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Lithium extraction public health analysis

Additional submitted attachment is included below.

Health impacts of lithium extraction at the Salton Sea: an overview of ongoing and potential health hazards

Regional Setting

The Salton Sea region has already been identified as having significant health impacts among the communities living in the area. The health impacts include multiple factors, including economic disparities and limited healthcare access, residential housing quality, as well as environmental and man-made inputs, all affecting the health of residents. Therefore, to assess any potential impacts from proposed new projects, the ongoing health hazards must be described to provide a context. In this discussion, we will focus mainly on environmental and man-made hazards.

Ongoing Health Hazards – Man-made

Man-made hazards in the region can be identified from two main sources: chemicals such as pesticides from agriculture activity, and air pollution from the transportation corridor (Interstates 10 and 8). Interstate traffic on these routes are major routes between Southern California and Phoenix, Arizona to the East, but they run far enough north (I-10) and south (I-8) of the Salton Sea that the impacts from vehicle emissions (e.g., diesel exhaust and related emissions) are likely to be relatively minor in the Salton Sea region. Commercial traffic in the Salton Sea region is also present, serving the communities, but the population density is also relatively low so that emissions from local traffic are also relatively minor.

There is significant concern over the health impact of pesticides and related chemicals from the high level of agriculture activity in the region, both in the area northeast of the Salton Sea (e.g., North Shore), but especially in the southern end surrounding Brawley, where the population is also more concentrated. Although many of the newer pesticides are relatively short-lived in the environment, pesticides that are no longer in active use in the United States, such as DDT and its metabolites, can be persistent in the environment, and can still be found in Salton Sea sediments and dust even decades after their use had been discontinued. Runoff contributions from the Alamo and New Rivers coming from Mexico likely add to the pesticide mix. Pesticides are known to be a health hazard, with potential toxicity (e.g., liver, metabolic effects). While it is possible that agriculture workers may be exposed to significant levels, for many residents the exposure may be lower, and much of the pesticide is sequestered in Salton Sea lake sediment. However, the effects of long term low level exposure are still potential factors, though there is insufficient information on these effects over the long term.

Ongoing Health Hazards – Environmental

A major recognized environmental hazard near the Salton Sea is the high levels of dust, measured as counts for particles below 10 microns in size (PM10), and particle below 2.5 microns (PM2.5). In this arid desert environment with strong prevailing winds, high dust levels are detectable, especially in the region near the Salton Sea, where the PM10 and PM2.5 levels exceed EPA minimum thresholds dozens of days each year, and chronic exposures to lower levels throughout the year can be assumed even in the absence of dust storms. High dust levels are known to be associated with increased susceptibility to pulmonary diseases such as asthma, as well as cardiovascular effects. These health effects have been established in many settings, regardless of the specific components of the aerosols (such as diesel exhaust, etc.)

Additional environmental health hazards near the Salton Sea fall into two main categories: toxic chemicals and elements such as heavy metals, and biological ecosystem toxins. In the first category, the chemistry of the Salton Sea geology is known to include high concentrations of a number of known toxic elements such as Arsenic, Manganese, and Selenium, and these are in Salton Sea lake sediments, sea water, as well as groundwater. The community level exposures to these may vary, since untreated groundwater in some areas is well above the EPA limits on

exposures to these heavy metals, and even incidental contact with ground water may lead to unacceptable exposures. The health impacts of these exposures will depend on the levels of exposures, as some of these elements can be both essential for life at low levels, but toxic above a specific threshold. Metabolic effects, organ and neurological toxicity are all possible at significant exposure levels, so access to clean water for drinking and bathing is essential.

Biological ecosystem toxins have unfortunately not yet been studied in great detail. One type of toxic chemical produced by biological processes is hydrogen sulfide, which is generated in the Salton Sea from breakdown of organic matter at the bottom of the sea under low oxygen conditions. It is a respiratory irritant, and can be toxic at high concentrations, but at the Salton Sea its health effects are mainly confined to the annoying rotten egg smell, as the local concentrations are well below known toxicity levels.

An area that is very poorly understood is the impact of microbial toxins produced in the Salton Sea ecosystem and entrained into the high dust levels in the region. The Salton Sea is retreating due to decreased freshwater runoff from unused agriculture irrigation into the sea, and the highly saline water with low oxygen levels has produced an ecosystem that is increasingly unable to sustain fish life, and migratory birds are now mostly reliant on insects. The microbial ecosystem is only beginning to be studied in detail, but there is potential for this ecosystem to contain microbes capable of producing toxins such as cyanotoxins produced by cyanobacteria (blue-green algae) that are known to live in the water. Levels of cyanotoxins have not been reported at the Salton Sea, and it is not known whether significant amounts are contained in the dust produced at the exposed lakebed (playa). The high salt levels in the water mean that only salt-tolerant (halophilic) microbes can survive, and their potential to produce toxic material is yet unknown. However, recent studies suggest that dust collected from sites near the Salton Sea can induce lung inflammation when exposed to mouse models in the lab, so some toxicity may be concentrated in the Salton Sea dusts.

Assessment of Health Impacts

The main health impacts known from the conditions described above can be difficult to quantify, given the numerous factors described above. Data on health impacts can be obtained in only a few ways, such as statistics on hospital admissions for specific conditions such as asthma or cardiovascular disease (heart attack, stroke), or from broad health assessment surveys. These methods are limited in this region for a few reasons. First, the relatively low population density in the region means that the overall data may have insufficient statistical power to detect detailed trends and impacts. Second, the region has a high proportion of Latino/Hispanic residents, mainly immigrants from Mexico, and many of these residents are undocumented and/or without health insurance. Superimposed with community level suspicion of government agency data collection methods, data from the most highly impacted communities might not be adequately reflected in the available statistics.

With these caveats, it is still evident that from both health survey and hospital admissions data, the Salton Sea region has the highest incidence of asthma in the state of California, with asthma incidence and hospital admissions for asthma at least twice the state level. Recent studies based on symptoms, rather than medical diagnoses, suggest that the incidence among children in the Imperial Valley may be even higher.

Thus, to assess the health impacts of proposed lithium extraction, this must be viewed in the context of the ongoing high levels of dust and associated pulmonary disease, and the underlying low level chronic risks from toxic chemicals in the region.

Geothermal Energy Emissions

The proposed lithium extraction projects are largely based on leveraging existing availability of geothermal energy. The highest deposits of lithium and the geothermal energy sites (Salton Sea Geothermal Field) are in close proximity at the southern end of the Salton Sea, so the

combination is fortuitous. At present, there are eleven geothermal power stations in this area. In general, geothermal energy production is considered sustainable with CO2 (carbon dioxide) emissions only about 5% of the levels produced by other methods (e.g., coal fired power plants). The geothermal fields also have the potential to release trace toxic elements (see above) if they are present in the brine, but control over the fate of the water used in power generation can mitigate these potential risks. Thus, the overall potential health impacts of geothermal power generation are relatively low relative to the existing hazards described above.

Potential New Emissions with Lithium Extraction

There are a few considerations regarding the potential health impacts of lithium extraction. As noted above, the use of geothermal energy to power the recovery of lithium-containing brines has lower CO2 generation and less potential for aerosol pollutants as in the case of coal-fired power plants. However, the expansion of geothermal energy by construction of additional power plants needs to be taken into consideration.

The extraction of lithium at the southern Salton Sea region has additional considerations beyond the production of greenhouse gasses (GHG), and these have a number of unknown impacts, since the specific method of lithium extraction to be used in the region is still undergoing experimental testing. In some of the traditional methods of extraction from brines, evaporation ponds are used to precipitate lithium containing salts, which then requires additional energy for refining into industrial grade lithium chloride. If more conventional refining methods are used at this stage, emissions from the refining process may be relevant but it is unknown whether they would apply here. Importantly, pilot projects are testing the potential of using absorbent materials to extract lithium directly from the brines, which may bypass the need for some of the additional refining processes. Additional unknowns remain, as the use of the absorbent material and their regeneration is still in testing stages. The availability of geothermal power could support these steps, and the health impacts of this growth in geothermal power production might be relatively minor as noted above.

Considerations for Lithium Battery Manufacturing in the Region

A related question is whether the lithium that is extracted at the Salton Sea will then be transferred to battery manufacturing at new facilities to be built in the region. Here, additional environmental considerations come into play, with any related health impacts. As with any manufacturing process, any lithium ion battery manufacturing process might produce emissions affecting water, air, and produce solid waste, and these would be subject to the relevant federal regulations (Clean Water Act, Clean Air Act, etc.). However, at this stage we cannot anticipate whether such manufacturing facilities will be built, and what pollutants might be released, but this will be relevant to the overall potential impacts of the lithium process.

Summary

The overall picture of the health impacts at the Salton Sea is complex, and this discussion only covered the major environmental and man-made factors. From the above discussion, it is clear that the ongoing effects of the dust and related environmental hazards are significant contributors to community health impacts. What is less clear is whether these effects are so overwhelming that any additional health effects of increased geothermal power production, and new methods for lithium extraction will be undetectable above this background.