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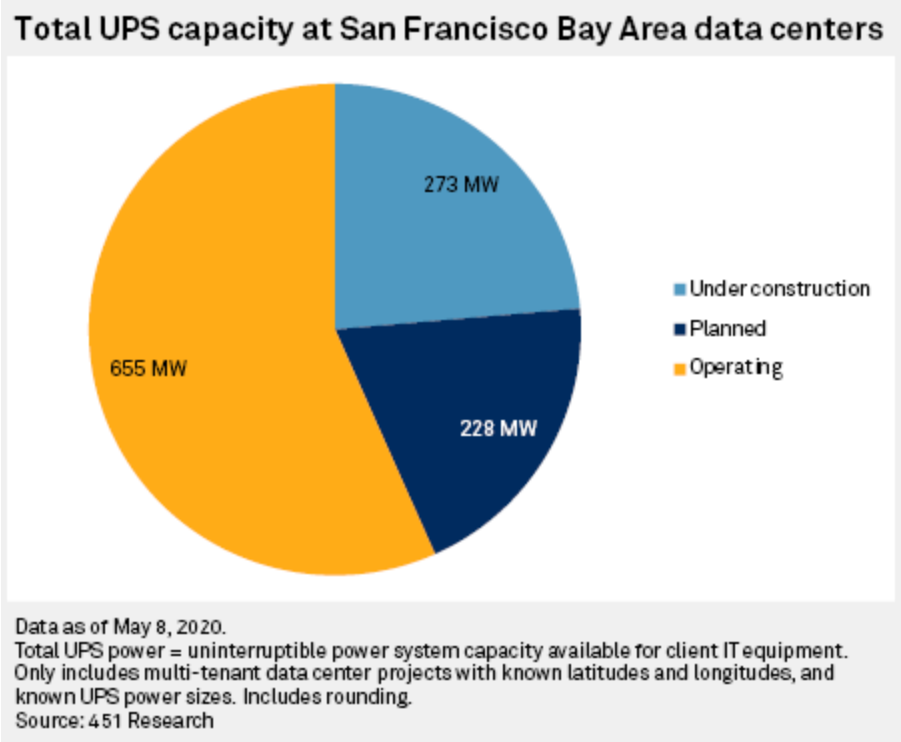
With cleaner options available, data centers double down on diesel

The global coronavirus pandemic has driven "two years' worth of digital transformation in two months," according to Microsoft Corp. CEO Satya Nadella. While some segments of the economy are in a tailspin, demand for Microsoft's online services and infrastructure is booming: Revenue for Azure, Microsoft's primary cloud product, surged 59% in the first quarter from a year ago, while its remote working platform Teams shattered its previous usage record by logging 2.7 billion meeting minutes on a single day in March.

Microsoft and other tech giants, including Amazon.com Inc., Apple Inc., and Google LLC, as well as smaller multi-tenant data center specialists like Digital Realty Trust Inc., Equinix Inc. and Switch Inc., are aggressively adding data centers to meet surging demand: In Silicon Valley alone, more than two dozen multi-tenant data centers are planned or under construction, with a combined 501 MW of uninterruptible power supply capacity, according to S&P Global Market Intelligence's 451 Research unit. Those facilities are power-hungry, and much of the power they consume comes from fossil fuels, including backup generators that burn diesel fuels, one of the most carbon-intensive sources of electricity.

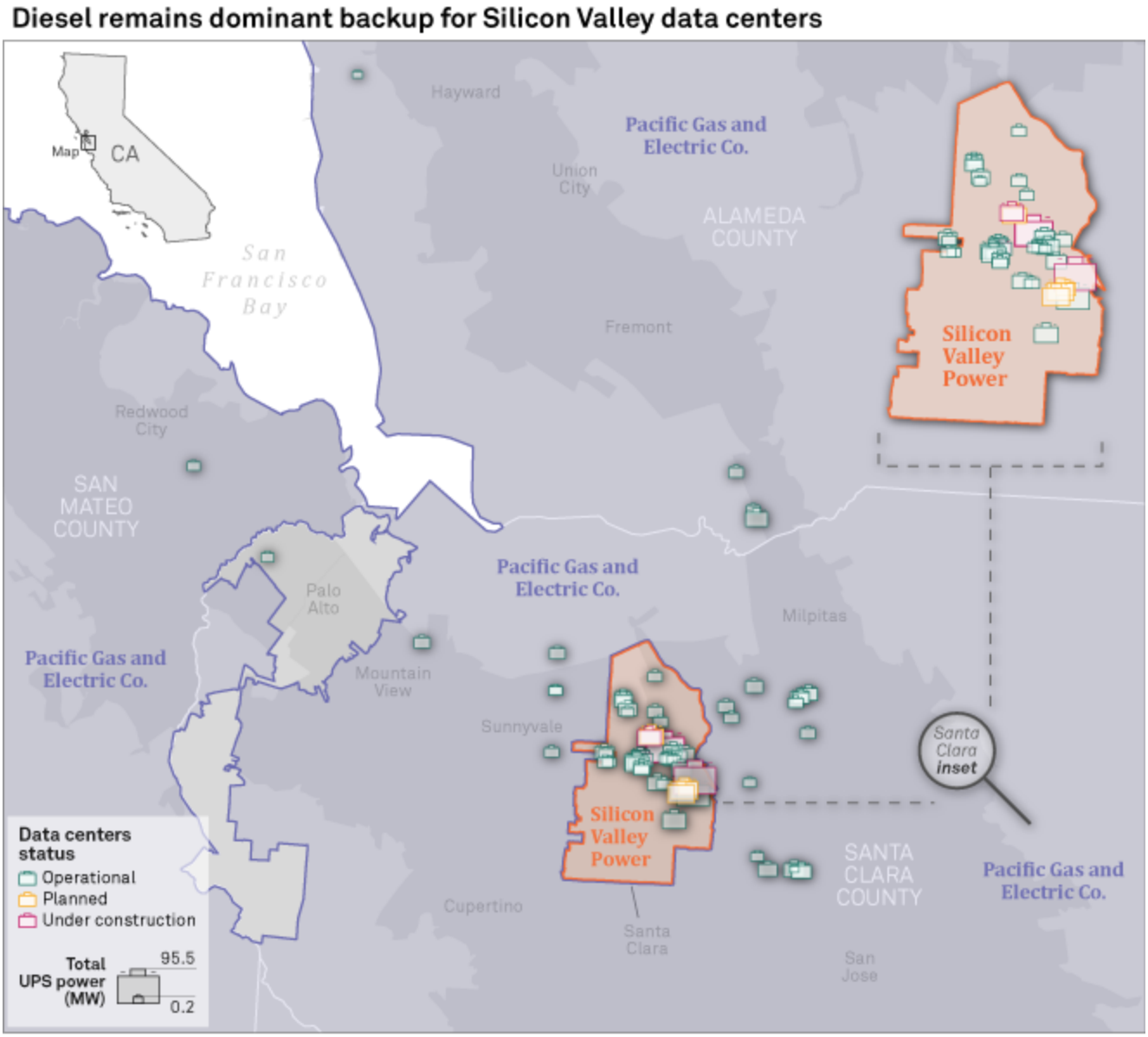
Data center operators have amassed an impressive portfolio of wind and solar power contracts to fuel their facilities. But variable renewable resources rely heavily on natural gas-fired generation when the sun is not shining and the wind is not blowing. And data centers remain dependent on diesel-fired backup to keep operating when the grid goes down.



Microsoft, for example, has proposed a 99-MW diesel-backup system for a new data center in San Jose, Calif. — one of seven co-location and enterprise data center projects, totaling roughly 650 MW of diesel backup, that are under review at the California Energy Commission, the state's primary power plant siting authority, or were recently exempted under the agency's small power plant program.

Along with CyrusOne Inc., Digital Realty, EdgeCore Internet Real Estate LLC, Equinix, Oppidan Investment Company and Vantage Data Centers LLC, Microsoft sought state exemptions for diesel backup systems so it can proceed under less onerous local permitting standards. Though relatively small compared to grid-scale power plants, these auxiliary generators, ranging from 78 MW to 99 MW, would include California's largest diesel-fired generators at data centers, according to state records.

Microsoft, which in January announced a goal to become carbon negative by 2030, and Equinix, which has a 100% renewable energy target, have proposed projects in Pacific Gas and Electric Co., or PG&E, service territory, where increasingly frequent power outages aimed at preventing wildfires could cause the companies to use their standby diesel generators more often in coming years. Already, the greater San Francisco Bay area is home to more than 100 operating multi-tenant data centers with nearly 655 MW of combined uninterruptible power system capacity, 451 Research data shows, including customers of PG&E and Silicon Valley Power. Much of that is powered by diesel.



Data as of May 8, 2020.
Total UPS power = uninterruptible power system capacity available for client IT equipment.
Only includes multi-tenant data centers with known locations and known UPS power sizes.
Silicon Valley Power is the municipal utility for the city of Santa Clara.
Map credit: Ciaralou Agpalo Palicpic
Source: S&P Global Market Intelligence

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'Black smoke everywhere'

Data center operators argue that diesel is the only technically and economically feasible backup power option, even if that runs counter to their clean energy goals, as well as those of the state and region.

Regulators, independent researchers and power equipment suppliers disagree. They say that combinations of zero- to low-carbon resources — including lithium-ion batteries, fuel cells, solar

power and turbines partially powered by green hydrogen — are ready to provide the high level of reliability that data centers require, or at least reduce the need for diesel.

The Bay Area Air Quality Management District this year asked state regulators to conduct more thorough analyses of CyrusOne and Digital Reality Trust projects "to include an evaluation, disclosure, and discussion" of whether they are consistent with state climate policies. The air agency also called for cleaner backup and improved energy efficiency.

Recently proposed diesel backup generation at Silicon Valley data centers

Data center facility	Ultimate owner	City	Utility service territory	Diesel backup (MW)	Status	100% renewables/ zero-carbon goal
Great Oaks South	Equinix Inc.	San Jose	Pacific Gas and Electric Co.	99	Under review	Yes
Laurelwood	Edgecore Internet Real Estate LLC	Santa Clara	Silicon Valley Power	99	Exemption granted	No
McLaren	Vantage Data Centers LLC	Santa Clara	Silicon Valley Power	99	Exemption granted	No
Mission College	Oppidan Investment Co.	Santa Clara	Silicon Valley Power	78	Under review	No
San Jose City	Microsoft Corp.	San Jose	Pacific Gas and Electric Co.	99	Under review	Yes
Sequoia	CyrusOne Inc.	Santa Clara	Silicon Valley Power	96	Under review	No
Walsh	Digital Realty Trust Inc.	Santa Clara	Silicon Valley Power	80	Under review	Yes

Data as of May 12, 2020.
Includes only projects proposed between 50 MW and 100 MW granted or seeking small power plant exemptions from the California Energy Commission.
Backup capacity includes rounding.
Sources: California Energy Commission; The Climate Group; companies

"It is definitely not a technology [issue] as it is available now, and not a cost issue as it is proven to make good business sense and achieve a [sustainable] cost of ownership," according to Susanna Kass, an energy fellow at Stanford University and data center adviser to the United Nations sustainable development team.

Kass recently co-designed an alternative to the status quo, initially targeted for Europe, that offers up to 200 MW of carbon-free generation through a network of fuel cells, batteries and other resources to provide 99.999% uptime to data centers. "All at an affordable pricing of ... pay-as-a-service for those who don't want to [invest] for the on-premise carbon-free energy assets," she said in an email.

The wider electric grid "becomes a backup source," Kass added.

Finland's Wärtsilä Oyj Abp, a long-time supplier of diesel- and natural gas-fired reciprocating engines for power plants, including at data centers, is pitching a similar model that would rely on a microgrid of lithium-ion batteries and engines that can run on a mix of hydrogen and natural gas.

"Especially in California, with PG&E being a major player ... if the grid goes out these diesels are ramping up and you're seeing black smoke everywhere," Quoc Pham, key account manager for data centers at Wärtsilä, said in an interview. "They've got to get away from that."

'Just at the start'

Demand for cloud platforms from Amazon, Google, Microsoft and hundreds of smaller players is likely to continue to grow even after the COVID-19 crisis eases, according to Melanie Posey, a research vice president at 451 Research.

Slowly, said Kass, "a different mindset" is beginning to arise in Silicon Valley, in part triggered by PG&E blackouts, that could put those future data centers on a cleaner path.

Microsoft CEO Satya Nadella in January unveils a new goal to reach negative carbon emissions by 2030.
Source: Microsoft Corp.

After achieving its goal to offset its global power consumption with renewable energy purchases on an annual basis, Google wants to decarbonize its operations at all times. That includes when variable wind and solar resources are not generating power and when power outages occur. Part of its strategy is to shift computing load to periods when its data centers are consuming mostly renewables.

The Alphabet Inc. subsidiary is also turning to battery-backed solar farms, including at a new data center near Las Vegas.

"But we are just at the start of our 24/7 carbon-free energy journey," Raiford Smith, director of Google's global energy and location services, said April 27 during a virtual conference.

Microsoft, which this year announced a $1 billion fund for carbon reduction, capture and removal technologies, "can clearly do better" at reducing operating emissions, added Douglas Mouton, general manager of the company's global data center procurement and construction, during the virtual conference.

"When we think about all the generators that go into our data centers and their run hours, that's contributing to our emissions in operations and we want to rethink how [we approach] generation," Mouton said.