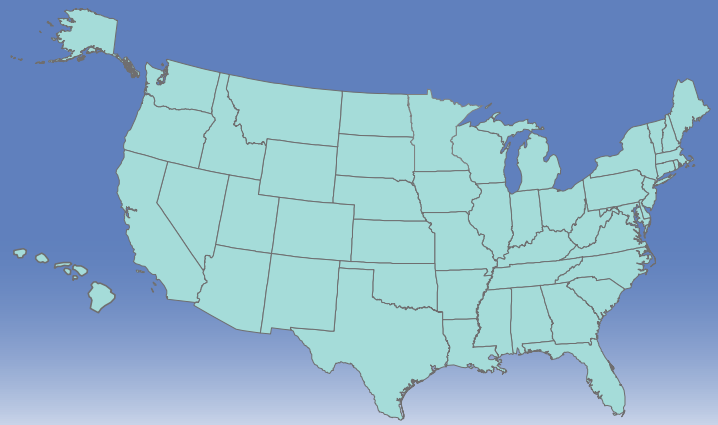


United States Environmental Protection Agency

Renewable Energy Projects at Mine Sites

Progress and Highlights from Across the Country

This fact sheet highlights renewable energy projects at current and former mining sites. These include active utility-scale energy production and green remediation projects, as well as planned projects and renewable energy assessments.

Active Projects

Chevron Questa Mine (Questa, New Mexico)
Molybdenum mining and related activities began at the site in 1920. Years of open-pit mining resulted in over a million tons of waste rock around the open-pit area. Seepage and surface water runoff over mining waste piles contaminated area groundwater and soils.

Chevron, the potentially responsible party, coordinated with EPA and state agencies during cleanup planning, enabling construction of a 1-megawatt (MW) concentrated photovoltaic (CPV) solar facility over 20 acres of the site. The 175-panel facility has been operating since April 2011. Today, it is the largest facility of its kind in the United States. A local energy cooperative purchases the energy through a 20-year purchase agreement. The solar facility generates enough electricity to power about 300 homes.

For more information, check out EPA's in-depth case study: *New Energies: Utility-Scale Solar on a Tailing Disposal Facility*.

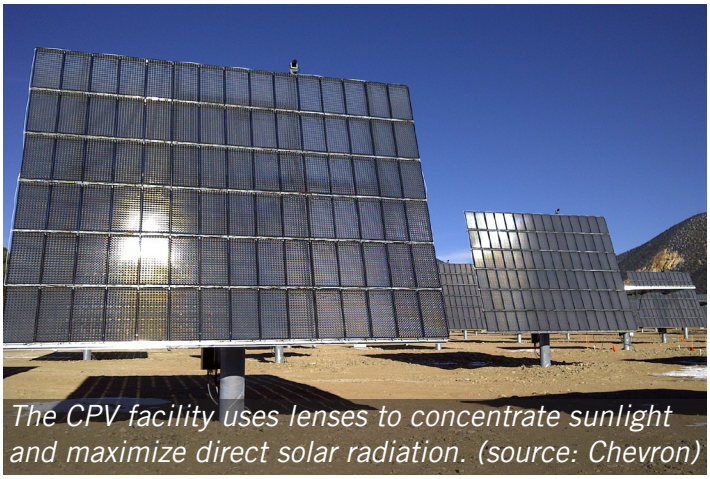
Leviathan Mine (Alpine County, California)
At this remote, high-elevation site, open-pit mining wastes cover 253 acres. Acid mine drainage has affected

EPA Abandoned Mine Lands Renewable Energy Support

As part of EPA's interest in encouraging renewable energy development on current and formerly contaminated land and mining sites, EPA's Abandoned Mine Lands (AML) Team works with Regional offices to provide technical and analytic support to communities and other mining site stakeholders to explore alternative energy opportunities. Support is provided through pre-feasibility energy analyses and other forms of technical services. Mine sites where EPA's AML Team has provided technical and community support include:

- ASARCO Mission Mine (Arizona)
- Brewer Gold Mine (South Carolina)
- Chevron Questa Mine (New Mexico)
- Chino Mine (New Mexico)
- Iron King Mine-Humboldt Smelter (Arizona)
- McKinley Mine (New Mexico)
- Summitville Mine (Colorado)

For more information about EPA's AML Team technical and analytic support services, please contact Shahid Mahmud at mahmud.shahid@epa.gov or visit: www.epa.gov/aml.



The CPV facility uses lenses to concentrate sunlight and maximize direct solar radiation. (source: Chevron)

Superfund and Green Remediation

Green remediation strategies maximize the environmental benefits of cleanups. There are green remediation opportunities throughout the Superfund process, from early investigations and cleanup planning to remedy implementation and long-term operation and maintenance activities.

Best practices include the use of renewable energy and cleaner burning fuels, water conservation, green reuse designs following cleanup, greenhouse gas emission reduction technologies, and waste reduction and recycling programs.

For more information about EPA's Superfund Green Remediation Strategy, visit: www.epa.gov/superfund/greenremediation.

Mobile solar units provide 24/7 power security, even during inclement weather. (source: EPA)

Summitville Mine is first in the nation to get power from a community solar garden. (source: EPA)

waterways as far as nine miles downstream. A feasibility study by Atlantic Richfield, the potentially responsible party, is looking into estimated power needs for the site's long-term cleanup. With no access to the power grid and winter snows preventing transport of fuel to the site for half the year, the use of renewable energy could enable water treatment to take place for longer periods.

Funded by a grant from EPA's RE-Powering America's Land Initiative, the National Renewable Energy Lab (NREL) analyzed how renewable energy resources, including wind and solar, could power the cleanup. NREL installed wind and solar data collection units to study the area's wind and solar resources. The study found adequate resources for solar development. Today, small solar units warm a bioreactor control room year round and power monitoring equipment and data transmission instruments.

Pennsylvania Mine (Keystone, Colorado)

This silver, lead and zinc mine operated from 1879 to the 1930s, producing over $3 million worth of precious metals. Mining contaminated Peru Creek, a tributary in the Snake River watershed, with heavy metals. EPA is currently working to stabilize residual mining waste to prevent future contamination. The Colorado Division of Mines, Reclamation and Safety is plugging surface water pathways and mine tunnels to reduce the flow of contaminated water.

These efforts would normally require diesel fuel generators to power construction lighting, tools, sampling devices, electronic equipment and other devices for field operations. EPA came up with a creative alternative, using a hybrid solar-diesel generator to recharge equipment and power remediation activities. The mobile unit integrates solar panels with a diesel generator, which provides consistent power over prolonged periods while reducing greenhouse gas emissions and noise pollution. The solar-powered generator operated during the summer of 2014, and EPA plans to use it again for cleanup work in 2015.

Summitville Mine (Rio Grande County, Colorado)

Gold mining at this 1,400-acre site released metals-laden mine water into the Alamosa River. In 1994, EPA began cleaning up the area, which included capturing and treating contaminated water. Water treatment requires consistent, year-round power sources, while

seasonal snow accumulation limits solar energy opportunities. EPA and the Colorado Department of Public Health and Environment (CDPHE) researched other renewable energy options and designed a micro-hydroelectric power plant. The plant, which consists of a pipe penstock and turbine, began operating in September 2011. Today, it provides up to 32 kilowatts (kW) of power to help run the site's water treatment system.

Recently, CDPHE and EPA reassessed ways to lower costs and fossil fuel consumption associated with ongoing water treatment. CDPHE and EPA partnered with a community solar garden in Antonito, a nearby town located 40 miles south of the site. Using virtual net metering, subscribers who invest in the shared solar array receive energy credits as if the panels are located on their own property. CDPHE and EPA invested in a 10-kW subscription (about 40 panels). The power produced by those 40 panels feeds into the local utility, which then provides CDPHE and EPA with energy credit as if the 40 panels were located on the water treatment plant's roof. The subscription increases overall usage of clean energy and will offset about 15 metric tons of greenhouse gases each year.

Planned Projects

ASARCO Mission Mine (Sahaurita, Arizona)
The site covers 29 square miles of an open-pit copper mine, operated by ASARCO, about 18 miles south of Tucson. Following a request from the Tohono O'odham Nation, which formerly leased land to ASARCO for mining activities, EPA prepared a renewable energy assessment in 2011. The assessment evaluated renewable energy development opportunities for a tailings area at the site and concluded that the area could accommodate a utility-scale solar energy project. While no projects are currently active at the tailings area, the assessment offers valuable resources applicable to the larger ASARCO Mission Mine complex.

Building on the 2011 assessment, ASARCO, Tucson Electric Power and Clenera, LLC moved forward with plans to redevelop a nearby area of the ASARCO mine property for a utility-scale solar array. The project, called the Avalon Solar Facility, broke ground in May 2014. The facility will deliver 35 MW of clean energy for the local utility provider. Tucson Electric Power will buy generated power under a 20-year power purchase agreement.

The site's 35-MW array will provide enough energy to power about 7,000 homes. (source: Inside Tucson Business)

Renewable Energy Assessments

Anaconda Co. Smelter (Anaconda, Montana)
Covering more than 300 square miles in Anaconda-Deer Lodge County, this Superfund site was the location of an Anaconda Minerals Company ore processing facility from 1884 to 1980. For decades, the company removed copper from ore, which created milling and smelting wastes. Cleanup is ongoing. Looking forward, county officials and local partners are pursuing opportunities for a wind energy project at the site, given wind resources in the area and the site's location near a power plant and substations. EPA conducted an assessment of wind resource by measuring wind speeds with 60-meter towers at two locations over a four year period. Data confirms that the site could support a wind farm in the future.

ASARCO (East Helena, Montana)
ASARCO operated a lead and zinc smelter in East Helena from 1888 to 2001. A recent EPA-NREL assessment found that, based on available feedstock sources, the site could support a 10-to-20-MW biopower plant in the future. Today, the community is engaged in a planning process that integrates site cleanup plans with redevelopment goals and is looking at ways to make renewable energy projects happen. The study is available to inform cleanup and redevelopment activities in the future.

Chino Mine (Silver City, New Mexico)
This site includes 9,000 acres of open-pit copper

mines and smelters. Smelting ended in 2003 and cleanup began. Site stakeholders and the community are investigating how solar power could help offset the cleanup's increasing energy requirements, which are partly due to a regional water distribution system expansion. Building on an earlier study by EPA's AML Team, an EPA-NREL assessment found that the site, which is flat and well wired, could support a large-scale solar photovoltaic (PV) system. Such a system could generate up to 348 MW of power for the site's cleanup as well as other local energy needs.

Iron King–Humboldt Smelter (Dewey-Humboldt, Arizona)

EPA's AML Team completed a renewable energy assessment for this site, which includes a former lead, gold, silver, zinc and copper mine and an independent smelter. The assessment looked at potential opportunities for renewable energy facilities to provide electricity for light industrial and commercial uses on site as well as feeding power back to the grid. It found that solar energy and bioenergy are the most promising options for the site.

Jeddo Mine Tunnel (Hazelton, Pennsylvania)

An EPA-NREL assessment funded by EPA's RE-Powering America's Land Initiative looked closely at the area's capacity to support hydroelectric and geothermal energy production. The assessment found that the site could successfully support a hydroelectric system. The turbine manufacturer and the dam designer did not identify any major construction or maintenance concerns. The assessment also clarified how such a facility could qualify for federal tax incentives, including grants and low interest loans, strengthening the project's financial viability.

Peru Mill Industrial Park (Deming, New Mexico)

Mineral extraction and processing at this 1,420-acre site resulted in contamination requiring cleanup. Looking to the future, the City of Deming rezoned the site for industrial uses, including renewable energy facilities. A recent EPA-NREL assessment found that a large-scale PV system could generate up to 36.4 MW of power at the site.

Uranium Mills Tailing (Lakeview, Oregon)

Starting in 1957, the Lakeview Mining Company, under contract with the U.S. Atomic Energy Commission, operated a uranium processing mill at this 169-acre site. While mill operations ended after a few years, residual radioactive contamination required cleanup, which took place from 1986 to 1989. Recently, EPA and NREL worked with the Lake County Resources Initiative, a workgroup of local citizens and business owners, on a renewable energy assessment for potential geothermal power generation at the site. The assessment concluded that there is an adequate geothermal resource beneath the site for non-utility-scale power generation projects.

RE-Powering America's Land

This EPA initiative identifies wind, solar, geothermal and biomass resources at Brownfields, RCRA, Superfund and mining sites. It also provides technical information to communities, utility providers and developers to help them make informed decisions about renewable energy development opportunities at sites across the country.

EPA's RE-Powering America's Land Initiative also partnered with the Department of Energy's National Renewable Energy Laboratory (NREL) to conduct renewable energy assessments at several mining sites across the country.

For more information about the initiative or EPA-NREL assessments, please visit: www.epa.gov/renewableenergyland.

Vermont Asbestos Group Mine Site (Eden and Lowell, Vermont)

This 1,500-acre asbestos mine operated from the late 1800s until 1993. After mining operations ended, EPA conducted removal actions to assist in preventing off-site asbestos contamination and protect human health. Seeking opportunities to reuse idle land, EPA and NREL selected the site for a renewable energy assessment. The assessment evaluated potential solar power opportunities and identified 11 acres of the site suitable for large solar arrays that could generate up to 2.2 MW. Incentives from the Vermont Sustainably Priced Energy Enterprise Development (SPEED) program could help enable the site's reuse for solar power generation in the future.

The Peru Mill Industrial Park site is nearly flat and well suited for solar development. (source: NREL)