



Data Centers – The Digital Power

Drive to the Net Zero Carbon Data Centers

Life Is On

Schneider
Electric

2023 Long-term Load Forecasting Workshop
Denver June 14, 2023

A grayscale photograph of a hand touching a smartphone screen. The word "DIGITAL" is overlaid in large, bold, green capital letters across the center of the image.

DIGITAL



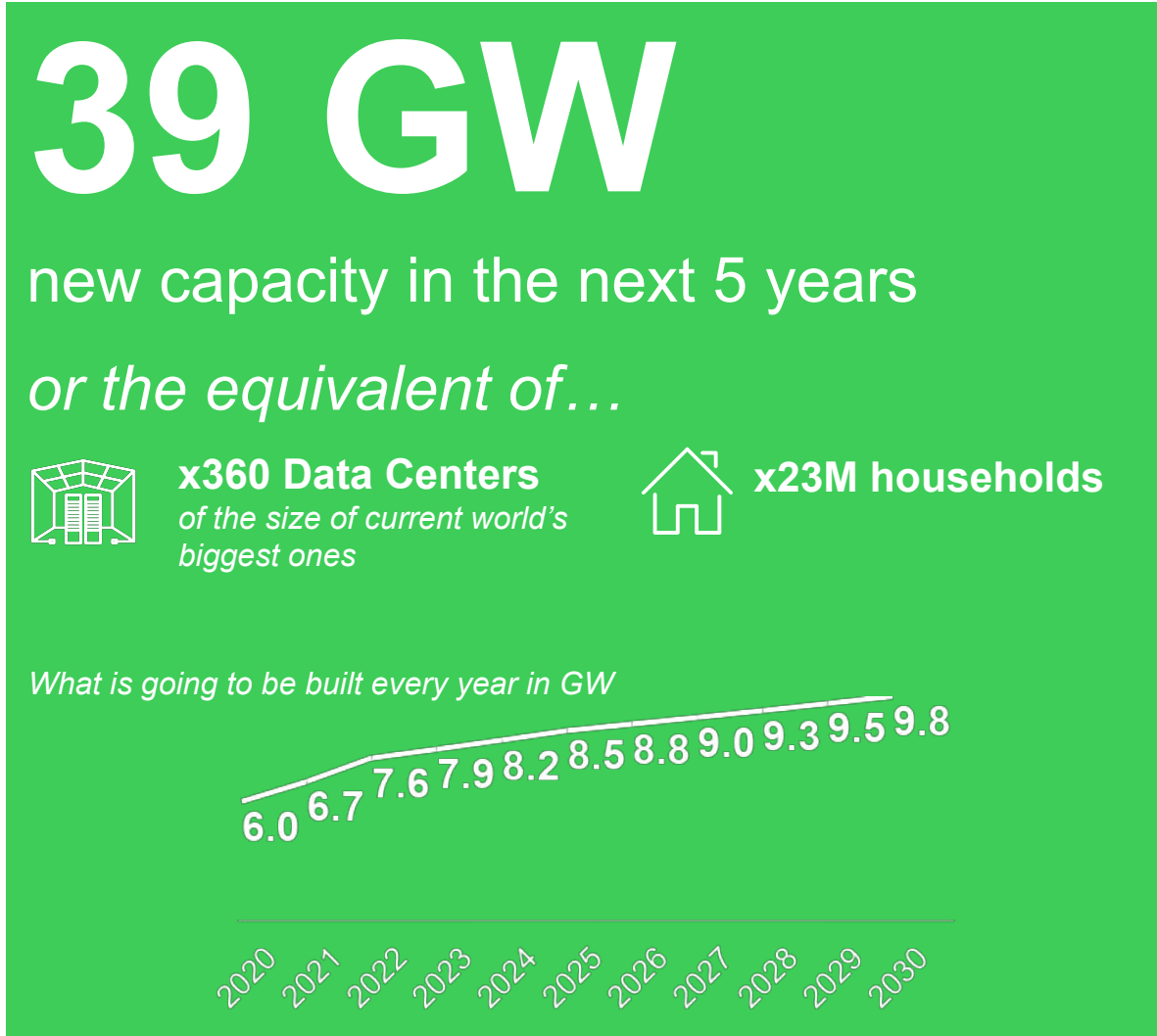
By 2025

90%

of Fortune 500 companies will become digital providers, both selling and consuming digital services

Source: Equinix

A market going to keep hitting records high

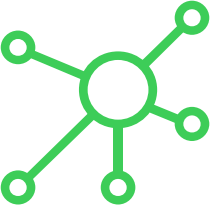




5% CAGR new build growth (CAPEX)



Led by Europe & China

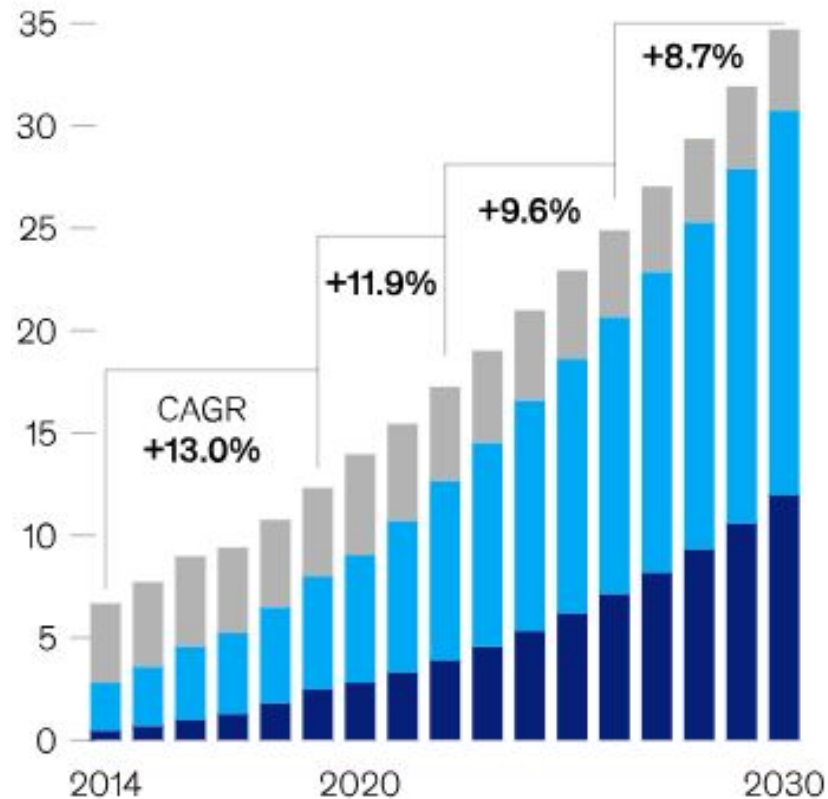


Internet Giants (and North America) remaining the technology epicenter (~40% of global market)

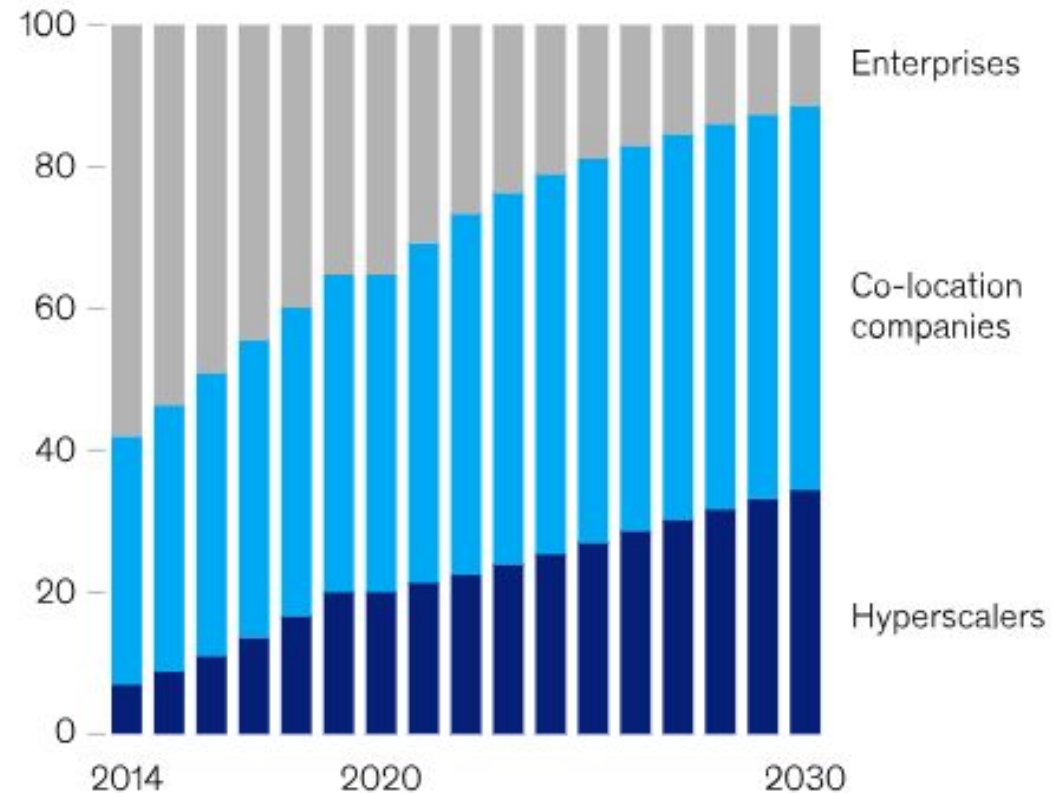
US Data Center demand is forecasted to grow 10% per year

35GW by 2030, up from 17GW in 2022

Data center power consumption, by providers/enterprises,¹ gigawatts



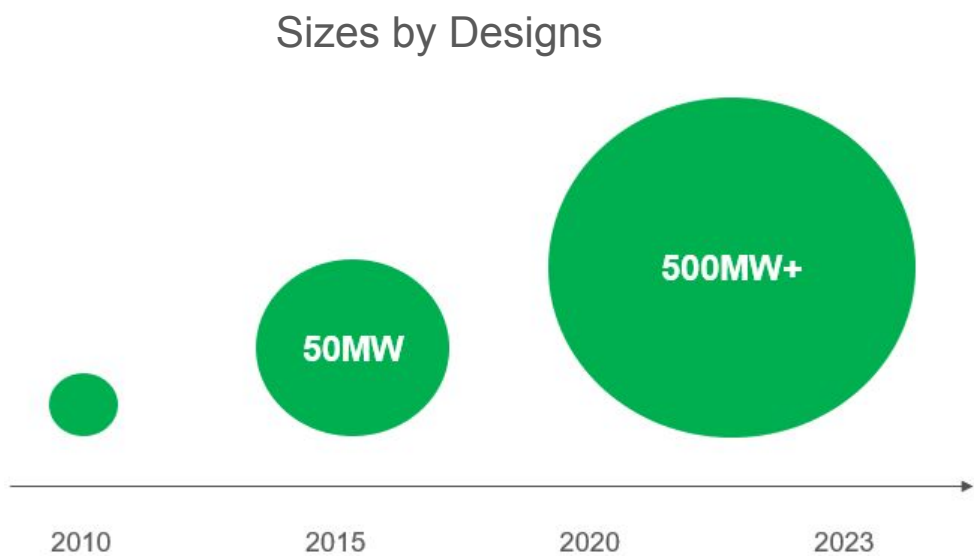
Data center power consumption, by providers/enterprises,¹ % share



Source: <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/investing-in-the-rising-data-center-economy>

Large Data Centers getting bigger and bigger

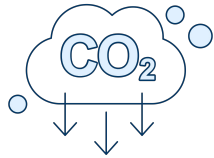
and Edge Data Centers will exceed the power consumption in the next decade



#	Location	Data Centers	Megawatts
1	Northern Virginia	275	2,600
2	Dallas	150	650
3	Northern California (Silicon Valley)	160	625
4	Phoenix	90	600
5	Chicago	105	550
6	Atlanta	75	375
7	Portland (including Hillsboro)	40	355
8	New York & New Jersey	140	295
9	Seattle (including Quincy)	75	290
10	Los Angeles	65	210
Total	—	1,175	6,550

Source: Dgtl Infra Real Estate 2.0 (January 2023)

Data Center Pressures: Climate targets, Climate realities



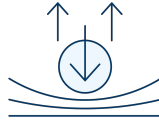
GHG emission reductions

6.21% increase in 2021 U.S. greenhouse gas emissions putting the U.S. further off track from achieving climate targets

Rhodium Group

32 business reporting quarters remaining to cut carbon emissions in half to keep global warming below pre-industrial levels

UN IPCC



Resilience

\$148 Billion the five-year average cost of billion-dollar-plus natural disasters

NOAA

6,681 extreme weather events over the past two decades (2000-2019)

UN Office for Disaster Risk Reduction



Reliability

1.33 billion outage hours across the U.S. in 2020

PowerOutage.US

\$5,500/minute average cost of downtime

S&C State of Commercial & Industrial Power Reliability Report



Cost-stability

65% increase in U.S. electricity prices in the last 20 years

EIA

79% increase in U.S. natural gas prices in the last 20 years

Bureau of Labor Statistics

Three key priorities for the data center industry to achieve a net-zero future



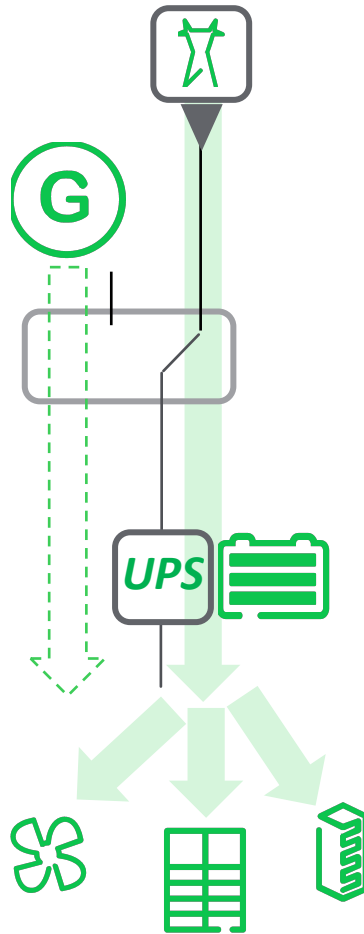
A grayscale photograph of a person wearing a hard hat and safety vest, walking away from the camera on a dirt path towards a large wind turbine. The path is flanked by grassy fields, and several other wind turbines are visible in the distance under a hazy sky.

CONVERGED ENERGY

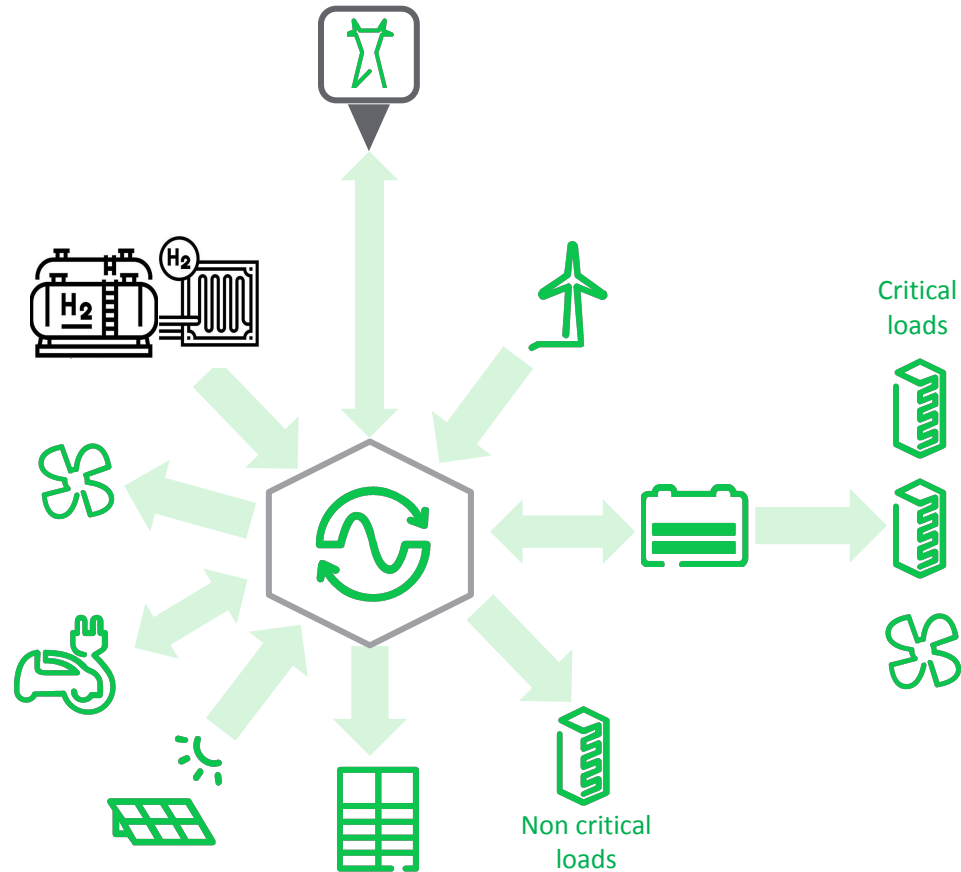
We are building a future where the words Genset, UPS and Microgrid are not distinct but converged, with the aim to achieve net zero

Sustainable energy resiliency for multi-sourced critical systems

From *legacy “top down” power distribution*



To new *Adaptive Energy Spine (AES)*

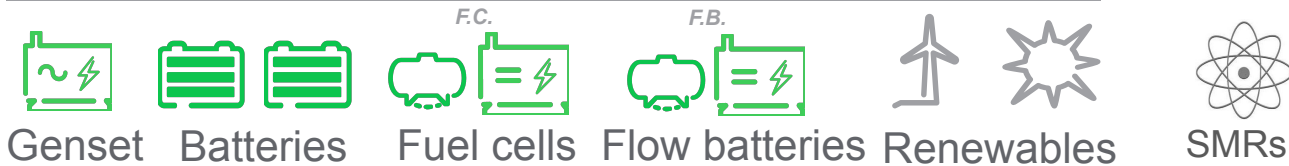


Adaptive Energy Spine, a software-defined energy connection system

A system that can integrate and adapt to different storage tech and use cases

Customer-driven choice

High variability based on maturity, geography, risk, etc.

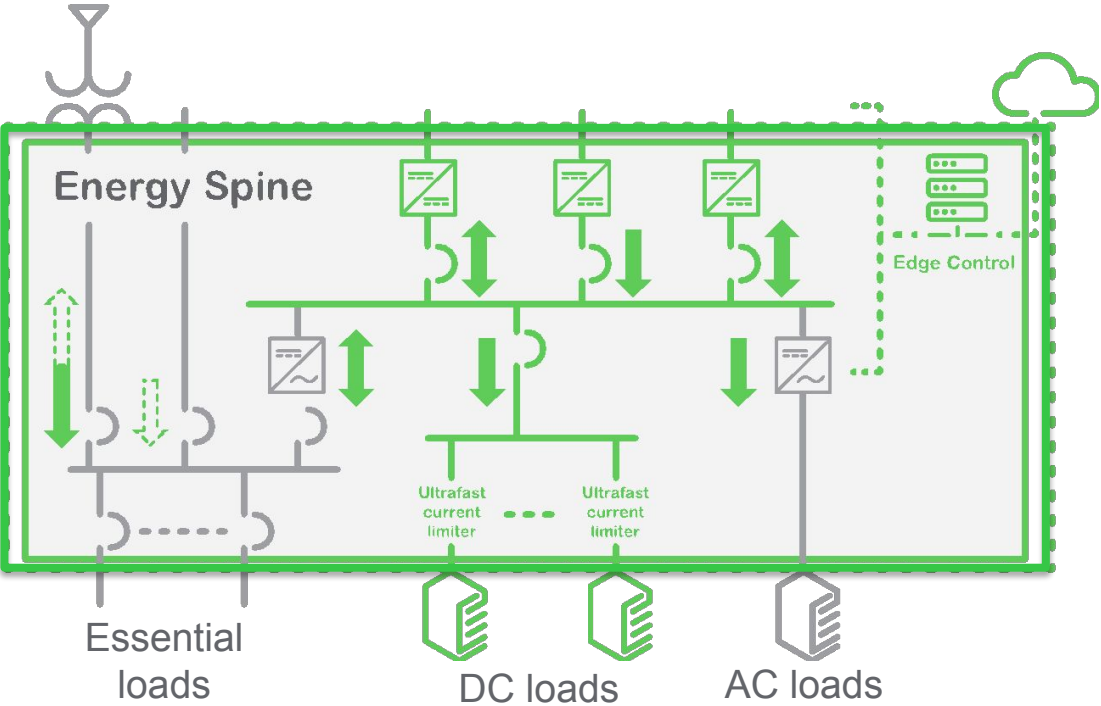


Industry can focus on value delivery not implementation

Industry architecture:

Standard physical, electrical, and control interfaces

Suppliers differentiate on implementation



A “Container” inclusive of:

- Switchgear
- Protection
- Power conversion
- Control with APIs
- Monitoring & sensors

Holistic energy management that harmonizes with the grid

Schneider Electric's version for advisory and orchestration

DRIVERS



24/7 time matching of
CO₂ intensity regulation

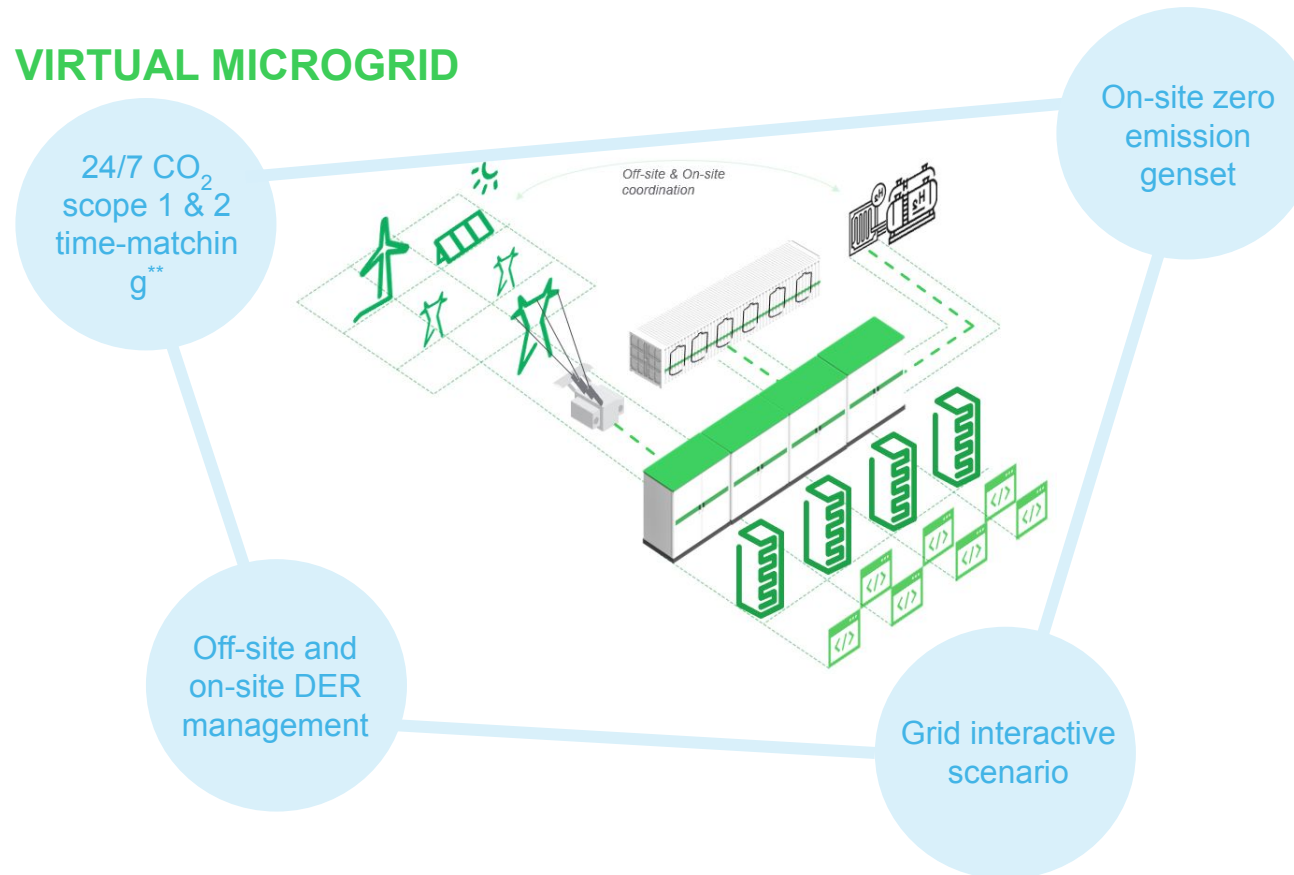


Multiple off-site/on-site DERs to
harmonize and orchestrate

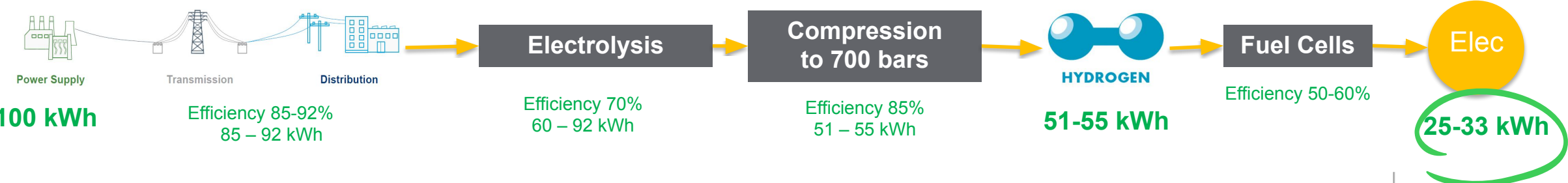
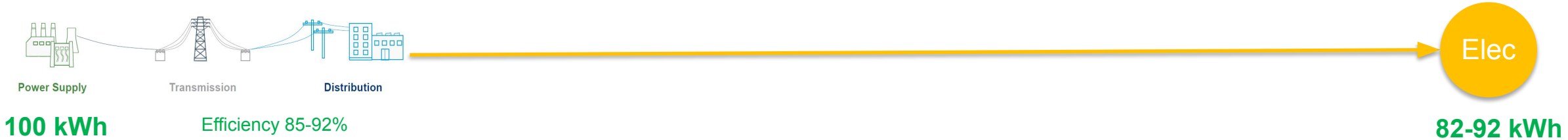
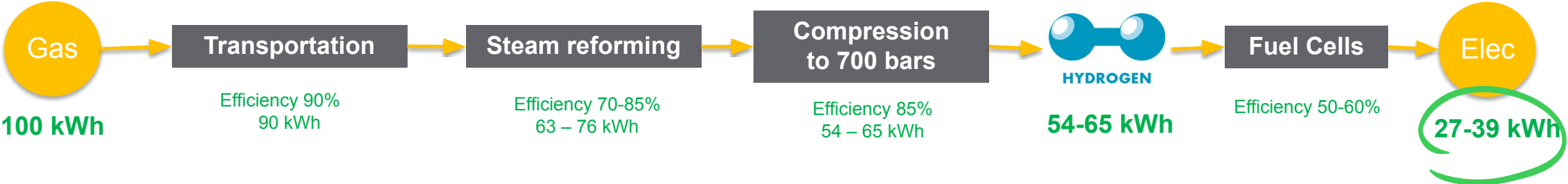


TCO reduction and
prosumer considerations

VIRTUAL MICROGRID



Efficiency of hydrogen production?



Key Takeaways

1

Data Center Capacity will continue to grow, both for Hyperscale and Edge applications.

2

Data Centers are looking for ways to become more autonomous from Utility companies (Prosumer).

3

24x7 Sustainable energy matching will be the holy grail (efforts are already under way).

A grayscale photograph of a hand interacting with a tablet. The hand is positioned diagonally across the frame, with the index finger touching the screen. The screen displays a faint, glowing circular graphic. The background is dark and out of focus.

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