Major Data Centre Operator Chooses Flywheels over Batteries – A Case Study

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ee publishers

Data Centre Operator

Background

- More than 25 years of industry experience
- Japanese Parent company KDDI, a $45 billion telecommunications and integration giant (Global 300 company)
- Operating a network of 47 data centres in 23 strategic locations in the EMEA, the Americas and the Asia-Pacific region including facilities in:
  - UK
  - USA
  - Germany
  - Japan
  - China

https://www.telehouse.net/data-centres

Case Study Data Centre

Telehouse - Requirements

- Power supply infrastructure replaced and improved to cope with today‘s and tomorrow‘s requirements

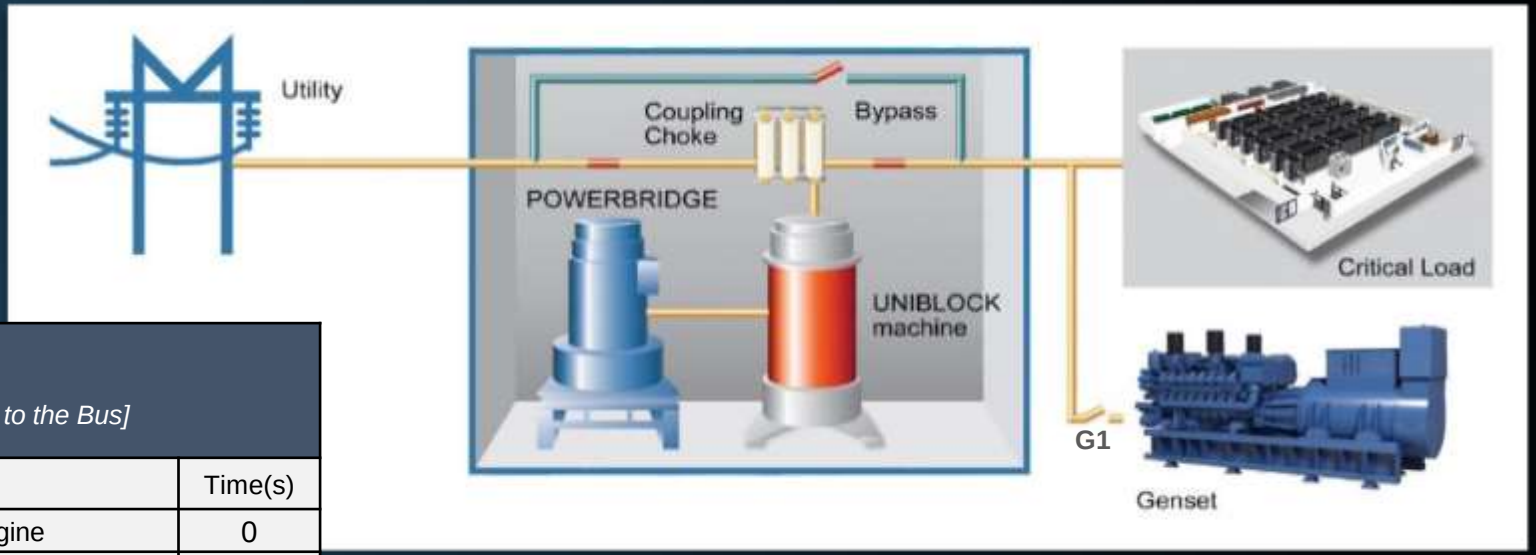
- Power and cooling demand for
  - Building A South: 7.2 MW
  - Building B North: 3.5 MW
  - New DC: 3.6 MW

Case Study Data Centre

Telehouse - Requirements

- Requirement to new power supply:
  - Scalable, space optimised and efficient
  - Minimum Tier III
  - Design UPS and integration of gensets
  - Infrastructure like busbars and PDU N+N
  - Mechanical load supplied from UPS
  - Low PUE
  - Designed for up to 50°C

Site Generation
Diesel Generator Paralleling



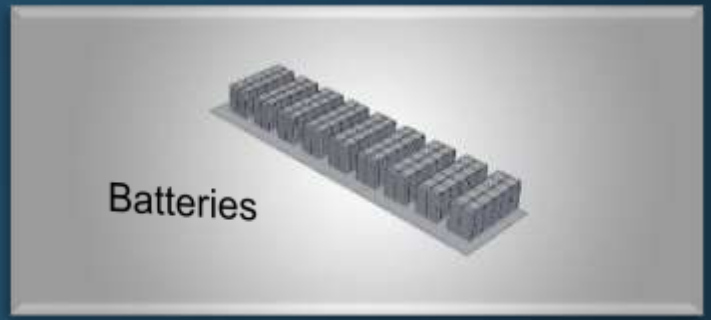
Paralleling
[Single Engine on to the Bus]

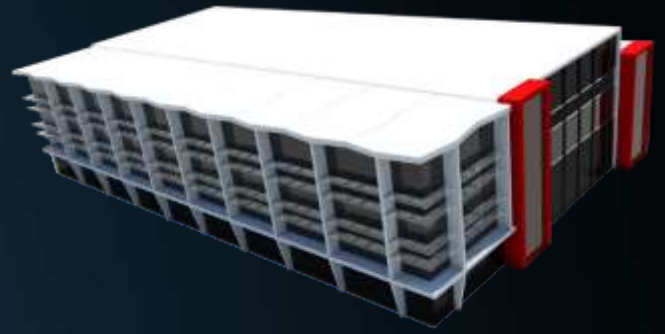
	Time(s)
Start Signal to Engine	0
Excitation on	0
Engine to full speed and voltage	6-9
Synchronise to bus and close G1 breaker	1-6
Total Cumulative	**7-15**

Building Constraints

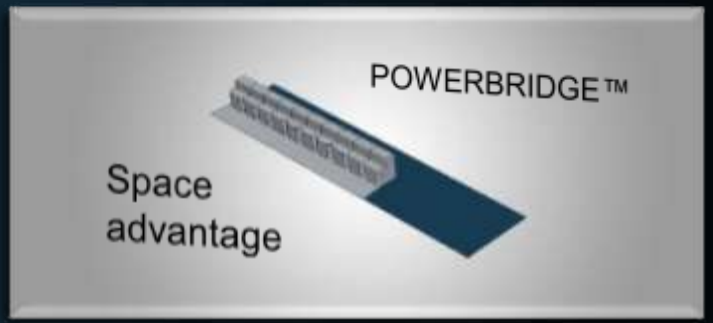
The integrated store massively reduces the footprint and weight:

- Reduced building costs
- Increased “white space” capacity
- Elimination of battery room
- Batteries for a 3.6MW installation = 31 m² and 86 tons





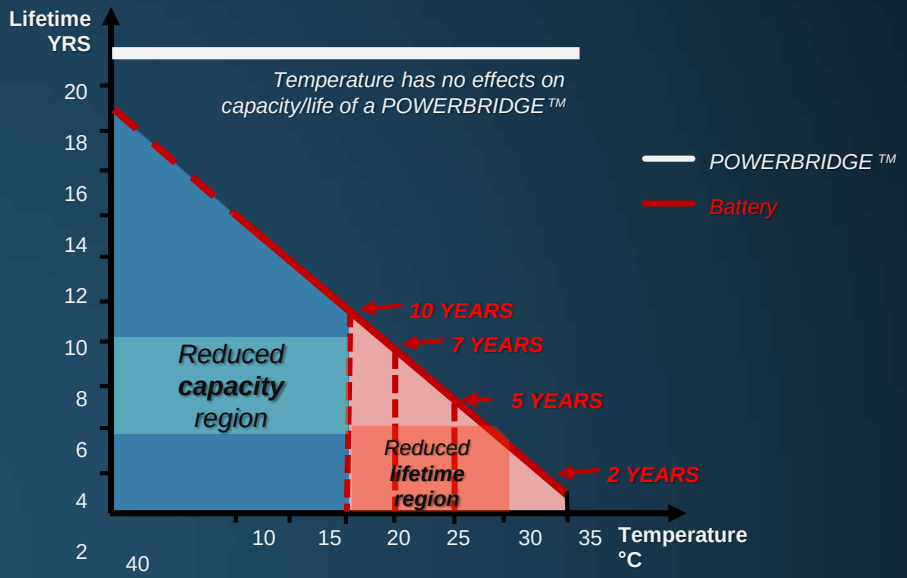
- PB60+ for a 3.6MW installation = 12 m² and 40 tons



Cooling
Temperature Effects

Ambient Conditions

Operation in conditions up to 50°C



The POWERBRIDGE™ PB60+ loses neither **capacity** nor **lifetime** with temperature change.

Annual Maintenance & Overhaul

BATTERY-SYSTEM	Duration
Inspect battery continues yearly	4hrs
Annual performance test	4hrs
Replaced failed blocks	2hrs
Check & maintain environmental control	n/a *
Complete replacement after 5-7 yrs[1) 2)]	72hrs

POWERBRIDGE™	Duration
Check settings	1hr
Change grease after 5 years	36hrs
Bearing change after 10+ years	48hrs

Note:
1) Transporting replacement batteries to this site would see lorries contribute

~30 tonnes of CO_2

2) Conservative when operating at 50°C

* Does not typically require battery to be isolated

Result

Av. Annual maintenance time (20 year cycle):

Batteries = 21 hrs

POWERBRIDGE = 7 hrs

Battery Availability = 99.76%

POWERBRIDGE = 99.92%

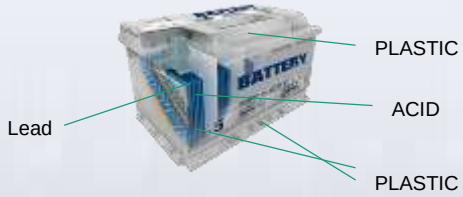
1 MW Energy Store Comparison

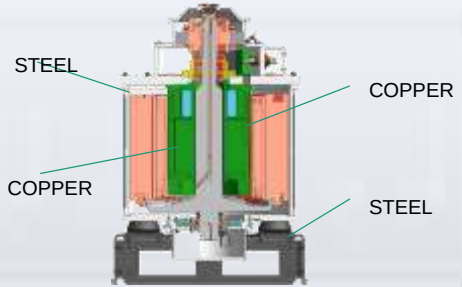
	VRLA-Battery	Li-Ion Battery	PB60+
Ambient temperature	20°C	5-25°C	0-50°C
Life time	5-8 years	up to 10 years	more than 15 years
Performance for frequency stabilisation	Very limited	Very limited	Very good capability (100% load step)
Environmental impact	Lead, acid	Transport of dangerous goods & materials must be recycled - unclear	Steel, copper
Annual maintenance	Annual discharge tests and measurements	Annual discharge tests and measurements	Check settings only
Reliability	Low	Undetermined	Very high
Full re-charge time *	Min.12h	Min. 30min	Min. 3min

* Based on 10 minute battery and full load discharge for 1 minute

Environmental Impact

Lead Acid Battery	Li-Ion Battery	POWERBRIDGE™
Material = plastic, acid, lead recyclable	Materials must be recycled - unclear	Material = copper, steel 100% recyclable
Toxic components	Highly toxic components	Non toxic components
Limited transport – battery-dependent	Transport of dangerous goods	Standard transport without any restrictions
Air conditioning coolants	Thermomanagement	No requirements
Hardly flammable	Flammable	Not flammable
5-8 years life time	Up to15 yrs estimated life time	over 15 years life time

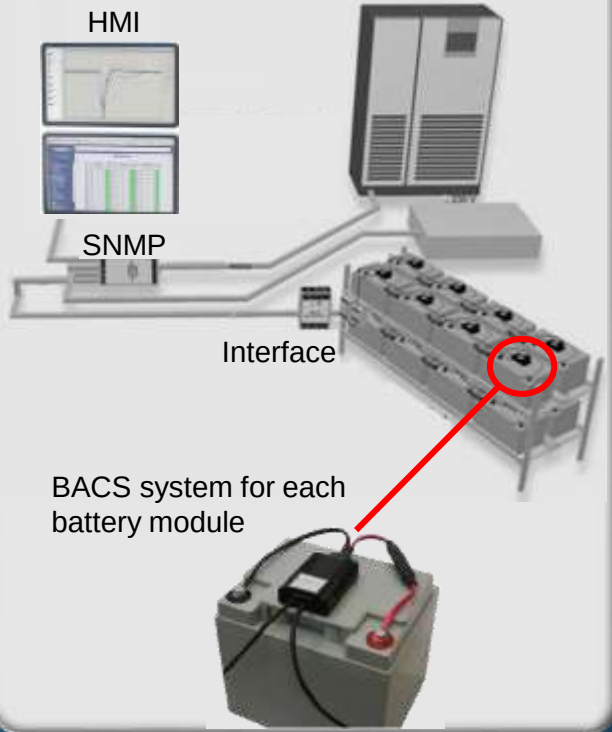




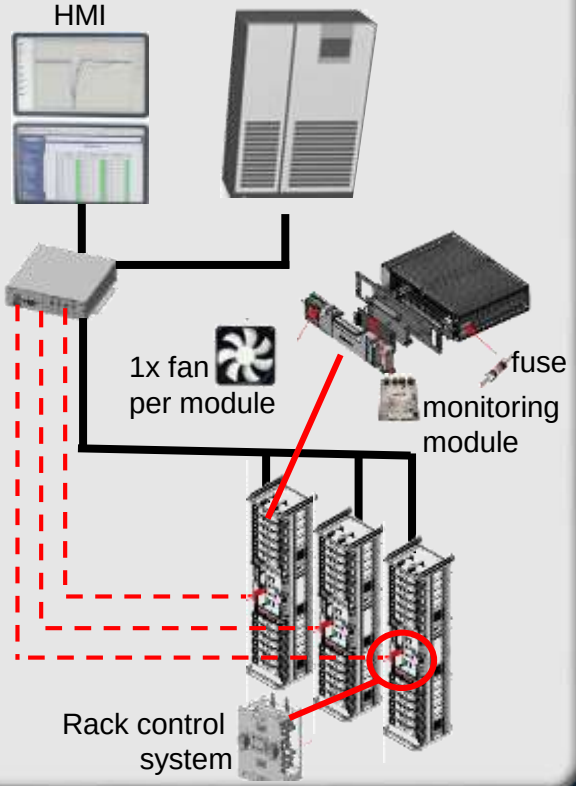
VRLA-Battery vs Li-Ion Battery vs KE Store

Major components for Monitoring

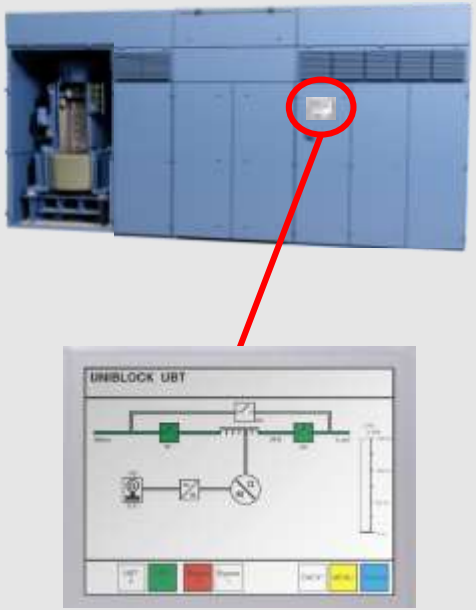
VRLA-Battery



Li-Ion Battery



POWERBRIDGE™



Case Study Data Centre

Telehouse - Piller Solution

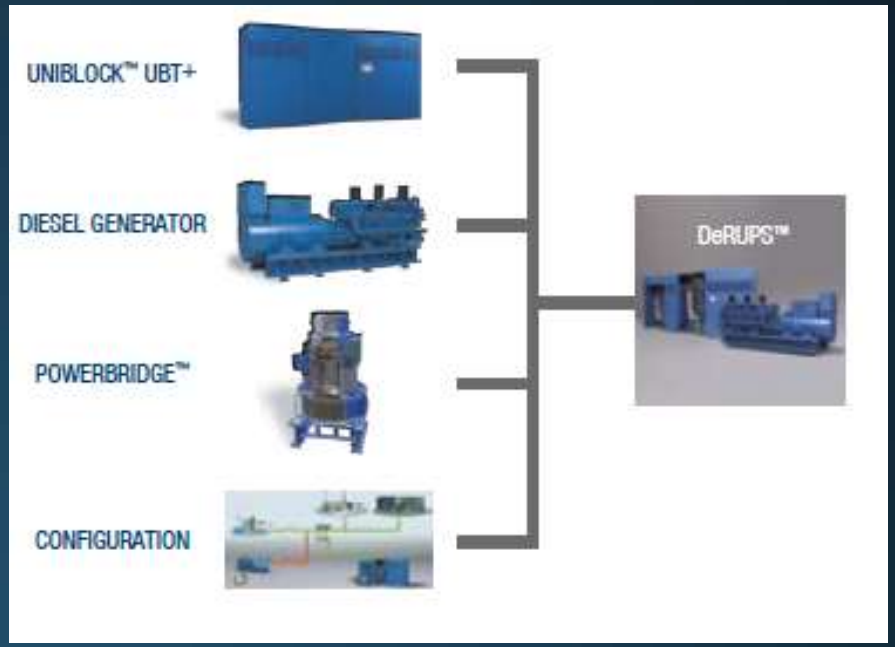
- Piller (via IP Bus N+2 configuratio)
- 3x UBT+1800 with PB60+ together with already installed gensets
- Tier 4 ready
- 2 fully independent supply paths down to the load
- Mechanical load supplied (via IP Bus)
- Up to 50°C ambient temperature
- PUE < 1.2

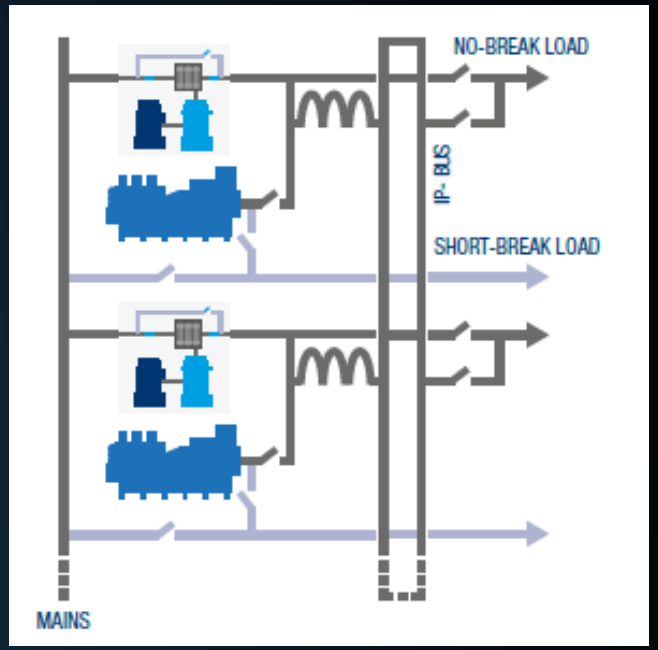
- Meets exhaust emission requirements of city of Frankfurt (< 200mg/m³)
- Meets noise emission requirements of city of Frankfurt (< 27dB(A) during night time)

System Overview

- Highest reliability (MTBF approx. 1,380,000 h)
- Low operating costs because of high efficiency
- Total flexibility
- Easy and reliable parallel operation
- UNIBLOCK is self-ventilated

IP-Bus design (general)





Intelligent configuration with auto / manual load sharing
to operate at optimum redundancy and efficiency levels

Case Study Data Center

Telehouse - Piller Solution

Armin Höfner –Technical Director Telehouse Deutschland– said:

“The configuration is about keeping the design elegantly simple, and keeping the paths separated to make it fault tolerant. The data centre that we build and operate are infrastructure for the future, and they have to meet the highest reliability standards with the highest power density.”

Winner of the German data centre award 2019
for PB60+ kinetic storage & 1 – 0 – 1 concept

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