Measuring Energy Consumption on OLCF's Summit Supercomputer

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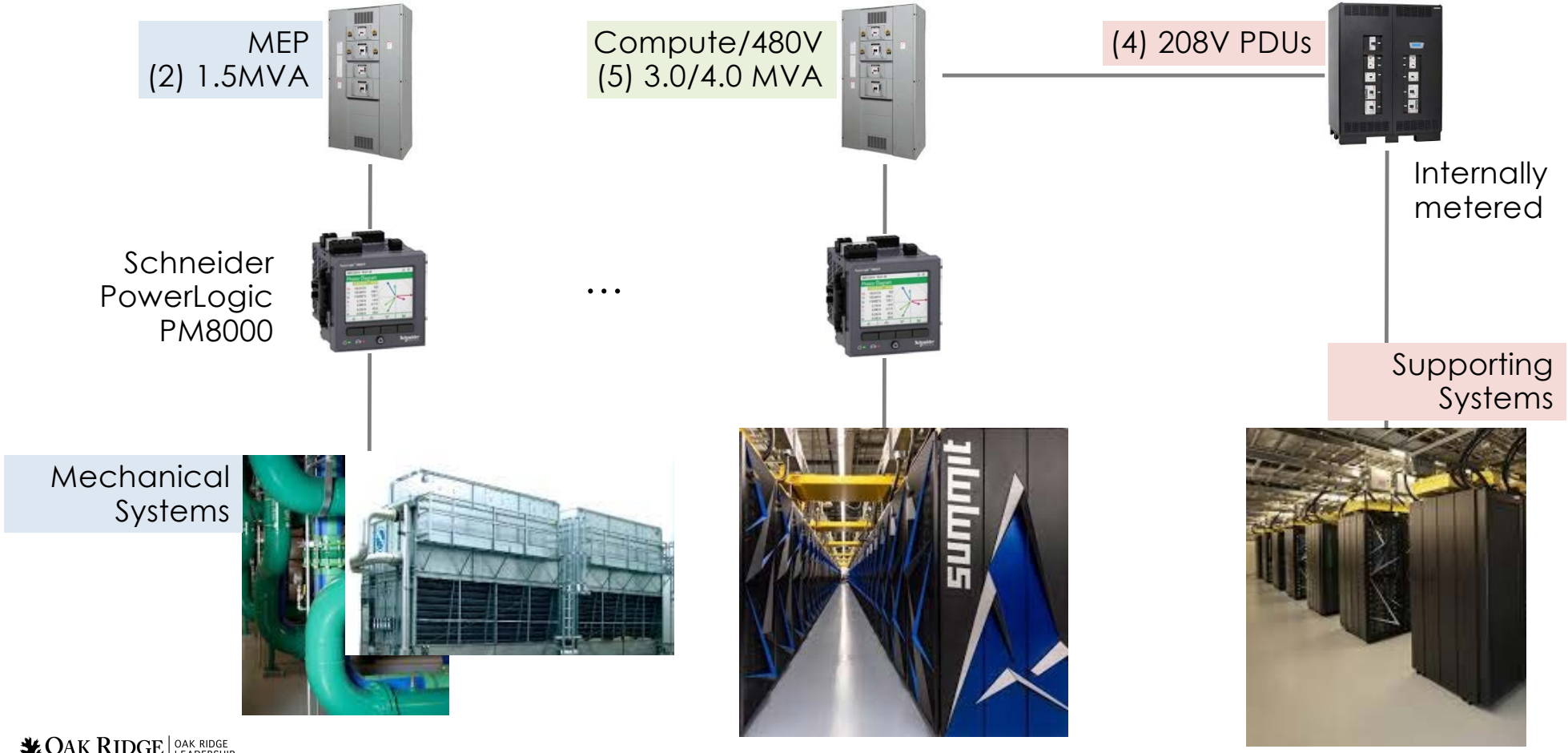
OLCF Facility Measurement Capabilities



Summit HPL Run – October 25, 2018

```
                                                                                3:31:48
                                                                                9:32:00
================================================================================
T/V                N    NB     P     Q               Time                 Gflops
--------------------------------------------------------------------------------
WR03L2R4    16693248  1536   143   192           21611.88              1.435e+08
--------------------------------------------------------------------------------
||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)=     3.524032e-08 ...... PASSED
```

- HPL application run as part of the performance test for Summit's Acceptance

- Runtime: 21,611.88 seconds (6 hours, 12 seconds)
- Seven Industrial meters, reporting power each second (151,284 measurements)
- Total mechanical load captured, including pumping, fans, lights, control systems
- Includes Infiniband switch loads, management system loads, and file system loads.

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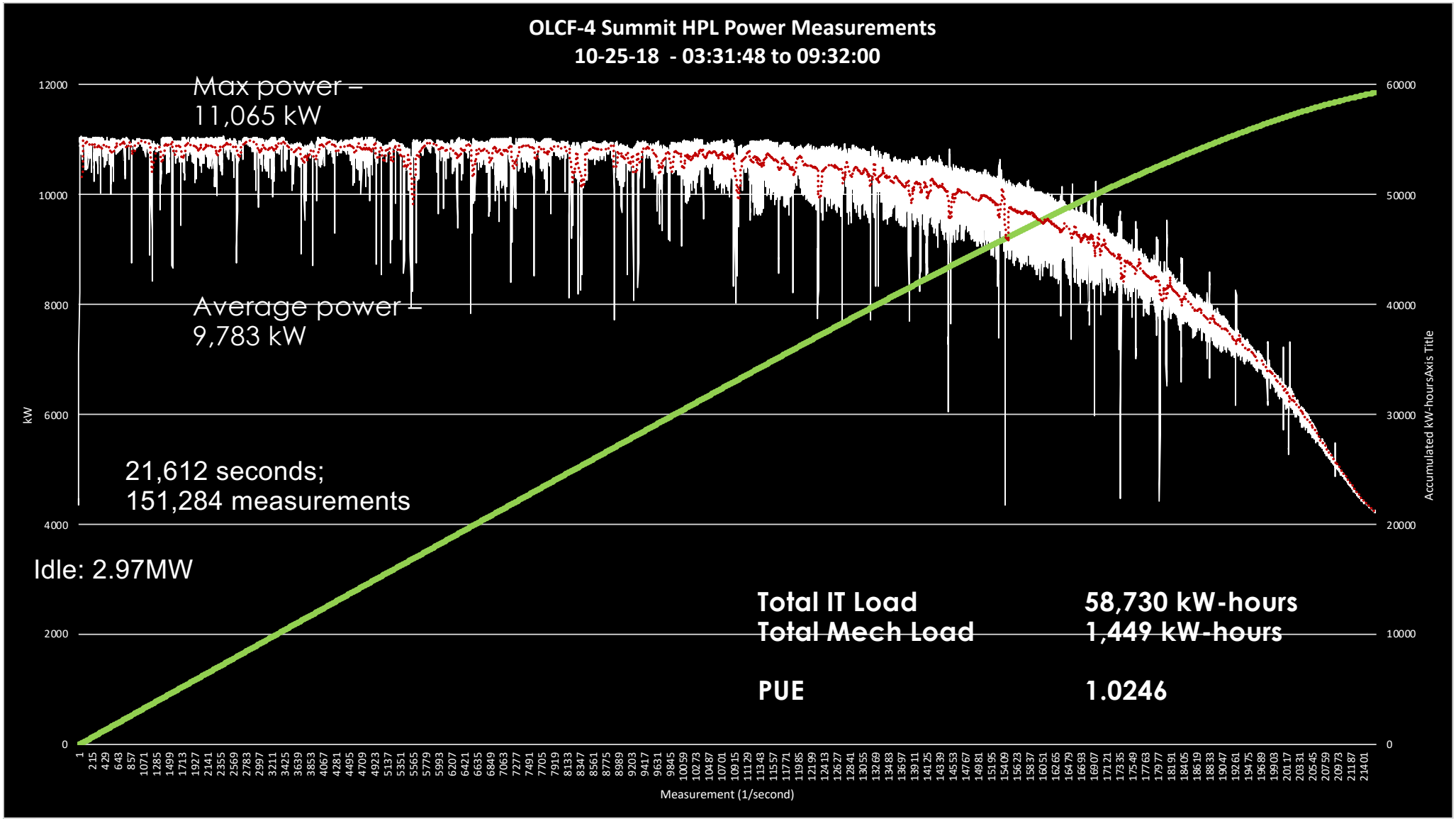
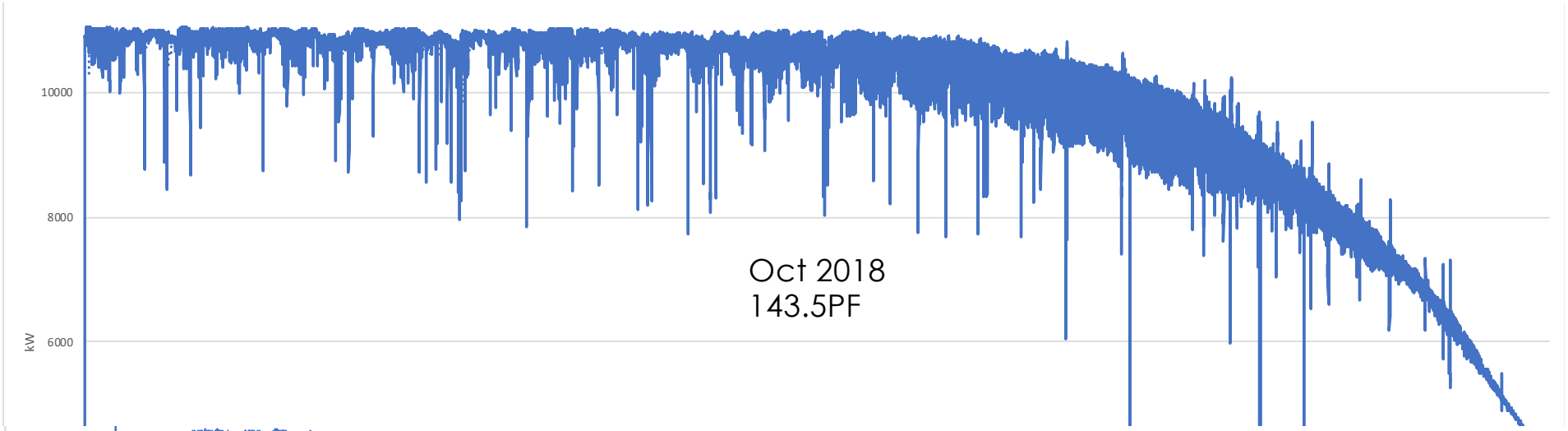
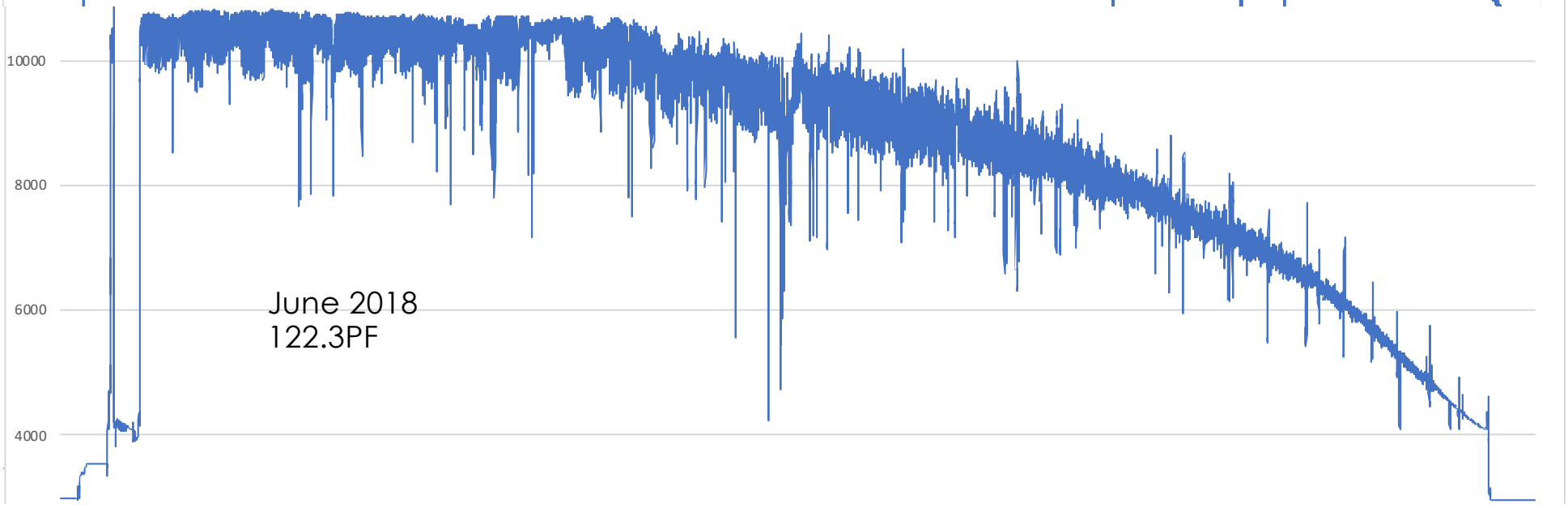

OLCF-4 Summit HPL Power Measurements
10-25-18 - 03:31:48 to 09:32:00
Max power –
11,065 kW
Average power –
9,783 kW
21,612 seconds;
151,284 measurements
Idle: 2.97MW
Total IT Load 58,730 kW-hours
Total Mech Load 1,449 kW-hours
PUE 1.0246
kW
Accumulated kW-hoursAxis Title
Measurement (1/second)


10000
8000
6000
kW
Oct 2018
143.5PF


10000
8000
6000
4000
June 2018
122.3PF

Projecting Sustained Performance

- Demonstrated Performance on Summit (Oct 2018)
- 143.5 PF 11,065kW peak 9,783kW average
- (Linearly) Projecting:
- 1000 PF 77,108kW peak 68,174kW average

Summit: 14.66 GFLOPs/Watt

We need to get to 50GFLOPs/Watt to reach the magic 20MW (avg) target for a sustained exascale system.

How far away are we? 2021? 2022? 2023? 2024?

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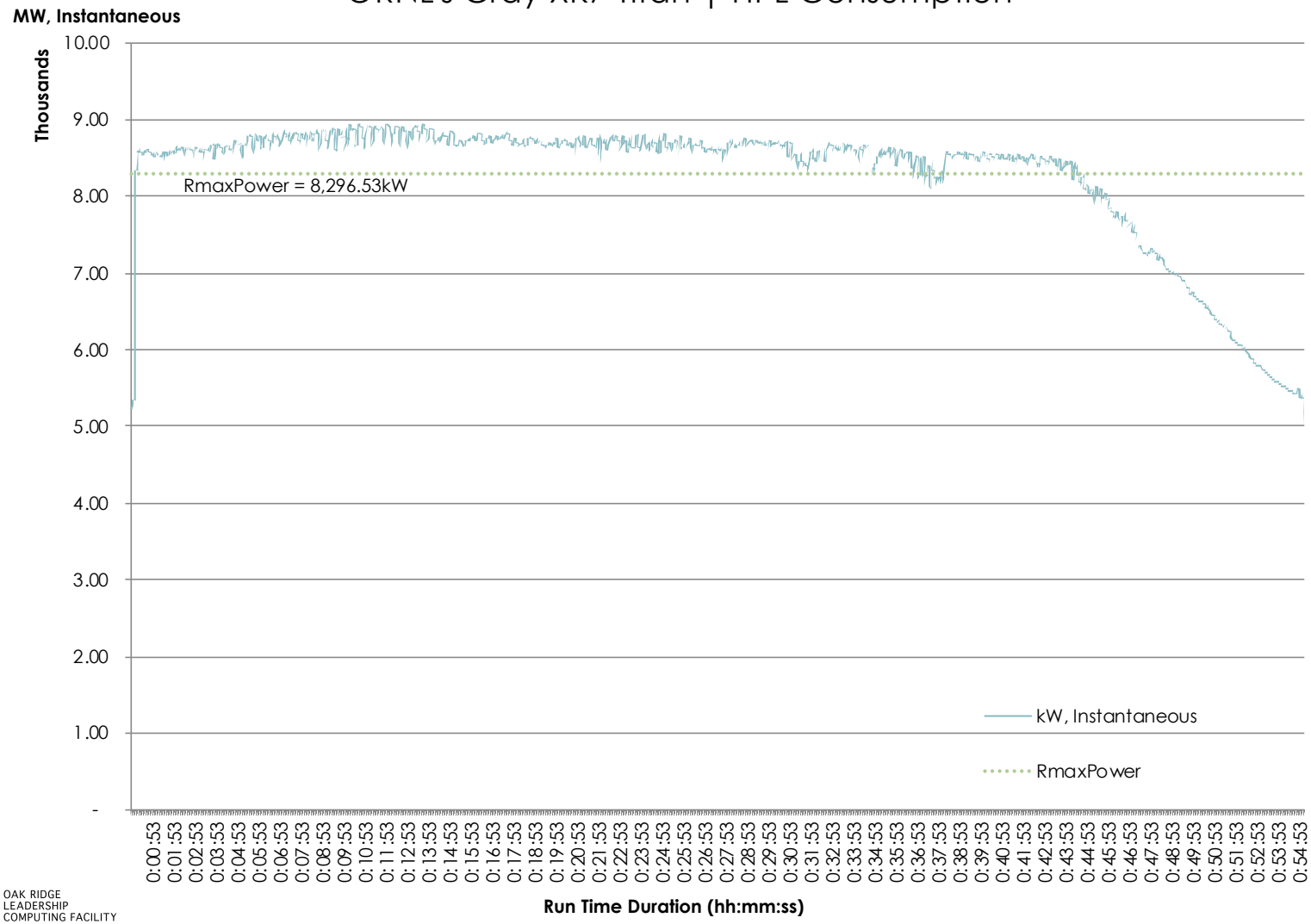
ORNL's Cray XK7 Titan | HPL Consumption



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Comparing Energy Performance - Titan to Summit

- Demonstrated Performance on Titan (Oct 2012)
- 17.59 PF 8.9MW peak 8.3MW average

- Demonstrated Performance on Summit (Oct 2018)
- 143.5 PF 11,065kW peak 9,783kW average

8.16x performance increase ***17.9% avg. power increase***

Titan: ~2.1 GFLOPs/Watt

Summit: 14.66 GFLOPs/Watt

>***7x increase in energy efficiency***

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