Lessons From the Field: Best Practices for Supercomputer Implementation and Evaluation

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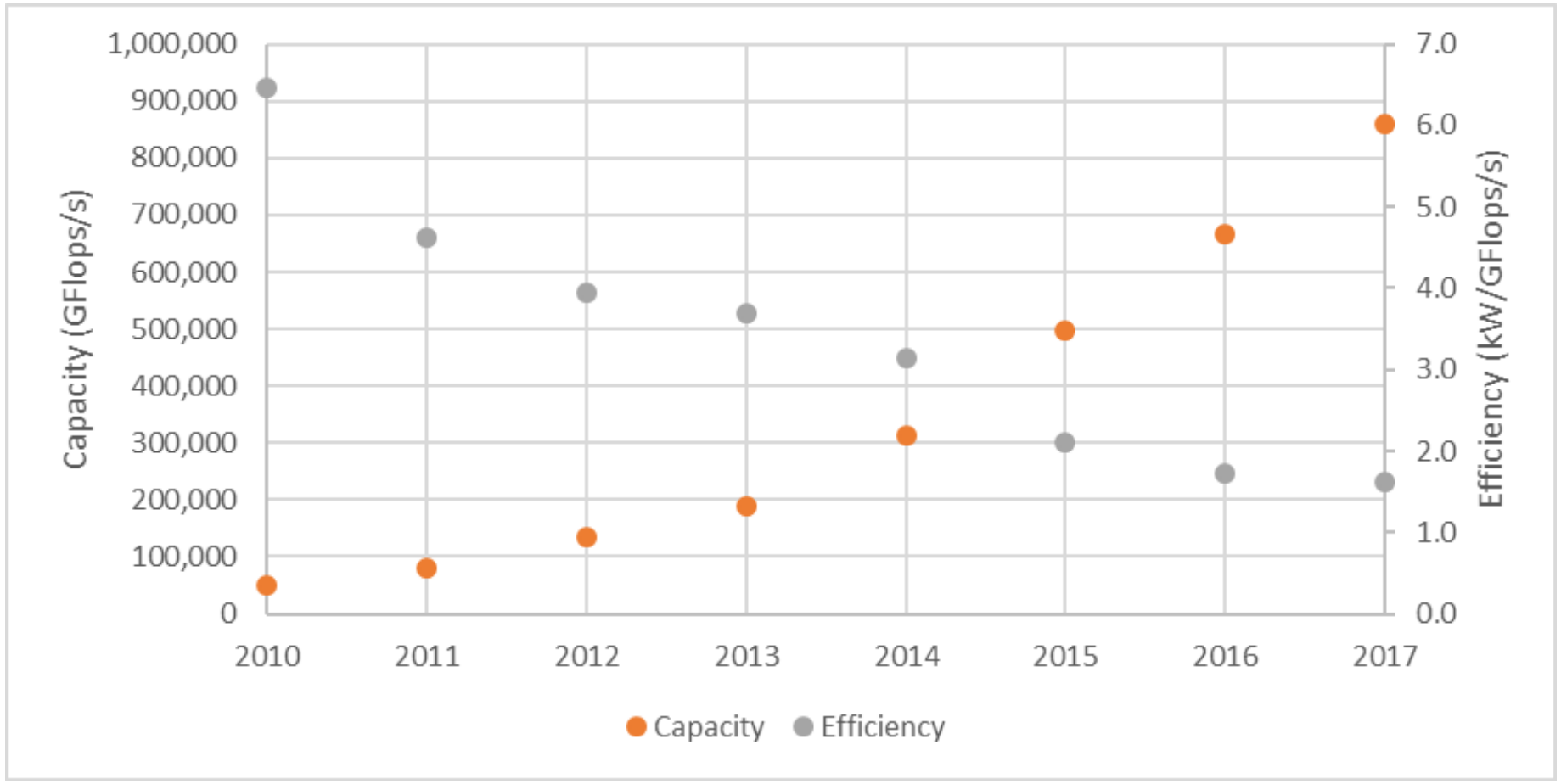
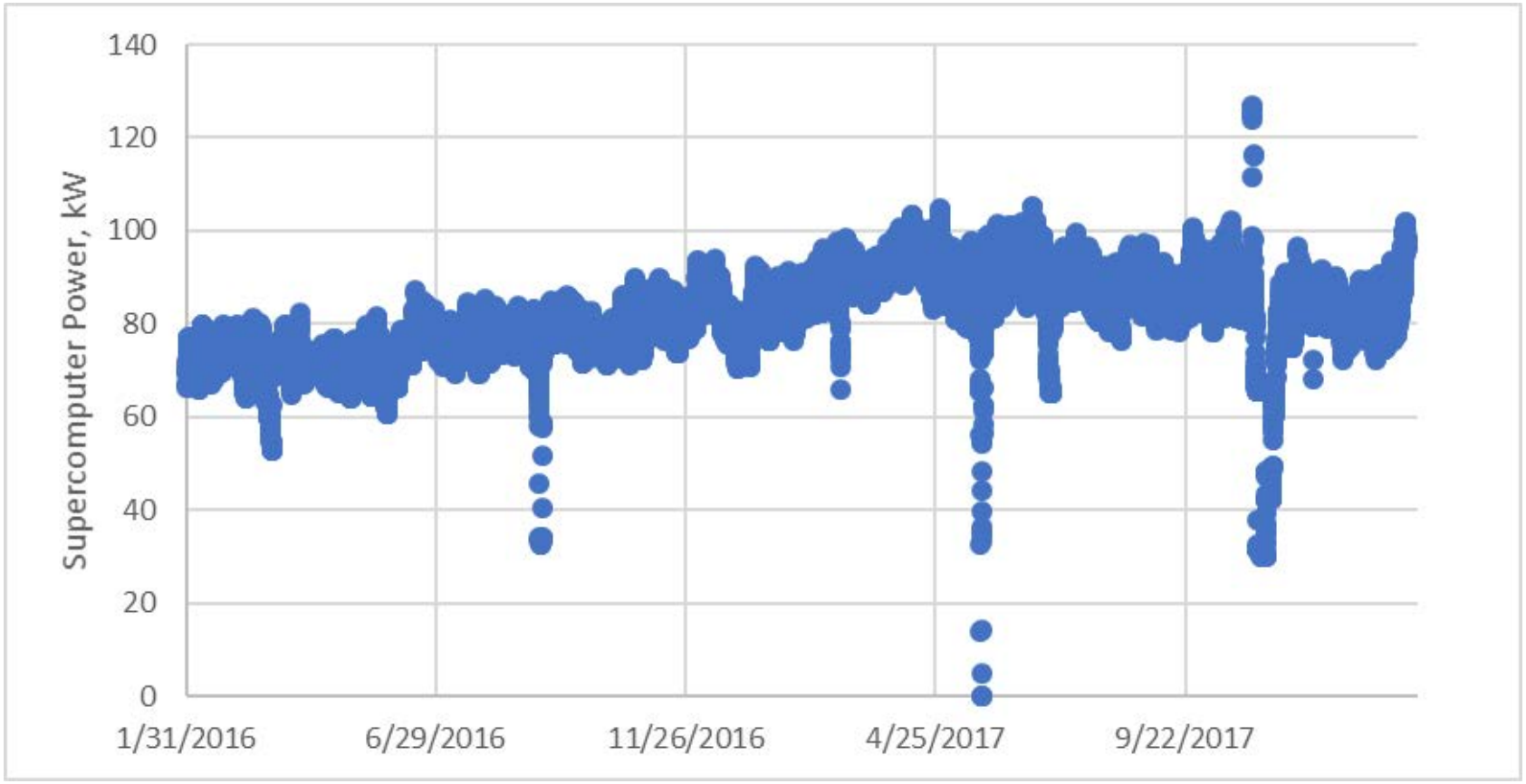
BACKGROUND


1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Capacity (GFlops/s)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Efficiency (kW/GFlops/s)
2010
2011
2012
2013
2014
2015
2016
2017
Capacity
Efficiency

35,000,000 KWH EVALUATED SAVINGS

90% REALIZATION RATE

Accurate Loading



- "Typical Operations" may be slippery
- **Incentive contingent on M&V plan from outset**

RR effect:
Some <5%
Some >20%

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Baseline Efficiency

- Existing machine + Expanded capacity
- Top500.org, filtering criteria:
  - Year of installation
  - Capacity range
  - Theoretical vs. measured efficiency
  - Location of Installation
- **Consistent methodology for selecting theoretical baseline**

Top500.org year of publication	Cumulative number of 2011-year units included	Increase in reporting population
2011	4	N/A
2012	16	400%
2013	19	475%
2014	21	525%
2015	22	550%
2018	23	575%

Evaluators had different results due to increase in published data

RR effect:
-12%
across all sites

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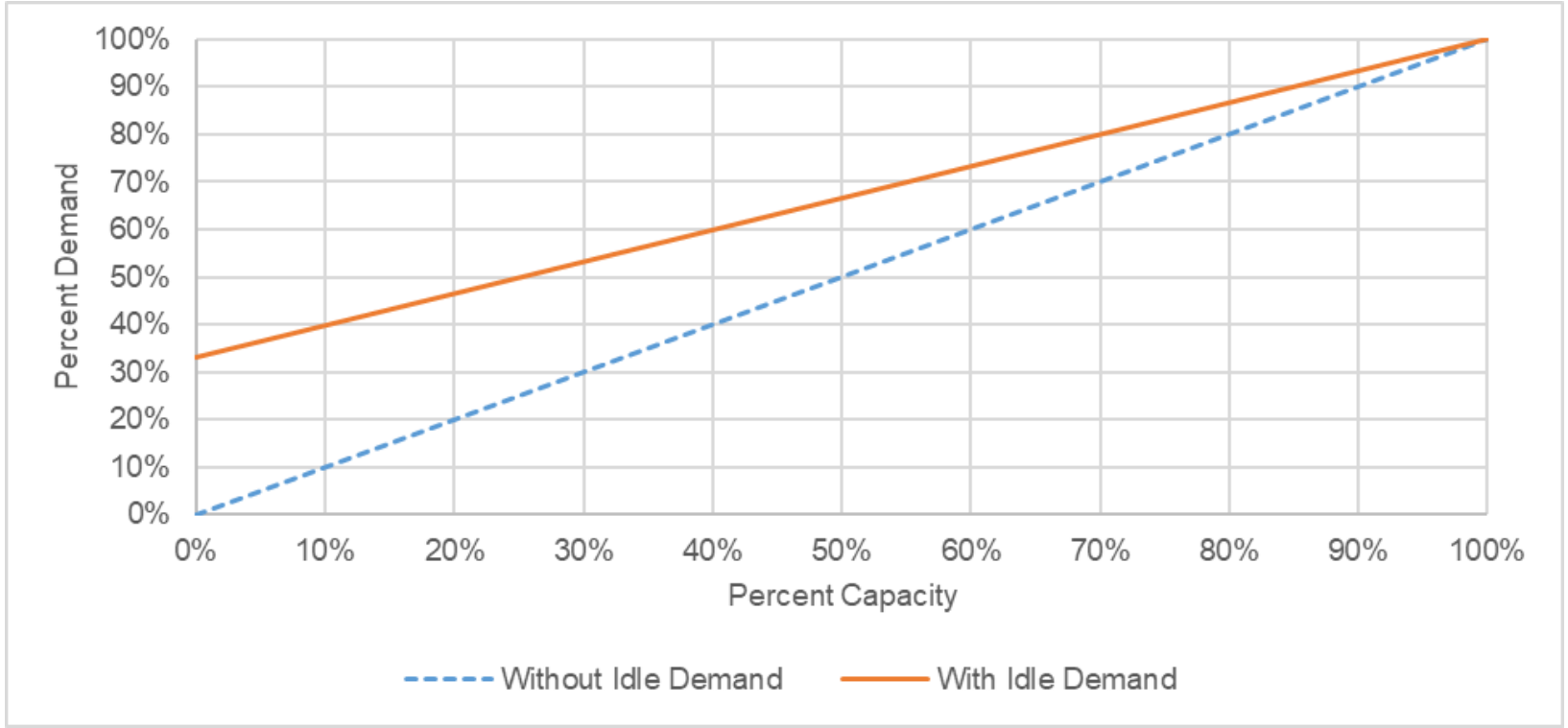
Idle Demand



- Power consumed at no-load is not 0 kW
- May be published by Manufacturer
- **Spot measure at installation**
- **Consistent assumption for baseline unit idle demand**

RR effect:
Some N/A
Some + ~10%

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Cooling Interactivity

Total Demand Reduction

1 kW IT + **??? kW Cooling**

- All IT energy must be met with cooling
- Reconsider baseline cooling efficiency at appropriate part-load
- **Whole-cooling plant efficiency should be considered**
  - **Chillers, pumps, towers, etc.**
  - **At appropriate part-loads**

RR effect:
+9%
across all sites

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