

# Sun Eco Optimization 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 Optimization Service for Data Center as more fully described herein ("Service"). This Service provides periodic site assessments, cooling optimization suggestions and ongoing remote technical support providing email and telephone assistance with issues related to this Service or the general environmental conditions in Customer's data center. Select the appropriate number of periodic site assessments for the Service from the following list:

- ( ) WW-PS-ECO-DOS-1: One year contract for Service. One site visit per Service term. Remote technical support for the duration of the Service term.
- ( ) WW-PS-ECO-DOS-2: One year contract for Service. Two site visits per Service term. Remote technical support for the duration of the Service term.
- ( ) WW-PS-ECO-DOS-3: One year contract for Service. Three site visits per Service term. Remote technical support for the duration of the Service term.

## 2. Tasks and Deliverables

### 2.1 Pre-Visit Data Collection

- During the planning stages, and prior to a visit at Customer's site, data regarding the Subject Area (as defined in Section 4 below) and the site in general will be collected through questionnaires and telephone interviews (as available and appropriate).

### 2.2 Site visits

- Sun will visit Customer's site to collect the information necessary to provide the Service. The site visit for this Service will typically require two (2) to four (4) engineer days spread over two (2) consecutive days. Customer may order one (1) or two (2) additional site visits which will typically include one (1) to two (2) engineer days spread over one (1) to two (2) consecutive days. This may be accomplished with one person for two days or two people for one day. If the site visit requires multiple days, these will typically be consecutive days. The Service may also be provided on non-consecutive days, under certain circumstances, as agreed by the parties. The site visits schedule will typically be spread evenly across the term of the Service, but the schedule can be modified to address events such as major equipment reconfigurations.
- The site visit(s) will be scheduled for mutually convenient times and dates. The site visit(s) 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.

### 2.3 Site Inspection & Analysis. Sun will provide the following to Customer:

- Visual Examination of Subject Area (as defined in Section 4.1 below). This Service includes the collection and documentation of critical site information and compilation of such information in a single, illustrated resource that includes both technical data and high-level [explanations to facilitate Customer's decision-making process. Sun will inspect various aspects of the Subject Area including the subfloor void, ambient equipment space, ceiling void, ancillary rooms, infrastructure support rooms and other associated spaces. Conditions will be documented and areas of concern will be noted.
- Onsite Testing: Periodic site visits are provided to document and measure conditions. Temperature, relative humidity, air distribution, particulate concentrations, and other factors are measured and profiled across the Subject Area. This data is used to evaluate changes in the Subject Area between visits,

identify issues or potential issues, assist with ongoing balancing and optimization, and measure the ongoing conditions.

- Site Meetings & Interviews: During each site visit, meetings are scheduled with appropriate Customer personnel, including facilities, IT, maintenance, and Customer's vendor personnel to discuss any data center issues. These meetings are intended to bring Customer personnel together to facilitate Sun's understanding of Customer's ongoing data center issues.
- Data Center Preferred Practices. The Subject Area is evaluated in relation to industry-recognized preferred practices, consensus and compliance standards, manufacturer specifications and field-tested methodologies (as described in Section 4.2 below). Areas covered will range from goal conditions and Subject Area design to general cleaning and maintenance. References are modified as necessary based on industry or geography. General and specific references are discussed with the Customer and included in associated Service documentation.
- Site Visit Reports: Reports detailing site conditions, findings and recommendations are provided with each site visit, and any available interim support documentation may be provided in Sun's discretion.

#### **2.4 Cooling & Air Distribution Optimization. Sun will provide the following to Customer:**

- Temperature & Relative Humidity ("T&RH") Baseline. The T&RH profiles are used for assessment 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 Sun on-site engineers based on numerous factors such as Subject Area size and shape, air conditioner placement and computer equipment type and arrangement. The profiles are 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. 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. The analysis will focus on air bypass, inappropriate recirculation and inefficiencies in design or implementation.
- Environmental Support Equipment Design & Installation Assessment. The design of the environmental support equipment providing cooling to the Subject Area, such as air conditioners, 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 maintenance of the environmental support equipment.
- 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 fashion 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, including all airflow in between these points.

Cooling short cycles, air distribution tile placement, hardware alignment, influences on control sensors and similar issues are examined and evaluated.

- For select Subject Areas at Sun's discretion, air distribution tiles and cable cutouts are examined and compared to available capacity 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.
- 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. 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 heat load distribution and field validation.
- Temperature & Relative Humidity (T&RH) Reassessment: After each adjustment to the air conditioners and air distribution, the Subject Area is reassessed to measure changes. In some cases, Temperature & Relative Humidity (T&RH) data loggers are used in strategic locations to document changes. This is repeated as often as reasonably necessary in order to achieve optimal results as determined by Sun. Conditions are allowed to acclimate (typically overnight) prior to assessment.
- Temperature & Relative Humidity (T&RH) Final Assessment: The initial baseline profile measurements are repeated to assess changes 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.
- Ongoing Optimizations: During each site visit, conditions are reassessed and adjusted as necessary to address changes in the Subject Area.
- Up to one major optimization is included per Service term. Fine-tuning and adjustments are included during each scheduled site visit (as described in section 2.2 above).

## **2.5 Monitoring & Control Support. Sun will provide the following to Customer:**

- Monitoring & Maintenance Support. This Service examines existing monitoring capabilities to identify areas in which improvements in either design or utilization may facilitate operation of a more stable and energy efficient Subject Area. In addition, Sun will examine available site monitoring data both during site visits and any new or additional data provided between visits (if applicable).
- 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 both during the site visit, and also for a one (1) to two (2) week period before or after the site visit. This 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.
- Temperature & Relative Humidity Measurement Equipment: A temperature & relative humidity meter will be provided for the Subject Area. This test equipment is provided to Customer for use in interim data center maintenance and monitoring. A calibration check of the meter's sensor is provided during each site visit (if applicable) and adjustments or replacements are made as necessary for the term of the Service.

## **2.6 Site Planning & Installation Support. Sun will provide the following to Customer:**

- 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 the data has on long-term planning.
- Electrical & Cooling Load Calculations. The general electrical load of the Subject Area is evaluated and

a total load is calculated. Factors associated with sources of heat load are calculated in relation to available cooling capacities, and are then evaluated in relation to inefficiencies in all areas of the Subject Area and supporting infrastructure. The calculations may lead to recommendations such as design modifications, elimination of extraneous influences, equipment upgrades and distribution optimizations, and refreshes of the computer technology to newer and more efficient designs ("Technology Refresh"); the implementation of these recommendations is not included in the Service. Data is typically collected from electrical infrastructure equipment (UPS or PDU) displays or from the Building Monitoring System serving the Subject Area. In the absence of these sources, alternative approaches will be discussed.

- Cabinet / Rack Design & Placement Assessment. This includes an assessment of cabinet / rack design, arrangement of hardware within the racks or cabinets, distribution of the equipment heat load within racks, arrangement of racks in relation to each other (intake & exhaust aisles), orientation in relation to air conditioning and supplemental cabinet-level cooling.
- Heat Density Calculations. Using available data from site infrastructure equipment, general heat density calculations for the Subject Area are determined. This will include both the current operating conditions as well as system limits. In addition, the Service includes an assessment of system load limiters, such as cooling capacity or critical power capacity. Additional calculations at the rack level are also provided for samples of targeted equipment in high-density areas in the Subject Area.

## **2.7 Personnel Training & Procedural Support. Sun will provide the following to Customer:**

- Customer Site Personnel Training: Data Center Environmental Awareness Training provides a basic understanding of the ways in which the availability of data processing, storage and telecommunications equipment is affected by environmental influences. The information is presented in a manner designed to be accessible to non-technical personnel, while still providing value and detail for those with a more technical background. Training will take place on site if scheduled in conjunction with planned site visits or remotely if not aligned with the site visits.
- Specialized Vendor Training: Training can be tailored as necessary to different audiences such as cleaning personnel or contractors working in the Subject Area.
- Training sessions are provided in conjunction with scheduled site visits upon request One training session per Service term is included. Training materials are provided in electronic format.
- Remote Technical Support: Reasonable Sun email and telephone support is available for issues directly related to the Service provided by Sun under this Service Listing. Sun shall determine, in its sole discretion, whether an issue is directly related to the Service set forth in this Service Listing. Issues that are directly related to the Service may include, for example, questions related to data center environmental preferred practices, cooling and air optimization and balancing, monitoring and maintenance of the Subject Area to facilitate a more energy efficient environment, and interpretation of the results of the Service. Examples of issues that would not be directly related to the Service would include implementation of any of the findings resulting from the Service described in this Service Listing, and modifying or building a data center based on the findings resulting from the Service; such services may be available from Sun for an additional fee subject to availability of resources pursuant to a separate Statement of Work executed by the parties.
  - Customer will supply all necessary information regarding the requested support issue, and will ensure that Customer's designated contact is reasonably available and cooperative with the Sun representative.
  - Response Time & Availability: Response times to Customer's requests for support will vary depending upon the complexity of the request. Sun will provide Customer with an email support alias and telephone contact numbers. Sun will provide confirmation of receipt of Customer's

request for support. Response from a Sun representative, including requested information or a projected time-line for delivery of requested information or assistance, will generally be provided within forty-eight (48) hours of receipt of the request, excluding weekends and holidays, Monday through Friday in the local time zone of the origin of the request.

- Sun will use commercially reasonable efforts to resolve Customer's support requests; provided, however, that there may be issues for which (i) there is no resolution or (ii) a resolution will require additional investigation and analysis that exceed the scope of the Service set forth in this Service Listing, as determined in Sun's sole discretion.

## **2.8 Assessment Reports. Sun will provide the following to Customer:**

- Data Analysis & Reports: Reports include documentation of findings, analysis of site data, trending of measurements and recommendations for modifications and adjustments. The 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 Subject Area, but also any mechanical or electrical rooms supporting the Subject Area, and any adjoining areas exposed to the Subject Area.

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 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 Subject Area (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 is defined as follows:**

- The Subject Area is a single primary equipment area that does not exceed 15,000 square feet, and may include up to two (2) additional ancillary or support rooms (such as operations or command center, networks, tape or storage, or similar). The total area of all rooms combined in a Subject Area shall not exceed 25,000 square feet.
- 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 provide the Service.
- All rooms must be located in the same building, and be supported by the same environmental infrastructure.
- Any exceptions to this Subject Area size limitation shall be mutually agreed to by the parties.
- 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. 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.

#### **4.3 Environmental Testing and Monitoring Equipment:**

During the Service, a variety of instrumentation and testing equipment may be used. Although the instruments used onsite will vary according to the situations encountered, at a minimum, the following items may be utilized, at Sun's discretion:

- 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)
- Laser-based Airborne Particle Counter
- Power Quality Meter
- Digital Camera (Photo Documentation of conditions)
- Additional test equipment may be employed as necessary.

#### **4.4 Exclusions. The following exclusions apply to the ongoing consulting portion of this Service:**

- The Service is limited to the Subject Area.
- Remote technical support is limited to one year.

- This Service does not include design or architectural drawings, engineering documents, formal procedures documentation, building specifications or other design documentation.
- The Service is not intended to be used to assist in the construction of a new facility.

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.

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