DR13.08: EPRI EB III D – Automated Demand Response in Data Centers

OPPORTUNITY

What have previous studies demonstrated about the potential for automated demand response in data centers?

Data centers can consume more than 40 times the power density of conventional office space.

TECHNOLOGY

How does automated demand response in data centers work?

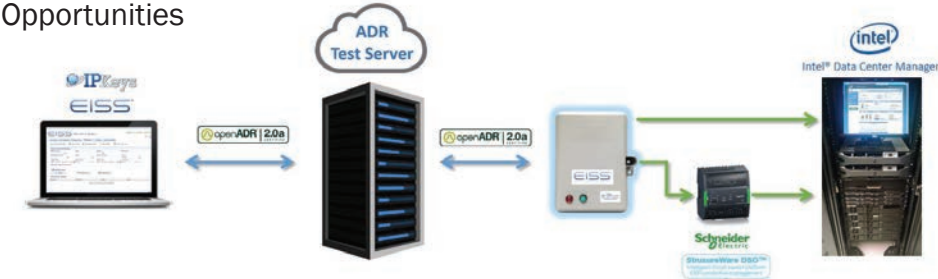Server Management Software For Potential Data Center Demand Response Opportunities

Figure 1: Diagram of Communications Pathway

M&V

Where did Measurement and Verification occur?

The Electric Power Research Institute deployed a small proof-of-concept demonstration of this technology in its Innovations in Datacenter Efficiency Advances Laboratory, as well as a field site at California Institute for Telecommunications and Information Technology at the University of California, Irvine.

The technology selected for this demonstration is the power-capping feature in servers using the latest line of Intel® processors, enabled by Intel's Node Manager technology.

RESULTS

How did Automated demand response software in data centers perform in M&V?

UP TO 19%

Reduction in average server power when applied to a loaded web server in the field.

However, power reduction levels increased the time to deliver HTTP requests.

5-10%

POWER DEMAND CAPPING is likely practical for short durations (seconds and minutes) in less critical operations.

GRID BALANACING

Where significant penetration of renewable energy exists, server DR can provide the most value in grid balancing for frequency or voltage regulation.

For example, server DR can ramp power consumption down and up as fast as power generation from a solar PV system when a patch of cloud passes by.

DEPLOYMENT

Where does M&V recommend deploying automated demand response software in data centers?

Evaluate power capping with additional real-world applications

Additional testing is recommended to evaluate power capping with additional real-world applications, such as e-mail server, database, etc., so the impact to workloads with different needs may be evaluated.

It is also recommended that more robust DR signal communication pathways are developed that allow an intelligent load to communicate its current state and make an informed decision about how to respond.