SURVEILLANCE REQUIREMENTS (Continued)

the auto-connected emergency loads through the load sequencing system and operate for ≥ 5 minutes while the generator is loaded with the emergency loads.

c) Verifying that on the safety injection actuation signal, all diesel generator trips, except engine overspeed and generator differential, are automatically bypassed.

4. Verifying the diesel generator set operates for ≥ 60 minutes while loaded to ≥ 3500 kw.

5. Verifying that the auto-connected loads to each diesel generator set do not exceed the 2000 hour rating of 3730 kw.

6. Verifying that the automatic sequence timers are OPERABLE with the interval between each load block within ± 1 second of its design interval.

d. At least once per 18 months by verifying that each fuel transfer pump transfers fuel from each fuel storage tank to the engine mounted fuel tanks on each diesel via the installed cross connection lines.

4.8.1.1.3 The Class 1E underground cable sytem shall be demonstrated OPERABLE:

a. Within 30 days after the movement of any loads in excess of 80% of the ground surface design basis load over the cable ducts by pulling a mandrel with a diameter of at least 80% of the duct's inside diameter through a duct exposed to the maximum loading (duct nearest the ground's surface) and verifying that the duct has not been damaged.

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On 31 March 1982 representatives of Florida Power & Light (FPL) and two cable manufacturers met with the ACRS Subcommittee on AC/DC Power Systems Reliability. The purpose of the meeting was to provide the ACRS subcommittee with FPL and industry experience with direct buried cable installations. The Class 1E underground system at St. Lucie Unit 1 is a direct buried installation.

The purpose of the ACRS subcommittee discussion was to determine whether, in light of existing data, a Tech Spec similar to the St. Lucie Unit 1 in situ cable performance monitoring specification (#4.8.1.1.3.b & .c) is necessary for the direct buried cable installation at St. Lucie. The consensus of the subcommittee was that in situ cable performance monitoring was not required. Accordingly we request that existing St. Lucie Unit 1 specifications #4.8.1.1.3.b & .c be deleted. The technical basis is provided below.

The St. Lucie Tech Spec was provided as a measure to monitor the electrical properties of cables in the Class 1E underground system until such time that the qualification of the cables for their ambient service condition could be demonstrated. The requisite qualification has now been demonstrated.

The underground Class 1E system is installed above the normal water table, thus the predominant service condition is dry. However since the system is not designed to preclude the entry of water, water may enter the system during, for example, periods of heavy rainfall. High temperature and radiation are not associated with the Class 1E underground system. Accordingly the only environmental service factor that is a design consideration is water. The cables may operate in a dry, or a wet, or an alternately wet and dry environment.

Water is not an unusual or unique cable design consideration. Designing to accommodate wet environmental conditions is commonplace, as is the use of direct buried cable installations. Cables have been installed and have successfully operated under rivers and in submarine service as early as the 1880's - - - there is considerable industry experience with designing cables to accommodate wet conditions.

The qualification of the St. Lucie Unit 1 cables for the service conditions of wet, or dry, or alternately wet and dry is a two fold process, namely,

- o Cables operating for many years under similar operating conditions to those at St. Lucie Unit 1 are shown to maintain their electrical properties in the in situ environment.

- o Cable insulations utilized at St. Lucie 1 are shown by accelerated laboratory testing to exhibit a superior ability to accommodate the service environment than the insulations that have actually demonstrated in situ their ability to accommodate the wet, or dry, or alternately wet and dry service environment.

Each cable manufacturer supplying cable for the underground Class 1E system must independently test the cable insulation system to confirm their cables resistance to electrical deterioration. Representative cable manufacturer's test data has been provided to the NRC Staff in Appendix 3A to the St. Lucie Unit 1 FSAR, and as an attachment to FPL's St. Lucie Unit 2 letter L-81-348 dated 11 August 1981.

It should also be noted that the in situ cable tested at St. Lucie Unit 1 pursuant to Tech Spec 4.8.1.1.3.b & .c has shown no electrical deterioration of the cable. The results of the Unit 1 in situ test program are provided infra.

The qualification of the underground cables at St. Lucie Unit 1 can best be built on the relationship between long-term field data and accelerated laboratory studies. We feel that this is a very reliable way to predict cable life by building on actual service experience of similar materials.

As the most representative of the type of cable being used at St. Lucie (but having a long service record) are the butyl rubber insulated cables in the duct and manhole system of Miami Beach. The environmental conditions such as heat, decaying vegetation, torrential rains, hurricanes and ocean tidal action at Miami Beach are worse than the conditions at St. Lucie. Much of the Miami Beach cable system operates continually submerged. Another segment is at the tide line and hence is wet twice a day, while the rest of the system is subjected to only occasional flooding from rain or sea water. No attempt is made to control the water in this system except when crews are working on the system.

Data from the Miami Beach system shows that the service experience on these rubber insulated cables installed beginning in the 1940's has been excellent. We have reviewed FPL cable failure records and interviewed the supervisors, splicers and engineers in that district and have found that there has never been an electrical deterioration failure of any kind on these cables or the splices associated with them. These cables operate in all degrees of wet, dry and alternately wet and dry, as well as, in both sea and fresh water situations without problems. This vast FPL *in situ* experience has qualified butyl insulation for a wet, or dry, or alternately wet and dry environment.

New, improved insulating materials have taken the place of butyl for such applications, e.g., crosslinked polyethylene and ethylene propylene (EPR). The need then is to show how these materials will perform in an environment similar to Miami Beach.

Accelerated tests allow one to compare one material with other materials. One typical example of such a test is illustrated by Figure 1. This has

been developed by one of the suppliers of the St. Lucie Unit 1 cables.

Note that the cable samples are short and have very small conductors. The thin walls of insulation magnify the effects of moisture. The 90°C water is another accelerator. Power factor is a term used by cable engineers to describe the amount of electrical leakage through a cable insulation. The crosslinked polyethylene has the lowest and most stable value. From this, and large quantities of similar evaluations, crosslinked polyethylene is rated as a superior cable insulation for use in a wet environment. The EPR is also stable and has other properties that make it very acceptable. It must be noted that this is a very severe laboratory test since butyl has proven to be completely satisfactory in actual service, but "failed" this test in a short time.

The point to be made by the accelerated testing is that the cable insulations FPL has specified, purchased and installed at St. Lucie Unit 1 are among the best that are obtainable anywhere in the world for electrical stability under wet, or dry, or alternately wet and dry conditions. From the standpoint of a cable engineer, these cables are positively qualified for the environment of St. Lucie and can be expected to perform as designated for the service life of the plant.

FPL has been conducting insulation resistance (meggar) and high voltage dc tests at St. Lucie Unit 1 since 1978. The cables have tested and worked perfectly. We reviewed the test data and saw a rather wide range of leakage current during the dc tests of the 5 kV cables. They have varied from 0.0 to 17 microamperes over the 4 year period. On March 25, 1982, circuit 887 that had the 17 microamp reading in 1981 was retested. Careful cleaning of the porcelains yielded a new net leakage was 0.15 microamps after 10 minutes demonstrating that the leakage was due to dirty connections and not due to deterioration of the electrical insulation. The test levels of all cables are 3 to 10,000 times better than the required level.

We believe that the FPL Miami Beach experience coupled with the cable manufacturer's laboratory testing qualifies the St. Lucie cable for a wet, or dry, or alternately wet and dry environment. Thus Technical Specifications 4.8.1.1.3.b & .c are no longer necessary and should be deleted.

ELECTRICAL STABILITY IN 90C WATER
14 AWG WIRE, 0.047" WALL

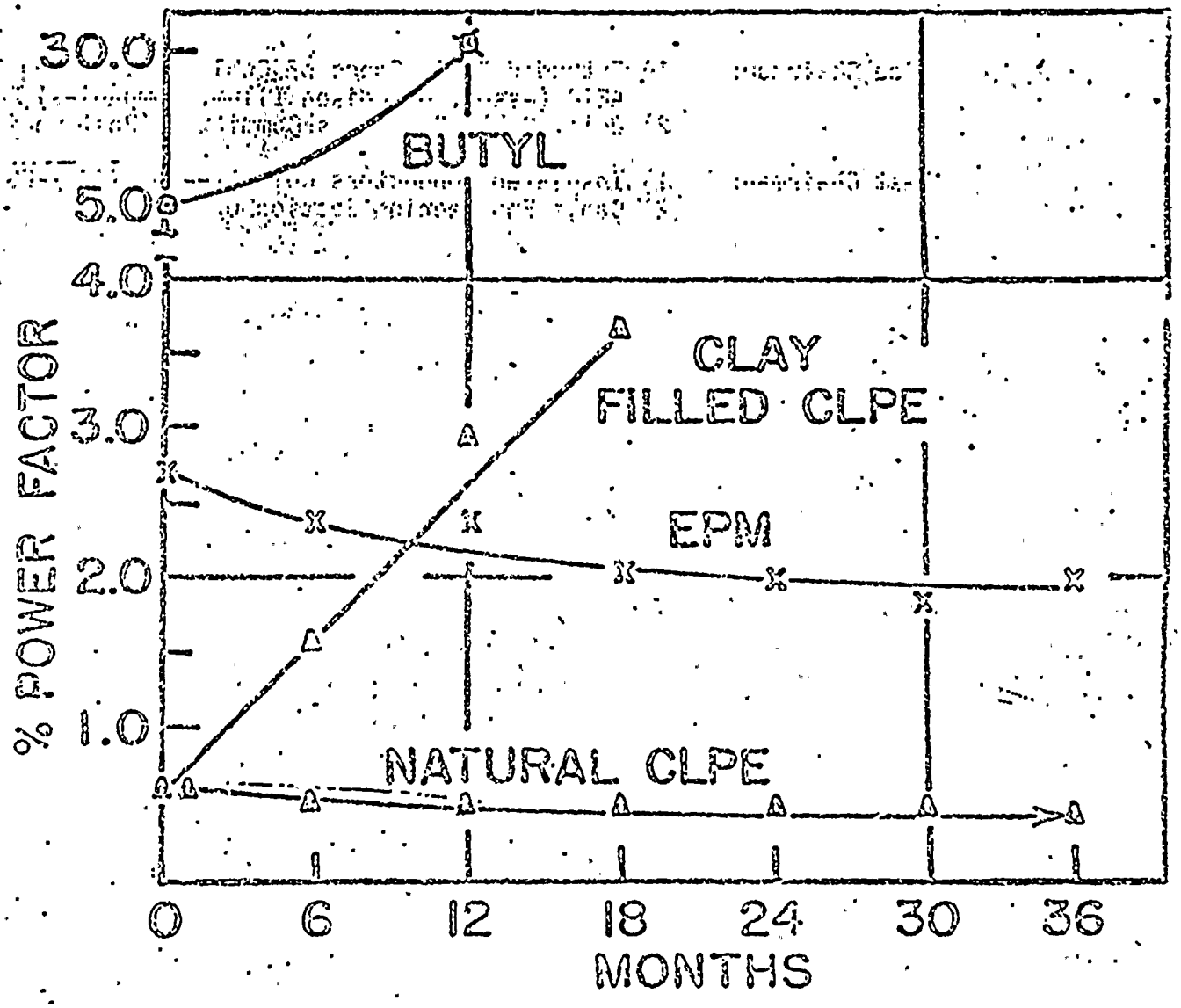

FIGURE 1

6/23/82

STATE OF FLORIDA)
) ss.
COUNTY OF DADE)

E. A. Adomat, being first duly sworn, deposes and says:

That he is Executive Vice President of Florida Power & Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this said document are true and correct to the best of his knowledge, information, and belief, and that he is authorized to execute the document on behalf of said

E. A. Adomat

Subscribed and sworn to before me this

_____ day of _____, 19____

_____
NOTARY PUBLIC, in and for the County of Dade, State of Florida

My commission expires: _____