CASE STUDY

Embedding Circular Thinking in Data Centers

At Facebook, we aim to minimize our energy, emissions and water footprint, while embracing the responsibility and opportunity to impact the world beyond our operations.

The opportunity

At Facebook, we embed sustainability in everything we do and are committed to minimizing our environmental footprint. As we continue expanding our services to better connect people around the world, we will require new data centers to provide the critical computing and storage infrastructure needed to power this experience. We are constantly exploring ways to drive data center efficiency and sustainability by maximizing use of our server equipment to stay ahead of rising power demands while also reducing our impact. This forward-thinking approach is what led us to help found the Open Compute Project in 2011, an open source community where global technology leaders collaborate and share ideas to efficiently support the growing demand for computing infrastructure.

A key piece of our approach to sustainability is circular thinking, which is embedded into how we design, operate and manage the hardware in our data centers. We consider circularity at every stage of the hardware's life cycle, starting with building repairability and recyclability principles into the hardware design process. By making our equipment easy to repair in the field, we ensure data center technicians are able to quickly and safely identify and repair issues, thereby extending life span of our hardware.

Finally, we drive sustainability at our data centers by rethinking our approach to managing deprecated server, rack and power equipment. By ensuring our hardware is easy to disassemble during design, we are able to harvest and redeploy components and systems that meet our reliability standards, find a second life for parts outside of our data center through secondary markets, and ensure all residual materials are recycled responsibly.

A solution

In 2014, we began testing the use of lithium-ion batteries in place of traditional lead-acid batteries in our battery backup units (BBU), a core component of our Open Rack V2 configuration that provides power as the hardware switches from a utility source to a backup generator during power outages. We were proud to be one of the first hyper-scale tech companies to implement these widely. In addition to their higher energy density, lithium-ion batteries have a life span that is twice as long as a typical server rack and their smaller size allows them to be stored directly in the rack.

When the BBUs are used in our data centers, they are monitored throughout their life span, providing data that gives us the ability to monitor the health of the battery cells and quickly triangulate any issues in the field. As soon as we started shipping BBUs into production, we began to proactively think about how we can use this health data to maximize the lifes pan of our BBU and extend the life of these battery cells, even while the other parts of the server hardware are being decommissioned. Over the past three years, we've taken a data-driven approach to understanding near-term degradation of our BBUs, using the health data we've collected to better understand how the battery cells are currently performing in the server racks to predict life expectancy.

Using recorded health-check data, our teams developed a set of criteria to help determine which battery modules could survive beyond the next decommission cycle and be eligible for reuse internally. The criteria consider various aspects to determine the health of a BBU, including full charge capacity, firmware revisions, serial numbers and calendar age. Through this process, BBUs approved for reuse are expected to meet design requirements for at least an additional four years.

This data continues to play a role in helping us understand and forecast degradation in the long term, as well as create forecast models to demonstrate reuse potential of these cells beyond the first decommission cycle.

The impact

The example of BBUs illustrates the power of embedding circular thinking into how we design and manage our hardware and its role in reducing our overall environmental impact. Currently, we have approximately 400,000 BBUs in our global data centers, representing more than 1,440 MW in battery power. In 2020, we expect to expand our server fleet to include 200,000 more BBUs due to data center growth. Based on the criteria we've developed, we expect 95% of our current fleet of BBUs will be eligible for reuse.

This eligibility is expected to increase over time to as much as 98% as we continue to perfect the identification process. For the small number of our BBUs that cannot be reused, we are working with partners and suppliers to map out various second-life scenarios and are identifying the best recycling methods to maximize resource recovery.

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More information

For more information visit our Sustainability site at sustainability.fb.com