Certified TIA-942 Tier IV Data Center

Beltsville, MD

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Data Center Standard TIA-942

- Developed by Telecommunications Industry Association
  - Leading, 600 member, trade assn. for global information and communications technology industries (www.tiaonline.org)
  - Accredited by American National Standards Institute (ANSI)
  - Standards development a key activity

- TIA-942: specification of minimum requirements for telecommunications infrastructure of (multi-tenant Internet hosting) data centers
  - Defines four data center tiers; Tier IV (or 4) most stringent

- Leading hallmarks of an ultra-reliable Tier IV data center:
  - Concurrent maintainability, and
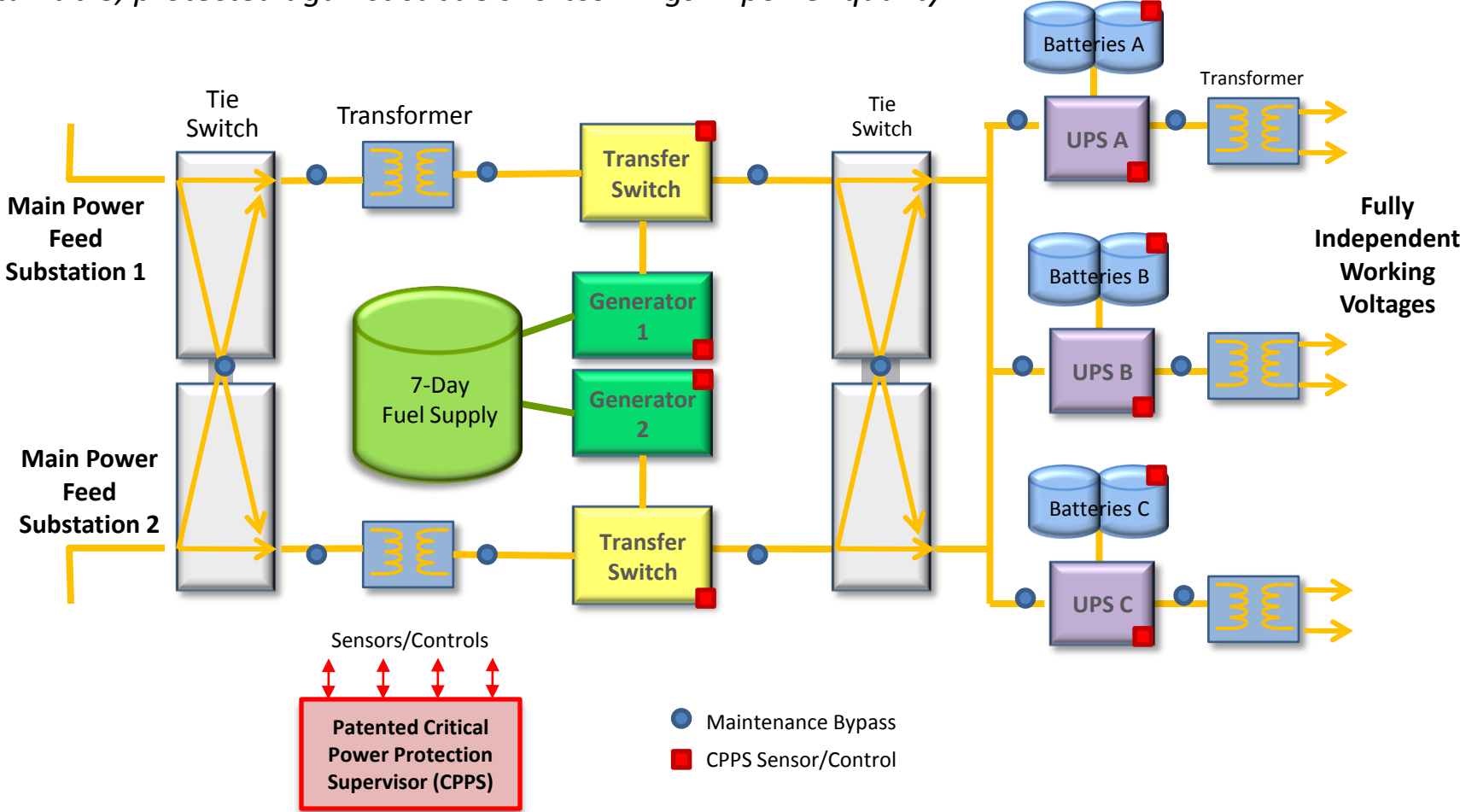 - Fault tolerance of a major system failure

- TIA-942 Tier IV certifications in 2006, 2010.

- Notable ultra-reliability features include:
  - Dual main power feeds from diverse substations
  - 2N power redundancy; 2N generator redundancy
  - Unique power protection by patented power quality management technology
  - Fully independent A, B and C power feeds delivered
  - 7-Day on site supply of generator fuel
  - Dual cooling/heat rejection loops
  - 3N chiller redundancy; 3N cooling tower redundancy
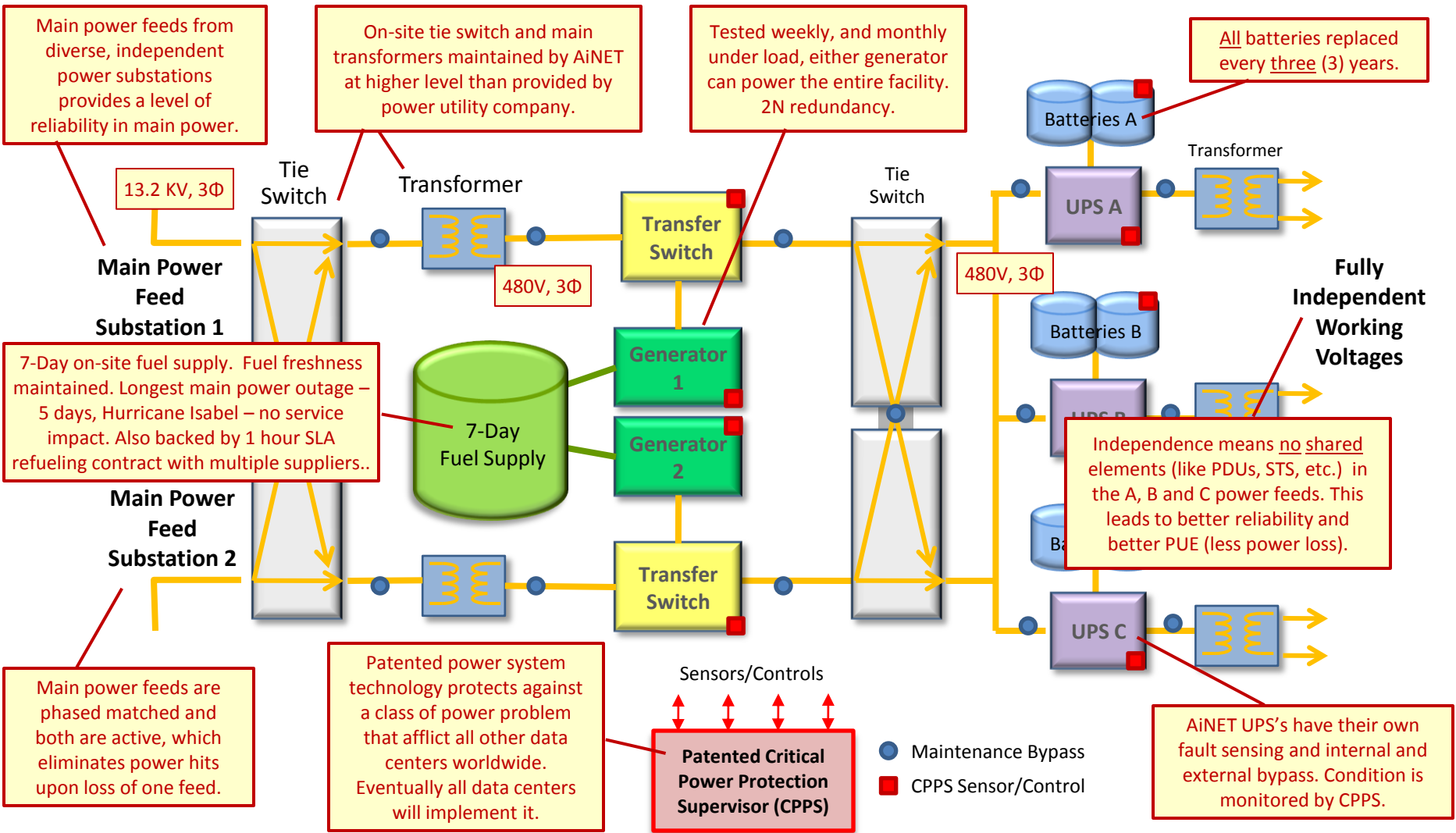 - Full maintenance bypass protections

Power System Block Diagram
Beltsville, MD TIA-942 Tier IV Data Center

No single point of failure; at least full redundancy of all systems; fully maintainable; protected against subtle shortcomings in power quality.
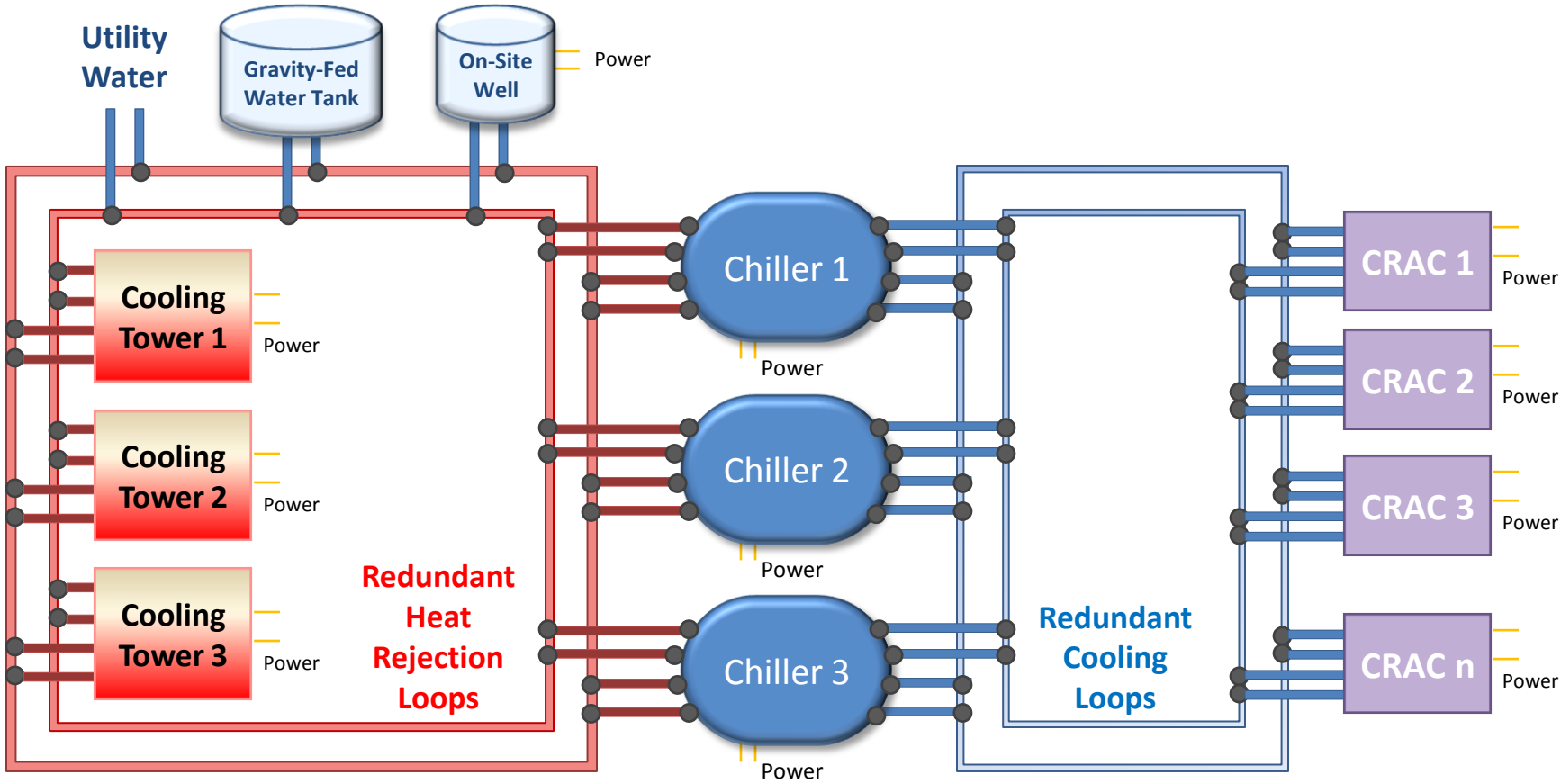
Comments on Power System

Main power feeds from diverse, independent power substations provides a level of reliability in main power.

On-site tie switch and main transformers maintained by AiNET at higher level than provided by power utility company.

Tested weekly, and monthly under load, either generator can power the entire facility. 2N redundancy.

All batteries replaced every three (3) years.

Batteries A

Transformer

Tie Switch

13.2 KV, 3Φ

Transformer

Tie Switch

480V, 3Φ

UPS A

Transfer Switch

Main Power Feed Substation 1

480V, 3Φ

Fully Independent Working Voltages

7-Day on-site fuel supply. Fuel freshness maintained. Longest main power outage – 5 days, Hurricane Isabel – no service impact. Also backed by 1 hour SLA refueling contract with multiple suppliers..

Generator 1

Batteries B

7-Day Fuel Supply

Generator 2

UPS B

Independence means no shared elements (like PDUs, STS, etc.) in the A, B and C power feeds. This leads to better reliability and better PUE (less power loss).

Main Power Feed Substation 2

Ba

Transfer Switch

UPS C

Main power feeds are phased matched and both are active, which eliminates power hits upon loss of one feed.

Patented power system technology protects against a class of power problem that afflict all other data centers worldwide. Eventually all data centers will implement it.

Sensors/Controls

Patented Critical Power Protection Supervisor (CPPS)

Maintenance Bypass

CPPS Sensor/Control

AiNET UPS's have their own fault sensing and internal and external bypass. Condition is monitored by CPPS.

Cooling System Block Diagram
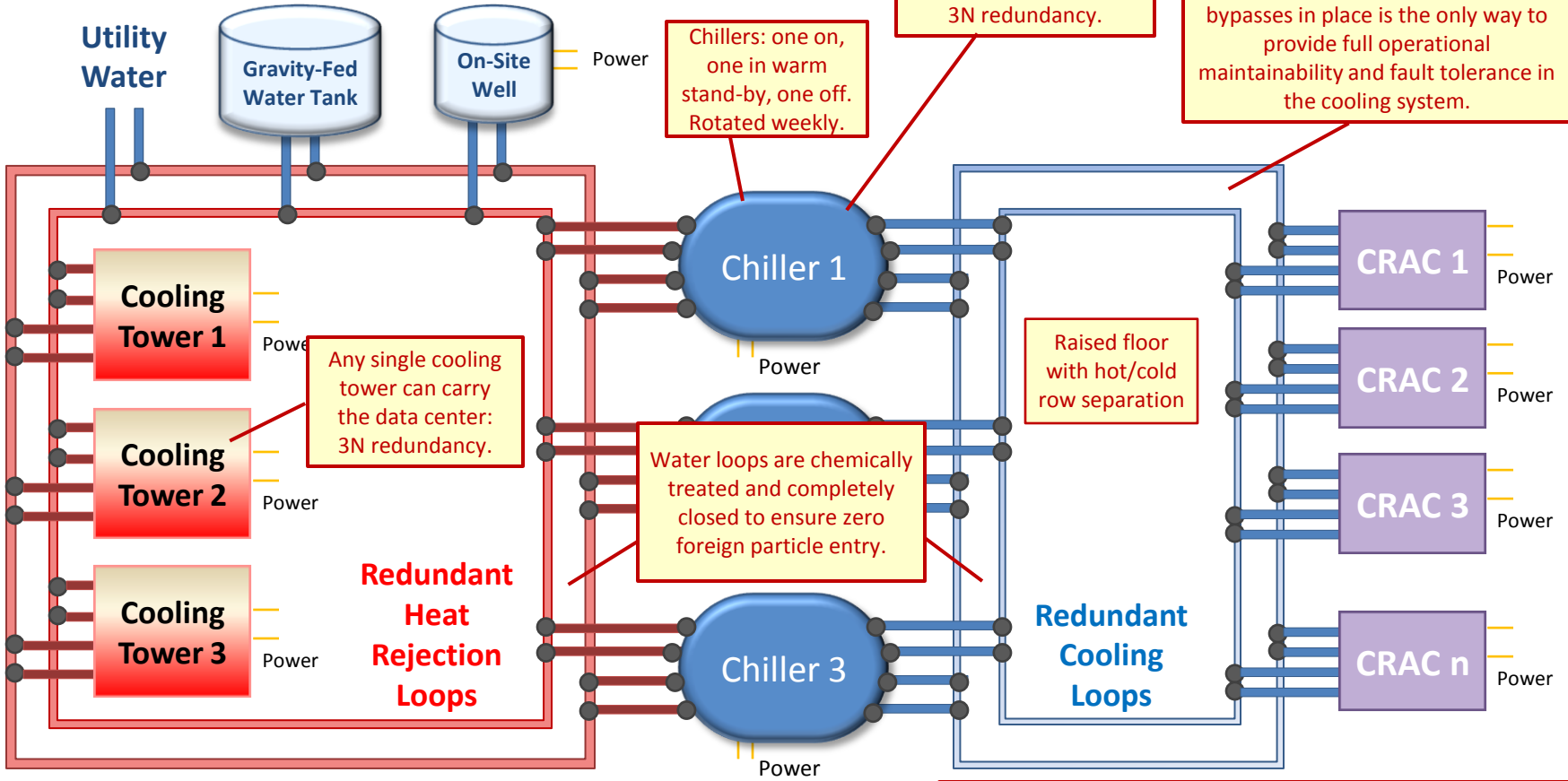## Beltsville, MD TIA-942 Tier IV Data Center

Cooling System Block Diagram
Beltsville, MD TIA-942 Tier IV Data Center

Three sources of supply for water, including an on-site well with indefinite runtime. Water deliver contract with multiple providers with 1 hour SLA.

Any single chiller can carry the data center: 3N redundancy.

Full redundancy of cooling/heat rejection loops with full maintenance bypasses in place is the only way to provide full operational maintainability and fault tolerance in the cooling system.

Utility Water

Gravity-Fed Water Tank

On-Site Well — Power

Chillers: one on, one in warm stand-by, one off. Rotated weekly.

Cooling Tower 1 — Power

Any single cooling tower can carry the data center: 3N redundancy.

Cooling Tower 2 — Power

Cooling Tower 3 — Power

Redundant Heat Rejection Loops

Water loops are chemically treated and completely closed to ensure zero foreign particle entry.

Chiller 1 — Power

Raised floor with hot/cold row separation

CRAC 1 — Power

CRAC 2 — Power

CRAC 3 — Power

Redundant Cooling Loops

CRAC n — Power

Chiller 3 — Power

● Maintenance Bypass

With fluids involved, these critical cooling/heat rejection loops need maintenance. Only redundant loops with bypasses can ensure operational maintainability.

Other certifications of Beltsville site include:

- SAS 70 Type II (operational security)

- DCID 6/9 (physical security)

- ICD 705/ICS 705.2 (physical security)

- HIPAA and EHNAC (medical privacy)

- PCI-DSS (secure financial operations)

- SOX (business and financial operations)