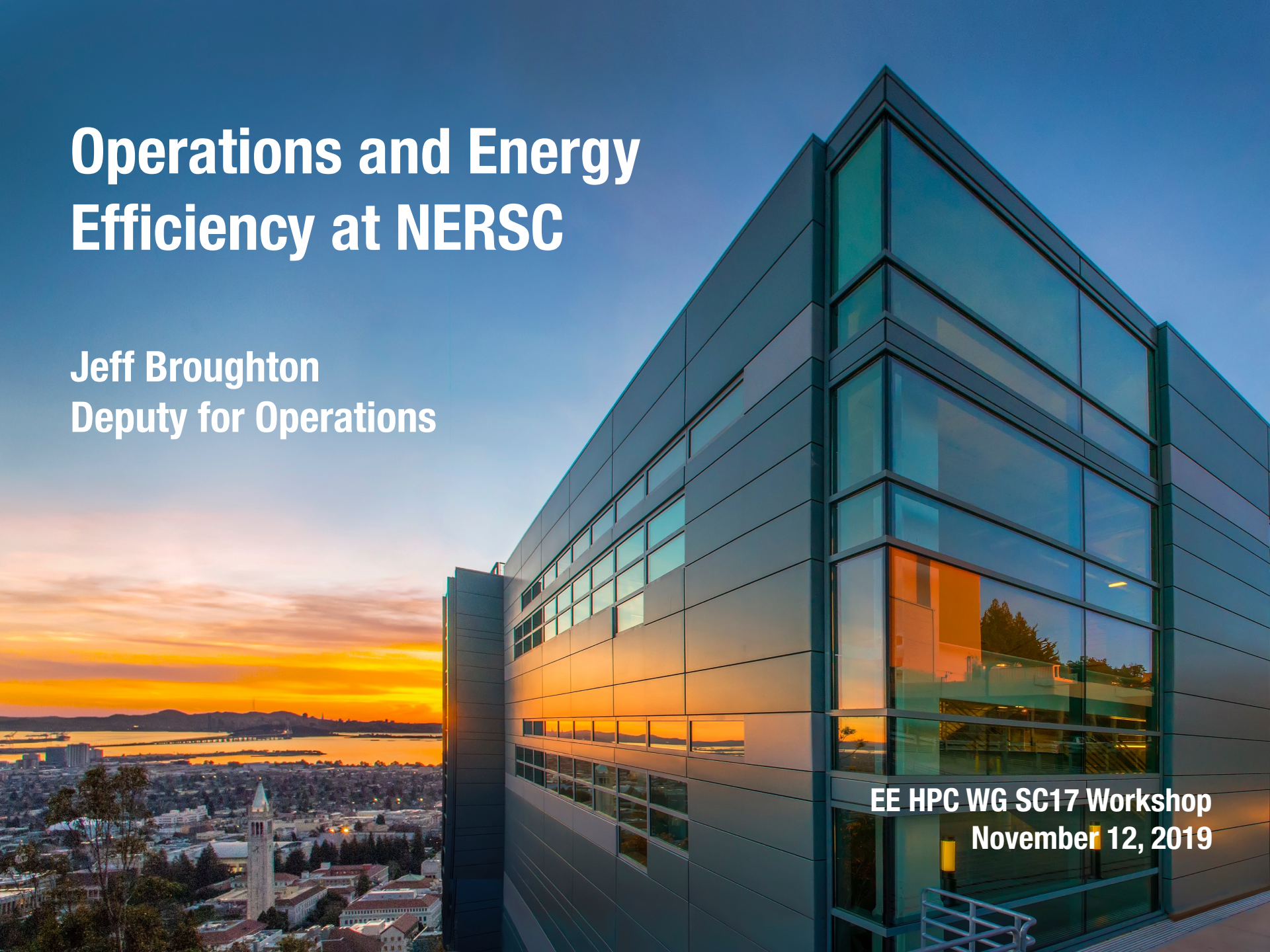
Operations and Energy Efficiency at NERSC

Jeff Broughton
Deputy for Operations



EE HPC WG SC17 Workshop
November 12, 2019

Shyh Wang Hall completed June 2015

- **Four story, 150,000 GSF**
  - 20Ksf data center and 60Ksf offices
  - Electrical and mechanical space
- **Houses two Crays:**
  - Cori (2016) and Edison (2013)
- **Power for the future**
  - 12.5MW initially provisioned
  - 10MW upgrade planned
  - 42MW max capacity
- **Energy efficient**
  - No chillers!
  - PUE < 1.1

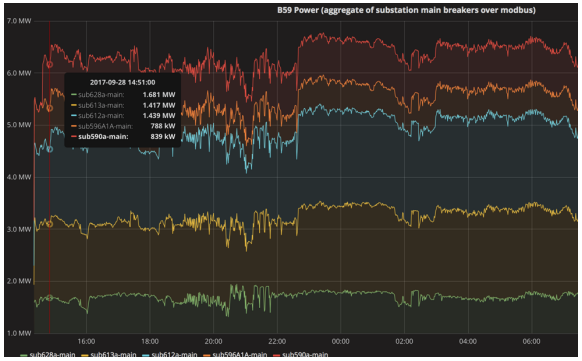
High Rate Data Collection System

- **Current Data Sources**
  - Substations, panels, PDUs, UPS
  - Cori & Edison SEDC
  - Onewire Temp & RH sensors
  - BMS through BACNET
  - Indoor Particle counters
  - Weather station

- **Future Data Sources**
  - Syslog
  - Job Data
  - Lustre + GFPS statistics
  - LDMS
  - Outdoor particle counters
  - ???

- **Rabbit MQ, Elastic, Linux**
  - Collects ~20K data items per second
  - Over 40TB data online (100TB capacity)
  - 45 days of SEDC (versus 3 hours on SMW)
  - 180 days of BMS data (6X more than BMS)
  - 260 days of power data

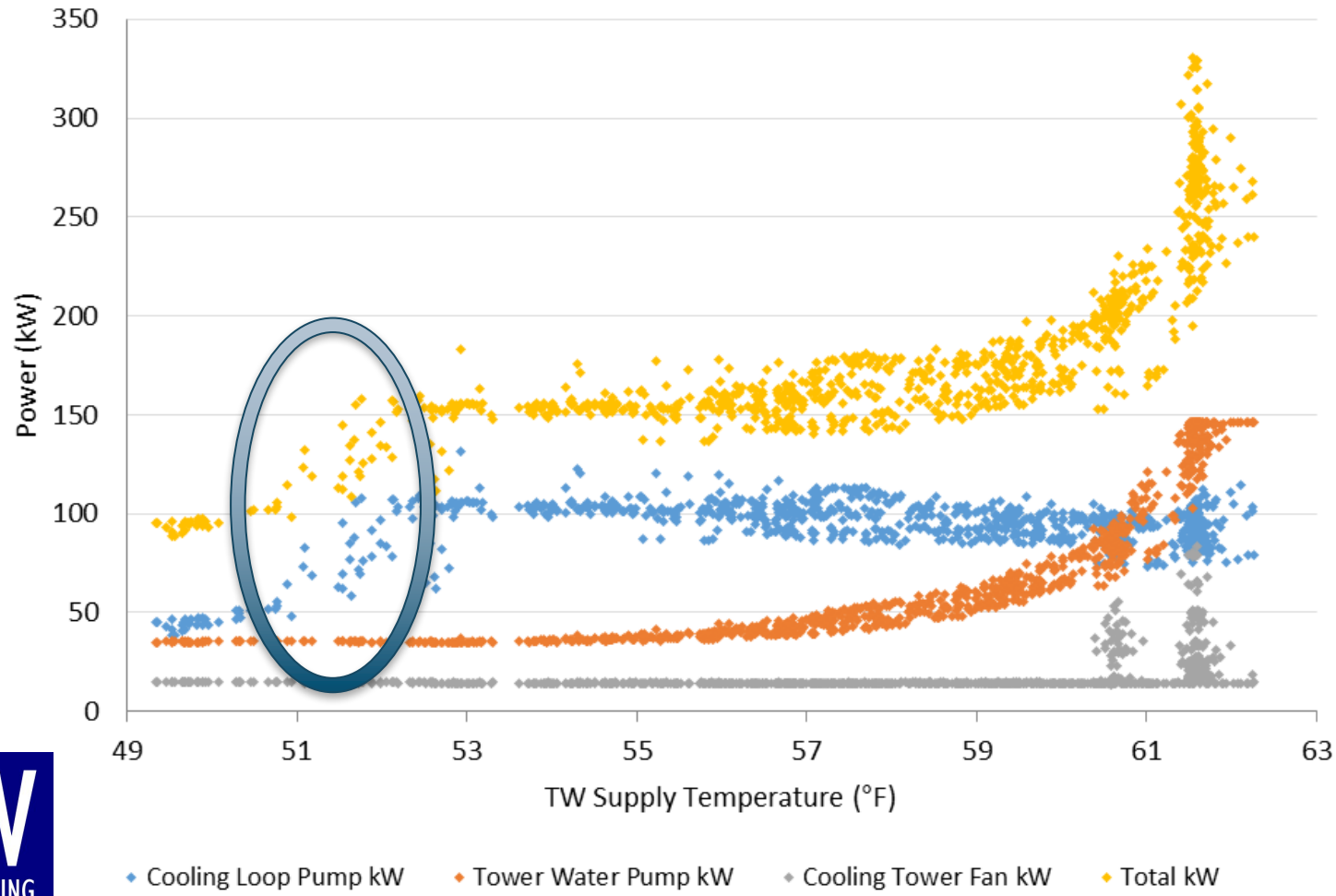
Kibana, Grafana



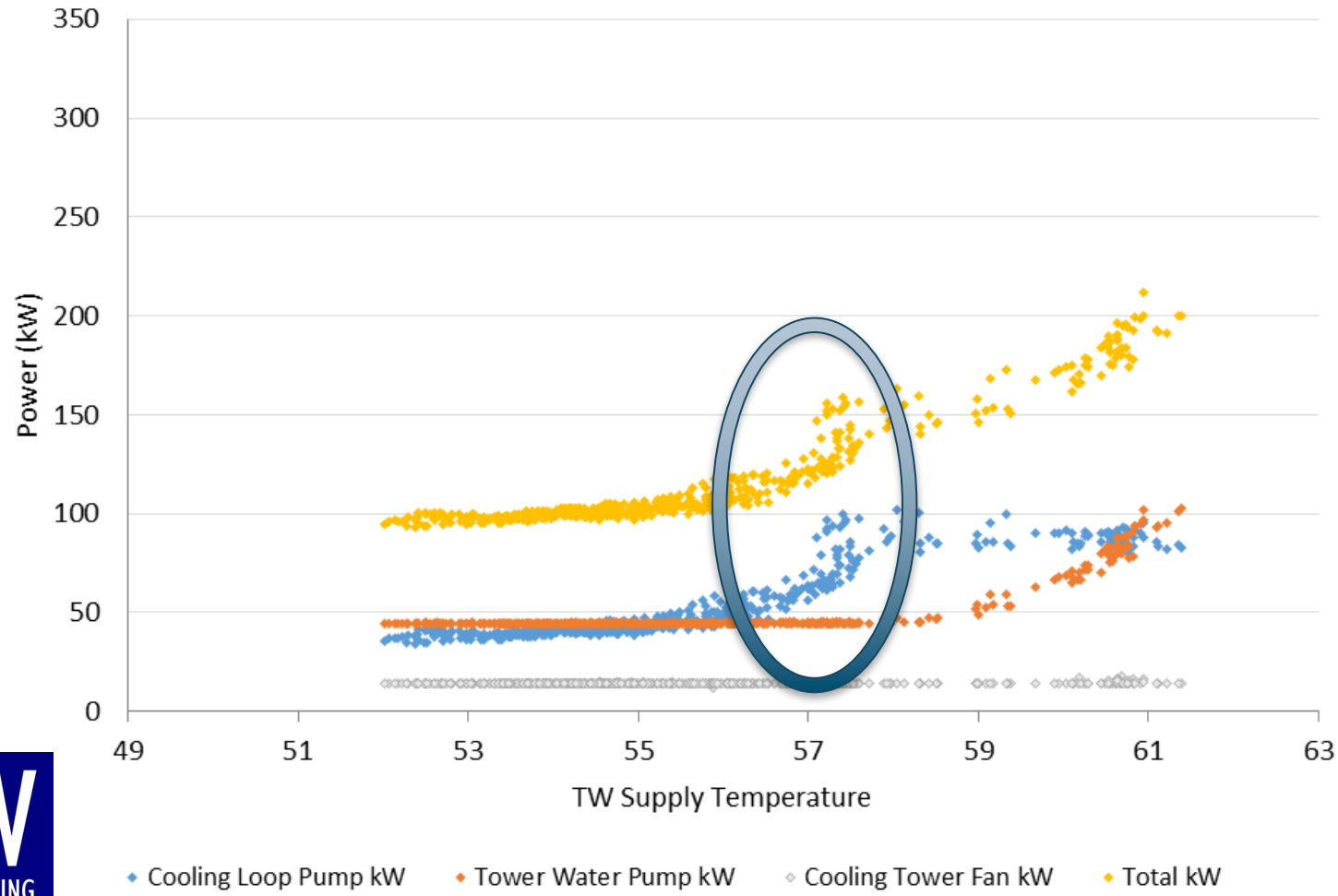
On-going optimization projects

- **Have saved 700,000 kWh/year**
  - Energy saving tradeoff:
    - Reducing water temperature by increasing CT fan speed saves pump energy by reducing cooling water demand
  - Used energy saving Eaton UPS mode
    - Dual conversion to sub-cycle online
- **In progress: ~540,000 kWh/year**
  - Installation of booster pump for roof-top HVAC reduces allows main pumps to run at lower speeds
  - Optimization of supply air fan speed
- **Under investigation: ~600,000 kWh/year**
  - Cray fan speed optimization
  - Adjust bypass valves to minimize pump energy

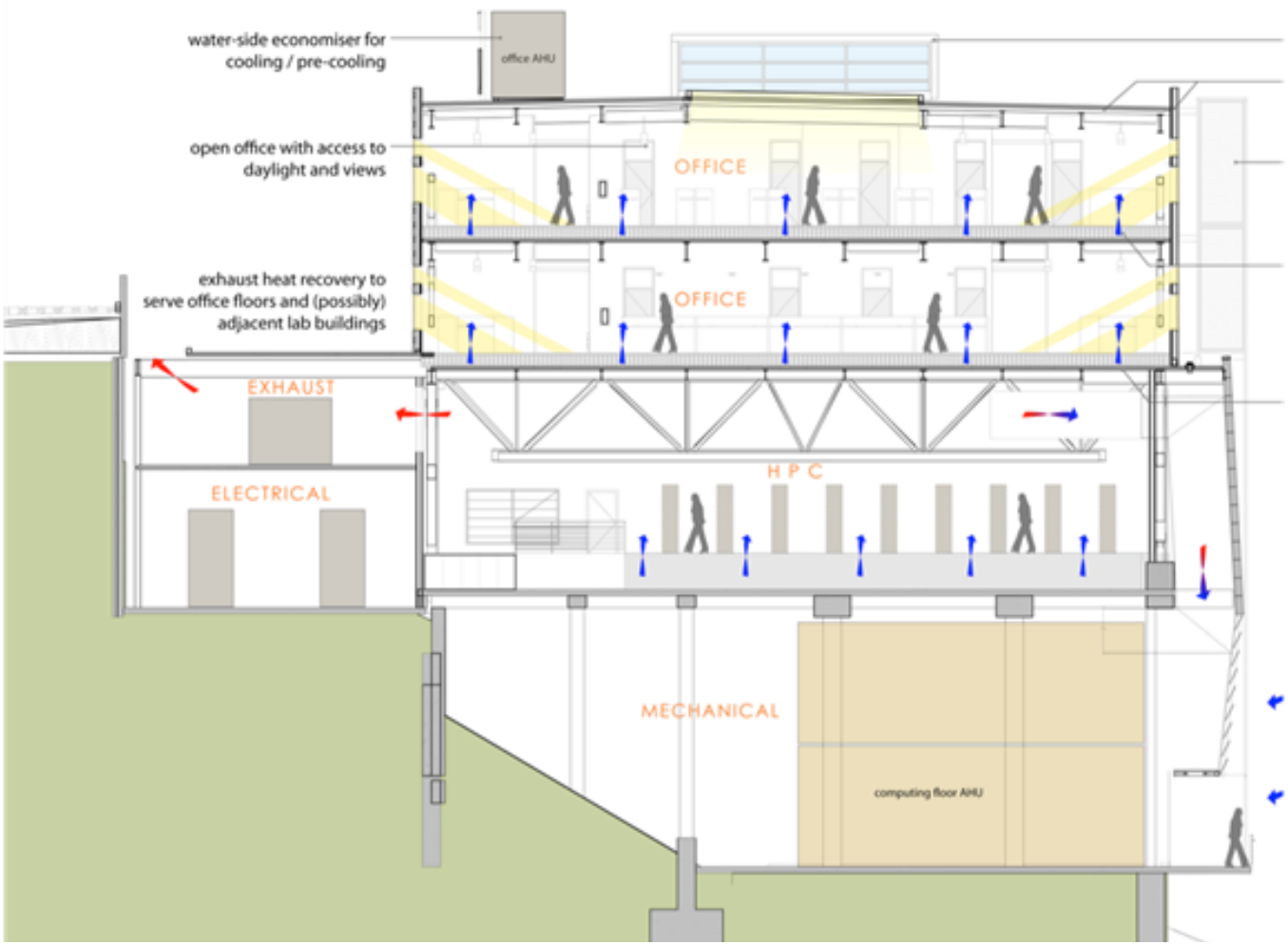
Liquid Cooling Performance Baseline



Liquid Cooling Performance Balanced



Bay Area environment allows cooling without chillers 100% of the year



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