



Hydrogen for Datacenter

Upshur Quinby
Energy Innovation Manager



Microsoft will be carbon negative by 2030

Jan 16, 2020 | [Brad Smith - President](#)



Microsoft President Brad Smith, Chief Financial Officer Amy Hood and CEO Satya Nadella preparing to announce Microsoft's plan to be carbon negative by 2030. (Jan. 15, 2020/Photo by Brian Smale)

Progress on our goal to be carbon negative by 2030

Jul 21, 2020 | [Lucas Joppa - Chief Environmental Officer](#)

Reducing our own carbon emissions

To reduce our Scope 1 and 2 emissions to near zero, we need to change how we operate. We're on the path to obtaining renewable energy power purchase agreements for 100% of the day-to-day power of our data centers by the middle of this decade. Today, we're additionally announcing that we're aiming to eliminate our dependency on diesel fuel by 2030.

Removing our own carbon emissions

Our climate commitments require us to reduce our carbon emissions by more than half by 2030 and remove the rest, while also removing all of our historical emissions since we were founded in 1975 by 2050. We aren't waiting until 2030 to get started. This fiscal year, Microsoft is taking concrete steps to remove 1 million metric tons of carbon from the environment. As the first step, this week we will issue a groundbreaking request for proposal (RFP) to source that carbon removal from a range of nature- and technology-based solutions that are net negative and verified to a high degree of scientific integrity.

Investing in climate equity and environmental justice

Finally, we're taking a step beyond what we announced in January. We recognize that climate and environmental issues don't affect every community the same way and that we need to address environmental equity as a broader issue. Today, we're announcing a new innovative partnership with [Sol Systems](#), a renewable energy developer and investor, for 500 megawatts (MW) of renewable energy that includes investments in communities disproportionately affected by environmental challenges.

Quincy Datacenter Power Infrastructure



https://www.youtube.com/watch?v=80aK2_iwMOs

Strategic Problem



Source: Caterpillar



Necessity:

- Generators enable 5-9s availability
- Datacenter must have 48-hour back-up



Issues:

- Noisy
- Polluting
- Difficult to permit
- Inhibits growth



Potential:

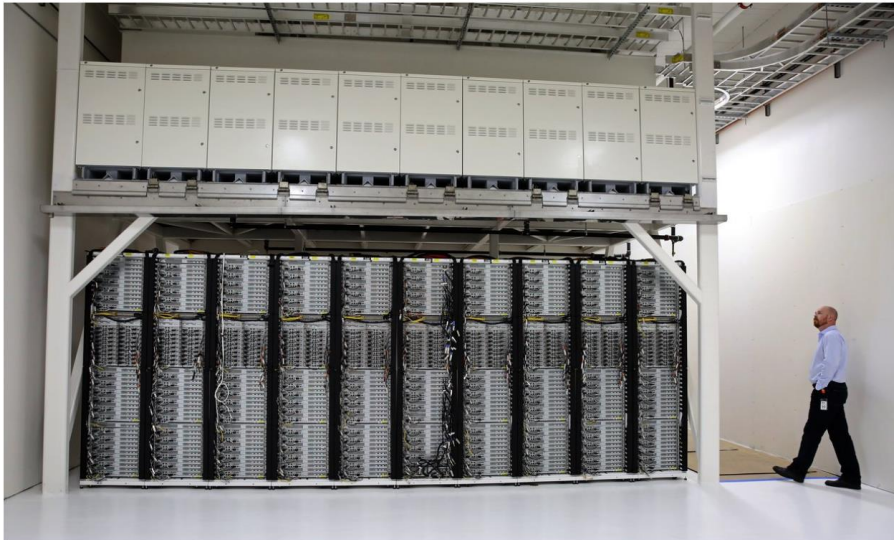
- Pollution free back-up enables capacity


Fuel Cell Research– since 2017

[Business](#) | [Environment](#) | [Microsoft](#) | [Science](#) | [Technology](#)

Microsoft makes a ‘crazy’ bet on fuel cells to feed power-hungry data centers

Originally published September 23, 2017 at 8:00 am



 1 of 4 | Microsoft engineer Sean James is dwarfed by the superstructure frame that supports servers on the bottom and European-made fuel... (Ken Lambert/The Seattle Times) [More](#) ✓

Source: The Seattle Times



Technology:

- SOFC (solid oxide fuel cell)
- Natural Gas feedstock



Positives:

- No grid connection
- No back-up generators
- Scalable solution



Challenges:

- Not instantaneous
- Produces CO2

Hydrogen testing begins..



Dec 2019: Scaled up to 250kW

Power Innovations – Daimler - Microsoft

Source: Power Innovations



Fuel Cell:

- Four Daimler 65kW automotive hydrogen fuel cells



Compute:

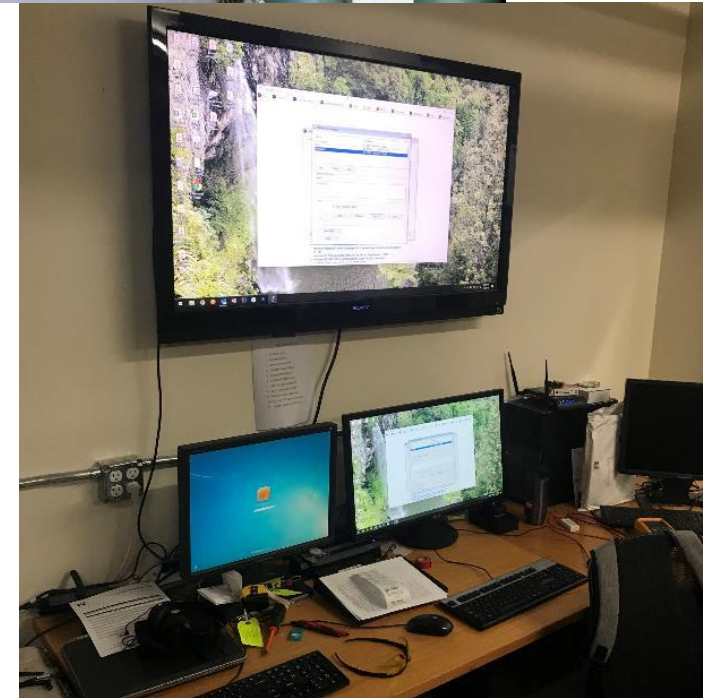
- 8 racks compute simulators
- 1 rack servers
- 295kW total load available



Integration & Testing:

- Managed by Power Innovations
- Test using combo of UPS & generator protocols
- 48 hours run on hydrogen







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Testing brings interest

Microsoft tests hydrogen fuel cells for backup power at datacenters

July 27, 2020 | [John Roach](#)



ENERGY STORAGE

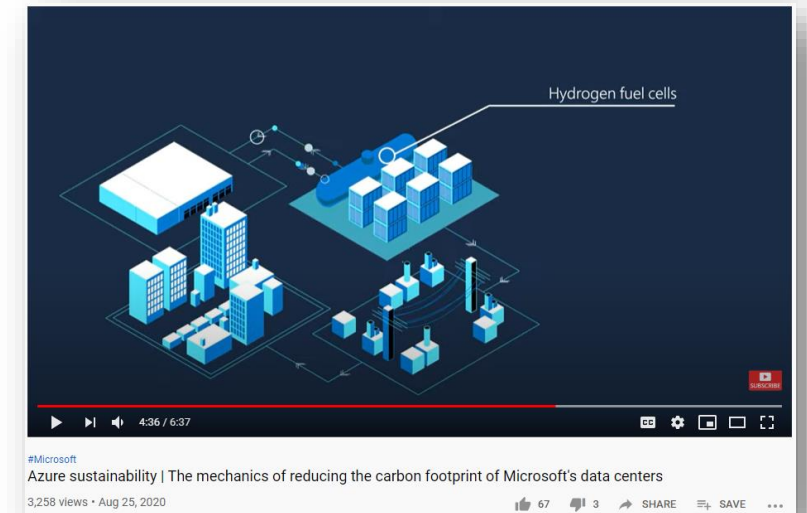
Microsoft Eyes New Tool in Decarbonization Quest: Green Hydrogen

Hydrogen could fill a role similar to batteries for data center operators looking to kick their diesel habit.

KARL-ERIK STROMSTA | JULY 27, 2020

Microsoft commits to H2 as an energy-transition fuel with senior role in Hydrogen Council

Tech giant joins the likes of Shell, BP, Saudi Aramco, Siemens and BMW in the CEO-led initiative, which wants to make the zero-carbon gas a decisive part of the fight against climate change



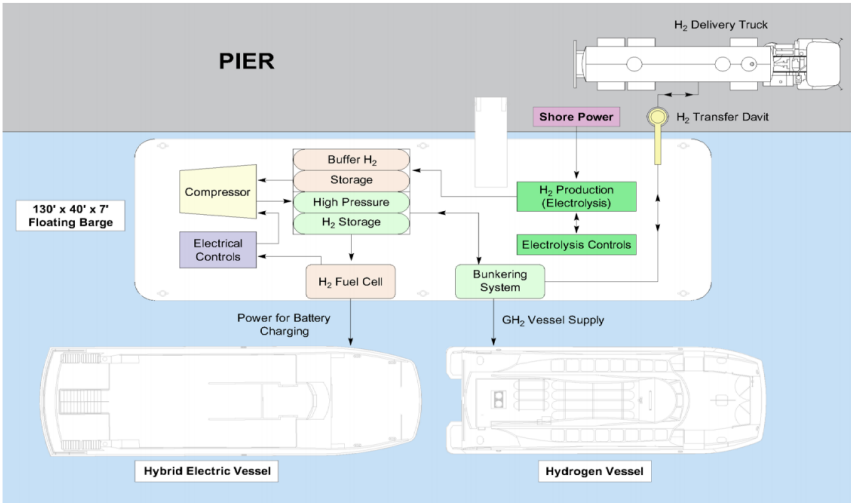
In Development: CAT 1.5MW Generator DOE Pilot

New Maritime and Data Center Selections Just Announced

SF Waterfront Maritime Hydrogen Demo Project

Total Budget
\$16M

Hornblower Yachts & partners (SNL, AL, Nel, IGX, Port of San Francisco, et al)

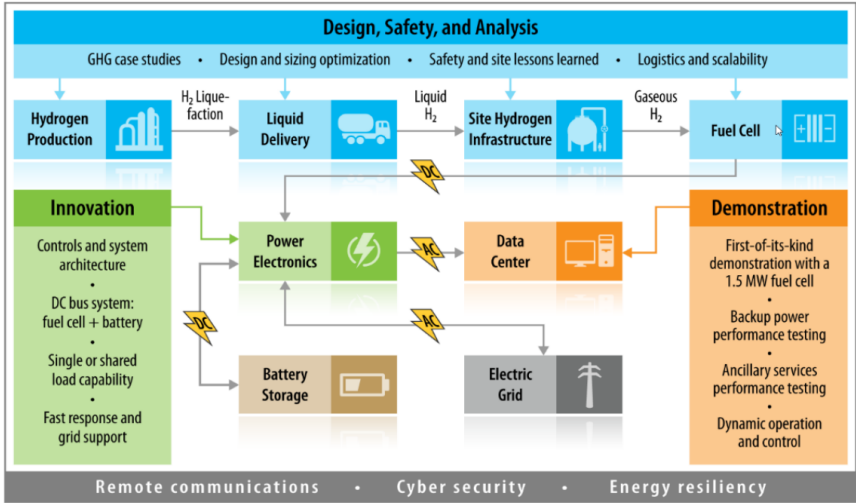


Goals: Demonstrate a first-of-its-kind maritime H₂ refueling infrastructure for up to 530 kg H₂ /day, integrated system of green H₂ electrolysis + fuel cell on moveable barge for electricity and H₂ production.

PEM Fuel Cell for Data Center Power

Total Budget
\$13.7M

Caterpillar & partners (Ballard, Microsoft, NREL)



Goals: Demonstrate 1.5MW fuel cell (FC) to meet data center requirements; build capability to scale FCs to multi-MW data centers and provide FC power solutions for other portions of the electric power industry

Source: US Dept of Energy

Scale will present challenges



Source: Praxair



Calculations:

- 30MW of IT load
- 48 hours of back-up
- 100 metric tons of H₂



Storage:

- Cryogenic LH₂ today
- Pipeline to bulk or utility?
- Metal Hydride?



Thank you

For inquiries please contact:

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