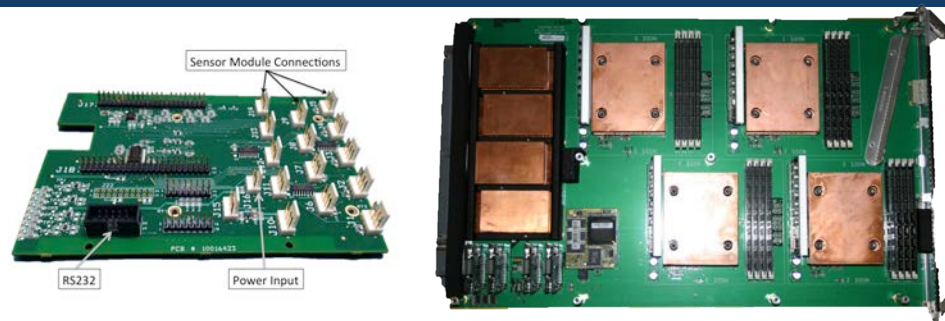# Building Energy Efficient HPC: 4th Annual Energy Efficient HPC WG Workshop

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Exceptional service in the national interest

Sandia National Laboratories

Sensor Module Connections
RS232
Power Input

National Leadership in High Performance Computing

COMPUTING RESEARCH

Robert W. Leland, Director

U.S. DEPARTMENT OF ENERGY

NNSA
National Nuclear Security Administration

Moving State of the Art Forward

- Trinity procurement requirements intentionally vague
  - Vendor capabilities all over the map
- Invest NRE to push state of the art
  - Approach:
    - Vendor delivers base capability
    - Collaborate on Advanced Capabilities
      - Advanced relative to base
- Accelerates path from Research to Production capability
- Future procurements will require specifics
- Leveraged **Scenarios** to describe what we were looking for

Scenarios and Procurement

- Scenarios can be very useful in procurements
  - At RFP
    - Communicate motivations, needs, intentions, etc. to Vendors
      - Avoids proscribing the solution
      - Describes what we want not how to accomplish it
  - At acceptance
    - Scenarios become test cases
      - Verify a number of base requirements using a single test scenario

Scenario Goal:
Increase Energy Efficiency

① Run Application

- Collect Data – "Energy Profile"

② Analyze Data

③ Run Application with new settings (e.g. P-state change)

- Collect Data

④ Analyze Data

- Good? Bad?

☺ Repeat

Measure   **Tune**

Sweet-Spot

Baseline
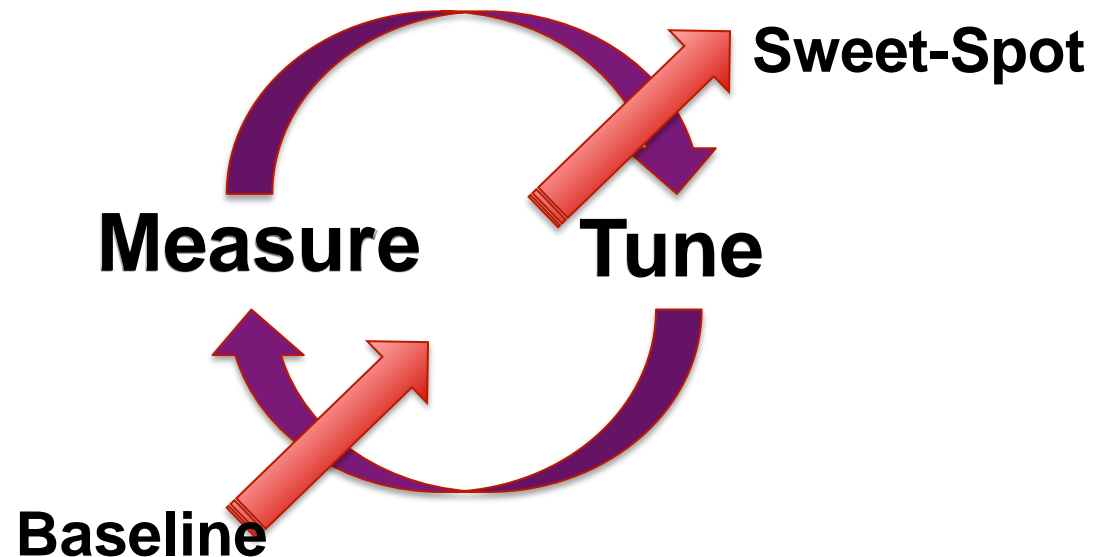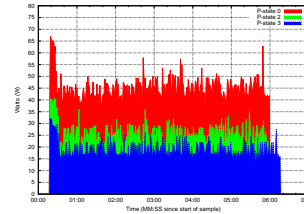
We are ALL blazing the trail

- Other Scenarios for power capping and power aware scheduling
  - Overloaded terms
- Move towards Standards
  - Power API