

# DATA CENTER RISK ANALYSIS

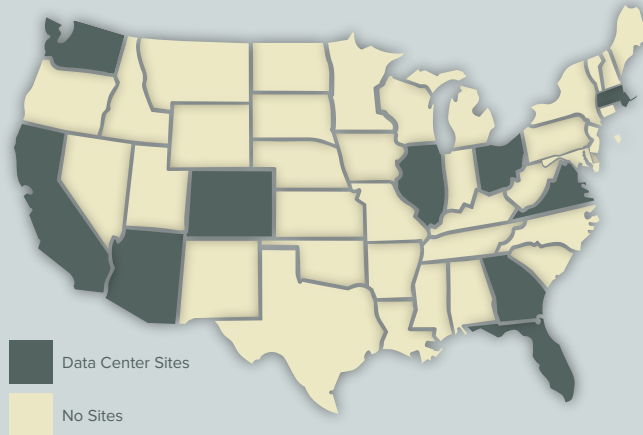
The data center risk analysis quantifies how climate change is projected to impact data centers across the US, with a specific focus on a facility in Santa Clara, CA. The analysis is broken up into three different categories: design risk, operational risk, and acute risk.

Design risk represents the vulnerability of changes to building design standards, including HVAC.

Operational risk represents the vulnerability to changes in cooling energy and the amount of free cooling hours available at a location.

Acute risk represents the physical risks (flooding, wildfire, etc.) to the data center site and surrounding infrastructure.

## Key Findings For All 10 Sites:



### Design Risks

- Extreme annual temperature is projected to increase for all locations by 0.9°F to 3.1°F by 2030 and 1.6°F to 5.1°F by 2050.
- 0.4% humidity ratio (grains of moisture/lb dry air) is projected to increase for all locations to 9.0% by 2050.



### Operational Risks

- Cooling costs are projected to increase by 6% to 11% by 2030 and 13% to 24% by 2050.
- Total cooling costs are projected to increase by \$3.5 to \$6.6 million between 2020 to 2040.



### Acute Risks

- 70% of locations are projected experience an increase in extreme precipitation events by 2030.
- 30% of locations are projected to experience 20 additional days of extreme wildfire risk days annually by 2030.

## Key Findings For Santa Clara Data Center:

Specifications: 6,000 square foot enterprise-class data center with 1,200 servers and an average annual energy consumption of 5 MWh with a with a power usage effectiveness (PUE) of 1.54.



### Design Risks

- Increase in ASHRAE design standards:

	Extreme Annual Temperature (°F)	.4% Humidity Ratio (gr/lb dry air)	.4% Enthalpy (BTU/lb dry air)	Cooling Degree Days (Base 65°F)
<b>Baseline</b>	<b>98.8</b>	<b>85.6</b>	<b>33.0</b>	<b>624</b>
2030	99.0 to 99.8	85.7 to 87.4	33.2 to 33.4	658 to 652
2050	100.3 to 101.0	88.8 to 90.7	33.7 to 34.2	772 to 897

Table 1: Changes in ASHRAE Design Conditions for median climate projection



### Operational Risks

- Average annual cooling energy is projected to increase 8% to 12% by 2030 and 20% to 36% by 2050. Site cooling energy from 2020 to 2039 is projected to increase from \$467,000 to \$687,000.
- By 2030 the PUE is projected to be 1.60 because of a decrease in free cooling hours.



### Acute Risks

- By 2030 extreme precipitation events are projected to increase by 50% to 100%.
- By 2030 annual extreme fire risk days are projected to increase by 5 to 12 days.
- By 2030 extreme heat days are projected to increase from 7.3 days annually to 22.2 to 25.4 days annually.