BRUNS-PAK
DATA CENTER "HYBRID" SOLUTIONS

# BRUNS-PAK Facility Infrastructure Consulting Services

## High Level Audit

- Typically one (1) on-site meeting per site, three to four (3-4) week engagement.
- No IT programming/modeling/ impact on the infrastructure design.
- Ten to twenty (10-20) page report.
- Summary in format.
- High level observations and commentary.
- General recommendations.
- Construction cost estimate ranges – orders of magnitude. Identifies existing status and deficiencies. (#1)
- Provides general "current status" conditions of existing facility.
- Provides high-level "Gap Analysis" commentary (#2)

**vs.**

## Comprehensive Assessment

- Three to four (3-4) on-site meetings, eight to twelve (8-12) week engagement
- *IT Programming* - Analysis of current IT plan and future growth.
- 80-150 Page report subject to size, complexity, etc.
- Detailed in format.
- Detailed analysis.
- Detailed recommendations and opinions.
- Definitive construction budget estimates. (±15%)
- Identifies existing status, deficiencies and viable options/ alternatives for corrections/improvements/upgrades. (#3)
- Provides the "Support Infrastructure Plan" for corporate IT and the "Program Set of Requirements for the project. Analysis of work flows and adjacencies.
- Evaluation of Green/LEED and energy saving options.
- Conceptual floor plan.
- Equipment block diagrams.
- Mechanical flow diagrams
- Electrical single line drawings.
- Project schedules.

***See pages 2-3 for "specific" comprehensive assessment***

- *#1 - General recommendations for improvements/upgrades, Gross magnitude cost range for stated recommendations.*
- *#2 - Tells you in general terms where you are today, how you compare to best practices, and the positive and negative aspects of the facility.*
- *#3 - BRUNS-PAK provides an expert and experienced opinion of what the options and alternatives are for the data center facility infrastructure based on the client provided summary IT/Facility requirements.*

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## Single Point of Failure (SPOF)

- Assess an end users existing data center facility electrical/mechanical infrastructure support systems.
- Review the existing condition ("as-built") electrical, fire protection, and mechanical drawings associated with an end users data center.
- Identify potential facility infrastructure components that can interrupt the end users operation that results in any single points of failure/risks associated with potential "impacts" to the reliability/uptime associated with the site.
- Provide recommendations associated with the elimination of single points of failure identified along with construction cost estimates for any stated recommendations for improving the reliability/uptime for the data center facility.
- Corresponding magnitude budget estimates/ranges with schedule for each recommendation provided.

## CFD Analysis (Computational Fluid Dynamic Model/Thermal Airflow Analysis)

- An underfloor and above floor environment is modeled.
- Models both supply and return to validate that the hot air discharged from the hardware is not recaptured into the supply air stream.
- Ensures that failure simulations are performed to validate redundancy requirements.
- Confirms concepts will perform as intended.
- Allows for a predictive solution can be designed.
- Corresponding magnitude budget estimates/ranges with schedule for each recommendation provided.

## Lifecycle Replacement

- Confirm the age of each critical (or select) piece of infrastructure equipment that supports the Data Center.
- Identify the recommended life cycle replacement age based on industry best practices:
  a. Which equipment is past due for immediate replacement or should be replaced in one (1) year or less - High Priority.
  b. Which equipment could be anticipated to need life cycle replacement within the next five (5) years - Medium Priority.
  c. Which equipment is not expected to need replacement for five (5) years or greater – Low Priority.
- Identification of systems that are up for lifecycle replacement will be portrayed in an easy-to-follow matrix.
- Provide recommendations associated with major equipment recommended to be replaced (where applicable) suggesting whether said equipment should be replaced "in kind" or "upgraded" based on future growth model.
- Corresponding magnitude budget estimates/ranges with schedule for each recommendation provided.

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## ESG/Carbon Zero (0)

- A consulting study will involve collecting general building envelope data such as the size, building type, construction, energy sources, utility demand history, and workflows.
- The typical facilities infrastructure support equipment that will be analyzed in the analysis will include (as applicable): lighting, the utility bill, electric motors, variable speed drives, the HVAC systems, building management systems, the building water service and heat recovery related equipment.
- Identify and recommend energy efficiency/reduction areas that reduce the carbon footprint, decrease the operating cost, and improve the green initiatives for the architectural/mechanical-electrical-plumbing superstructures.
- Input to future growth projections shall be supplied by the end user for the development of a more energy efficient data center by utilizing the new energy efficient data processing equipment and techniques.
- Energy saving alternatives or energy conservation measures (ECMs) will be developed to best fulfill the an end users energy management philosophy, while taking into consideration the short/long term computer equipment growth projections and desired reliability level for the data center facility.
- Corresponding magnitude budget estimates/ranges with schedule for each recommendation provided.

## HPC (High Performance Compute) Study

- Field verification of the end users site designated for the proposed High Performance Compute (HPC) area.
- Interviews with HPC Data Center stakeholders to establish/confirm the end users preliminary set of data center program requirements and the proposed short/long term projected data/telecommunication growth plan.
- Provide a conceptual short/long term Data Center computer equipment floor plan that optimizes work flow, provides technical efficiency, and maximizes adjacencies.
- Develop a Data Center facility infrastructure program set of requirements based Data Center stakeholders interview(s).
- Offer recommendations, options, and performance criteria for systems that will be supporting the HPC environment in a best practice, leading technology, vendor neutral, format.
- Corresponding magnitude budget estimates/ranges with schedule for each recommendation provided.

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## Immersion Cooling Feasibility Study

***An assessment of the viability of immersion cooling for the specific application or industry under consideration. This report would analyze the technical, economic, and environmental factors to determine if immersion cooling is a suitable option. Potential deliverables in the Feasibility Report could include:***

- Cooling Performance Analysis which will be a detailed evaluation of how immersion cooling performs compared to traditional cooling methods. This includes measuring heat dissipation, temperature regulation, and any potential improvements in cooling efficiency.
- Energy Efficiency Evaluation which is an analysis of the energy consumption and efficiency gains (if any) achieved through immersion cooling. This evaluation may involve comparing immersion cooling to conventional cooling systems in terms of power usage effectiveness (PUE) or other relevant metrics.
- Cost-Benefit Analysis which is a comprehensive comparison of the costs associated with adopting immersion cooling technology versus the potential benefits, such as reduced energy expenses, extended hardware lifespan, or improved computing performance.
- Environmental Impact Assessment which is a study of the environmental effects of using immersion cooling, including its carbon footprint, impact on water usage (if applicable), and other sustainability factors.
- Risk Analysis which identifies and evaluates potential risks and challenges associated with implementing immersion cooling, along with strategies to mitigate these risks.
- Hardware Compatibility Review that will examine how various hardware components (e.g., servers, GPUs, ASICs) can be adapted or designed to work effectively with immersion cooling solutions.
- Best Practices and Recommendations which offers a set of guidelines and best practices for implementing immersion cooling systems, including installation, maintenance, and safety protocols.
- Case Studies providing real-world case studies showcasing successful immersion cooling implementations and their outcomes, to provide concrete examples and data.
- Future Outlook providing potential future developments and trends in immersion cooling technology and its applications.
- Supporting Data and Models detailing data, simulations, and models used in the study to validate the findings and allow for future analyses.
- Presentation and Documentation that offers a well-structured, organized report or presentation summarizing the study's findings and conclusions for stakeholders and decision-makers