Data Operations Center Renovation

Frederick County's main Data Center is located at Winchester Hall and was originally designed to house five HP3000 computer systems and the support hardware needed for this technology. Since 2000, major technology changes have dramatically changed the Data Center. The Data Center now handles 130 file servers, approximately 85 terabytes of online storage in an Internet protocol based, fiber network.

While the Data Center environment design is adequate to handle the daily needs of the Data Center, vital safe guards and energy efficiency are lacking. Implemented over ten years, the Data Center poses risks to staff and assets by inadequate power, inefficient and unreliable air conditioning, lack of redundant UPS power, mixed varieties of racks, power and network cables under the floor, a water line mingled with power and data lines. The Data Center is lit 24 x 7 five days a week when a lights as needed environment saves not only energy but reduces costs.

This data operations center renovation project will modernize the Data Center to be energy efficient with redundant and more effective systems to ensure the integrity of County hardware, software and data assets. This renovation project also positions the County to move the Data Center in stages with minimal impact on operations if a disaster requires relocation.

Air Conditioning
Estimated Cost: $200,000.00

Current Environment:
The Data Center is cooled using a 25 ton Liebert air conditioner. The system has redundant compressors and is contained in one unit.

System Failure Points / Risks:
- Compressor shutdown due to internal parts failure resulting in total loss of cooling in the Data Center
- Loss of one compressor – not capable of keeping the Data Center cool enough, requires spot coolers, Data Center equipment shutdowns
- Loss of power to the chiller requires manual intervention to turn on water to the unit
- Fifteen minute window to react to the air conditioning system going down before the temperature rises to around 90 degrees, the temperature where servers and network equipment begin to experience problems
- Inefficient mode cooling the entire data center
- 65 PSI water line under the floor of the Data Center with the potential of breaking and flooding the Data Center or creating electric shock hazard

Enhancement:
Install inline rack air conditioning units that provide targeted cooling with 'n + 1' redundancy for the Data Center. The cooling is more efficient with the ability to power up in stages and power down in stages as needed saving electricity. The inline design will require our rack layout to change. Our current layout of two facing rows of server / network equipment with a third row off to one side will be replaced with a more efficient setup of two rows of server / network equipment. The new rows will have the back of the equipment facing each other creating a hot spot. The rack air conditioners will cool the front of the servers / network equipment providing targeted cooling and an energy efficient environment. If the Data Center moves we will be able to move a unit at a time to the new location providing cooling to the new location and the old location during the move.

UPS
Estimated Cost: $80,000.00

Current Environment:
The Data Center has two MGE UPS units in production. Due to lack of power into the Data Center the units can not run at full potential. The oldest unit is a 30KVA; the newer unit is a 40KVA.

System Failure Points / Risks:
- Inadequate power into each UPS forces a configuration where half of the servers / network equipment are on one UPS and the other half are on the other UPS. If a UPS goes down the equipment relying on the UPS will not be protected.

Enhancement:
Install a modular UPS rack unit. The initial installation will be three 10KVA units. The configuration will provide for 'n + 1' so loss of a 10KVA unit will not jeopardize the infrastructure. This configuration provides complete redundancy for the infrastructure. The modular nature of the system will allow us to grow by 10KVA units when needed. If the Data Center moves we will be able to move a unit at a time to the new location providing UPS to the new location and the old location during the move.

Electrical Cabling
Estimated Cost: $35,000.00

Current Environment:
All electrical cabling and outlets are located under the Data Center raised floor.

System Failure Points / Risks:
- Data Center has a 65PSI water pipe to the Liebert Air Conditioning unit located under the raised floor. A leak in the pipe or an accident causing the pipe to break creates an electric shock hazard for personnel

- A break in the water pipe has the potential of shorting out servers and network equipment. The potential loss to replace hardware and get applications back online plus the impact on lost productivity for County operations could run into the millions.

Enhancement:
Move electricity from under the raised floor to overhead server / network racks. One Electric drop per rack will proved the needed electricity to power the equipment. If the Data Center moves this configuration will allow us to move a rack to the new location, plug in the power and the rack will be ready to go back online.

Network Cabling
Estimated Cost: $35,000.00

Current Environment:
All network cables are located under the Data Center raised floor adjacent to electric cables.

System Failure Points / Risks:
- The Data Center has a 65PSI water pipe to the Liebert Air Conditioning unit located under the raised floor. A leak or an accident causing the pipe to break could short the adjacent network cables.
- Data cables are mingled with electrical cables. Interference from electrical cables is known to cause poor performance from the cables, impacting applications and productivity.

Enhancement:
Move network cables from under the raised floor to overhead server / network racks using a single network connection dropped from the ceiling and plugged directly into the top of the racks. Servers / network equipment will be wired internally to the rack. In an emergency, racks could be relocated, plugged into a network connection and the rack will be back online.

Removal of Electrical / Network Cabling
Estimated Cost: $20,000.00

Current Environment:
All network and electrical cables are located under the Data Center raised floor.

Enhancement:
Remove and dispose all network and electrical cables located under the Data Center raised floor.

Server / Network Racks
Estimated Cost: $36,000.00 (12 Racks)

Current Environment:
The Data Center has six different types of racks used to house server / network equipment. These racks are not designed to receive overhead power or network cabling. The existing racks can't be closed for efficient cooling do the rack design.

Enhancement:
Replace current server / network racks with racks designed to receive power and network connectivity from overhead. The new racks allow cable to run down the side of the rack so all cables are housed within the rack structure allowing for the rack to be closed on all sides. The closed racks maximize the cooling efficiency while decreasing the cooling requirement per rack.

Raritan In-Rack Power Units
Estimated Cost: $60,000.00 (12 Racks)

Current Environment:
The server racks have Raritan power units off the back of the racks. Power cords sticking out of the back of these units prevent the use of rack doors.

Enhancement:
Install In-rack Raritan power units that will enable all power cords to remain within the rack space allowing the back door of the rack to be closed maximizing air flow through the rack.

Liebert Water Line
Estimated Cost: $3,000.00

Current Environment:
The Liebert air conditioner has a 65 PSI water line running from the rear of the Data Center to the Liebert.

System Failure Points / Risks:
- During a power outage to the chiller staff is required to lift the floor tiles to get to the emergency water valves located at the Liebert. If staff were to drop a tile on the 65 PSI pipe or step on the pipe there is a good chance the pipe would break. A break has the potential of flooding the room, potentially electrocuting personnel and shorting out the Data Center.
- Staff periodically needs to open the tiles located over the water pipe. The possibility exists for a tile or tools to drop on the pipe or staff to step on the pipe which could cause a break. The water pipe break could potentially electrocute personnel and shorting out the Data Center.

Enhancement:
Move the 65 PSI water line to Liebert Air Conditioning unit under the Data Center floor. Connect straight up through the floor to the unit.

<mark>*Data Center Lighting*</mark>
Estimated Cost: $2,500.00

Current Environment:
The Data Center is lighted in all areas during the hours employees are present.

Enhancement:
Install direct lighting for the front of the racks that remain lighted at all times. Install motion detection devices for all other lights in the server areas. Lights would remain out until personnel access the server room. This enhancement will save energy.

<mark>*Estimated Cost*</mark>

Air Conditioning:	Estimated Cost: $200,000
UPS:	Estimated Cost: $ 80,000
Electrical Cabling:	Estimated Cost: $ 35,000
Network Cabling:	Estimated Cost: $ 35,000
Remove Old Cabling:	Estimated Cost: $ 20,000
Server / Network Racks:	Estimated Cost: $ 36,000
Raritan In Rack Power Units:	Estimated Cost: $ 60,000
Liebert Water Line:	Estimated Cost: $ 3,000
Data Center Lighting:	Estimated Cost: $ 2,500
	Project Total: $471,500