1) Meeting with
B+R - Sept 17, 1979

Introductions:

Questions by B+R lawyer to Allison as to what we would be driving at - Ans - to determine design basis for the Control Panel Design - including considerations of design + training.

Discussion of the role of B+R as an A+E (per our background info) (while waiting for their lawyer to get "agreement with Rogovin re "ground rules" for this meeting)
The plant was changed from OC 2 to TMI 2.
The Units 1+2 at TMI are much different.
The intent was to make only those changes at TMI 2 to adapt to new site - not to optimize. but but built two more cooling towers. B+R are application engineers - they do not design equipment.

We have a temporary agreement - Transcript will be held in confidence (at first, at least) and sent to Mr Trowbridge.

Tech Memo 351 and Battelle Exhibit 9 made available to us to look at.

8001220798

We gave them our list of documents still needed from B+R. + Chuck on Thurs

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~~[illegible]~~

Cotitla gave us a list of people in his job, in chronological order (but without specific dates.

On the Record:

1) Discussion of who designed which Panels.

2) Any criteria by Ulitilles imposed - A - don't know? (over)

3) Any management reviews by B+R / A - No.

4) Did anyone make a detailed review of panel ~~re panel layout~~ in terms of panel operation.
A: yes but not a detailed review

5) Were alternative panel concepts taken into consideration - A: yes

6) What were they?, Separate bench board and vertical panel behind it? (as opposed to integral).

7) What were criteria for acceptance. ~~by~~
A: Client made decision.

8) Was the B+R design similar to other B+R panel?
A - I don't know - I suspect ~~they~~ ~~started~~ Cohan started from Square 1

in choice of hardware

9) What criteria were used for panel?
A. Ruggedness; miniturization; operator preference, Client preference.

10) Why was it OK for "one operator"?
A. I don't know - not in my area. The CR desk should two chairs. ~~we did~~ The actual number of operators was not our concern. Bottalls assumed Client would assign sufficient operators on panels

11) What documentation was B+K supposed to supply.
A. No specific requirement.

12) Did you examine for any personnel selection or training problems with CR. A-No.

13) What role did precedent play - Experience ?
A. We used conventional annunciators ~~Everyone~~ all designers (e.g. Bahan) know, it many years of experience to the job?
& also we had a computer. However, no feedback automation.
(By automation, Ken meant computer automation.

A- Initially, precedent played most important role in labelling. Then, client made changes during development also, industry standards re annunciator engraving, etc - Red + green lights in accordance with industry standards

14 Q Was panel design directed to minimize likelihood of human error?
A - yes -

15 Q, What steps did you take to ensure that A/ we standardized lights, locations of devices on panel boards - gathered annunciator functions - kept controls near indicators - put vertical panels which were concerned with a subject directly behind related console section - "most concern" control + readouts were more convenient to the operator.

16) Any failure mode + effects analyses -
A - yes, for plant + as a whole

Was FEMA of control room or B+R scope?
A - NO, However we evaluated consequences of error - also fire consideration - But

no formal facts FCMA

17) Q- Acceptance tests to assure that the as built panels were comprised to B+R specs

A. QA

18) Q Interpretation of alarm philosophy
A (Be more specific)

A. field contacts were normally closed-

Q) Sequence of events?

A If contact opened, alarm lite flashed- horn sounded- acknowledge silence horn- light to steady bright. Reset condx- lite would flash- then ack. (Return to normal.

Q Basis for frequency of annunciator flashes

(A) A. up to the mfgr? Also ISA-2A? for the seq. std
(annunciator sequence std).

Q Why was this annunciator selected?

A. Uniformity.

(A) See transcript for exact title of ISA std-

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19) Anthropometric Range
A ~ 5-8" ♂ 5-9"

20) Q: Convention for lights -
A Red for open valves, operating pumps, etc
Green for de-en ergy - closed valves
Also - they proposed a system where in
normal operation, white, (per Cont
iso) then other colors under normal
operation. (Apparently they did not go
with his suggestion). (The color
coding was still up in the air when
he left.

21) Q Basis for red + green
A Nema Std - Svc closed - power on, (Red) open valves
Green for opposite - (e.g. closed valves
ISA 5.2? Same.

22) Q were the Stds available in 1967-68
A Don't know

23) Q who selected ~~Pat~~ Panel Color?
A (perhaps) I did. I had a hand in it
It should not be the same as Unit
1 to avoid operator confusion as to
which unit he was in

24) Q Anyone look at Contrast?
A In a general way -

25) Did anyone look at readability of displays?
A yes

26) Did you ever try to duplicate the visual environment?
No.

27) Q) Bases for lighting level.
A) (Someone else did that). B+R selected indicating light intensity on bases of lighting level.
A. 160 Ft candles in CR.

28) Q Rules + conventions for labeling
A Used Back-Engraved ~~Etc~~ label (so as not to catch dust.

29) Q Any effort to duplicate readability (for lobby) cards
A No

30) Q Convention to group control + displays
A To group the control with displays

31) Q Arrangement by systems
yes (flow ~~diagram~~ of information)

32) Use graphic panels?

A: yes - in electrical (e.g feeders) systems. and also in some infrequently used systems. Also - for isolation valves.

33) Q Boxes:
A frequency of use - lack of familiarity of operator - convention.

~~A~~ 34) (We were informed of a document at this time - we should get a copy of it)

34) Q Consider any other display than mimic?
A - yes - Non mimic
Semi mimic (~~geo~~ non graphic)
Non ~~mimic~~ mimic

35) Q Conventions used for grouping annunciator windows
A Don't recall specifically - Believe that the alarms for a board would be ~~on~~ above that board (in general).

36) Q Did auditory alarm come with the Ann's
A: yes.

37) Q Any conventions for orienting switches e.g. convention for o (to open - to close & positions).
A. The electrical dept would do that I ~~ma~~ imposed no conventions

38) Q/ Any consideration for operator with breathing ~~a~~ apparatus
A/ No
Q/ Any thoughts of shutting down from outside CR
A yes - We provided the capability.

39) Q Any consideration of how much the operator must be able to recall?
A. No.

40) Q Any consideration of how much info he must process per unit time?
A No -

41) Q Consideration of maintainability
A yes.

42) Q Did you look at time opr had available to respond to failures of plant equipment? (
A. No - We should ask System designers

43) Q What AEC reg + Stds were used & industry
guide panel design
A. Reg Guides, Nema Stds,
IEEE 279 is one of them. R.G 1.97,
Guides on Seismic Qualification

~~44)~~

44) Q ~~How~~ How do you guarantee (readability) accessibility
of ~~the~~ redundant systems.
A) ~~Re~~ Separation is suffficient to
meet separation requirements.
Don't ~~know~~ know how redundant
stuff was grouped. ~~—~~ (Sep is in elec criteria)
in document they
referred us to.

45) Q Any walkthrough on a model
A ~~the~~ Mercury ~~Co~~ company was asked
to provide full scale photos

by B+R
46) Q Is operator performance (experience) monitored
A) Yes. This info is fed back into
B+R Stds.

47) Q Any attempts made to optimize
noise level in CR
A. No - (May be wrong answer -)

48) Q · Did B+R participate in prepare plant Operating Procedures.

A B+R was asked to draft a certain number of procedures. (B+R has a complete set on file).

49) Q Were walkthroughs used re operating procedures

A) I wasn't involved at that time.

50) Q Basis for assigning readouts to panels vs computer readouts.

A) Originally, panel was to have all info with computer was backup. Concept changed & when computer was primary for operation and panel board was the adjunct - e.g. temp monitors alarms become too many for panel board. In any event, the client purchased a separate computer for BOP functions.

51) Q) were any controls + displays for the protection of equipment - e.g. guarded switch.

A

52) Q was values of controlled equipment taken into consideration of controls + Displays?

A yes

53) Q How did B+R remain covered?
A Discussions with peers-

54) Q Can we get a copy of Bason's letter?
~~A~~ A. They will look for it
~~A A A~~ Make a separate request for it

55) Q re ~~the~~ changes made from original design, when ~~and~~ it became THTR
A) Some changes were made. Positions on panel were changed some

56) Q Is Cadan with B+R
A yes

57) 8) To what ~~extent~~ were CR operators involved in design?
A. Discussion.

58 Q Can one operator operate the plant
A I can't say

59) Q What are "obvious reasons" the simulator is valuable if plant is designed & the same
A. Useful for training

60) Q Are some slightly criteria applicable in TMI-1?
A I don't know

61) Q Communication Question
A I don't know - will have to defer to Electricals?

62) Discussion of control room size

63) Discussion of information - too much will saturate the operator.

64) Hypothetical Question by B&K lawyer Does prioritization change in different accidents? A: Yes. (But the question that was asked is very broad).

65) Q Any stds re the "10 minute rule".
A yes. Thought was given to it. No immediate action required

66) General Question - Any thing else he might want to say - to help us understand
Objection by lawyer - too broad - (the record.
Discussion -
Related -
A. No.

Q Do you have any recommendations on improving CR design
A. EPRI has some staff - also, I + he attended a new ISA committee meeting, & the committee is making recommendations re ISA stds vis a vis NUREG 2. e.g. more efficient interface relationship between operator + annunciators

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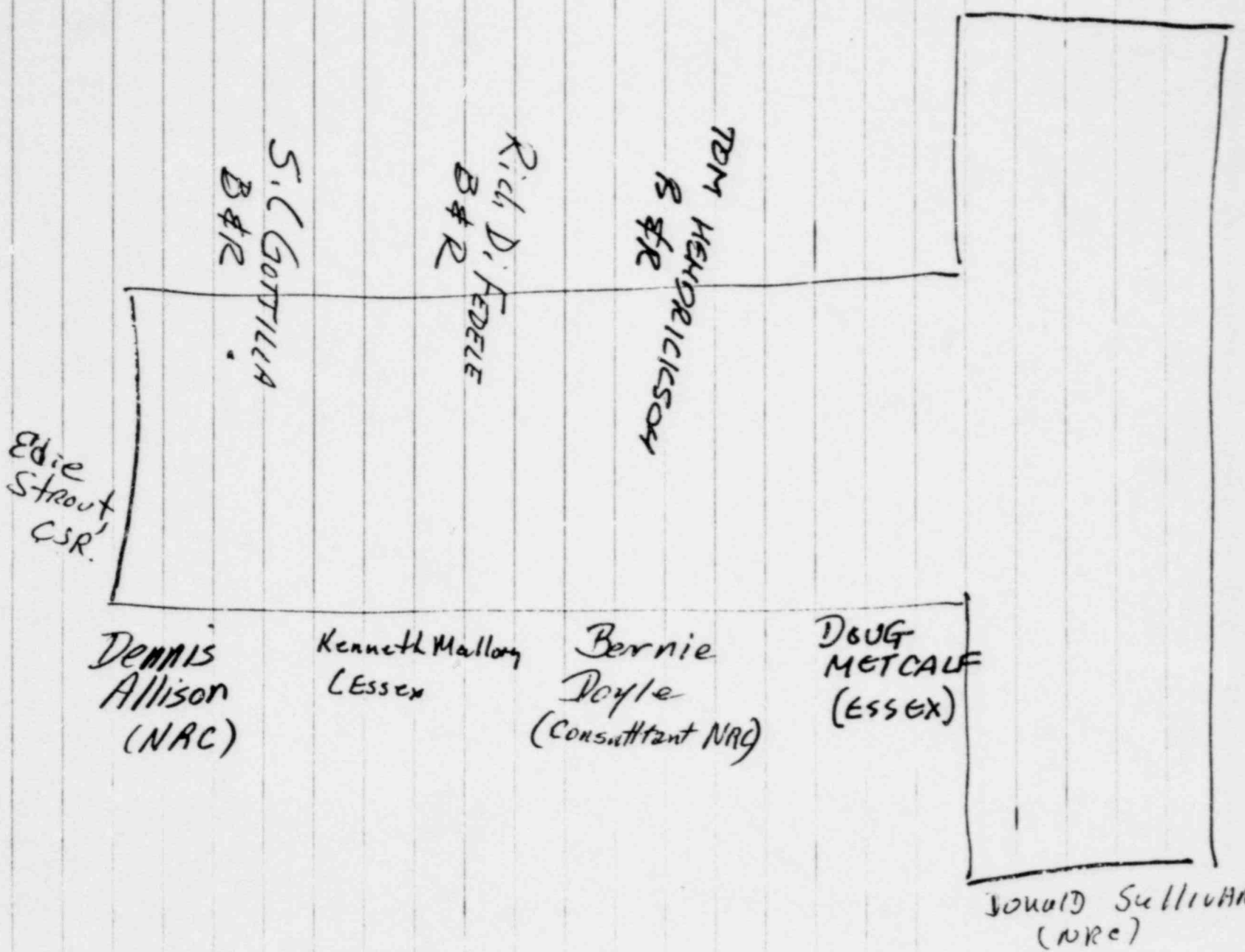
Off Record

Allesia compiled a list of documents, including all those mentioned in this deposition, that we need from B+R. B+R will provide them.


Edie Strout CSR.
S. C. Gottilla B#12
Rich D. Fedele B#12
Tom Hendrickson B#8
Dennis Allison (NRC)
Kenneth Mallory (Essex
Bernie Doyle (Consultant NRC)
Doug Metcalf (Essex)
Donald Sullivan (NRC)