

# Sun Eco Cooling Efficiency Service for Data Center

Korea

## 1. Scope

In this fixed price service, Sun will make commercially reasonable efforts to provide Customer with a Sun Eco Cooling Efficiency Service for Data Center as more fully described herein ("Service"). The Service includes an assessment of energy usage and availability in a data center and recommendations to help Customer optimize the energy usage and cooling of the existing infrastructure. Select the appropriate size of data center (the "Subject Area") for the Service from the following list:

- ( ) WW-PS-ECO-CES-5k: Sun Eco Cooling Efficiency Service for Data Centers under 5,000 square feet
- ( ) WW-PS-ECO-CES-15k: Sun Eco Cooling Efficiency Service for Data Centers between 5,000 and 15,000 square feet

## 2. Tasks and Deliverables

### 2.1 Site visit

- Sun will conduct a visit at Customer's site to collect the information necessary to provide the Service and to perform optimization activities as outlined in the Service. The duration of the site visit and resources allocated will vary depending upon the size of the Subject Area (as defined in Section 4, below) and Service options selected by Customer. The site visit will typically require two (2) to six (6) engineer days spread over two (2) to three (3) consecutive days. All optimization activity will take place during the site visit.
- The site visit will be scheduled for mutually convenient times and dates. Site visits must be scheduled and confirmed with a minimum of sixteen (16) calendar days advance notice before the proposed date. All scheduling considerations will be decided at the discretion of Sun with the appropriate Customer approval. Any requests for modification of the schedule by Customer must be approved by Sun.

### 2.2 Service Delivery

**2.3.1** As part of the Service, Sun will provide the following tasks and deliverables:

- Temperature & Relative Humidity (T&RH) Baseline: The T&RH profiles are used for evaluation of existing conditions and as a baseline for trending and optimization. The profiles are evaluated against relevant industry preferred practice recommendations, hardware specifications and Customer-defined Subject Area goals. The profile locations are determined by the on-site engineers based on numerous factors such as Subject Area size and shape, air conditioner placement and computer equipment type and arrangement. The profile is generated to document representative hardware intake conditions across the Subject Area. Areas of concern, such as hot-spots or high heat density hardware, are also identified and evaluated.
- Temperature & Relative Humidity Measurements at Hardware Intakes: This data documents conditions at the intakes of the actual hardware where they are most important. Measurements are typically multi-point, and may include intake or exhaust conditions, as appropriate to the particular evaluation. Measurement at the computer hardware intakes are used to document conditions and identify areas in need of improvement. Analysis will look for problem areas such as air bypass, inappropriate recirculation and inefficiencies in design or implementation.
- Temperature & Relative Humidity (T&RH) Data Logging: T&RH data will be recorded over time at strategic locations in the data center. This assessment will take place during the site visit. The recorded data is used to analyze the functioning of air conditioners, the influence of outside sources (such as make-up air) and other factors that affect both energy usage and availability.
- Environmental Support Equipment Design & Installation Assessment: The design of the environmental

support equipment providing cooling to the computer room is assessed in relation to site-specific conditions and computer hardware requirements.

- Environmental Support Equipment Baseline: All air conditioners serving the Subject Area are examined. Data regarding set points, sensitivities or dead bands, control modes, function modes, calibration, alarms and other factors are examined and documented as a baseline. Physical conditions and maintenance logs are also examined, and interviews are conducted with Customer personnel responsible for the policy and maintenance of the air conditioners.
- Environmental Support Equipment Calibration: Air conditioner and humidifier sensors are calibrated, where possible, against a control standard. This may be limited by the design or age of the equipment or by Customer-imposed site restrictions.
- Environmental Support Equipment Set Point Modification: After examination, a plan is developed to modify the air conditioner and humidifier set points. This plan is enacted in a manner designed to minimize impact on the Subject Area.
- Conditioned Air Distribution Efficiency Assessment: This is an airflow assessment from the air conditioners to the final distribution at the hardware, and all airflow in between those points. Cooling short cycles, air distribution tile placement, hardware alignment, influences on control sensors and similar issues are examined and evaluated for cooling efficiency.
- For most Subject Areas, air distribution tiles and cable cutouts are compared to available capacity and evaluated to determine potential recovery air conditioner capacity for more efficient cooling and energy utilization. Where alternate designs are used, the approach is modified as necessary, as determined by Sun.
- Conditioned Air Distribution Adjustments: Initial modifications to the air distribution tile placement and number are made to correct identified problems. Unnecessary or excessively large cable cutouts are minimized where possible or temporarily addressed. Additional adjustments are made, as necessary, after each reassessment of the Subject Area profile. Guidelines such as Intake and Exhaust Aisle air distribution are used, but actual balancing is determined by specific Subject Area heatload distribution and field validation.
- Temperature & Relative Humidity Reassessment: After each adjustment to the air conditioners and air distribution, the Subject Area is reassessed to measure changes in the T&RH. In some cases, T&RH data loggers are used in strategic locations to record changes. This is repeated as often as necessary. Conditions are allowed to acclimate (typically overnight) prior to assessment.
- Temperature & Relative Humidity Final Assessment: The initial baseline profiles are repeated to measure results and document final modified conditions. This is presented in an optimization report that explains the process and data, and provides guidelines for maintenance between site visits.
- Data Center Preferred Practices: The Subject Area is evaluated in relation to industry-recognized preferred practices, consensus and compliance standards, manufacturer specifications and field-verified methodologies (as described in Section 4.2, below). Areas covered will range from goal conditions and Subject Area design to general cleaning and maintenance. Anything that could affect the cooling efficiency or hardware availability may be included at Sun's discretion. References are modified as necessary based on industry or geography. General and specific references are discussed with the Customer and included in associated project documentation.
- Future Planning Considerations: All data from the assessment is evaluated with regard to its effects on existing conditions, what short-term measures can be implemented to optimize the existing infrastructure and what effects it will have on long-term planning.
- During the monitoring, testing and observations, a variety of instrumentation and testing equipment is used. Although the instruments used onsite will vary according to the situations encountered, at Sun's

discretion, the following items may be utilized:

- Electronic Thermo-hygrometer (Real-time Temperature & Relative Humidity Meter)
- Electronic Thermo-hygrometer (Temperature & Relative Humidity Data Logger)
- Manometer (Differential Pressure Gauge)
- Anemometer (Air Velocity Meter)
- Digital Camera (Photo Documentation of conditions)
- Additional test equipment may be employed as necessary.

**2.3 Assessment Report.** Sun will provide the following to Customer:

- **Data Analysis & Report:** An optimization report will follow the site visit. This report includes a description of the actions provided, a summary of findings, graphic representations of improvements achieved and recommendations for further actions required. The final report will typically be available approximately twenty-one (21) business days following the site visit and will be provided in electronic or print format.
- **Presentation:** Upon request by Customer, a remote presentation of findings will be provided.

### **3. Customer Responsibilities**

Customer will provide the following:

3.1 A project manager ("Project Manager") to:

- Provide direction and guidance to Customer as required by Sun to maintain project momentum;
- Provide information and resources in a timely manner as needed by Sun to enable Sun to provide the Service described in this Statement of Work;
- Be readily available and on-site as and when required by Sun for the duration of the Service;
- Receive any deliverables created as a result of this Service.

3.2 Adequate workspace for Sun's personnel, as well as access to telephones, copiers, faxes, conference rooms, and printing facilities as reasonably necessary.

3.3 Customer's relevant business requirements and service-level agreements.

3.4 Access to Customer personnel, including business, IT and operational staff.

3.5 Parking and access passes as required by Sun for Service delivery.

3.6 A timely response (i.e., in a time period that does not adversely affect Sun's scheduled delivery of the Service) to all of Sun's requests for information.

3.7 Timely delivery of information and support (i.e., in a time period that does not adversely affect Sun's scheduled delivery of the Service) from suppliers of non-Sun equipment and services as requested.

3.8 Any relevant operational performance standards in use by Customer related to Service delivery.

3.9 An escalation procedure in the event that Customer does not provide timely responses to Sun to enable the Service to be completed within the established time frames.

3.10 A timely response (i.e., in a time period that does not adversely affect Sun's scheduled delivery of the Service) to the review of all Service-related documentation.

3.11 Copies of Customer's relevant business, organizational, configuration and process documentation.

3.12 Facilities access and access to relevant internal and external systems as required by Sun.

3.13 Access to Customer's existing IT infrastructure.

3.14 Customer will notify Sun of any system, application, or equipment modifications known to present a potential issue, or deviations from industry standard practices.

3.15 Access to all Subject Areas and Support Areas (as defined in Section 4.1 below). This includes not only the data center areas being studied, but also any mechanical or electrical rooms supporting the data center, and any adjoining areas exposed to the controlled environment.

3.16 Customer personnel familiar with the history and projected plans for the Subject Areas. A full-time escort is only necessary if it is company policy, but Customer personnel should be available to answer questions at all times during the site visit.

3.17 Customer personnel knowledgeable about the mechanical systems and electrical infrastructure serving the Subject Areas. This includes any air introductions from outside the controlled environment (make-up air, fresh air, building air, shared primary air, etc.), as well as the electrical infrastructure from the utility supply to the facility to the data center (generators, UPS, PDUs, etc). Typically, 30 to 60 minutes will be needed for discussion of such mechanical systems and electrical infrastructure. Customer personnel should be available throughout the duration of the site visit to answer any questions that might arise.

3.18 Authorization to Change Air Conditioner Set Points: During the course of the Service, it will typically be necessary to make modifications to air conditioner set points, modes and calibration. Permission to make these changes is necessary. The Customer should have personnel available throughout the duration of the site visit familiar with the set points, passwords and other associated controls on the air conditioners to assist with these activities.

3.19 Authorization to Move Air Distribution Panels: The Customer should have personnel available to assist with the relocation of air distribution panels in the raised access floor. These personnel will need to provide access to any stock of additional solid or perforated floor tiles and be able to provide authorization for any changes. Depending on the size of the Subject Area, Customer personnel may be necessary to assist in the actual relocation of the tiles, movement of stock tiles to the Subject Area or removal of unused tiles from the Subject Area.

3.20 The most recent floor plans available. These should include the floor grid and hardware layout, including air conditioners and other support equipment. These will be used to identify test locations, problem areas and other points of reference. Due to inclusion in the report documentation, 11X17 prints are preferred. Sun requests that these plans be emailed if reasonably possible, as it would greatly facilitate Sun's preparation of its reports. Most CAD formats are acceptable.

3.21 Wheeled Cart: A cart with a work surface approximately 3 to 4 feet high and top surface area approximately 10-12 square feet will allow field personnel to easily maneuver test equipment through the Subject Areas. The cart should be appropriate for use in a data center.

3.22 Permission to take photographs. Permission to take photographs is deemed granted, unless explicitly denied by Customer. These photographs greatly enhance the descriptive quality of the report. No client names, monitor screens or other proprietary information will be photographed. All photographs are strictly confidential, and will be used solely for illustration purposes.

3.23 Site-specific project logistics will be arranged at the time of scheduling. Failure to provide necessary authorizations may limit the effectiveness of the Service and could, at Sun's discretion, impact scheduling or result in the postponement of the Service.

3.24 Additional Expenses. Customer will pay for reasonable travel, accommodations, meals, and incidental expenses in the event that travel is required for Sun to conduct the on-site visit.

#### **4. Additional Provisions**

##### **4.1 Subject Area:**

- The Subject Area for this Service will be comprised of a single room.
- Subject Areas exceeding the maximum limits defined in Section 1 above may incur additional charges at Sun's discretion. Any exceptions to this Subject Area size limitation shall be mutually agreed to by the parties, and will be subject to a separate SOW between the parties.
- Areas housing the support infrastructure for the Subject Area ("Support Areas") are not included in the maximum limits defined above, and will be examined only if Sun deems it necessary to support the Service.
- All rooms must be located in the same building, and be supported by the same environmental infrastructure.
- Definition of the Subject Area for the Service will be determined by Sun in its sole discretion.

**4.2 Reference Standards and preferred practices used in the Service will be as follows:**

- The data and observed conditions compiled during the site visit will be evaluated in relation to applicable industry and manufacturer recommendations as determined by Sun. These include a variety of preferred practices and compliance and consensus standards.
- Hardware Manufacturer Recommendations: Specifications used will be influenced by the specific hardware in place at the facility, as well as future planned equipment. Additional manufacturer information from Sun regarding potential energy savings from equipment refresh will also be included.
- Environmental Support Equipment Manufacturer Recommendations: Specifications used will be influenced by the environmental support equipment in place at the facility. Additional information from manufacturers not in place at the facility will be used as necessary.
- Industry Standards: The following standards are used (ASHRAE, ASTM, BSI, IEC, IEE, IEEE, ISO, NEC, NFPA, Telcordia).
- Government Standards: Relevant government codes and standards will be referenced as appropriate to the location where the Services are being provided.

This Service is subject to your existing services agreement with Sun that governs the delivery of Services. If you do not have a services agreement with Sun that would govern the delivery of Services, then Sun's delivery of Services shall be subject to the terms located at [www.sun.com/sales/salesterms](http://www.sun.com/sales/salesterms). This Service Listing or SOW does not constitute an offer by Sun. The Services described above are subject to availability and unless otherwise stated, are only available within the above-referenced country. Any reference to "Customer" in this Service Listing entitled to receive the Services.

Last Revised: February 2009