentrate sales. The 5% rate applies to spodumene concentrate only, and when it is used as feedstock in the production of lithium carbonate or lithium hydroxide. There is no additional royalty levied on any of the lithium carbonate or lithium hydroxide produced from the spodumene concentrate.¹²

Comparatively, the average price for spodumene has historically been lower than the average price for lithium carbonate. According to published first quarter 2023 results from Allkem, an international lithium chemicals company with operations in Australia and Argentina, the average price for spodumene was \$5,702 per ton (USD) compared to \$53,175 per ton (USD) for lithium carbonate.¹³ For fiscal year 2021-22, Western Australia reported a total of \$150 million (USD) in lithium royalty revenue.¹⁴

Chile

Like its neighbor Argentina, Chile is a top producer of lithium carbonate extracted from salt brines. Chile was once the world's lithium powerhouse; however, in 2017, it was overtaken by Australia as the world's top lithium supplier.¹⁵ Chile still produced a quarter of the world's lithium supply in 2021, and the Atacama Desert in Chile holds the world's largest known lithium reserves at 9.3 million tons.¹⁶ Chile is the world's largest lithium producer from brines and remains the second largest producer overall after Australia.¹⁰ Chile classifies lithium as a strategic resource, and its development is reserved for the state or private companies that get a special permit from the Chilean government.

The mining industry in Chile has been dominated by only two companies that possess mining permits, Albemarle (which also owns the Silver Peak mine in the U.S.) and SQM; governmental regulations have discouraged new investment.¹⁰ SQM's license expires in 2030, and Albemarle's license expires in 2043. Lithium producers in Chile pay sliding royalties that range from 6.8% to 40% of the LCE export price. The 40% royalty rate takes effect when the export price reaches \$10,000 per ton. In addition, the Chilean government requires that 25% of output be sold at a preferential price to domestic Chilean value-added producers.¹⁷

In April 2023, Chilean President Gabriel Boric introduced plans to restructure Chile's lithium industry, nationalizing lithium to exert more state control. Under the plan, the Chilean government will negotiate for a larger stake in their current contracts with SQM and Albemarle, and future lithium contracts would be issued as public-private partnerships with a state-controlled lithium company as the majority partner. The president's plan must still seek approval from Chile's National Congress later this year, meaning that the plan could undergo significant changes before being approved.¹⁸ Therefore, it remains to be seen what Chile's lithium industry and royalty structure will ultimately look like moving forward.

¹² MinterEllison. 2020. "New lithium royalty regime commences in Western Australia." www.minterellison.com/articles/new-lithium-royalty-regime-commences-in-western-australia.

¹³ TradingView. 2023. "5 lithium price insights from Allkem's first quarter results." www.tradingview.com/news/marketindex:88d09796a094b:0-5-lithium-price-insights-from-allkem-s-first-quarter-results/.

¹⁴ Government of Western Australia. 2022. "Western Australia Battery Minerals Profile – June 2022." www.wa.gov.au/system/files/2022-07/WA%20Battery%20Minerals%20Profile%20-%20June%202022.docx.

¹⁵ The Economist. 2022. "Argentina could help the world by becoming a big lithium exporter." www.economist.com/the-americas/2022/11/15/argentina-could-help-the-world-by-becoming-a-big-lithium-exporter.

¹⁶ Wilson Center. 2023. "All Eyes on Chile amid Global Scramble for Lithium." www.wilsoncenter.org/blog-post/all-eyes-chile-amid-global-scramble-lithium.

¹⁷ Hailes, Oliver. 2022. "Lithium in International Law: Trade, Investment, and the Pursuit of Supply Chain Justice." www.researchgate.net/publication/358653654_Lithium_in_International_Law_Trade_Investment_and_the_Pursuit_of_Supply_Chain_Justice.

¹⁸ Foreign Policy. 2023. "Chile's White Gold Rush." foreignpolicy.com/2023/04/21/chile-lithium-reserves-albemarle-sqm-nationalize-boric-santiago/.

China

China holds only 7% of the world's lithium resources, and its domestic mines account for roughly 12% of the world lithium supply. Still, it is the world's largest importer, refiner, and consumer of lithium, supplying approximately 70% of global battery-grade lithium products.^{4, 19} Therefore, while China is the leader in global lithium processing and refining, it sources the bulk of its raw lithium products by importing from Australia, Chile, and Argentina. Estimates indicate that mines in these three countries account for over 80% of lithium extracted worldwide. China has contracts for up to 95% of the lithium mined in Australia.²⁰ China's dependence on foreign entities for raw lithium is likely due to insufficient national development of its exploitation potential and the inferior quality of its mineral resources.²¹ As a result, the potential for China to exploit its domestic lithium resources has not yet been fully realized.

On September 1, 2020, China's updated natural resource tax law took effect, allowing local provinces to levy taxes on a standardized list of 164 different natural resources, on a sales or volume basis at rates specified in the law by the Ministry of Finance. The taxable natural resources include crude oil, natural gas, coal, raw nonmetallic minerals, raw ferrous metals, nonferrous metallic minerals, and salt (both solid and liquid).²² The new law includes certain tax relief options and exemptions;²³ however, no public information could be found to specifically identify whether lithium is included as one of the 164 taxable natural resources, or if it is one of the resources subject to exemption.

U.S.

In addition to its presence in Chile, North Carolina-based Albemarle Corporation owns and operates the only active lithium mining operation in the U.S., located in Silver Peak, Nevada. Albemarle extracts lithium in this region through underground brine resources found in well fields. Wells continuously pump brine from below the surface to man-made evaporation ponds, where over an 18-month period, lithium is extracted through evaporation and ultimately converted to lithium carbonate through a chemical cleansing process.²⁴ The Silver Peak Mine currently produces approximately 5,000 metric tons of lithium carbonate equivalent annually, a statistically insignificant amount compared to worldwide lithium production. Albemarle hopes to double production by 2025.²⁴

Although Nevada currently does not have a specific tax designated for lithium, it does have a severance tax (to be discussed in the next section) with a cap of 5% on net proceeds that applies to all minerals extracted in the state. Lithium is taxed at the maximum 5% rate, and the Nevada Department of Taxation's 2021-22 *Net Proceeds of Minerals Bulletin* reports that Albemarle generated approximately \$41.7 million in gross revenue. However, after roughly \$25.4 million in tax deductions, the state's 5% net proceeds tax only generated \$816,000 in tax revenue from lithium sales.²⁵ In 2021, the Nevada legislature added a gross revenue tax for higher revenue-generating minerals, such as gold and silver, at rates of 0.75% on gross revenue between \$20 million and 1.1% on gross revenue \$150 million and above.²⁶ If lithium extraction in Nevada rises to the level of gold and silver, the gross revenue tax could foreseeably apply to lithium in the future as well.

¹⁹ The Wall Street Journal. 2023. "In China, Bidding Wars for Lithium Top Out at 1,300 Times the Starting Price." www.wsj.com/world/china/in-china-bidding-wars-for-lithium-top-out-at-1-300-times-the-starting-price-5fc65393.

²⁰ The Salt Lake Tribune. 2022. "How the Great Salt Lake soon could be powering your phone, computer and car." www.sltrib.com/news/environment/2022/04/17/how-great-salt-lake-soon/.

²¹ Frontiers in Environmental Science. 2022. "Improving China's Global Lithium Resource Development Capacity." Policy Brief, published 17 June 2022, doi: <https://doi.org/10.3389/fenvs.2022.938534>.

²² Santander. 2023. "China: Tax system." <https://santandertrade.com/en/portal/establish-overseas/china/tax-system>

²³ U.S. Geological Survey. 2019. "2019 Minerals Yearbook: China." pubs.usgs.gov/myb/vol3/2019/myb3-2019-china.pdf.

²⁴ Mesabi Tribune. 2023. "Silver Peak Mine the only source of lithium in U.S." www.mesabitribune.com/mine/silver-peak-mine-the-only-source-of-lithium-in-u-s/article_dbffa8c4-a95a-11ed-82c1-1b0b7db2f567.html.

²⁵ Nevada Department of Taxation, Division of Local Government Services. 2022. "2021-22 Net Proceeds of Minerals Bulletin." tax.nv.gov/LocalGovt/PolicyPub/ArchiveFiles/NetProceedsBulletins/2021-2022_Net_Proceeds_Bulletin/.

²⁶ Nevada Current. 2023. "Lithium: 'More economic colonialism?' Nevada: 'Yes, please.'" www.nevadacurrent.com/2023/03/23/lithium-more-economic-colonialism-nevada-yes-please/.

II. U.S. Severance Tax Overview

Severance Taxes and Royalties. In the U.S., other than Nevada’s minerals tax, the best comparison we have to a lithium tax or royalty is a severance tax. State severance taxes are those taxes and fees imposed on the extraction of nonrenewable natural resources from privately owned lands. Royalty payments made to governments, like those in Australia and South America, are similar to U.S. severance taxes; however, they are paid for minerals extracted from government-owned lands.

The most common severance taxes are on crude oil and natural gas extraction. According to the National Conference on State Legislatures (NCSL), 38 states have severance taxes on crude oil or natural gas. Twenty-seven states have severance taxes on coal, and twelve western states impose taxes on hard rock mineral extraction.²⁷

CDTFA Review. CDTFA tabulated severance tax data for top-producing states for crude oil, natural gas, and coal. The top ten states examined account for 81% to 91% of all U.S. production.

Summary Findings. State severance taxes vary widely in tax bases, structure, and rates. The two main tax bases are gross or net receipts and volume of physical weight.

- In 2022, 72% to 91% of crude oil, natural gas, and coal, extraction was subject to a severance tax.
- Most states apply tax either to gross or net receipts as a tax base. Fewer states have volume-based taxes.
- Rates vary significantly for both volume and gross or net receipts tax bases. In gross or net receipts systems, the vast majority of production is taxed at rates from about 2% to 8%.
- Many gross or net receipts-based severance taxes are extremely complicated. While rates may vary for volume-based severance taxes based on production or income, few other factors generally apply. Volume-based taxes are generally simpler and more transparent than many gross or net receipts-based tax systems.
- Tax structure may include deductions and varying rates based on the age of wells, volume of production per well, types of wells, and other factors. Some rate structures can be highly complicated. For example, Alaska imposes a rate of 35% of value of crude oil and natural gas but may (as one option) include the value after netting out qualified lease expenditures. The 2018 NCSL study cited includes eight exceptions for Alaska.
- While most states tax either volume or gross or net receipts, some states impose tax on a combination of the two, such as a volume-based structure, up to a maximum amount produced. Methods of taxing oil and gas can be complex. The 2018 NCSL study cited discusses this complexity in a section titled “Ways to Tax Oil and Gas Production”.²⁷



²⁷ National Conference of State Legislatures (NCSL). 2018. “State Oil and Gas Severance Taxes,” 2022. “State Severance Tax Overview.” U.S. Government Accountability Office (GAO). 2019. “Hardrock Mining: Updated Information on State Royalties and Taxes.”

Specific Commodities

Hard Rock Minerals. Table 2 summarizes hard rock severance taxes tabulated by the Government Accountability Office (GAO) for 11 states. Nine states have receipts-based systems, one uses a volume-based system, and one uses both systems. As shown in the table, rates vary from less than 1% to as high as 7%, depending on the specific commodity. Nearly all of these severance tax systems have restrictions, deductions, or exclusions.

Table 2
Severance Taxes on Hard Rock Mining in Eleven Western States

State	Volume-Based Rates	Gross Receipts-Based Rates	Description and Notes
Alaska		3% - 7%	Net income > \$40,000; deductions and restrictions.
Arizona - Metallic		2.50%	Net receipts 50% of gross receipts.
Arizona - Nonmetallic		3.13%	Gross receipts; deductions and restrictions.
California	\$5/oz. gold; \$0.10/oz. silver		Minimum of \$100; maximum of \$10,000.
Colorado - Metallic		2.25% > \$19 million annually	Gross receipts; deductions and restrictions.
Colorado - Molybdenum	\$0.05/ton > 625,000 tons annually		Gross receipts; restrictions.
Idaho		1%	Deductions.
Montana - Metallic		1.6% - 1.8%	Several restrictions and exclusions.
Montana - Nonmetallic		0.5% - 10%	Several restrictions and exclusions; some minerals volume based.
Nevada		0% - 5%	Lease specific royalties; source: KP Public Affairs, 4/5/23.
New Mexico		0.125% - 3.5%	Rate depends on the commodity.
Utah - Metals		2.60%	Several restrictions and exclusions.
Utah - Beryllium		2.60%	Tax base defined as 125% of costs.
Washington		0.48%	
Wyoming - Uranium		4.00%	Several restrictions and exclusions.
Wyoming - Specified minerals		2%	Not include any processing.
Totals	2	10	

Source: *Hardrock Mining: Updated Information on State Royalties and Taxes*, U.S. Government Accountability Office (GAO), July 16, 2019.

Crude Oil. The top ten crude oil producing states shown in Table 3 accounted for 81% of U.S. production in 2022. Federal area production is an additional 15%, so all but 4% of crude oil produced in the U.S. is subject to a state severance tax if it can be so taxed. All ten states have receipts-based systems. Rates generally vary from 2% to 12%. Alaska has a 35% rate, but its rate is not comparable to the others because it is based on net receipts, not gross receipts. All of these state systems have restrictions and exclusions, and many of these systems are complicated.

Table 3
Crude Oil Severance Taxes—Top 10 Producing States in 2022

State	Gross Receipts-Based Rates	Description and Notes
Texas	7.5%	Several restrictions and exclusions. Texas produced 42% of U.S. crude oil in 2022.
New Mexico	2% - 4%	Complicated rate structure.
North Dakota	2% - 6%	Several restrictions and exclusions.
Alaska	35%	Net production value for oil and gas. Several restrictions and exclusions.
Colorado	2% - 5%	Progressive, based on oil income. Exemptions.
Oklahoma	2% - 7%	Several restrictions and exclusions.
California		No statewide severance tax.
Wyoming	2% - 6%	Complicated rate structure.
Utah	3% - 5%	Complicated rate structure.
Louisiana	3% - 12%	Complicated rate structure.

Source: *State Oil and Gas Severance Taxes*, National Conference of State Legislatures, 2018, www.ncsl.org/energy/state-oil-and-gas-severance-taxes.



Natural Gas. The top ten natural gas-producing states shown in Table 3 accounted for 91% of production in 2022. Seven are gross receipts systems, and three are volume-based systems. Except for Alaska, rates vary from 2% to 7.5%. (As with crude oil, natural gas in Alaska is taxed on net value, not gross value.) Pennsylvania has a unique tax system. It is not technically a severance tax since it is a fee per gas well. The fee is based on well volume, and many other factors. Press reports indicate that in 2022, Pennsylvania natural gas was taxed at close to one percent of its value.²⁸

Table 4 below displays the top 11 producing states in 2022 for natural gas severance taxes. A large amount of natural gas comes from Texas, 26% in 2022, and is taxed at 7.5% of value.

Table 4
Natural Gas Severance Taxes—Top 11 Producing States in 2022

State	Volume-Based Rates	Gross Receipts-Based Rates	Description and Notes
Texas		7.5%	Several restrictions and exclusions. Texas produced 26% of U.S. natural gas in 2022.
Pennsylvania			Fee per gas well that changes annually with the price of natural gas, age of well, and other factors. Technically not a severance tax. Very complicated structure. The fee accounted for less than 1% of the value of production in 2022.
Louisiana	\$0.01 - \$0.12 per 1,000 cubic feet		Complicated rate structure.
Alaska		35%	Net production value for oil and gas. Several restrictions and exclusions.
West Virginia		5%	Some exceptions.
Oklahoma		2% - 7%	Several restrictions and exclusions.
New Mexico		2% - 4%	Complicated rate structure.
Ohio	\$0.025/mcf*		
Colorado		2% - 5%	Progressive, based on oil income. Exemptions.
Wyoming		2% - 6%	Complicated rate structure.
North Dakota	\$0.0705/mcf		
Totals	3	7	

Source: *State Oil and Gas Severance Taxes*, National Conference of State Legislatures, 2018, www.ncsl.org/energy/state-oil-and-gas-severance-taxes.

Note:

*Mcf = 1,000 cubic feet.

²⁸ Pittsburgh Post Gazette. 2023. "Shale well impact fees rise as natural gas prices surge." www.post-gazette.com/business/powersource/2022/06/23/shale-well-impact-fees-rise-as-natural-gas-prices-surge-pennsylvania/stories/202206220115.

Coal. Six states with severance taxes accounted for about 72% of U.S. coal production in 2021, as shown in Table 5. The top ten coal-producing states accounted for 91% of production in 2021. However, four of these top ten states do not have severance taxes: Pennsylvania, Illinois, Texas, and Utah (listed in order of 2021 production). These states account for about 19% of U.S. coal production. By contrast, every top ten natural gas producing state has a severance tax. (While Pennsylvania does not technically have a severance tax on natural gas, it does have a fee per well based mainly on production volume.) Of the six states with coal severance taxes, four have gross receipts-based taxes and two have volume-based taxes. Coal severance taxes for these states tend to be higher than other commodities, ranging from 4.5% to 15% of value.

Table 5
Coal Severance Taxes—Top 6 Producing States in 2021

State	Percentage of U.S. Production in 2021	Volume-Based Rates	Gross Receipts-Based Rates	Description and Notes
Wyoming	41.4%	N/A	7.0%	7% on surface extraction, which is 98% of total production.
West Virginia	13.6%	N/A	5.0%	State and local rate, with restrictions and exceptions.
Montana	4.9%	N/A	10% - 15%	10% -15% for surface mining (about 75% of all Montana coal production) with restrictions and exceptions.
North Dakota	4.6%	0.37/ton	N/A	With restrictions and exceptions.
Kentucky	4.6%	n.a	4.5%	With restrictions and exceptions; rate applies only for coal shipped out of state.
Indiana	3.4%	\$0.03 - \$0.055/ton	N/A	Varies from \$0.03 per ton (surface) to \$0.055 per ton (underground). Each are close to 50% of state production.
Totals	72.5%	2	4	

Sources: Production: U.S. Energy Information Administration; Rates: *State Severance Tax Overview*, National Conference of State Legislatures (NCSL), October 2022. legislature.maine.gov/doc/9137.

III. Volume-Based vs. Gross Receipts Tax

California's current lithium tax structure, which became effective on January 1, 2023, is based on volume, imposing a tax on each metric ton of LCE extracted. The tax applies to all methods of lithium extraction, including geothermal fluid, rock, minerals, clay, or any other naturally occurring substance in the state.

An alternative to the current volume-based lithium tax structure is to tax lithium producers as a percentage of their gross receipts from sales of LCE.²⁹ The Sales and Use Tax Law has been referenced to define "gross receipts" and "sales price" in other tax programs where the tax is imposed on that basis and may be applicable to a lithium gross receipts tax. Under Revenue and Taxation Code (R&TC) section 6012, "gross receipts" is defined as "the total amount of the sale or lease or rental price, as the case may be, of the retail sales of retailers, valued in money, whether received in money or otherwise, without any deduction...", as specified.³⁰

Since the definition of "gross receipts" under R&TC section 6012 only includes retail sales, the definition of "sales price" under R&TC section 6011, which also includes non-retail sales, may be a more appropriate model for defining gross receipts subject to a lithium extraction gross receipts tax. R&TC section 6011 defines the "sales price" as "the total amount for which tangible personal property is sold or leased or rented, as the case may be, valued in money, whether paid in money or otherwise, without any deduction...", as specified.³¹ Borrowing from the definition of "sales price" under R&TC section 6011 to define "gross receipts" for purposes of the lithium extraction gross receipts tax would better capture all in-state production of lithium.

CDTFA Review. SB 125 requires CDTFA, on or before December 31, 2023, to prepare a study of replacing the current volume-based tax with an equivalent tax based on gross receipts. CDTFA research staff analyzed both the state's current volume-based lithium tax structure and an equivalent gross receipts tax from the perspectives of:

- Administrative feasibility
- Revenue stability
- Reliability
- Tax burden impacts on lithium producers

Administrative Feasibility

Ease of Administration. The current volume-based tax only involves imposing a fixed tax of \$400-\$800 on each metric ton of LCE extracted (which locks in at \$800 once a producer reaches a cumulative extraction total of 30,000 metric tons) and is easier to administer than a gross receipts tax. The current tax is based entirely on the volume of LCE extracted and does not require price verification. Pursuant to current law, the only tax rate change required is an annual adjustment beginning on January 1, 2025, to keep rates consistent with changes in the cost of living as measured by the California Consumer Price Index (CPI).

Since a gross receipts tax would be based on price, CDTFA would need to verify market prices to calculate the tax burden and prevent tax fraud. Currently, there is no standard or traditional market for lithium where large numbers of buyers and sellers are brought together, either online or in person. Lithium is typically valued using foreign spot prices and not traditional markets. In February 2023, the South Dakota legislature voted down a proposal to add lithium to its list of minerals subject to the state's 4.5% severance tax on the basis that they could not adequately address how to tax lithium or determine its value.³² This demonstrates the inherent difficulty in determining the market price of lithium at present, adding major administrative complexity to any potential gross receipts tax system.

²⁹ The Urban Institute. 2023. "State and Local Backgrounders: General Sales Taxes and Gross Receipts Taxes." www.urban.org/policy-centers/cross-center-initiatives/state-and-local-finance-initiative/projects/state-and-local-backgrounders/sales-taxes.

³⁰ CDTFA. 2023. "Sales and Use Tax Law, Revenue & Taxation Code: section 6012." www.cdtfa.ca.gov/lawguides/vol1/sutl/6012.html.

³¹ CDTFA. 2023. "Sales and Use Tax Law, Revenue & Taxation Code: section 6011." www.cdtfa.ca.gov/lawguides/vol1/sutl/6011.html.

³² South Dakota Public Broadcasting. 2023. "Bill taxing lithium mining fails in committee." listen.sdpb.org/politics/2023-02-03/bill-taxing-lithium-mining-fails-in-committee.

Administrative Costs. CDTFA estimates administrative costs associated with a volume-based tax versus a gross receipts tax would not differ significantly. The number of taxpayers and tax returns would be the same under either structure, and staff hours needed to accommodate a system change are estimated to be minor. One-time programming changes are currently estimated to be under \$100,000.

Revenue Stability

Assuming extraction volume does not fluctuate widely, the current volume-based tax system could offer more stability than a gross receipts tax system, based on its potential to generate a relatively steady and predictable source of revenue from year to year. While total worldwide volume also is typically correlated with price, causing production volume to fluctuate to some degree, production volatility would likely be less than price volatility under a gross receipts tax.

Multiplying volume by any number greater than one, such as price per unit of volume under a gross receipts tax, would necessarily magnify any volatility of volume. The accompanying price volatility with a gross receipts tax would also add an element of uncertainty for governments relying on a dedicated source of revenue. With 80% of revenue returned to counties and 20% dedicated to Salton Sea restoration, revenue volatility each year could pose challenges for government resources and planning, as governments generally have difficulty adjusting to a volatile funding source. Employee compensation, contractual obligations, and other spending are subject to laws and regulations that do not anticipate quick reversals in revenue.

The tiered structure of the current volume-based tax also offers stability for producers who are likely to incur many upfront costs early in the extraction process. Producers piloting new technologies or initially extracting on a smaller production scale would pay according to the lower tiers of the volume-based tax until they reach the 30,000 metric ton threshold. Some producers would potentially remain at the lower \$400 and \$600 tiers for several years before extracting a cumulative total of 30,000 metric tons. Once a producer hits that 30,000 metric ton threshold, which could be early in the process for some producers according to industry estimates, a single tax rate would lock in at \$800 per metric ton, magnifying the impact of price on the amount of tax paid.

Reliability

SB 125 requires CDTFA to analyze reliability in terms of providing a meaningful measure of the value of lithium production within a particular time period. Industry stakeholders indicated to CDTFA their concern that the current volume-based tax is not a reliable method to keep pace with unpredictable lithium price volatility in the future. As the value of lithium over a specific time period is tied to price, a gross receipts tax could be more reliable than a volume-based tax in reflecting the most up-to-date price trends. Actual production prices are unknown as they will be set by private contracts and not by actual public markets.

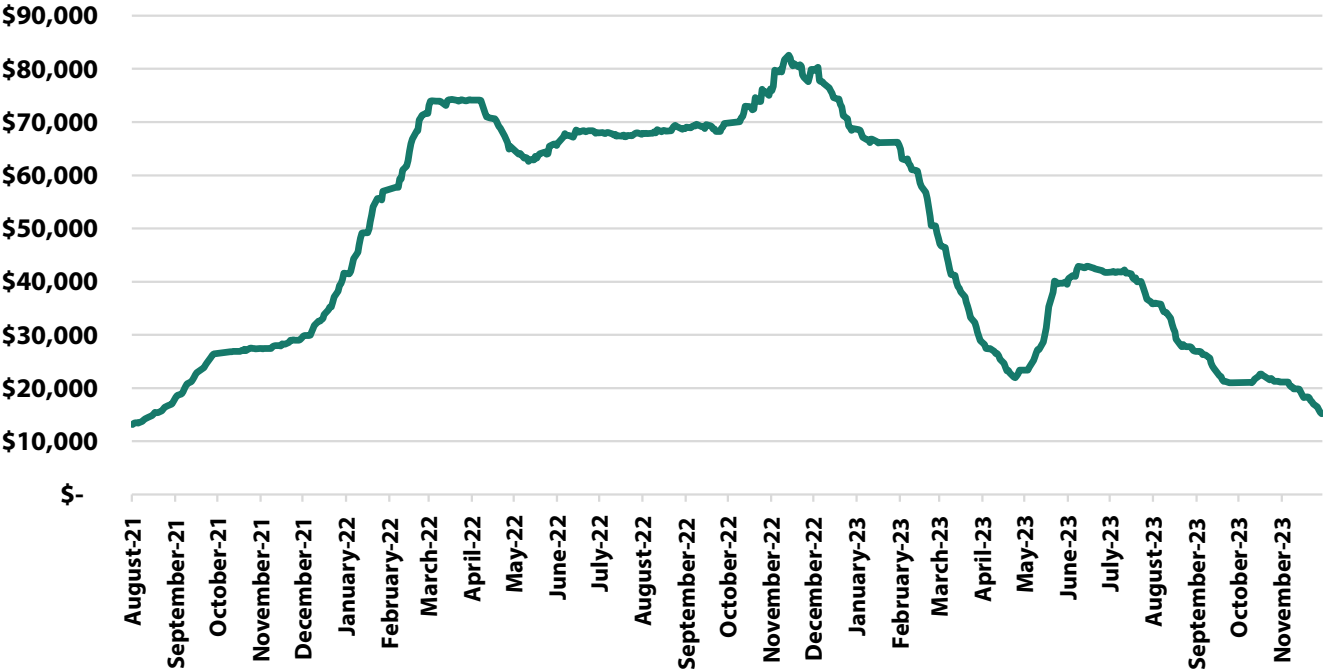
Further, industry stakeholders stated that prices included in negotiated contracts are typically lower than spot prices and approximately 80% of lithium supply deals are contract-based. Negotiated contract prices usually lag behind spot prices since they refer to prices from a prior time period. Additionally, battery manufacturers could vertically integrate or enter into joint ventures with mining operations, resulting in mining activity with no market transactions. The potential absence of market data leaves questions regarding whether a gross receipts tax would be a more reliable measure of value than a volume-based tax.

Without available contract price information, spot prices are the best indicator of current and recent lithium prices. Chinese spot prices (expressed throughout this study in terms of U.S. dollars) have primarily been used as a reference since no individual price index has been accepted as the industry standard; the lithium industry is historically smaller compared to other mineral industries with established index-linked pricing. Industry stakeholders argue that the current volume-based tax system was based on a peak high point-in-time Chinese spot price of \$80,000 USD (equivalent to 575,000 Chinese Yuan) for LCE and did not consider that prices are likely to trend considerably lower with increased supply and negotiated contracts. The third-tier fee of \$800 (over 30,000 metric tons) under the current volume-based system is equal to 1% of a price point of \$80,000.

Since the average spot price for lithium has trended downward since its peak of just over \$80,000 per metric ton in late 2022, producers could potentially have a lower equivalent tax burden under a gross receipts tax with lower LCE prices. The Chinese spot price for lithium plummeted in late April 2023, dropping below \$25,000 per metric ton before rising slightly, then declining to approximately \$15,000 at the end of November 2023. In the spring of 2023, Goldman Sachs estimated that prices could drop to \$15,000 per metric ton by 2024.³³ The average 2023 LCE price year to date is approximately \$40,000 per metric ton.

Figure 1 below displays the recent volatility in the U.S. equivalent Chinese spot price for LCE from August 2021 through November 2023. To put lithium price volatility into some perspective, over this two-year period, the highest monthly average price was more than six times the lowest. In contrast, the price of gasoline in California (a commodity with some of the most volatile prices commonly encountered in the economy) was only 1.5 times as volatile over the same period. The next section will quantify and compare the potential tax burdens of both a volume-based and gross receipts tax system using different hypothetical scenarios of price and volume.

Figure 1
Lithium Carbonate 99% Min China Spot Price Converted to U.S. Dollars



Sources:
www.investing.com/commodities/lithium-carbonate-99-min-china-futures-historical-data
www.exchangerates.org.uk

Note: China spot price converted to U.S. dollars using daily conversion rates.

³³ Financial Review. 2023. "Barrenjoey, Goldman warn of more pain for lithium prices."
www.afr.com/markets/commodities/barrenjoey-goldman-warn-of-more-pain-for-lithium-prices-20230413-p5d02i.

Tax Burden Impacts on Lithium Producers

A main point of interest in comparing a volume-based tax and a gross receipts tax is the level of tax burden each system imposes on producers. The industry stakeholders who voiced concern over the potential long-term instability of a volume-based tax also expressed concern over the potentially excessive tax burden it would impose on in-state lithium producers. One worry is that the volume-based tax could impact the industry's capacity to attract investment in California, with investment dollars instead going to other states with planned lithium mining industries, such as Nevada, Arkansas, or North Carolina. For example, industry estimates producers could potentially pay tens (or possibly hundreds) of million of dollars less in taxes with Nevada's net proceeds tax or its 1.1% gold and silver gross receipts tax (if lithium is added to this tax), compared to California's current volume-based tax system.

CDTFA Review. To quantify and compare the estimated tax burden from the current volume-based tax system and a gross receipts tax system, CDTFA analyzed multiple scenarios using hypothetical extraction volumes and prices to compare the difference in tax burdens generated using the two systems. In analyzing the estimated tax burden for the two systems, it's important to identify how the percentage of gross sales with the volume tax increases or decreases at a particular average price and how this percentage compares to hypothetical gross receipts taxes of 1-3%.

Estimated Annual Extraction Volume. The U.S Department of Energy's Argonne National Laboratory included in its October 2022 report *Lithium Production from North American Brines* the estimated annual lithium extraction volume from three companies setting up production in the Salton Sea region.³⁴ The lowest estimated annual extraction volume of the three is EnergySource Minerals at 13,000 metric tons of LCE per year, and the highest is Controlled Thermal Resources (CTR) at 300,000 metric tons per year. EnergySource Minerals intends to extract 2,500-3,500 metric tons of LCE per year initially and scale up in phases over subsequent years until it reaches its annual target of 13,000 metric tons. In May 2023, the company entered into a contract with Ford Motor Company to supply the company with the equivalent of 13,000 metric tons of LCE annually, with production estimated to begin in 2025.³⁵ CTR plans to extract 25,000 metric tons of LCE initially in 2024, then ramp up to 300,000 metric tons by 2030.³⁶ For the scenarios in this review, CDTFA staff analyzed potential tax burdens using hypothetical annual extraction volumes of 2,500, 13,000, and 300,000 metric tons of LCE.

Estimated Lithium Pricing. Since there are currently no publicly available production contract prices or a U.S. market price for lithium carbonate, we will assume contract prices equal Chinese spot prices (converted from Chinese Yuan into U.S. dollars), which have experienced volatile pricing shifts over the past year and are difficult to predict into the future. As shown in Figure 1, the Chinese spot price reached a peak high of \$80,000 in November 2022, dropped to \$15,000 in November 2023, and is averaging \$40,000 for the year to date. While sources such as Goldman Sachs predict a decline in spot price in 2024 due to increased supply, S&P Global forecasts prices will remain around the average 2023 price of \$40,000.³⁶ Therefore, it is difficult to confidently predict the trajectory of lithium prices over the long term. For the scenarios in this review, CDTFA used a current "baseline" price of \$40,000 (2023 average), along with hypothetical prices of \$10,000, \$25,000, \$50,000, and \$80,000.

³⁴ U.S. Department of Energy, Argonne National Library. 2022. "Lithium Production from North American Brines." www.osti.gov/servlets/purl/1891626/.

³⁵ Cision PR Newswire. 2023. "EnergySource Minerals (ESM) Announces Contract With Ford for Geothermal Lithium." www.prnewswire.com/news-releases/energysource-minerals-esm-announces-contract-with-ford-for-geothermal-lithium-301830259.html.

³⁶ S&P Global Market Intelligence. 2023. "Lithium and Cobalt CBS March 2023 – Lithium prices slide, cobalt prices steady." www.spglobal.com/marketintelligence/en/news-insights/research/lithium-and-cobalt-cbs-march-2023-lithium-prices-slide-cobalt-prices-steady.

Hypothetical Gross Receipts Tax Rates. The royalty rate closest to a gross receipts tax is Argentina’s 3% maximum rate on extracted LCE, while U.S. severance taxes based on gross receipts range from below 1% in Nevada to an average of 2% to 7% in other states. For the simplest comparison to the tax burden from a volume tax, CDTFA used hypothetical gross receipts tax rates of 1%, 2%, and 3%. These hypothetical rates are for illustrative and comparative purposes only and in no way represent the only possible rates the state may consider in any potential shift to a gross receipts tax.

Scenario 1: Annual extraction volume of 2,500 metric tons of LCE at Tier 1 of the volume-based tax

Scenario 1 compares the tax burden for a producer starting with a smaller scale of extraction of 2,500 metric tons at Tier 1 of the volume-based tax (\$400 per metric ton) and hypothetical gross receipts tax rates of 1%, 2%, and 3%. Table 6 below displays the various tax amounts at the baseline price of \$40,000 per metric ton, as well as prices below and above the baseline.

Table 6

Scenario 1: Extraction volume of 2,500 metric tons at Tier 1

Average Price	Gross Receipts (price* metric tons)	Gross Receipts Tax Revenue at Hypothetical Rates of:			Volume Tax	
		1%	2%	3%	Revenue (\$400 per mt*)	Percentage of Sales
\$80,000	\$200,000,000	\$2,000,000	\$4,000,000	\$6,000,000	\$1,000,000	0.5%
\$50,000	\$125,000,000	\$1,250,000	\$2,500,000	\$3,750,000	\$1,000,000	0.8%
\$40,000	\$100,000,000	\$1,000,000	\$2,000,000	\$3,000,000	\$1,000,000	1.0%
\$25,000	\$62,500,000	\$625,000	\$1,250,000	\$1,875,000	\$1,000,000	1.6%
\$10,000	\$25,000,000	\$250,000	\$500,000	\$750,000	\$1,000,000	4.0%

Notes:

*Assumes a producer has not yet reached the cumulative “Tier 2” threshold of 20,000 metric tons of LCE extracted.

With a total extraction volume of 2,500 metric tons of LCE at the baseline price of \$40,000 per metric ton of LCE, the volume-based tax burden would be \$1,000,000, or 1% of gross receipts. Notably, this would be less than both a 2% and 3% gross receipts tax. At prices higher than \$40,000, the percentage of gross receipts would drop below 1%. If the LCE price drops to \$25,000, the volume-based tax burden would still only be 1.6% of gross receipts, lower than gross receipt taxes of 2% and 3%. At a price of \$10,000 per metric ton, however, the percentage of gross receipts increases to 4.0%, making the volume-based tax burden higher than all three hypothetical gross receipts tax rates. As producers aim to ramp up production volume over the first few years, once they reach the Tier 2 rate (\$600 per metric ton for cumulative LCE total between 20,000 and 30,000 metric tons), they would likely only stay briefly at Tier 2 before reaching Tier 3.

Scenario 2: Annual extraction volume of 13,000 metric tons of LCE after reaching Tier 3 threshold of 30,000 cumulative metric tons extracted

Once a producer hits the Tier 3 threshold of a cumulative LCE extraction volume of 30,000 metric tons, they are locked in for the life of production at the rate of \$800 per metric ton. Scenario 2 compares the tax burden for a producer who has reached Tier 3 and extracts a total of 13,000 metric tons of LCE (the lowest annual estimate for Salton Sea extraction).

Table 7

Scenario 2: Extraction volume of 13,000 metric tons at Tier 3

Average Price	Gross Receipts (price* metric tons)	Gross Receipts Tax Revenue at Hypothetical Rates of:			Volume Tax	
		1%	2%	3%	Revenue (\$800 per mt*)	Percentage of Sales
\$80,000	\$1,040,000,000	\$10,400,000	\$20,800,000	\$31,200,000	\$10,400,000	1.0%
\$50,000	\$650,000,000	\$6,500,000	\$13,000,000	\$19,500,000	\$10,400,000	1.6%
\$40,000	\$520,000,000	\$5,200,000	\$10,400,000	\$15,600,000	\$10,400,000	2.0%
\$25,000	\$325,000,000	\$3,250,000	\$6,500,000	\$9,750,000	\$10,400,000	3.2%
\$10,000	\$130,000,000	\$1,300,000	\$2,600,000	\$3,900,000	\$10,400,000	8.0%

Notes:

*Assumes a producer has reached the cumulative “Tier 3” threshold of 30,000 metric tons of LCE extracted.

As Table 7 illustrates, the amount of tax paid under the volume tax stays constant at \$10,400,000 regardless of the average price, as it only accounts for the volume of LCE extracted (13,000 metric tons). However, at various price points, the level of tax burden can be measured by the change in the percentage of gross sales. At a baseline price of \$40,000, an extraction volume of 13,000 metric tons of LCE would result in a tax burden equal to 2% of gross sales and equivalent to a 2% gross receipts tax. If prices tend to drop lower than baseline, however, the percentage of gross sales increases. At a price of \$25,000, the percentage of gross sales increases to 3.2%, and at a price of \$10,000, the percentage of gross sales climbs up to 8%, which is significantly higher than any of the gross receipt taxes of 1-3%. Therefore, at the Tier 3 volume-based tax rate, the lower the LCE price, the higher the discrepancy in tax burden between the volume-based tax and a 1-3% gross receipts tax.

Scenario 3: Annual extraction volume of 300,000 metric tons of LCE after reaching Tier 3 threshold of 30,000 cumulative metric tons extracted

As mentioned above, one producer (CTR) plans to start at 25,000 metric tons of LCE per year initially and then ramp up to 300,000 metric tons per year. Scenario 3 compares the tax burden for a producer who has reached Tier 3 and extracts a total of 300,000 metric tons of LCE (highest annual estimate for Salton Sea extraction).

Table 8

Scenario 3: Extraction volume of 300,000 metric tons at Tier 3

Average Price	Gross Receipts (price* metric tons)	Gross Receipts Tax Revenue at Hypothetical Rates of:			Volume Tax	
		1%	2%	3%	Revenue (\$800 per mt*)	Percentage of Sales
\$80,000	\$24,000,000,000	\$240,000,000	\$480,000,000	\$720,000,000	\$240,000,000	1.0%
\$50,000	\$15,000,000,000	\$150,000,000	\$300,000,000	\$450,000,000	\$240,000,000	1.6%
\$40,000	\$12,000,000,000	\$120,000,000	\$240,000,000	\$360,000,000	\$240,000,000	2.0%
\$25,000	\$7,500,000,000	\$75,000,000	\$150,000,000	\$225,000,000	\$240,000,000	3.2%
\$10,000	\$3,000,000,000	\$30,000,000	\$60,000,000	\$90,000,000	\$240,000,000	8.0%

Notes:

*Assumes a producer has reached the cumulative “Tier 3” threshold of 30,000 metric tons of LCE extracted.

Similar to Scenario 2, Table 8 illustrates that once a producer reaches the Tier 3 volume-based tax rate of \$800 per metric ton, the amount of tax paid stays constant regardless of price. Therefore, the percentage of gross receipts is the same as Scenario 2 at the same price points. For example, at the baseline price of \$40,000, the percentage of gross receipts is again equivalent to a 2% gross receipts tax rate and also jumps to 8% of gross receipts at a price of \$10,000. However, at large extraction volumes such as 300,000 metric tons per year, Table 8 shows how much higher the actual tax amounts are for the volume-based tax at lower price points compared to gross receipts tax rates of 1-3%. For example, at a price of \$25,000, a producer would pay \$90,000,000 more in taxes with the volume-based tax (300,000 metric tons X \$25,000 = \$240,000,000) compared to a gross receipts tax of 2% (300,000 metric tons X \$25,000 = \$7,500,000,000 X 2% = \$150,000,000). Further, at a price of \$10,000, a producer could potentially pay \$180,000,000 more in tax compared to a 2% gross receipts tax (\$240,000,000 - \$60,000,000) and \$150,000,000 more compared to a 3% gross receipts tax (\$240,000,000 - \$90,000,000). Scenario 3 shows that at high extraction volumes, the dollar difference between the taxes paid under a volume-based tax and a 1-3% gross receipts tax becomes magnified at lower price points. High-extracting producers could potentially pay tens of millions more in taxes with a volume-based tax system compared to a gross receipts tax system.

Tax Burden Impact Summary. For producers starting at the Tier 1 volume-tax rate of \$400 per metric ton, the tax burden is initially more favorable under the volume-based tax. For example, at the baseline price of \$40,000, the tax burden is only 1% of gross receipts, and at \$25,000, the tax burden is still only 1.6% of gross receipts. Only at very low prices, such as \$10,000, does the percentage of gross receipts under the Tier 1 rate rise higher than a gross receipts tax of 3%. However, as most producers will eventually reach Tier 3 (some sooner than others), at \$800 per metric ton, the tax burden from the volume tax can grow significantly higher than a gross receipts tax, depending on price and gross receipts tax rate, as Scenarios 2 and 3 exhibited. As with Scenario 3, if the average LCE price dropped to \$10,000 per metric ton, the tax burden under the volume tax would rise to 8.0% of gross receipts. Taxpayers would pay significantly more tax dollars compared to a gross receipts tax of 1-3%, since the tax dollar impact becomes magnified with high extraction volumes.

Alternatives to a Volume-Based Tax Structure

The only practical alternative to a volume-based tax structure is a tax structure based on gross or net receipts. A gross receipts tax, as discussed in this study, would likely be more straightforward than a net receipts tax, as it avoids complex tax deductions that accompany a net receipts tax. However, as noted above, vertical integration and joint ventures with battery manufacturers and mining operations could complicate a gross receipts tax where there are no market transactions.

IV. Conclusion

Compared to a gross receipts tax, a volume-based tax may be simpler to administer and could offer a slightly more stable and predictable revenue source. However, fluctuating prices likely will cause production volume to fluctuate to some extent, creating the potential for some revenue instability with either tax system. A gross receipts tax could be more reliable in measuring the most up-to-date value of lithium production and potentially lessen the tax burden for producers depending on LCE contract prices. However, this assumes a traditional transparent lithium market, which currently does not exist.

Using Chinese spot prices as a reference, the average price of LCE has experienced volatile highs and lows over the past year, going from a peak high of \$80,000 to below \$25,000, back up to \$40,000, then declining to \$15,000 in a span of only 11 months. If LCE contract prices stay around the average 2023 price of \$40,000 per metric ton, Scenarios 2 and 3 demonstrate that a volume-based tax under Tier 3 (\$800 fee per metric ton) would generate a reasonable tax burden equivalent to a 2% gross receipts tax. However, there is a realistic concern that future LCE spot prices and actual contract prices will be lower than \$40,000 per metric ton. If this is the case, the tax burden scenarios illustrate that as price decreases, the percentage of gross receipts under the volume-based tax can grow significantly higher than a gross receipts tax of 1-3%.

Consequently, it is difficult to confidently predict where the price of lithium may be headed, given that domestic lithium mining and the ever-increasing demand for electric vehicles is just beginning to take shape. For a supplemental analysis on pricing, the Appendix provides a summary of historical price trends for lithium and other minerals. Ultimately which tax system may be best for the state will heavily depend on lithium prices once producers start extracting lithium from the Salton Sea and potentially other regions in California.

V. Appendix—Trends in Long-Term Mineral Prices

Background. As noted in this study, lithium prices have been quite variable in recent years, especially over the past 12 months. However, mining companies must evaluate profitability of making large investments in mining operations since revenues will begin to accrue years later after the investment. Future lithium prices are a crucial determinant of mine development decisions. However, future prices are extremely difficult to accurately predict. To better understand the likelihood of future trends in lithium prices, CDTFA examined the literature on long-term price trends of lithium and other minerals.

Summary of Results. Despite the likelihood of large future increases in demand for lithium, when compared to historical trends of other minerals with similar increases in demand, long-term lithium prices (adjusted for inflation) are more likely to decrease rather than increase.³⁷ While long-term prices are inherently difficult to predict, our review of the literature suggests that lithium prices, in constant-dollar terms, are not likely to rise from 2023 levels. The overwhelming long-term trend for most minerals, when viewed over 50-100 years, is declining real prices.³⁸

Review of Mineral Price Literature. Mineral prices reflect a complex interaction of many supply and demand factors. On the demand side, factors include income, population, government regulation, and social preferences. Supply factors include, as a Colorado School of Mines study (hereafter referred to as CMS study) phrases it, as “a tug of war between exploration, depletion, and technological change.” The CSM study concludes that, “[t]he tug of war continues with exhaustion nowhere in sight.”

After analyzing 102 mineral commodities (most with price data covering over 100 years), the CSM study makes the following points:

- There is no consistent pattern in the long-term trends of most real mineral prices.
- Only 9 of the 102 minerals have experienced consistent price increases over the past 100 years.
- Of the 102 minerals, 69 have mostly negative trends in real prices.
- Another 24 minerals exhibit no trend either up or down.

While not all minerals have shown declining prices, other price studies show similar results for most minerals. According to one study, mineral prices fell by over 40 percent between 1870 and 1957.³⁹ Real crude oil prices in 2010 were lower than real prices in 1870.⁴⁰ Increased exploration, fracking, and other technologies have vastly increased crude oil production in recent years. This increased production has kept real prices from increasing in the very long term.

Twentieth Century Real Mineral Prices. The chart on the next page, copied from a U.S. Geological Survey publication, generally shows a downward trend in the composite price index for all minerals during the twentieth century.⁴¹

³⁷ Throughout this appendix, references to prices are always considered to be prices adjusted for inflation.

³⁸ Tilton, John E., Colorado School of Mines. 2001. “*Depletion and the Long-run Availability of Mineral Commodities.*”

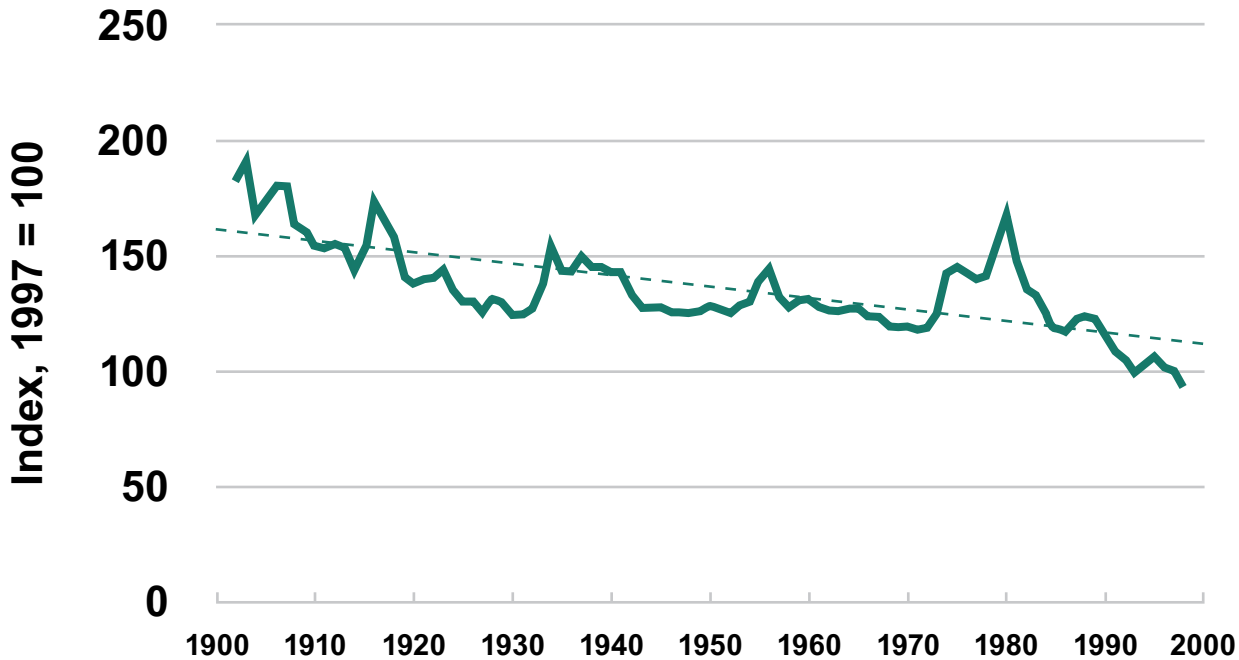
³⁹ For a review of long-term mineral commodity price studies, see *Depletion and the Long-run Availability of Mineral Commodities*, Chapter 4.

⁴⁰ Hamilton, James D., National Bureau of Economic Research. 2012. “*Oil Prices, Exhaustible Resources, and Economic Growth Working Paper 17759.*”

⁴¹ Sullivan, Daniel E., Sznoppek, John L., and Wagner, Lorie A., U.S. Geological Survey 2000. “*20th century U.S. mineral prices decline in constant dollars.*”

Figure A1

U.S. Geological Survey Twentieth Century Mineral Composite Price Index



Long Term Lithium Price Projection. CDTFA could only find one long-term lithium price projection study, conducted in 2014. The middle scenario of that study projects an average 2070 real lithium price that is 28% of the average 2014 lithium price.⁴² The two extreme scenarios show real prices that are 10% and 34% of the 2014 price. The authors conclude that, “[t]hese results indicate that problematic price increases of lithium are unlikely if the latest technological trends in the automotive sector will continue up to 2070.” As the demand for both lithium and electric vehicles has changed dramatically since 2014, the long-term projections from this particular study may not be valid any longer; however, it shows that lithium price has always been a difficult one to predict.

Price Increases and Inflation. One compelling argument for a gross receipts tax is that it would likely keep up with inflationary increases over time. However, if lithium prices increase rapidly, lithium mining tax revenues will not necessarily approximate overall consumer price-based inflationary increases. The U.S. CPI nearly tripled from its 1982-1984 base from that period to December 2022, going from 100 to 296.8. There are no specific producer prices for lithium in the U.S. Bureau of Labor Statistics (BLS) data base that would indicate how lithium prices changed over that period. However, BLS producer price index for “other metal ore mining” (the category which would include lithium prices) increased about nine times from December 1985 prices, rising to 914.6. If lithium prices followed this trend, a gross receipts tax would result in about nine times more revenue than the current tax and three times more than the CPI.

⁴² Jasinski, Dominic., Meredith, James., Kirwan, Kerry. 2018. “The life cycle impact for platinum group metals and lithium to 2070 via surplus cost potential.” www.researchgate.net/publication/317140536_The_life_cycle_impact_for_platinum_group_metals_and_lithium_to_2070_via_surplus_cost_potential.