

[0004a] According to an aspect, there is provided a method for operating a data storage device to control power usage of the data storage device, the method comprising: identifying a power threshold for the data storage device; determining power consumption characteristics for the data storage device by at least: writing a set of identifiers to predefined locations on storage media of the data storage device responsive to an asynchronous request from a host system; measuring associated power usage from writing the set of identifiers; and entering into a power controlled mode for the data storage device; and responsively adjusting at least a storage transaction queue depth in the data storage device to establish the power consumption characteristics as below the power threshold for the data storage device.

[0004b] According to another aspect, there is provided a data storage device for controlling power consumption comprising: a storage control system configured to identify a power threshold of the data storage device; and a power measurement system configured to monitor power consumption characteristics of the data storage device by at least: writing a set of identifiers to predefined locations on storage media of the data storage device responsive to an asynchronous request from a host system; and measuring associated power usage from writing the set of identifiers; wherein the storage control system is further configured to: enter into a power controlled mode for the data storage device; and responsively adjust at least a storage transaction queue depth in the data storage device to establish the power consumption characteristics as below the power threshold for the data storage device.

CLAIMS

What is claimed is:

1. A method for operating a data storage device to control power usage of the data storage device, the method comprising:

- identifying a power threshold for the data storage device;
- determining power consumption characteristics for the data storage device by at least:
 - writing a set of identifiers to predefined locations on storage media of the data storage device responsive to an asynchronous request from a host system;
 - measuring associated power usage from writing the set of identifiers; and
 - entering into a power controlled mode for the data storage device; and
- responsively adjusting at least a storage transaction queue depth in the data storage device to establish the power consumption characteristics as below the power threshold for the data storage device.

2. The method of claim 1 further comprising dedicating a maximum storage transaction queue depth for the data storage device to increase throughput above a throughput threshold while the power consumption characteristics are maintained below the power threshold.

3. The method of claim 1 further comprising decreasing the storage transaction queue depth to reduce latency to below a latency threshold while the power consumption characteristics are maintained below the power threshold.

4. The method of claim 1 further comprising adaptively adjusting the storage transaction queue depth proportional to a difference between actual power consumption characteristics and target power consumption characteristics.

5. The method of claim 1 further comprising measuring power consumption characteristics utilizing a power measurement system in the data storage device.

6. The method of claim 1 further comprising communicating power consumption characteristics to the host system.

7. The method of claim 1 wherein determining power consumption characteristics further comprises at least one of configuring a sampling rate, establishing a measurement period, and selecting among a time-based power measurement and a transaction-based power measurement for a power measurement system.

8. The method of claim 1 further comprising controlling operation of a power measurement system of the data storage device by the host system.

9. The method of claim 1 further comprising identifying a range of queue depth sizes within the storage transaction queue.

10. A data storage device for controlling power consumption comprising:

- a storage control system configured to identify a power threshold of the data storage device; and

- a power measurement system configured to monitor power consumption characteristics of the data storage device by at least:

- writing a set of identifiers to predefined locations on storage media of the data storage device responsive to an asynchronous request from a host system; and

- measuring associated power usage from writing the set of identifiers;

- wherein the storage control system is further configured to:

- enter into a power controlled mode for the data storage device; and

- responsively adjust at least a storage transaction queue depth in the data storage device to establish the power consumption characteristics as below the power threshold for the data storage device.

11. The data storage device of claim 10, wherein the storage control system is further configured to dedicate a maximum storage transaction queue depth for the data storage device to increase throughput above a throughput threshold while the power consumption characteristics are maintained below the power threshold.

12. The data storage device of claim 10, wherein the storage control system is further configured to decrease the storage transaction queue depth to reduce latency to below a latency threshold while the power consumption characteristics are maintained below the power threshold.

13. The data storage device of claim 10, wherein the storage control system is further configured to adaptively adjust the storage transaction queue depth proportional to a difference between actual power consumption characteristics and target power consumption characteristics.

14. The data storage device of claim 10 wherein the power measurement system is further configured to measure power consumption of the data storage device to determine the power consumption characteristics.

15. The data storage device of claim 10, wherein the storage control system is further configured to communicate power consumption characteristics to the host system.

16. The data storage device of claim 10 wherein the power measurement system is configured to determine the power consumption characteristics with at least one of a configurable sampling rate, a configurable measurement period, a time-based power measurement, and a transaction-based power measurement.

17. The data storage device of claim 10, wherein the storage control system is further configured to receive and respond to control commands from the host system to control operation of at least the power measurement system.

18. The data storage device of claim 10, wherein the storage control system is further configured to identify a range of queue depth sizes within the storage transaction queue.