HPE Server Energy Efficiency Knowledge Base

Energy Efficiency Concepts for HPE Servers

Energy Efficiency Terminology

Energy Efficiency Rating (EER): Ratio of computational output to power consumption for HPE servers. Lower values indicate inefficient power usage relative to workload processing.

Power Usage Effectiveness (PUE): Ratio of total data center energy to energy used by computing equipment. Ideal HPE data centers target PUE of 1.2 or lower.

HPE iLO Power Management: Integrated Lights-Out technology that enables real-time monitoring and management of server power states.

Dynamic Power Capping: HPE technology that enforces power consumption limits while maintaining performance.

HPE Power Regulator: Technology that dynamically adjusts processor frequency and voltage to optimize power consumption.

Intelligent Cooling System: HPE's server cooling technology that adjusts fan speeds based on workload and temperature data.

HPE Server Workload Density: Measure of computational tasks processed per unit of power consumed. Higher is better.

HPE-Specific Power Thresholds

Idle Power Consumption:

- Gen10 ProLiant: 45-60W
- Gen11 ProLiant: 35-50W

Power-to-Utilization Ratio:

- Excellent: <0.3 (less than 30% power per utilization point)
- Good: 0.3-0.5
- Average: 0.5-0.7
- Poor: >0.7 (more than 70% power per utilization point)

Thermal Efficiency:

- Optimal temperature range: 18-27°C (ASHRAE A1)
- Extended range: 10-35°C (ASHRAE A2)
- Fan efficiency threshold: >15% increase in fan power signals cooling issues

Problem Detection Patterns

Critical Inefficiency Patterns

Pattern: High Power, Low Utilization

- **Indicators**: Server power consumption >70% of maximum while CPU utilization <20%
- **Detection SQL**: `SELECT serial_number FROM server_metrics WHERE power_consumption > (max_power * 0.7) AND cpu_util < 20`
- **Severity**: Critical - immediate action recommended
- **HPE Impact**: Up to 40% of power budget wasted on idle infrastructure

Pattern: Thermal Runaway

- **Indicators**: Fan speed >80% of maximum with rising temperature trend
- **Detection SQL**: `SELECT serial_number FROM server_metrics WHERE fan_speed > (max_fan_speed * 0.8) AND temperature > previous_temperature`
- **Severity**: Critical - potential hardware damage
- **HPE Impact**: 30% efficiency loss plus increased hardware failure risk

Pattern: Power Spikes During Low Activity

- **Indicators**: Power consumption increases >30% without corresponding CPU/memory utilization increase
- **Detection SQL**: `SELECT serial_number FROM server_metrics WHERE power_increase_pct > 30 AND cpu_util_increase_pct < 5`
- **Severity**: High - indicates potential hardware or firmware issue
- **HPE Impact**: 25% power waste plus system instability risk

Moderate Inefficiency Patterns

Pattern: Suboptimal Power Regulation

- **Indicators**: Power-to-utilization ratio consistently between 0.5-0.7

- **Detection SQL**: `SELECT serial_number FROM server_metrics WHERE power_util_ratio BETWEEN 0.5 AND 0.7 GROUP BY serial_number HAVING COUNT(*) > 10`
- **Severity**: Medium - optimization opportunity
- **HPE Impact**: 15-25% efficiency improvement possible

Pattern: Unbalanced Workload Distribution

- **Indicators**: Some servers consistently >80% utilized while others <20% utilized
- **Detection SQL**: `SELECT server_group FROM (SELECT server_group, MAX(cpu_util) as max_util, MIN(cpu_util) as min_util FROM server_metrics GROUP BY server_group) WHERE max_util > 80 AND min_util < 20`
- **Severity**: Medium - consolidation opportunity
- **HPE Impact**: 20-30% overall datacenter efficiency improvement possible

Pattern: Suboptimal Cooling Response

- **Indicators**: Fan speed increases >20% without corresponding temperature increase
- **Detection SQL**: `SELECT serial_number FROM server_metrics WHERE fan_speed_increase_pct > 20 AND temperature_increase_pct < 5`
- **Severity**: Medium - indicates potential cooling system misconfiguration
- **HPE Impact**: 10-15% cooling energy waste

Energy Efficiency Recommendations

Critical Actions for HPE Servers

High Power + Low Utilization (EER < 0.3)

Action 1: Implement HPE OS Power Regulator

- **Implementation Steps**:
  1. Access HPE iLO interface for affected server
  2. Navigate to Power Management > Power Settings
  3. Enable Dynamic Power Savings Mode
  4. Apply and restart the server
- **Expected Impact**: Reduces idle power consumption by 15-20%
- **HPE-Specific Note**: Compatible with all ProLiant Gen10 and newer servers

Action 2: HPE Workload Consolidation

- **Implementation Steps**:
  1. Use HPE OneView to identify migration targets
  2. Create migration plan using included Virtual Connect technology
  3. Execute workload migration to higher-efficiency servers
  4. Power down or place underutilized servers in deep sleep state
- **Expected Impact**: 100% power savings for decommissioned servers
- **HPE-Specific Note**: Utilize HPE OneView's workload balancing features for optimal distribution

Action 3: HPE iLO Power Capping

- **Implementation Steps**:
  1. Access the HPE iLO Advanced interface
  2. Navigate to Power Management > Power Capping
  3. Enable Dynamic Power Capping
  4. Set limit to 70% of server's maximum power rating
- **Expected Impact**: Forces the server to operate within more efficient power envelope
- **HPE-Specific Note**: Available on all HPE ProLiant servers with iLO Advanced license

Thermal Efficiency Issues

Action 1: HPE Thermal Configuration Optimization

- **Implementation Steps**:
  1. Access HPE iLO Management
  2. Navigate to Power & Thermal > Thermal Configuration
  3. Change from "Maximum Cooling" to "Optimal Cooling"
  4. Apply changes without server restart
- **Expected Impact**: Reduces fan power consumption by 20-30%
- **HPE-Specific Note**: Safe for all HPE data centers with proper air containment

Action 2: HPE Direct Liquid Cooling Implementation

- **Implementation Steps**:
  1. Evaluate server models for DLC compatibility (Gen11 ProLiant recommended)
  2. Install HPE Apollo 2000 or ProLiant XL225n with direct liquid cooling options

3. Connect to existing chilled water infrastructure or dedicated HPE CDU

- **Expected Impact**: Reduces cooling energy by up to 40% compared to air cooling
- **HPE-Specific Note**: Most effective for high-density HPE clusters (>20kW per rack)

High Impact Actions for HPE Servers

Server Virtualization on HPE Infrastructure

Action 1: Deploy HPE GreenLake Virtualization Services

- **Implementation Steps**:
  1. Audit current physical server utilization patterns
  2. Implement HPE GreenLake virtualization with consumption-based model
  3. Migrate workloads from physical servers to virtualization platform
  4. Decommission or repurpose physical servers
- **Expected Impact**: Reduces physical server count by 60-80% while maintaining capacity
- **HPE-Specific Note**: Compatible with all HPE server models and integrates with existing HPE OneView management

Action 2: HPE Hardware Upgrade to Gen11 ProLiant

- **Implementation Steps**:
  1. Identify servers with poor power-to-performance ratio
  2. Replace with HPE ProLiant Gen11 servers with AMD EPYC or Intel Xeon 4th Gen
  3. Use HPE Financial Services to optimize capital expenditure
  4. Enable HPE Server System Restore for rapid provisioning
- **Expected Impact**: Reduces power consumption by 30-50% for equivalent workloads
- **HPE-Specific Note**: Gen11 ProLiant servers feature built-in sustainable packaging and higher recycled material content

Action 3: HPE Integrated Lights-Out (iLO) Power Management

- **Implementation Steps**:
  1. Enable HPE iLO Advanced on all servers
  2. Configure server workload profiles in power management section
  3. Set power regulator to "Dynamic Power Savings Mode"
  4. Implement scheduled low-power periods during known low-utilization times

- **Expected Impact**: 10-15% reduction in overall power consumption
- **HPE-Specific Note**: Provides detailed power telemetry for continuous optimization

Optimization Actions for HPE Infrastructure

Action 1: HPE Continuous Power Monitoring

- **Implementation Steps**:
  1. Deploy HPE InfoSight for Power Monitoring
  2. Configure automated power reporting and alerts
  3. Set custom thresholds based on server workload profiles
  4. Create automated response policy for sustained low utilization
- **Expected Impact**: Early identification of efficiency degradation preventing 5-10% waste
- **HPE-Specific Note**: HPE InfoSight uses AI to predict and prevent power-related issues

Action 2: HPE Intelligent Power Discovery

- **Implementation Steps**:
  1. Install HPE Power Discovery Services
  2. Map power topology of data center
  3. Enable automated power path mapping
  4. Configure redundancy optimization for multi-power source environments
- **Expected Impact**: Reduces overprovisioning of power infrastructure by 10-15%
- **HPE-Specific Note**: Integrates with HPE Intelligent PDUs for dynamic load balancing

Action 3: HPE Modular Cooling Solution

- **Implementation Steps**:
  1. Deploy HPE Adaptive Rack Cooling System
  2. Integrate with existing cooling infrastructure
  3. Implement direct hot-spot cooling for high-density racks
  4. Configure dynamic response based on thermal mapping
- **Expected Impact**: Reduces cooling energy by up to 30%
- **HPE-Specific Note**: Compatible with all HPE rack systems and provides real-time efficiency metrics

HPE-Specific Integration Points

HPE Server Management Tools

HPE OneView:

- Access via: https://[OneView-Server-IP-Address]
- Key Energy Features:
  - Power capping policies
  - Thermal visualization maps
  - Server utilization dashboards
  - Power history reports
  - Group-based power management

HPE iLO Advanced:

- Access via: https://[Server-IP-Address]/ilo
- Key Energy Features:
  - Power Regulator settings
  - Dynamic Power Capping
  - Power history and metrics
  - Temperature monitoring
  - Fan control settings

HPE InfoSight:

- Access via: https://infosight.hpe.com
- Key Energy Features:
  - AI-driven power analytics
  - Cross-stack correlation
  - Predictive issues resolution
  - Efficiency optimization recommendations
  - Custom reporting and dashboards

HPE Server Hardware Solutions

ProLiant Gen11 Energy Features:

- Silicon-level telemetry
- Liquid cooling compatibility

- Advanced power supplies (80 PLUS Titanium)
- Persistent memory options reducing storage power
- Workload-matching profiles for power optimization

HPE Apollo Systems:

- Density-optimized for data centers
- Direct liquid cooling options
- Shared power infrastructure reducing overhead
- Sophisticated thermal design
- Modular servicing reducing operational energy

HPE Synergy Composable Infrastructure:

- Dynamic resource composition reducing idle hardware
- Shared power infrastructure
- Integrated cooling management
- Fabric-integrated management reducing network overhead
- Template-based provisioning for optimal configuration

Implementation Process for HPE Environments

Assessment Phase

1. Run HPE Power Advisor to establish baseline power profiles for all servers
2. Calculate server-specific EER values using iLO power metrics and performance counters
3. Generate HPE OneView power and thermal maps to identify hotspots
4. Create server efficiency classification report using Power Regulator data

Planning Phase

1. Develop migration schedule prioritizing servers with lowest EER values
2. Design workload consolidation architecture using HPE OneView Templates
3. Create power capping strategy based on workload criticality
4. Define cooling optimization roadmap with rack-level recommendations

Execution Phase

1. Apply HPE iLO power management settings to all targeted servers

2. Implement dynamic power capping through HPE OneView groups
3. Execute workload migrations according to priority schedule
4. Deploy HPE cooling optimizations identified in assessment

Monitoring Phase

1. Configure HPE InfoSight power analytics dashboards
2. Set up automated alerts for efficiency degradation
3. Schedule monthly efficiency reviews with trend analysis
4. Document energy savings and ROI using HPE Financial Services calculators

Example Scenarios and Responses

Scenario 1: Critical Power Inefficiency

Query: "Server XYZ-001 shows 90% power consumption but only 10% CPU utilization. What actions should be taken?"

Response: "HPE server XYZ-001 has a critically low EER of 0.11, indicating severe power inefficiency. Recommended immediate actions:

1. Enable HPE Dynamic Power Savings Mode via iLO Power Management interface
2. Schedule workload migration to server ABC-042 which has 70% capacity available and uses HPE's Gen11 architecture
3. After migration verification, apply HPE Server Standby state to preserve configuration while minimizing power draw

Expected power savings: 2.3kW continuous (20,148 kWh annually). Would you like me to generate an HPE OneView migration plan?"

Scenario 2: Thermal Inefficiency

Query: "Fan speeds on DL380 Gen10 servers in rack B12 are consistently over 70% while temperatures remain normal. What's causing this?"

Response: "HPE ProLiant DL380 Gen10 servers in rack B12 show suboptimal thermal configuration. The fan algorithm is likely set to 'Maximum Performance' mode rather than 'Optimal Cooling'.

Recommended actions:

1. Access the HPE iLO interface for these servers
2. Navigate to Power & Thermal > Thermal Configuration

3. Change from 'Maximum Performance' to 'Optimal Cooling'
4. Verify temperature remains within safe range after 24 hours

Expected impact: 25% reduction in fan power consumption with no impact on server performance. This change can be made without server restart and implemented across all rack B12 servers simultaneously through HPE OneView group policy."

Scenario 3: Systemic Power Inefficiency

Query: "Our data center shows high overall power consumption compared to workload. What HPE-specific approaches should we consider?"

Response: "Analysis indicates systemic power inefficiency across your HPE server environment. Recommended holistic approach:

1. Implement HPE GreenLake Flex Capacity to right-size infrastructure with consumption-based pricing
2. Deploy HPE Adaptive Power Manager across all ProLiant servers to enable workload-based power optimization
3. Upgrade cooling infrastructure to HPE Cooling Modules with variable frequency drives
4. Consolidate workloads onto HPE Synergy composable infrastructure to reduce idle resources

Expected impact: 30-40% reduction in overall power consumption while maintaining or improving performance. HPE Financial Services can provide TCO analysis comparing current state to optimized future state, typically showing ROI within 18-24 months.

Would you like a phased implementation plan prioritized by impact areas?"