Rv. 3

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

April 9, 1974

Docket Nos. 50-424
50-425
50-426
50-427

APPLICANT: Georgia Power Company

FACILITY: Alvin W. Vogtle Nuclear Plant

SUMMARY OF MEETING TO DISCUSS DESIGN OF REACTOR CAVITY

A meeting was held in Bethesda, on April 5, 1974, at the request of the applicant to discuss the design of the reactor cavity for the Vogtle plant. Attendees at the meeting are listed in the enclosure. A summary of the meeting is presented below.

The applicant reported that the reactor cavity for the Vogtle plant was in process of being redesigned. The redesign was necessitated in order to meet the various design criteria that have been imposed by the staff - specifically, meeting the stress limits of Appendix F of Section III of the ASME Code while having also to meet the conservatisms inherent with the 40% margin on calculated pressure, the 50% margin on allowable stress and the nodal approach to the pressure analysis. The applicant stated that with these conservatisms applied, the previous design was not adequate and would not meet Code stress limits.

The objectives of the new design are to open up the vent areas around the reactor nozzles to the steam generator compartments while restricting the vent areas to the reactor cavity. Spider supports are being designed to support the coolant pipes inside the shield wall. The maximum break area of the cooling pipes will be restricted to not more than one square foot. The applicant presented preliminary drawings showing revised design.

With the new design, preliminary calculations indicate that all of our criteria will be met and use of the Westinghouse version of Appendix F criteria contained in RESAR-3 (Table 5.2-8) will not be necessary. The applicant stated the intent to fully meet our criteria. The applicant will provide documentation of the revised design with details of the calculations by about May 15, 1974.

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On the basis of the preliminary information presented by the applicant, the staff agreed that we could go ahead with the meeting with the Advisory Committee in Reactor Safeguards on April 12, 1974. Final evaluation of reactor cavity design will have to be accomplished after the May 15 submittal.

L. P. Crocker, Senior Project Manager
Light Water Reactors Branch 2-2
Directorate of Licensing

Enclosure:
List of Attendees

ATTENDANCE LIST

VOFTEL MEETING

APRIL 5, 1974

AEC
R. R. Maccary
G. C. Lainas
R. Gido
L. P. Crocker
K. Kniel
R. J. Bosnak
J. P. Knight
R. W. Klecker

SSI
Ozen Batum
F. E. Ehrensperger
R. F. Miller

Bechtel
John D. Durrin
C. S. Welty
T. Wineteer
C. Christian
William Wu
B. Koucharian
M. R. Thakar

Georgia Power
W. H. Ollinger

Westinghouse
H. Cofer
L. Vota
T. Campbell
W. Gangloff
R. Hull

Faxed from [illegible] on 1/23/87

QUALITY ASSURANCE CASE STUDY REPORT
Georgia Power Company Plant Vogtle
Waynesboro, Georgia

I. Statistical Data

Georgia Power Company's Plant, Alvin W. Vogtle, is currently under construction (about 36% complete) on the Savannah River about 35 miles from Augusta, Georgia. Vogtle is a dual reactor plant (two Westinghouse PWRs) each having a design capacity of 1160 MW electrical. Engineering work was started in December 1971 and the Construction Permit was issued by NRC in June 1974. The utility suspended construction activity in September 1974, apparently due to financing problems. The project was reactivated in July 1976 and the first permanent concrete was placed in August 1978. The original planning for the project included the installation of four reactors. However, this was changed in 1974 to the current plans for two units.

The Georgia Power Company is one of five subsidiaries of the Southern Company. The others are: Alabama Power Company, Mississippi Power Company, Gulf Power Company, and Southern Company Services. Engineering licensing and cost/schedule support for Plant Vogtle is provided by Southern Company Services.

The A-E for design of Plant Vogtle is Bechtel which has subcontracted the NSSS design to Westinghouse. Other major contractors include:

Westinghouse - NSSS supplier
General Electric - turbine-generator sets
NISCO, Inc. - NSSS installation
Walsh Construction Company - civil
Cleveland Electrical Contractors - electrical
Pullman Power Products - mechanical (piping)
Pullman Construction Ind/Kenith Fortson Company - HVAC
Ingalls Iron Works - rigging and non-Q steel
Research Cottrell, Inc. - cooling towers
Fundamental Materials, Inc. - concrete
Chicago Bridge and Iron -
Williams Contracting - coatings

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On December 2 and 3, 1982, team members Willard Altman, NRC, and Miles Patrick, Battelle, visited the Georgia Power Company's corporate offices and NRC's Region II office in Atlanta, Georgia. Discussions were held with V. Brownlee, NRC Region II Section Chief for Vogtle, and J. Lennehan, NRC Inspector. The following Georgia Power Company representatives were contacted:

J. H. Miller - President
R. J. Kelly - Executive Vice-president - Power Supply
R. E. Conway - Senior Vice-president - Engineering, Construction and Projects
D. E. Dutton - Vice-president - Generating Plant Projects
D. O. Foster - Vice-President and General Manager (Vogtle)
P. D. Rice - General Manager QA and Rad Safety and Health
C. Hayes - QA Manager - Vogtle
O. Batum - Manager Project Engineering and Licensing - Vogtle
M. Manry - Plant Manager - Vogtle Operations
R. Staffa - Manager - QA
J. A. Bailey - SCS/Licensing Manager
E. Turner - Assistant to Vogtle General Manager

The entire team visited the Plant Vogtle construction site 12/6/82 through 12/10/82, and had meetings together with the following:

NRC

W. Sanders - NRC Resident Inspector
V. Brownlee - NRC Region II Office

Georgia Power

D. O. Foster - Vice-president and General Manager (Vogtle)
R. Kelly - Executive Vice-president - Power Supply
J. Dorough - Manager Administration and Warehousing
J. Boddie - Site Document Control Supervisor
E. Groover - Site QA Supervisor
R. McManus - Manager QC
T. Weatherspoon - Assistant Manager QC
M. Googe - Assistant Project Manager - Construction
W. Evans - Mechanical Project Supervisor
W. Rountree - Superintendent of Field Coordination

Bechtel

J. McLaughlin - Site Manager

The subteam for construction, Harley Kirschenmann and Miles Patrick, interviewed the following persons:

W. Evans - GPC Mechanical Project Section Supervisor
M. Googe - GPC Assistant Construction Project Manager
W. Rountree - GPC Superintendent of Field Coordination
J. Stanley - GPC Supervisor of Area Coordinators
J. Beasley - GPC Supervisor of Area Coordinators
D. Sikes - GPC Supervisor in Construction Coordination
H. Richards - GPC Construction Coordinator
H. Miller - Cleveland Consolidated - Welding Coordinator
P. Mills - Cleveland Consolidated Training
T. Weatherspoon - GPC Assistant Manager, QC
R. Osborne - GPC Supervisor, QC, Mechanical
P. Runyon - Pullman Products, Manager QA/QC
T. Griffin - Pullman Products - Site Manager
D. Winburn - Pullman Products - Assistant General Superintendent
K. Weiss - Pullman Products - Assistant General Superintendent

II. Summary of Findings

(Nothing to add to those expressed in the exit interview by W. Altman)

III. Description of QA Program

(This is expected to be provided by another subteam)

IV. Description of QA Problems

The ones identified were:

1. Onsite materials receiving inspection procedures need strengthening.
2. Process data sheets for field work could be used more extensively, similar to current practices for piping work.
3. A specific Quality Engineering function should be established to strengthen QC procedures.

V. Analysis of Problems/Successes

(At a loss for what to include here)

VI. Description and Analysis of Remedial Action

(None identified except for a couple of detail items included in Section VII)

VII. Conclusions Relative to the Utility

A. General Management

The executive levels of management in the corporate offices of Georgia Power Company evidenced a very good understanding of the significance and ramifications of building and operating a nuclear power plant. This is probably due, in large part, to their experience with the Hatch plant where the first reactor came on-line in 1975. There was no indication of a "fossil mentality".

General management seems to be very much aware of the importance of complying with NRC requirements. However, the comment was made, "Satisfy the NRC and everything is O.K., is not true, you have to satisfy yourself." There is recognition that the utility is at risk and nothing else represents as great a potential corporate financial risk as does a nuclear plant. The evidence of this is GPU and the TMI-2 incident.

There was considerable evidence of a top management commitment to quality. Further, there were indications of activities to directly address bringing about improvement. Some of the comments that indicate this were:

- "There is a lot of talk about quality in nuclear construction, some think there is a need for more of the same thing that isn't working."
- "Maybe the industry and NRC need to back off and look, maybe QA wasn't put in place right the first time."
- "We don't want just more of the same, what can we do that is innovative?"
- "Are we looking to see if we are doing what we said we would do, or at what is right?"
- "We are going to reevaluate how we look at the QA organization and the growth potential for the people in it, also QC."

B. Project Management

The "construction" subteam did not probe the tools and techniques used in managing the Vogtle Project. However, there are three points in this area that are considered significant:

1. The utility, Georgia Power Company, is really managing the overall project directly, including construction.

2. The matrix organization includes people in key positions from Southern Company Services, Bechtel, and Westinghouse.

3. A project management board, made up of corporate level executives from several companies, plays an active role.

With respect to point one above, the extent of control exercised by GPC, particularly at the construction site, was impressive. The major construction contractors, except for Chicago Bridge and Iron and Research Cottrell, Inc. (cooling towers) are on a cost-reimbursable basis. The two exceptions are firm-fixed price, for specialty items. All materials and equipment used at the site are provided by GPC and GPC controls the staffing levels of all except the fixed-price contractors.

Near-term work schedules are developed in concert with the construction contractors but are controlled by GPC. These include daily, weekly, 6-week, and 3-month plans. Both QA and QC functions are provided by GPC for work done in electrical, civil, concrete, and miscellaneous steel work. Surveillance of contractor QA and QC is by GPC on the other work including piping and HVAC.

Longer term scheduling and budgeting is done by GPC. These items were rebaselined in September 1981. Zero based budgeting is utilized in developing the annual budgets used for project control. The project general manager reported the project is on budget for the year and about two months ahead of schedule, however, the progress curve has flattened somewhat in the last two months.

The NRC Region II Office staff commented that the high level of control by GPC, especially their extensive effort in doing their own QC, was a real plus factor.

With respect to point two above, the matrix organization, this feature applies primarily in the engineering and plant operations areas. The manager, project engineering and licensing, is employed by Southern Company Services and his home base is in Birmingham, Alabama. However, he has an office in Atlanta and takes his functional direction from the GPC project general manager. Apparently to strengthen this relationship the project general manager is employed by both GPC and SCS.

The licensing manager - SCS, and the project engineering manager - Bechtel, both functionally report to the manager project engineering and licensing - SCS. The Westinghouse project manager and the SCS project engineering manager both report functionally to the Bechtel project engineering manager.

The Vogtle plant manager reports functionally to the Vogtle project general manager, and administratively to GPC's vice-president for nuclear generation. The plant manager is assigned technical input/coordination responsibilities for GPC with respect to Bechtel's startup engineer, the Westinghouse project manager, and the Westinghouse lead engineer. It was apparent that through these channels the Vogtle plant operations organization plays an active role in design review and cognizance.

As indicated in point three above, GPC has elected to establish a high-level overview committee for the Vogtle Project. This is known as the project management board which is chaired by the GPC chief executive officer. The other board members are:

President, GPC
Executive Vice-president, Finance, GPC
Executive Vice-president, Power Supply, GPC
Senior Vice-president, Engineering, Construction, and Project Management, GPC
Senior Vice-president, Power Generation, GPC
President, SCS
Executive Vice-president, SCS
Vice-president, Project Management, GPC and SCS
General Manager, Oglethorpe Power Corporations
General Manager, Municipal Electric Authority of Georgia
Vice-president, Water Reactor Division, Westinghouse
Senior Vice-president, Administrative Services/Secretary of Board, GPC

It appears that the project management board is viewed essentially as a separate board of directors relative to the Vogtle Project. The board is obviously composed of those who can make major decisions and commitments of their respective organizations. Further, it provides a forum for executive-level communications between key organizations.

The project management board meets monthly. Several of the GPC management cadre emphasized the good attendance of board members at these meetings and their active participation in them. We must observe, however, that in a separate meeting we attended in Atlanta which included five GPC vice-presidents and the company president, the latter did all of the talking.

There was no indication that this board constitutes a "management by committee" situation. This may be because its involvement is limited (a monthly meeting) and/or the strength exhibited by the president of GPC.

C. Training

The extent of training programs relative to the Vogtle Project was impressive. The various programs that were identified can be categorized as: GPC's QC training, construction crafts training, and plant operations training.

All of the QC inspectors, GPC, have received at least one week of formal training conducted both onsite and offsite. The superintendent of field coordination has also required his entire staff attend the QC training program.

Craft training programs are conducted by the construction contractors. In addition to a half-day orientation to the Vogtle Project this has included specific classes in concrete placement and vibration, pipe weld preparation grinding, cad welding, the electrical specification requirements, and the storage and handling of materials.

The plant operations staff training program was particularly impressive. GPC has installed a complete control room simulator at the site and plans to train the station engineering staff as well as the control room operators on the simulator. Also, GPC

has established agreements with other utilities so that some GPC staff are assigned to an operating nuclear power plant for a period of 12 to 18 months.

D. Organizational Structure

The organizational structure seems complex considering the matrix features discussed under "B. Project Management." Further, the Vogtle project general manager, the highest ranking individual totally dedicated to the project, is a GPC vice-president, but is at the fifth level below the president.

GPC uses its own, unique titles for various positions which made it difficult to understand the structure from a functional standpoint. For example, the onsite manager for GPC is called "construction project manager," yet he is considered by the corporate office to be responsible for everything at the site.

The person entitled "manager, project engineering and licensing" focuses heavily on engineering design and analysis. Onsite field engineering, except for Bechtel and Westinghouse, does not report to him. The onsite field or project engineering functions generally fall under the heading of "project section supervision". The superintendent of field coordination views his function as the intermediary between engineering and field construction. However, at least one construction contractor views his official contact with GPC as the project section supervisor and the field coordinators as expeditors for materials and tools plus an arbitrator in relations with other contractors. The construction contractor's view is felt to be more accurate.

The QA and QC components are totally separated from each other and for GPC this seems to work well. However, GPC may consider some modification of this arrangement.

E. Contracting and Procurement

This function is managed from Atlanta. One of the significant practices at Vogtle is the minimal use of firm-fixed price construction contracts, as discussed earlier. Another significant practice is that

GPC provides all materials and equipment at the site. As a couple of people expressed it, "All the construction contractors bring to the site is their bodies and their expertise."

Source inspection in vendor's plants is provided through project engineering by Bechtel and/or SCS people. Receiving inspection at the site is provided by GPC's QC organization. The area of receiving inspection is one that could be strengthened. It appears currently to consist primarily of looking for shipment damage.

F. Design

The contractual arrangements and the organizational structure of the project design efforts were briefly discussed in sections VII. B and D, above. In summary, Bechtel has overall plant A-E responsibilities, Westinghouse is responsible for NSSS design, and SCS has design of certain ancillary facilities.

We were informed by the manager, project engineering and licensing, that it is planned to transfer the responsibility for the design of all Class I (safety-related) piping from Bechtel to Westinghouse. As a part of this change, the piping design group of about 40 will be relocated to the construction site along with a mobile computer unit. This change is scheduled for January 1983.

An audit of the design was done by INPO early in 1982. As a result of the findings of this audit, self-evaluation, design review teams were established to conduct a more extensive review. This is estimated to require over 15,000 man-hours of effort. The review teams are led by representatives from Bechtel groups that were not involved in the original design. The teams include GPC or SCS representatives also.

Basically two audits are in progress, one focuses on design procedures-related topics. The other one addresses the design calculations from the standpoint of methods used and input values, essentially everything except repeating the actual calculations.

It was reported that the design criteria and the resulting designs are reviewed by GPC operations, QA and engineering, SCS. It was also indicated that field and shop prepared fabrication drawings were, earlier on, not reviewed by engineering but they now are.

The piping isometric drawings are revised at the construction site by the mechanical contractor, Pullman Products. This is represented as a drafting service to incorporate approved changes and reflect as-built status. Bechtel approves these drawings after the contractor revises them.

A very large number of Field Change Requests are reportedly being generated at the construction site, identified as 1389 from 10/1/82 to 11/17/82. Apparently a large proportion of these are from the mechanical contractor, Pullman Power. The site manager for this contractor indicated that they are starting an effort to analyze these. Both he and the Pullman QA/QC manager indicated that they feel most of the FCRs are resulting from location or dimensional interferences between the electrical, structural, and mechanical features. If this should be confirmed it would indicate that a more thorough job could be done in checking these designs on paper and reduce the number of field modifications required. Such modifications can tend to increase the difficulty in maintaining high quality standards. Since each of these FCRs has to be approved by Bechtel, the large number can also be considered an indicator of tight engineering control over field changes, i.e., the contractor does not proceed with corrections unilaterally.

It was reported by the Vogtle plant manager for power generation (operations) that his staff has not only reviewed the design extensively for operability and maintainability, but has made significant inputs to key parts of the design, such as the control room, as it was developed.

G. Construction

The basic contractual arrangements and procurement practices were discussed in earlier sections and are not repeated here. These arrangements have been carefully structured so that there is no doubt that the Georgia Power Company is fully in charge and is, in fact, truly managing the work at the construction site. The GPC employees interviewed were very conscious of this situation and repeatedly expressed the conviction that GPC top management really want the plant built right the first time around. There were repeated indications of strong feelings of pride in both the corporations and Plant Vogtle.

As expressed by one person, "We want Vogtle to be the 'showplace of the South'".

The experience levels of the GPC staff and contractor managers varied considerably. Many of those in key positions with GPC have less experience than one would expect to find. However, many of them have been with GPC for 8 to 10 years and have worked at Hatch before going to Plant Vogtle. It is apparent that Plant Hatch has provided both the corporation and many of its people with valuable nuclear plant experience.

In the construction coordination group it is significant that about half of the staff had experience in QC inspection.

On balance, the experience levels, although marginal, particularly in GPC key management positions, is not necessarily a problem.

Prior experience in nuclear plant construction was evident in Cleveland Electric and Pullman Products, again at Plant Hatch, but also at other nuclear sites, i.e., Diablo Canyon and TVA. General construction experience was also evident.

An unusual shift work arrangement is used at Plant Vogtle. The project is manned nearly 24 hours per day, seven days per week, with four nonrotating shifts as follows:

A shift - four 10-hour days, Monday through Thursday
B shift - four 10-hour nights, Monday through Thursday
C shift - three 12-hour days, Friday through Sunday
D shift - three 12-hour nights, Friday through Sunday

There are problems with conflicts between shifts, but GPC considers the benefits worth the additional problems. Three of the benefits are:

1. More workers can be utilized to improve the schedule. Current total job-site work force is 7,700.

2. Somewhat better ambient temperature conditions for concrete placement. During the summer months most concrete is placed on the B (night) shift. In the cooler weather (fall, winter, spring) most of the concrete is placed on A (day) shift.

3. A larger pool of skilled crafts is available. With the shutdown of TVA plants under construction, a number of craftsmen have come to Vogtle. This is, in part, because they can work C and D shifts and have the other four days each week with their families in Tennessee.

One of the reasons this shift arrangement is workable is that GPC has negotiated special job-site agreements with the Craft Union locals. Additional information about these agreements was obtained from the Vogtle project manager by telephone on January 4, 1983.

The construction contractors also have contracts with the unions, but they are primarily the hourly rates. All parties have agreed to accept the separate agreements between the unions and GPC which include the following points:

- Shift work includes some shift differential.
- Each shift is paid straight time hourly rate for a specific number of hours in lieu of conventional overtime. For example, C and D shifts are paid 50 hours per week for 36 hours worked, including three lunch breaks.
- There are no formal, scheduled coffee breaks.
- In the event of a walkout by one craft there is no picketing, hence other crafts continue to work.
- GPC uses selective bid lists for onsite contractors, however, open shop contractors are permissible providing they abide by the special GPC/unions agreements.
- GPC takes an active part in negotiations between the unions and the construction contractors.

It was reported to us that at one time there was a problem with rock pockets in the surface of thin concrete walls (12 in. thick). This problem was resolved by reducing the pour lifts from 12 ft to 6 ft and increasing the attention given to vibrator techniques. Some consideration is now being given to returning to the higher lifts.

Apparently one reason for again using 12 ft lifts for thin walls is the practice of forming one side with plexiglass. This permits QC and construction forces to observe directly the placement and

vibration of the concrete. We were also informed that through-the-form vibration and inspection ports are used quite extensively.

During the plant walk-through one example of good, thorough QC inspection was observed. A "hold tag" had been placed on a spray ring pipe spool because center-punch marks near each end of the spool were considered too deep. The QC inspector had to have examined this approximately 30 feet long spool very closely to have found these small marks.

H. Testing and Startup

Planning and preparations for testing and startup is currently underway. These plans now include that component testing, except for hydrostatic testing, will be done by the plant operations forces. This includes, for example, all continuity and ground testing of electrical wiring and cabling. All preoperational testing will also be done by GPC's operations forces.

The first system turnover from construction to operations is currently scheduled for August 1984. This is expected to be the battery system.

Startup testing is planned to begin after fuel loading, scheduled in 1986 for Unit 1.

I. Maintenance

Planning for plant maintenance is underway and has included review of design and procurements for maintainability. This effort is under the plant engineering group in the operations organization, which currently has a staff of about 80 engineers at the site.

J. Operations

The total operations staff at the site is about 140 and is expected to increase to about 600 in 1985. In addition to the testing and startup and maintenance activities discussed above, this group is developing operational plans and procedures. Training, using the control room simulator is also in progress.

GPC plans to later transfer some of their current construction engineering staff into the plant operations organization. The utility will certainly benefit by retaining this detailed knowledge of the plant.

VIII. Conclusions Relative to NRC

The NRC has a resident inspector at Plant Vogtle and he is supplemented by periodic visits of an inspector from the Region II office.

In spite of several comments from GPC people that they want quality in the plant, it is apparent that satisfying the NRC is a dominating factor in their practices. The potential financial impact on the utility of a delay in obtaining the operating license and bringing the plant on-line is a recognized and understood factor. Further, Vogtle was recently "written up" for the third time in a year for improper protection of stored-in-place equipment and corporate management was reacting very forcefully.

Early in the construction the NRC inspector identified a problem due to rainwater erosion in the excavation for the plant. The utility initially disagreed that this was a problem, but subsequently agreed that it was potentially very serious and took corrective action. This is felt to be significant for two reasons:

1. It established early on that the NRC would be insistent about problems.
2. This was a real, physical problem identified by onsite NRC inspection rather than a procedural or records problem detected in a "paper" audit.

Other comments or observations by the NRC inspectors included:

- Consider Vogtle average except above average in doing their own QC
- Feel that QA and QC both good, and adequately staffed and trained
- Impressed with construction craft training programs at the site
- Feel that upper level management should be at the site more often
- Too many construction permits issued simultaneously, causing NRC inspection to be stretched too thin

IX. Additional Conclusions Relative to

(Nothing to add here)