

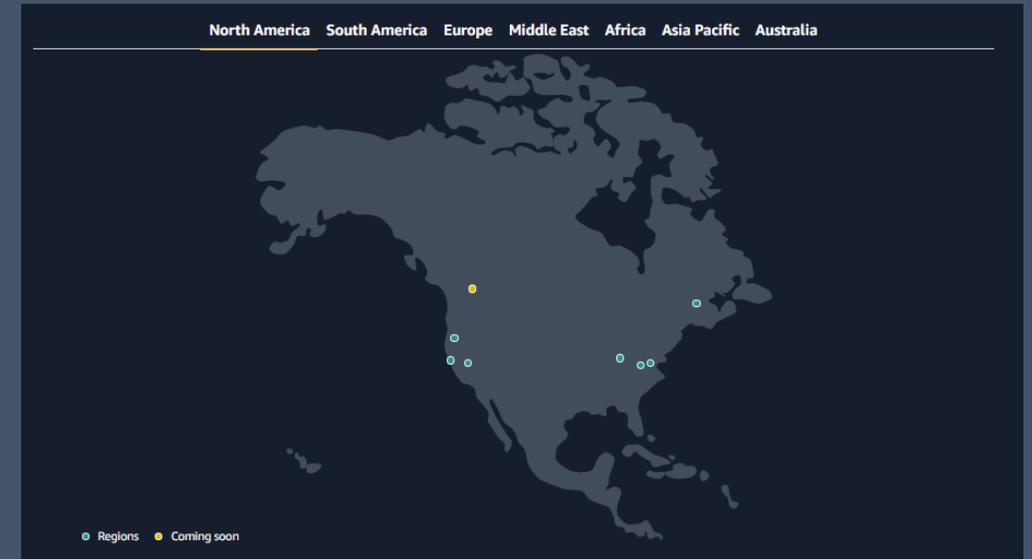


# PJM Load Analysis Subcommittee (LAS)

October 2022

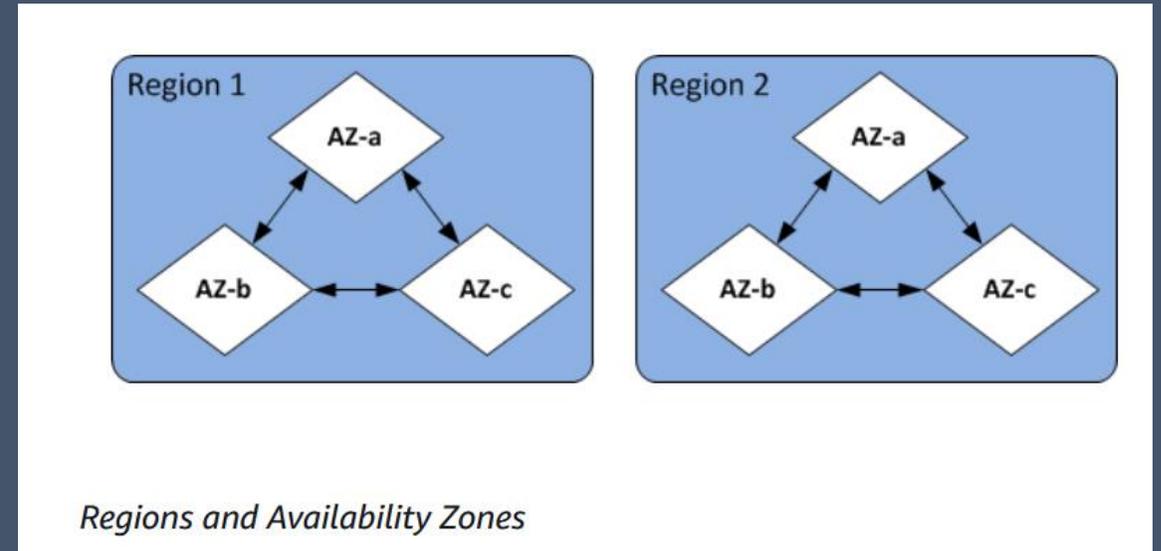
# AWS Infrastructure

- **GLOBAL** - The AWS Cloud spans 87 Availability Zones within 27 geographic regions around the world, with announced plans for 21 more Availability Zones and 7 more AWS Regions in Australia, Canada, India, Israel, New Zealand, Spain, and Switzerland.
- **North America** - The AWS Cloud in North America has 25 Availability Zones within seven geographic Regions, with 44 Edge Network locations and two Regional Edge Cache locations.
- Our largest footprints typically correlate with Regions, which are built up by multiple Availability Zones (AZ). We have operating regions in N. Virginia (6 AZs), Ohio (3 AZs), N. California (3 AZs), Oregon (4 AZs), US-East (3 AZs), US-West (3 AZs), Canada Central (3 AZs).

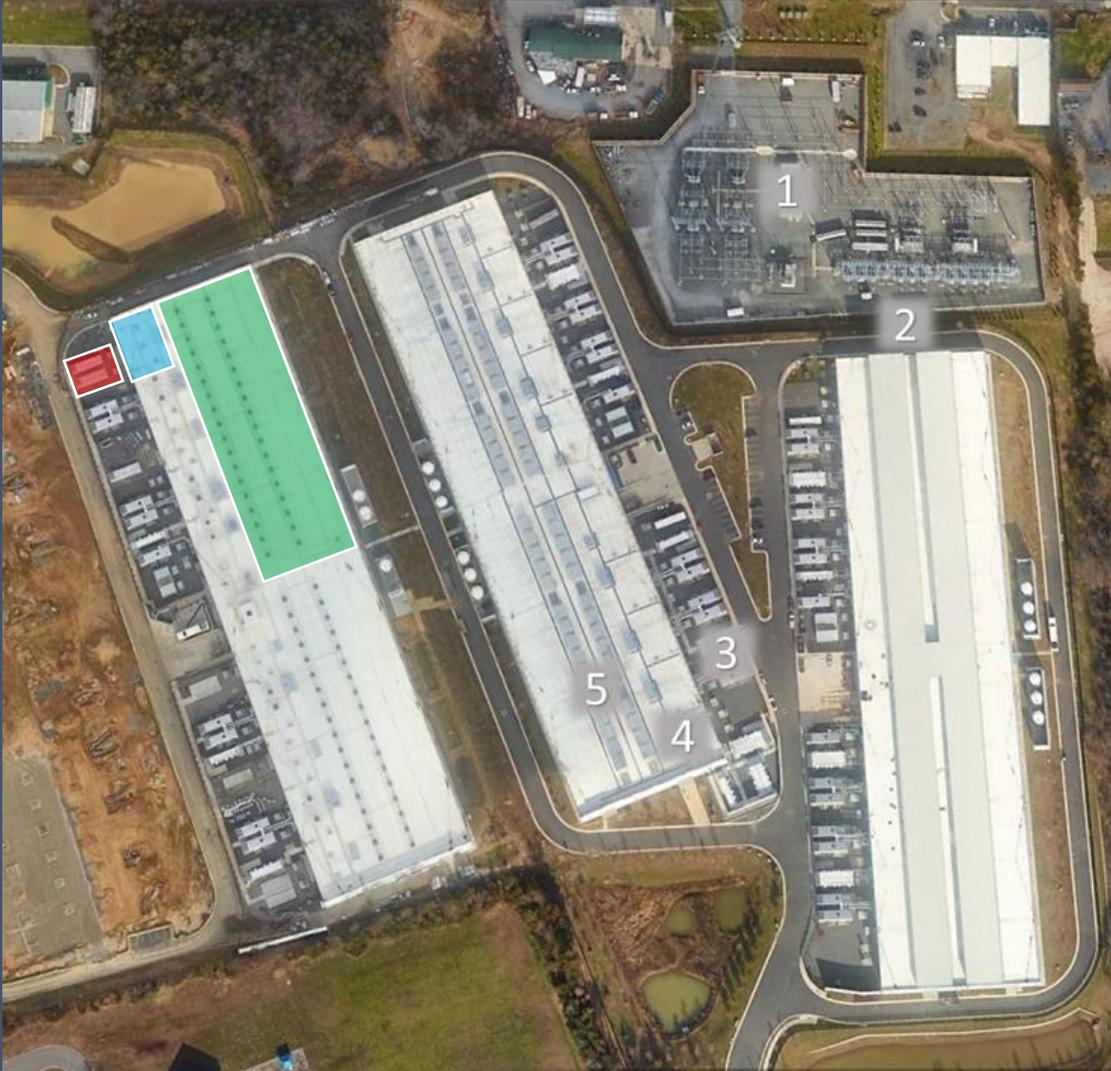


# Regions, Availability Zones, Data Centers

- **Regions** - a physical location around the world where we cluster data centers. Each AWS Region consists of multiple, isolated, and physically separate AZs within a geographic area.
- **Availability Zones** - An Availability Zone (AZ) is one or more discrete data centers with redundant power, networking, and connectivity in an AWS Region. All AZs in an AWS Region are interconnected with high-bandwidth, low-latency networking, over fully redundant, dedicated metro fiber providing high-throughput, low-latency networking between AZs. If an application is partitioned across AZs, companies are better isolated and protected from issues such as power outages, lightning strikes, tornadoes, earthquakes, and more. AZs are physically separated by a meaningful distance, many kilometers, from any other AZ.

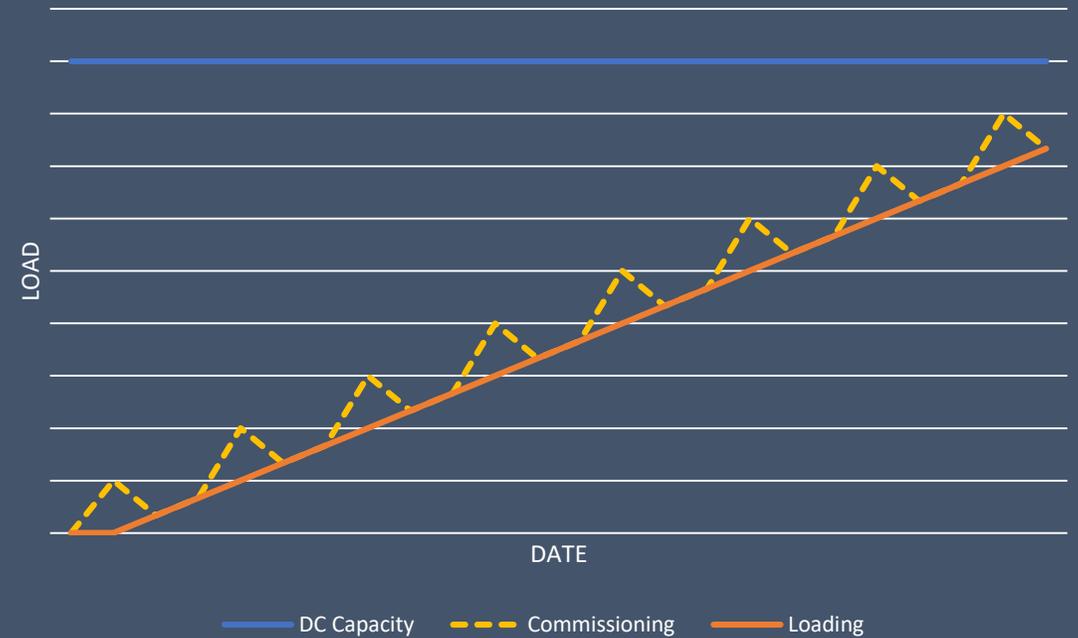


# General Overview of a Data Center



1. HV / MV Substation
2. MV Underground Feeders
3. 100%+ Backup Generation (N+1) (red)
4. Electrical Room (blue)
5. Data Hall (green)

Generalized Load Growth



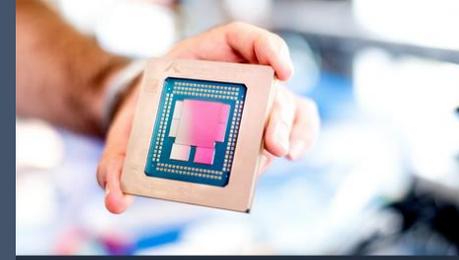
# Sustainability

<https://sustainability.aboutamazon.com/environment/the-cloud>

- Transitioning to renewable energy is one of the highest-impact ways to immediately lower emissions. Amazon is the world's largest corporate purchaser of renewable energy and is on a path to powering our operations with 100% renewable energy by 2025—five years ahead of our original target of 2030.
- #1 World's largest corporate purchaser of renewable energy
- 18.5 Gigawatts of total renewable capacity (as of September 2022)
- 85% Renewable energy reached across our business in 2021

## Moving to AWS Can Help Significantly Lower Carbon

Studies by 451 Research have shown that AWS' infrastructure is 3.6 times more energy efficient than the median of U.S. enterprise data centers surveyed and up to five times more energy efficient than the average in Europe. 451 Research also found that AWS can lower customers' workload carbon footprints by nearly 80% compared to surveyed enterprise data centers, and up to 96% once AWS is powered with 100% renewable energy—a target we're on path to meet by 2025.



ENERGY EFFICIENCY

### Power Efficiency

We're using innovation to improve power efficiency in multiple ways, including our investment in AWS-designed chips and the AWS Nitro System. For instance, AWS-designed Graviton3 is our most power-efficient general-purpose processor. Graviton3-based Elastic Compute Cloud (EC2) instances use up to 60% less energy for the same performance than non-Graviton EC2 instances. With the world's increasing need for computing and as machine learning has become mainstream, continually innovating at the chip level will be critical to sustainably powering the workloads of the future.



ENERGY EFFICIENCY

### Cooling Efficiency

AWS continually innovates on cooling efficiency. For example, we worked with our vendors to optimize the longevity and airflow performance of the cooling medium used in our data center cooling systems. The new medium provides twice the service life and allows air to pass through more easily than previous iterations, saving fan energy. This has significant impacts on building energy performance, reducing the energy use of cooling equipment by 20%.



SUSTAINABILITY IN THE CLOUD

### Water Stewardship

For AWS, operating sustainably also means reducing the amount of water we use to cool our data centers. Our holistic approach minimizes both energy and water consumption in our operations and guides the development of our water use strategy for each AWS Region where we operate.

# Q&A

THANK YOU

