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Summer 2002

designPLUS Survey

Since the last designPLUS Newsletter was issued, **FEA** has conducted a survey regarding its content, reader satisfaction and media preference.

The initial responses indicated that there was overwhelming agreement that the content was satisfactory. We also received many good comments and suggestions for future articles. I would like to thank everyone who responded.

We will be re-sending the questionnaire to those who have not responded and would appreciate it if you would return it so that we can provide future newsletters in your preferred format: U.S. Mail or EMail.

For the Summer 2002 issue we are again sending the designPLUS newsletter by U.S. Mail. The Fall 2002 issue will be sent by the method you chose.

The designPLUS logo is presented within a large black cross shape. The word "design" is in a lowercase, white, sans-serif font on a red rectangular background, and "PLUS" is in an uppercase, white, sans-serif font on a white rectangular background.

Post 9/11 Update

FEA has been involved in the design of mission critical systems for data centers for over 15 years. Recently we have seen an increased interest in the capabilities and benefits of this design concept, especially after the events of 9/11.

The government has conducted a number of studies that have identified building upgrades that would increase a facility's physical security against possible terrorist attack. These include physical barriers around the building, securing or filtering outside air supply intakes, moving personnel away from exterior walls, locating utility systems in a hardened structure, etc. Most corporations have reviewed and upgraded their surveillance and security systems not only to enter the building but also to come onto the property.

As a consultant, we have had the opportunity to visit many different buildings over the past months and have been amazed at the different ways companies have responded to the potential

risk and also the state of flux of their security arrangements. Some clients have changed their security protocol monthly as they respond to the need for heightened security. In most cases the level of security seems consistent with the business risk, but there are also cases where it does not or is non-existent. We have seen only a few upgrades that address the physical security issues. We assume that these take more planning and will be implemented in the future.

Along with the security upgrades and hardening of a facility's physical security, owners are beginning to review their utility infrastructures to insure that their buildings can continue to operate if there is a disruption to a utility system. As there is a possibility of a building being targeted, there is a growing concern that a utility system may be targeted - water supply, power generation system, communications systems, etc.

Utility system hardening should be part of any overall review of a facility's capabilities to withstand a possible attack.

Distributed Generation

There has been a lot of talk about Distributed Generation (DG) over the past few years but we have seen few installations that are resident at mission critical facilities.

While most mission critical facilities have emergency generators, we do not consider these to meet the requirement of distributed generation as they usually cannot be run at any time due to the operating constraints of their environmental operating permits. We consider a distributed generation system to be one that is continuously on-line and operating in parallel with the utility supply. In order for it to serve a mission critical facility it must also be capable of operating in an "island" mode when there is a problem with the utility supply.

The first requirement in the design of mission critical facilities is to provide highly reliable systems that will provide true "7x24xForever" operation. As this is not the basis of design for a distributed generation facility, it must be hardened to provide the redundancy and maintainability necessary for mission critical facilities. This is very costly as it requires a minimum of N+1

equipment. In addition to the cost of the basic installation, the facility maintenance personnel must also take on the added responsibility of operating and maintaining the DG system in addition to the mission critical equipment. This fact alone has discouraged many owners from pursuing DG. Many of the vendors that provide the "normal" mission critical equipment and associated maintenance are not the same vendors of distributed generation equipment; thereby adding installation and maintenance complexity.

The main types of distributed generation systems that have potential application in mission critical facilities include the following:

- * Micro-Turbines
- * Solar
- * Fuel Cells
- * Gas Driven Engine & Turbine Combined Cycle

While all of the above systems are proven technologies, they all have problems that preclude their present application in a mission critical facility.

MICRO-TURBINES are available in sizes under 100 kW. At this size, a moderate facility requires numerous units. The cost to provide redundancy is not that excessive but the system is very complex due to the number of units.

As the size of the units increase they should become more viable for mission critical applications.

SOLAR systems have had a significant reduction in cost but are still very expensive. These systems are not very prevalent so installation expertise and serviceability are not readily available. We predict they will not become a viable distributed generation option in the near future.

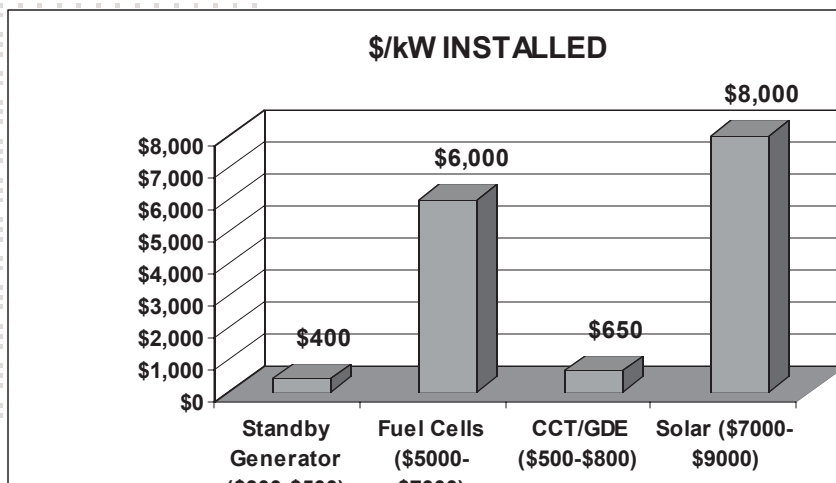
FUEL CELLS are one of the more promising technologies. At this time they are very expensive, especially for application in mission critical facilities where redundancy is required. The one commercially available unit, which has hundreds of units installed, is rated only 200 kW. In a large facility numerous units will be required. An inherent design deficiency is their inability to provide high levels of current during a fault, which is necessary to clear a breaker or fuse. This problem can be dealt with in the system design but adds to the overall cost. The development work that is presently being done to provide a fuel cell to the automotive market should result in a significant reduction in the cost of the system, which may make it a viable distributed generation alternative.

COMBINED CYCLE TURBINES & GAS DRIVEN ENGINE (CCT/GDE)

systems comprise a prime mover, electric generator and a heat recovery system to increase the overall efficiency of the system. The heat recovery can power a steam turbine driving another electrical generator or chiller, or other heat/steam driven equipment (absorption chiller, building heating, etc.). These are essentially the same systems that power large utility power generation plants. These systems can be scaled to make smaller systems more appropriate for stand

overall cost of the normal hardened systems.

The main problem with all these technologies is their cost as compared to the basic emergency generator. The following table shows a comparison of the installed cost of these systems as compared to a standby generator. Keep in mind that this cost comparison is based on N+0 systems, which would have to be substantially hardened to provide the redundancy necessary in mission critical N+N systems.



alone facilities. This technology requires an operating staff that is well versed in power plant operations. Depending on the size of the equipment and state regulation, it may require licensed operating engineers. At this time it is the most viable system for application in a mission critical facility, but its cost including the redundancy component adds significantly to the

The present economic conditions and the collapse of the dot.com industry have greatly reduced the interest and need of DG. As these conditions improve there will be increased government, regulatory and utility financial incentives for installing DG. This is an area that should be watched carefully in the future.

Interesting Facts

September 11, 2001, highlighted that Contingency and Disaster Recovery Plans did not adequately address personnel and organizational issues.

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The main problem facing hardened mission critical facilities is the substantial increase in load per square foot and providing a sufficient number of breakers to meet the requirements of dual power cord equipment.

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More Owners are hardening their LAN Rooms and are including true dual power cord capabilities (N+N).

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