Nevada Peaker Power Plants

Energy Storage Replacement Opportunities

In Nevada, five gas-fired peaker units located at four power plants help meet state peak electric demand. These plants include one standalone gas turbine peaker plant and four units co-located with natural gas combined cycle facilities but used for peak capacity. While these plants are all located near Nevada's population centers in Reno and Las Vegas, two are in urban areas in Las Vegas and the other three are in more rural areas outside the cities. These two urban facilities, Sun Peak and Clark gas turbine unit, are both located in low-income and minority communities with high cumulative environmental health burdens. Sun Peak, in particular, is used infrequently and has the shortest run hours of any of Nevada's units, suggesting it may be a good target for replacement with energy storage, solar, demand response, or a mixed portfolio of clean energy resources. Sun Peak also has the highest emission rates of carbon dioxide and criteria pollutants per unit of electricity generated, and operates frequently on days local ozone concentrations exceed federal standards. Nevada has plentiful solar resources and ambitious clean energy targets, which can facilitate the deployment of solar+storage and other resources to replace high-emitting peaker plants in vulnerable communities in Nevada.

Nevada State Policy and Regulatory Environment

Nevada has enacted a suite of policy targets to support clean energy adoption and emission reductions that could facilitate replacement of peakers with solar and storage. Key targets include:

- **2030:** 50 percent of electricity from renewable resources; reduction in greenhouse gas emissions to 45 percent below 2005 levels.

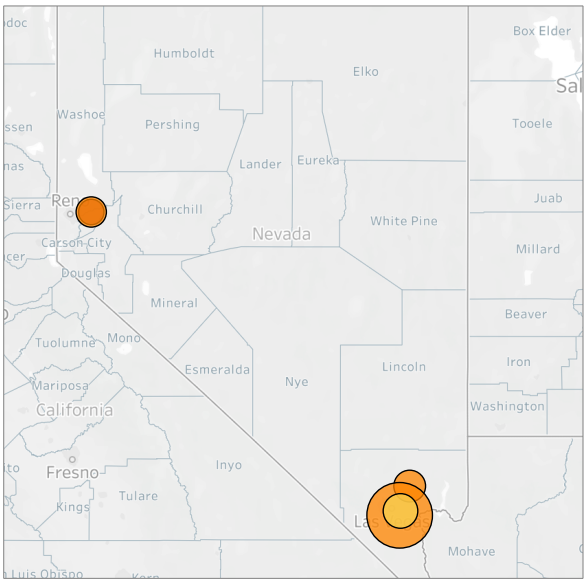

Figure 1: Peaker plants across Nevada.

- **2050:** 100 percent carbon-free electricity; near-zero economy-wide greenhouse gas emissions.

The Public Utilities Commission of Nevada has also drafted a proposal for 1,000 MW of energy storage by 2030, which could help reduce reliance on peaker plants while integrating solar and other renewable resources. Replacement of peaker plants serving load zones in Reno or Las Vegas regions would likely require deployment of clean energy resources in these same areas to meet local grid needs.

Nevada Peaker Plants

Peak electricity demand in Nevada is partially met by four gas turbines and one steam turbine; all but one of these units are located at larger plants. Features of some of these units suggest that they should be prioritized for replacement with energy storage or a portfolio of cleaner energy technologies, including:

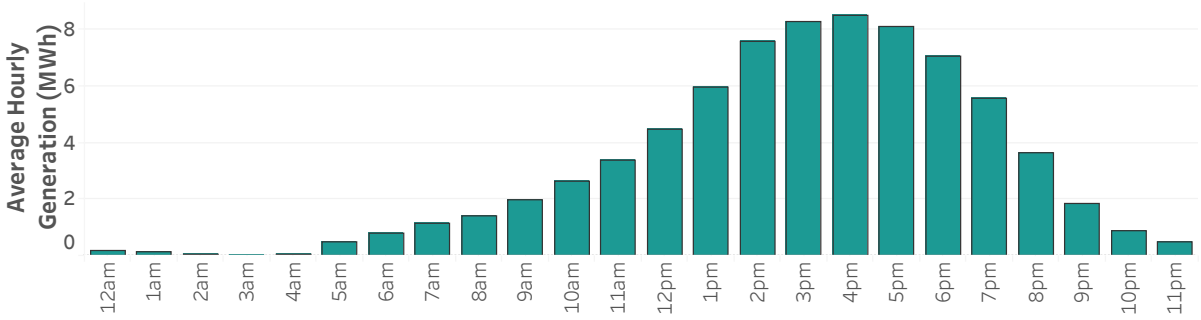

Figure 2: Average hourly generation from the Sun Peak Generating Station. The plant typically meets peak afternoon loads. It ran an average of 5.4 hours each time it started up between 2016 and 2018 and had a capacity factor of 1.3 percent. Batteries or solar+storage can serve a similar role on the grid.

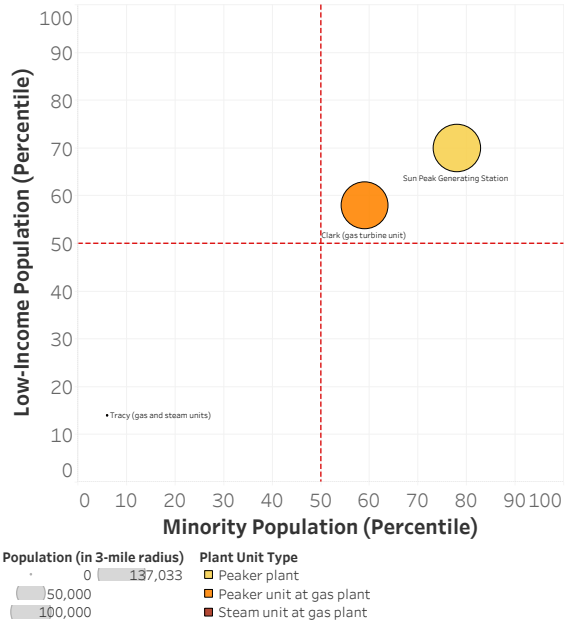

Figure 3: Demographics near Nevada power plants. Bubbles reflect population size. Axes mark state percentiles for low-income (double federal poverty limit) and minority populations living within three miles of each facility.

- **Aging:** All are over 25 years old.
- **Runtimes:** Nevada peakers run somewhat longer on average than other peakers nationwide, but the three units that run between 5.5 and 7.5 hours on average could potentially be replaced with a portfolio of solar+storage and demand response (see **Figure 2**).
- **Infrequently used:** Three of five peakers operate at a capacity factor of 5 percent or less—that is, they generate 5 percent of the electricity that they would if they were running constantly at full power year-round—and Sun Peak has a capacity factor of 1.3 percent.

Plants with longer runtimes might be best replaced with a mixed portfolio of cleaner resources that can meet similar grid needs, such as solar, storage and demand response.

Nearby Populations

Three Nevada peaker units are in rural areas (Tracy steam and gas units and Harry Allen), but Clark gas turbine unit and Sun Peak Generating Facility are both located in urban parts of Las Vegas with more than 130,000 people living within a three-mile radius of each plant. Communities living near these two urban plants have a larger share of low-income and minority populations than the rest of the state (see **Figure 3**). Many communities also have a high cumulative exposure to environmental health burdens from numerous sources. We developed a cumulative vulnerability index that integrates data on health burdens (asthma, heart attacks, premature birth rates); environmental burdens (ozone, particulate matter, toxics, traffic proximity, lead paint, and hazardous facilities); and demographic indicators (low-income, minority, linguistically isolated, and non-high school educated populations). The cumulative vulnerability index for populations living within three miles of each facility is shown in **Figure 4**, excluding Harry Allen. The index also illustrates that these two urban facilities are in regions with higher cumulative environmental health and socioeconomic burdens.

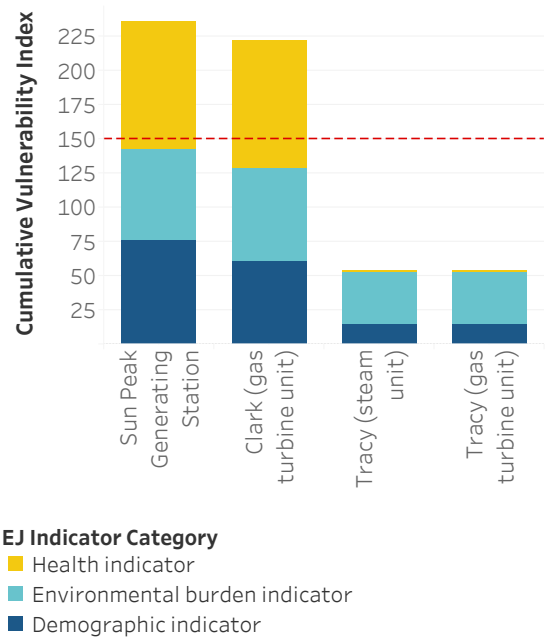

Figure 4: The cumulative vulnerability index reflects a set of environmental, human health, and demographic indicators for populations living within three miles of each plant. The score is based on a comparison of indicators to statewide values: if a plant ranked at the median percentile for all indicators, it would score 150, which is indicated by the red dashed line. (Note: Harry Allen has no nearby populations and so is not shown.)

Emissions and the Environment

Nevada peaker plants burn primarily natural gas, which produces nitrogen oxides (NO_x) and greenhouse gases. NO_x is a precursor to ozone and particulate matter formation. The Las Vegas area is considered out of attainment for federal ozone standards; operation of these plants on hot summer days to meet air conditioning demands can exacerbate these poor air quality conditions. Notably, between 5 and 11 percent of generation from each of Nevada's peaker plants occurs on days when local ozone concentrations exceed federal standards.

Summary

Nevada peak demand is met by five aging gas turbine and steam units, located primarily at the state's larger gas plants. Two of these units are in urban parts of Los Vegas with a disproportionate share of low-income and minority populations living nearby. One of these plants has higher emission rates than the other Nevada peakers and has a low capacity factor and short average runtime, suggesting it may be a good fit for replacement with energy storage+solar. Investment in clean energy resources in underserved communities nearby could help reduce the need for these facilities. The state's clean energy targets provide an opportunity to adopt clean energy resources while displacing more polluting facilities on the grid. In the attached table, we provide operational, environmental, and demographic data for Nevada peakers and nearby populations. Indicators such as nearby population, emission rates, heat rate (fuel used per megawatt-hour), operation on poor air quality days, capacity factor, and typical run hours can also inform whether a given plant might be a good target for replacement with storage, solar+storage, demand response, or other clean alternatives. These data should be accompanied by engagement with affected communities to determine replacement priorities and strategies.

Nevada peaker plant operational and demographic data.
For methods see: www.psehealthyenergy.org.

	Plant description					Operation and emissions						Demographics (3-mile radius)			
Name (EIA ID)	**Status**	**County**	**Fuel**	**MW**[1]	**Age**[2]	**Capacity factor**[3]	**Run hours/ start**[4]	**Heat rate**[5] MMBtu/ MWh	**CO_2 rate**[6] tons/ MWh	**NO_x rate**[7] lbs/MWh	**% MWh high ozone days**[8]	**Pop.**	**% non-white** (percentile)[9]	**% low-income** (percentile)[10]	**CVI**[11]
Clark (GT unit)[12] (2322)	Operating	Clark	Natural gas	797	47	4.7%	6.7	10.8	0.6	0.3	7.7%	133,802	55% (59)	37% (58)	222
Harry Allen[13] (7082)	Operating	Clark	Natural gas	187	25	4.8%	7.7	11.7	0.7	0.3	4.8%	0	NA	NA	NA
Sun Peak Generating Station (54854)	Operating	Clark	Natural gas	222	29	1.3%	5.4	12.8	0.8	1.8	10.5%	137,033	70% (78)	46% (70)	235
Tracy (GT unit)[14] (2336)	Operating	Storey	Natural gas	170	59	8.4%	13.1	13.0	0.8	0.4	6.8%	16	14% (6)	15% (14)	53
Tracy (steam unit)[15] (2336)	Operating	Storey	Natural gas	120	57	10.3%	39.1	11.5	0.7	1.6	5.7%	16	14% (6)	15% (14)	53

[1]Installed nameplate capacity (plant size).
[2]Age of oldest unit in 2020.
[3]Percent of time running as compared to running all year at full capacity.
[4]Average number of hours plant runs each time it is turned on.
[5]Heat rates are energy burned per unit of electricity generated; high heat rates reflect low efficiency.
[6]Direct carbon dioxide emissions per unit of electricity generated; does not include upstream emissions.
[7]Nitrogen oxides (NO_x) emitted per unit of electricity generated; NO_x contributes to ozone and particulate matter formation.
[8]Percent of generation on days nearby monitors record exceedances of federal ozone standards.
[9]Percentile minority population indicates percent of census tracts across the state with lower fraction of non-white populations.
[10]Percentile low-income population indicates percent of census tracts across the state with lower fraction of households below double the federal poverty limit.
[11]Cumulative Vulnerability Index combines state percentiles for demographic, health and environmental exposure indicators. A median on all values would score 150.
[12]Gas turbine unit at 1,103 MW gas combined cycle plant.
[13]Gas turbine unit at 745 MW gas combined cycle plant.
[14]Gas turbine unit at 885 MW gas combined cycle plant.
[15]Steam turbine unit at 885 MW gas combined cycle plant.