"Zombie" Servers and Inefficiency Drive Energy Waste at Data Centers

In nearly 3 million data centers across the United States, about 12 million machines serve up the emails, web pages, and files we access online every day. The high energy **demand** of those servers is well documented, but up to 30 percent of them are using power without actually doing anything. These "zombie", or comatose, servers are among the examples of energy **waste** documented in a report about U.S. data centers by the Natural Resources **Defense** Council (NRDC). If those **facilities** were to cut electricity **consumption** by 40 percent—half of what is possible using the **tools** now **available** to improve **efficiency**—the electricity **savings** would **amount to** $3.8 billion and 39 billion kilowatt-hours, according to the report. That is enough to **power** 3.5 million American homes. Large companies such as Google, Facebook, eBay, and Microsoft are already highly efficient, and their share of electricity use is just 5 percent of total data center consumption in the United States. "Our **concern** is more about the other 95 percent," said Pierre Delforge, who co-authored the new report, which focuses on corporate data centers, small- and mid-size server rooms, and firms that manage data for a variety of clients (multi-**tenant** data centers).

One of the main ways that data centers use energy is to **keep** all the large server machines cool. The industry has made **significant progress** in this area, some using **upgraded** systems that can generate power from waste heat or use outside air in cooler climates. But how the machines themselves are being **operated** leaves room for improvement. That millions of servers are running at only 10 to 15 percent capacity—or, in the case of zombie servers, at zero, is "one of the lesser known issues," Delforge said. Useless servers **tend to** stay powered up because no one is **aware of** them, or no one wants to take the risk of **unplugging** them in case they are wanted at some point down the road. As the report **notes**, data center managers do not get into trouble for keeping comatose servers online—their job is to **ensure** that servers are functioning **properly** and on keeping data secure. Bill Tschudi, who has worked for about 15 years on data center **efficiency**, said the larger Internet companies have made a lot of **advances** in recent years. "But then you look at the rest of the market, and there's been no progress," he said, noting that smaller data centers in particular **lack** the **resources** and **expertise** to make significant changes. Many small companies "are not even aware that their server room is a large energy hog and might be **responsible for** 30 to 50 percent of the **entire** electricity bill," Delforge said. Similarly, companies that **outsource** to multi-tenant data centers **likely** have no idea how electricity use factors into the bill, instead paying a flat fee for a block of server space.

Part of the barrier is a lack of **insight** at many facilities into just how much inefficiency there is. The industry has no agreed-upon **standard** for gauging how hard a server is working. Setting a simple metric for server utilization, and **disclosing** the figures, the NRDC report argues, would "help **resolve** one of the biggest efficiency issues in data centers: underutilization of servers." At many data centers, aversion to risk can make managers careful about trying new things. The NRDC recommends that data centers set common goals for efficiency among corporate executives and information technology managers. It also advocates for more investment in efficient equipment, pricing models that include **incentives** for efficiency, and more integration of renewable energy, a point also made in a Greenpeace report on data centers released in April. IO, a Phoenix-based multi-tenant data center provider that **contributed** information to the NRDC report, has designed systems that allow it to **measure** energy efficiency in real time. The firm is building energy savings into its business strategy, **aiming** to compete by offering its clients more **visibility** into how much energy their servers are consuming and where they might maximize efficiency. Delforge echoed the idea that data centers have lagged in the productivity and efficiency that they have enabled in other sectors. "We want to make sure that this is not **perceived** as 'data centers are bad,' " he said. "For data centers to be part of the solution in terms of having a more efficient economy, they need to start cutting the waste in their own backyard."

Adapted from the National Geographic