

JOIN THE JOURNEY TO NET ZERO

Power Generation Symposium Europe







Rolls-Royce Power Systems

Future-Proof Energy Solutions for Data Centers

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DATA, DA



Data Never Sleeps 9.0

How much data is generated every minute?

The 2020 pandemic upented everything, from how we engage with each other to how we engage with brands and the digital world. At the same time, it transformed how we eat, how we work and how we entertain ourselves. Data never sleeps and it shows no signs of solving down. In our 5th edition of the "Data Never Sleeps" inflographic we bring you a gimpse of how much data is created every digital mixtute in our increasing data-driven world.

GREEN DATA CENTER



As of July 2021, the internet reaches 65% of the world's population and now represents 5.1.5 billion people—a 10% increase from January 2021. Of this total, 39.5 percent accessed the internet via mobile devices. According to Statista, the total amount of data consumed globally in 2021 was 79 zetabytes, an annual number projected to grow to over 180 zetabytes by 2025.

Global Internet Population Growth



As the world changes, businesses need to change too—and that requires data. Domo gives you the power to make data-driven decisions at any moment, on any device, so that you can make smart choices in a raight changing world. Every click, swipe, share, or like tells you something about your customers and what they want, and Domo is here to help you and your business make sense of all of it.

Learn more at domo.com

IS: LOCAL IQ, BUSINESS OF APPS, DUSTIN STOUT, HOOTSUITE, ED RAMELINES, INTERNET WORLD STARS, STATETA, CNRC, MICH KILL INF CARLE BILL, VOLTUBE, RINSTAT, THE YERGS, MICHT COMMUNICATION: A CASE ANALYSIS APPROACH. T 114 YESTARS, SODA, STATTST





Trend meets Trend

Our Belgian site became the first Google data center to add on-site solar power

10,665 solar panels



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- All hyperscaler and Colocation providers are looking into the sustainability of data centers
 - From its operation towards its emergency power supply

Data Center Sustainability: It's More than Just Power

Green by design

tt Equinix, our purpose is to protect, connect and power a more sustainable digital world. We design, build and operate our data centers with high energy-efficiency standards and a long-term goal of using 100% clean and renewable energy for our global platform.

Sustainability in the Cloud

Amazon Web Services (AWS) is focused on efficiency and continuous innovation across our global infrastructure, as we continue on our path to powering our operations with 100% renewable energy by 2025.



Redesigning Datacenters for an Advanced Energy Future

Sep 24, 2017 | Christian Belady, General Manager & Sean James, Principal, Microsoft Cloud Infrastructure and Operations

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SUSTAINABILITY

THE DATA CENTRES OF TOMORROW BUILT SUSTAINABLY TODAY





mtu Portfolio for the next generation of Data Centers







Most common setup for Data Centers today

- UPS with Diesel as Backup
 - Standardization and Effencency increase
 - Scalability
 - Digitalization
 - Increase sustainable & Emission Efforts
 - Renewables Fuels
 - HVO & Gtl
 - The European Medium Combustion Plant Directive & BmschV

mtu emergency backup solution for Data Centers





Automated controller Plant Manager



Significant reduction of greenhouse gas emissions (HVO)





- CO₂ from the atmosphere will be bound in the raw materials
- The raw materials are used to produce HVO
- HVO is used in the combustion while the engine is operating
- Due to the combustion CO₂ is emitted back into the atmosphere
- Greenhouse gases are bounded again in the raw materials
 - ightarrow closed carbon cycle





In-house Customized Container design capabilities

Key features:

- 40ft. HC container & oversized enclosure Designs
- Very compact
- Sub-basetank (30m³)
- Fuel polishing system
- Various power breaker cabinet sizes
- Bus bar system
- Modular EGT Systems

Customized Container 20V4000









Static UPS vs D-UPS

Standard DC

- DUPS System Advantages
- Guaranteed Diesel engine starting
- Environmental friendly (mtuKinetic PowerPack: energy is stored in a rotating steel part, instead in chemical batteries for static UPS)

mtu emergency backup solution for Data Centers





Automated controller Plant Manager



Switching to NG Generators

Gas Generators

- CCHP Efficiency Cooling Solutions
- Startup Up from Gas Generator
 - Usage as District Heating
- Gas Generators are optimized for continous operation!

Switching to NG Generators –

Rethinking the use case for power generation





Faststart 1: (Ramp up parameter: 1,6%/s) + Study Battery System (200%/s)



Ramp up with cold exhaust system 20V4000L64FNER EU Faststart – Test engine: VG16 Testbench: 11 / CW32+33 in 2021

ROLLS

> Boundary conditions: - All tests parallel to grid @ 50Hz - Methane number ~ 88 - preheated engine: LT ~ 43°C / HT ~ 65°C - Intake air temperature >= 40°C / exhaust back pressure ~ 60mbar @ Full load - engine starters supported by test bench system, not by batteries





Focus first on fast setup of reliable backup solution, then stepwise transition to improved CO2 footprint



Phase I: Getting the system up & running

- Installing Gas CHP highly modular Units. Providing preassembled and pre-tested containerized units
- Full installation & Commissioning



Phase II: Improve CO2 footprint

- Add tank and H2 fueling system
- Add a Hydrogen Engine as a peaker or backup system (1MW)



Phase III: Full-fledge H2

- Upgrade the existing fleet to 100% hydrogen.
- Adding new System to cope with derating





Energy consumption Phase I & II

Energy sources and consumption







NG replaced with Hydrogen

Gas Aggregate with H2

- Mix NG with H2
- CO2 Reduction
- Full H2







The CO₂-free Data Center



Completely emissions free







The CO₂-free Data Center



Cooperation with Daimler Truck AG on stationary fuelcell systems.

Development of an alternative containerized prime mover.

PEM Fuel-Cell Container

Proposed Solution: FC Generator with UPS-Integration

Enabler for completely new power supply concepts!











Open Discussion

- Are these the same concepts as what you have seen & discussed?
- Do you see other use cases for on-premisis power generation?
- What has been your experience?





Thank you

