PW 1a Program Description, paragraph 2

Comment

While corrosion from the outer surface of buried pipes may be the dominant failure mechanism, there have been failures from the inside (supply water system e.g) which simply are not adequately covered by other programs listed in paragraph. It makes no sense of excluding internal corrosion and verification of the effectiveness of alternate programs

Staff Response

PW1b Program Description, paragraph 2

Comment

Entergy Vermont Yankee's Root Cause Report makes it clear that the failure of the underground AOG piping which recently released radiological contaminated water to the open environment was not the result of external corrosion. In fact, the RCR states, the leaks were not the result of corrosion at all (internal or external) but flow-driven, mechanical (non-corrosion assisted) internal erosion – pipe thinning. If this is really the case, then the unidentified programs which "manage aging of internal surfaces" need more than augmentation by an improved program that is limited to external surfaces. If the high public interest in the leaks at Vermont Yankee provided any contributing motive for the NRC piping and tanks initiative, then the initiative, according to the Entergy VY RCR is entirely unresponsive. The VY License Renewal ASLB is now reconvened on remand from the Commission. NRC Staff has the opportunity and the obligation to bring the matter of Entergy's piping AMP failure before the ASLB. [Root Cause Evaluation Report CR-VTY-2010-00069 says, at page 11-14, A and B Recombiner Steam Trap Drain Lines Leaks:…. The failed piping segment(s) can not be removed for inspection due to their inaccessible location. However, the visual inspections performed, and review of the operating parameters of the steam trap drain lines result in the reasonable conclusion that the failure occurred due to mechanical erosion. Mechanical erosion is caused by accelerated flows, droplet impingement, and two phase flow. Mechanical erosion is more likely to occur immediately downstream of changes in flow direction, such as elbows, where increased flow turbulence occurs.…Mechanical erosion differs from Flow Accelerated Corrosion (FAC), which is a chemical induced corrosion/erosion phenomenon.

Staff Response

PW 2a Program Description, paragraph 2

Comment

Opportunistic inspections should not be credited towards anything, rather they should be used to indicate and classify targeted examination.

Staff Response

PW 2b Program Description, paragraph 2

Comment

Absent from list are that there are no required, as there should be, inspections to establish the baseline conditions needed to evaluate the effectiveness of the program in the future.

Staff Response

PW 3a Program Description, paragraph 3

Comment

The water chemistry program is a mitigation program and does not provide detection for aging effects. More frequent complete inspections as part of the overall program are the only effective assurance that defects created by aging components will be uncovered. Tritium leaks at reactors across the country belie the effectiveness of water chemistry alone to prevent leaks.

Staff Response

PW 3b Program Description, paragraph 3

Comment

More broadly, the NRC Groundwater Contamination (Tritium) at Nuclear Plants-Task Force – Final Report, Sept 1, 2001 studied radioactive leaks from a variety of sources. The LLTF stated in the Executive Summary ii, that, “The task force did identify that under the existing regulatory requirements the potential exists for unplanned and unmonitored releases of radioactive liquids to migrate offsite into the public domain undetected.

Staff Response

PW 4 Program Description, paragraph 4

Comment

“Inaccessible Piping & Tanks” would be a better term

Staff Response

PW 5 Scope of Program

Comment

Add piping related to AOG system

Staff Response

PW 6a Preventive Actions, paragraph a.ii

Comment

“Periodic flow tests” should not provide a “pass.” It cannot detect leakage. Periodic is too loose, need specificity - what precisely does “periodic” mean in terms of months/years?

Staff Response

PW 6b Preventive Actions, paragraph a.ii

Comment

Moreover a flow test can indicate that there is not a breach in the piping at the time of the test but it does not indicate the level of corrosion/degradation in the material, wall thickness etc or whether there will be a breach the day after the flow test.

Staff Response

PW 7a Preventive Actions, Table 2a

Comment

Change to “Preventative Actions for Inaccessible Piping & Tanks”

Staff Response

PW 7b Preventive Actions, Table 2a

Comment

Add Baseline Inspection

Staff Response

PW 7c Preventive Actions, Table 2a

Comment

Also need detection capability-monitoring wells in sufficient number and placed according standard design practices, requires among other things recent subsurface hydro-geo analysis of site

Staff Response

PW 8a Preventive Actions, Table 2a

Comment

Titanium needs to be included in preventative measures. Titanium alloys, like other metals, are subject to corrosion in certain environments. The primary forms of corrosion that have been observed on these alloys include general corrosion, crevice corrosion, anodic pitting, hydrogen damage, and SCC.

Staff Response

PW8b Preventive Actions, Table 2a

Comment

Table 2a indicates the writers are unfamiliar with the corrosion of buried stainless steel (SS) facilities. While Stainless Steel (SS) may perform well in loose or fairly well aerated soils, it will corrode like carbon steel in tight or mucky soils. This is because in the absence of oxygen, the protective oxide film will not form on SS. I have encountered this in various places. The writers compound the matter by coating the structures (footnote 3) and then omitting cathodic protection (CP) - more on this late). Left bare, the SS will usually undergo general corrosion over the entire surface, usually leading to eventual failure.

When coated, but without CP, pitting corrosion occurs at breaks (holidays) in the coating. This leads to fairly rapid corrosion and failure. The DOT regulations for gas and flammable liquid pipelines, and the EPA regulations for buried storage tanks, prohibit the use of coating without CP. Nothing less should be accepted for nuclear plants.

Staff Response

PW 8c Preventive Actions, Table 2a

Comment

Table 2a also includes aluminum. Aluminum is a very poor material for buried use, and we see practically no use of it for that purpose today. Aluminum is a highly active metal and is anodic to just about any other metal to which it might be connected. CP can be used on aluminum, but great care must be taken. CP causes a rise in pH in the soil around the protected structure, and with a little too much CP, the pH can rise above 8.0, and it that range aluminum will corrode rapidly even under CP.

Staff Response

PW 8d Preventive Actions, Table 2a

Comment

Polymer: High Density Polyethylene & High Density Polypropylene:We have been advised that there should be reluctance to use polymeric piping in hot service and there is a pressure limitation that depends (like in steel pipe) on the wall thickness; it should never be used either of the materials in organic service (buried diesel or fuel oil lines) even though organic fluids are routinely transported in polyethylene or polypropylene totes; and that there is reason for concern about long term embrittlement (and eventual cracking) if used in buried structures. Another type of problem with buried polymeric pipe is the fact that when digging becomes necessary the polymeric pipe is cut that much more easily. If polymeric pipe (not really plastic pipe) are used for repairs, there are problems in the mating of steel pipes to polymeric ones. Bottom line, we are advised that there is not enough experience available to guarantee an additional 20 years of service.

Staff Response

PW 8e Preventive Actions, Table 2a

Comment

*Cementitious or Concrete requires cathodic protection*: The following summarises the international development of cathodic protection of steel in concrete. The technology was developed in Europe and the USA for applications to buried prestressed concrete water pipelines (Refs. 1 & 2) and in California to deal with deicing salt attack of reinforced concrete bridge decks, and has been widely applied throughout North America for that purpose. It has been used and further developed in the UK to deal with a variety of problems ranging from buildings with cast in chlorides to bridge substructures contaminated with deicing salts and to marine structures and tunnels. It is also widely used on buildings and car parks in UK and Northern Europe. In the Middle East, severe corrosion problems caused by high levels of salinity in soils as well as marine conditions have lead to many large projects being carried out. It has also been used extensively in the Far East including Australia, Japan and Hong Kong. http://www.azom.com/details.asp?articleID=1316. There are numerous articles on line

Staff Response

PW 8f Preventive Actions, Table 2a

Comment

What about components within scope NOT made of materials listed, such as monel bronze?

Staff Response

PW 9 Preventive Actions, Table 2a, Footnote 4

Comment

Omit “The equipment used to implement cathodic protection need not be 10 CFR 50 Appendix B qualified.” Rationale: Unless the rectifier (or any piece of equipment) was explicitly mentioned in the tech specs, its failure would be entered into the corrective action program but would not enter a limiting condition for operation with a deadline for fixing or shutting down

Staff Response

PW 10 Preventive Actions, Table 2a, Footnote 4

Comment

No exceptions, require as was original plan in Gall XI M-28 before NRC caved to bogus objections raised by NEI that retrofitting cathodic protection could be dangerous and then provided M34 as an alternative

Staff Response

PW 11a Preventive Actions, Table 2a, Footnote 4, subparagraph a

Comment

What does NACE SP0169-2007 say? We need a copy of the document.

Staff Response

PW 11b Preventive Actions, Table 2a, Footnote 4, subparagraph a

Comment

Not knowing, it seems to need qualification regarding if area backfilled, excavated or soil conditions are known to have changed- Entergy's BPTIMP, pg., 11 made this notation

Staff Response

PW11c Preventive Actions, Table 2a, Footnote 4 subparagraph a

Comment

Foot note 4a states that CP need not be provided in soils of resistivity greater than 20,000 ohm cm. This thinking dates back to the 1950s at which time it was believed that in soils of resistivity greater than 10,000 ohm cm corrosion failures were infrequent enough that it was less expensive to fix leaks than to protect the pipelines. That thinking was soon put to rest and by 1960, it was standard practice to provide coating and CP for steel pipelines. Footnote 4a also applies to carbon steel, and now is 60 years out of date.

Staff Response

PW 12 Preventive Actions, Table 2a, Footnote 4, subparagraph b

Comment

Omit this exception. The probability of corrosion is not constant with time and therefore cannot be characterized with a number and entered as such into a "Rule", like, if we established a rate based on 5 years of data, we can predict the rate going forward. First, the corrosion rate is *NOT* constant with time**.** Therefore, the probability would have to be adjusted with age, or the risk becomes a function of age. The so-called "Bath-tub curve of degradation" needs to be considered – as the component ages the rate sharply increases- the corrosion rate is not constant over time.

Staff Response

PW 13a Preventive Actions, Table 2a, Footnote 5

Comment

Re particle size backfill? What does SP0169-2007 section 5.2.3 say- is max size ½ inch as in previous draft? Crushed concrete of 1/2 inch diameter or less can be quite jagged and do much damage while river bottom pebbles may be harmless. Therefore the type of material as to its smoothness is relevant

Staff Response

PW 13b Preventive Actions, Table 2a, Footnote 5

Comment

Also absent from the discussion on backfill material was the degree to which the material retained moisture

Staff Response

PW 13c Preventive Actions, Table 2a, Footnote 5

Comment

Omit exception “Backfill not meeting this standard is acceptable if the inspections conducted in program element 4 of this AMP do not reveal evidence of mechanical damage to pipe coatings due to the backfill:” Program element 4 does not provide assurance- see comments below on #4

Staff Response

PW13d Preventive Actions, Table 2a Footnote 5

Comment

Footnote 5 implies that selected backfill is adequate corrosion control for buried facilities. It is not. Even if the backfill is completely uniform it soon assumes the corrosiveness of the surrounding soil. Also, one has little control over some future excavation that may disturb the backfill in one area and replace it with a different backfill; this creates a lack of backfill uniformity, a situation that leads to corrosion.

Staff response

PW 14 Preventive Actions, Table 2a, Footnote 6

Comment

define – data base not available on line

Staff Response

PW 15 Preventive Actions, Table 2a, Footnote 7

Comment

Omit exception – for example, abrasion ignored

Staff Response

PW 16a Preventive Actions, Table 2a, Footnote 8

Comment

Omit exception- stray currents ignored, for example

Staff Response

PW 16b Preventive Actions, Table 2b, Footnote 4

Comment

MIC may be issue for super austenitic steel AI6XN

Staff Response

PW 17a Parameters monitored/inspected

Comment

UT not work if piping is multi-layered such as having a CIP liner in the pipe paragraph needs to be qualified for conditions effective

Staff Response

PW 17b Parameters monitored/inspected

Comment

need to state how much of the component needs to be examined and precisely where on the component – some areas more susceptible to degradation – elbows, welds, high flow areas for example

Staff Response

PW 18 Parameters monitored/inspected

Comment

Pipe to soil potential? What about conduits/other containment for the piping if they are degraded, the pipe inside could be sitting in water, for example?

Staff Response

PW 19 Detection of Aging Effects

Comment

Need to include additional variables such as age component, flow velocity (FAC-flow accelerated corrosion), repair history

Staff Response

PW 20a Detection of Aging Effects, paragraph a.i

Comment

Opportunistic typically means that there has been a leak that needs to be repaired. Visual inspection is "stone age technology" There has to be a decision of how much more pipe to excavate and at least conduct some quantitative examinations

Staff Response

PW 20b Detection of Aging Effects, paragraph a.i

Comment

What if pipe does not become accessible for any reason?

Staff Response

PW 21 Detection of Aging Effects, paragraph b.i

Comment

See comments on Table 4a's footnotes

Staff Response

PW 22 Detection of Aging Effects, paragraph b.ii

Comment

What evidence is there to justify a 10 year interval? This is the crux. One simply cannot squeeze all these situations into the same shoe box. 10 years is too infrequent period – especially in license renewal when components may well be entering the "wear-out" stage (Region C) of the Bath Tub Curve of degradation. Inspection frequencies need to be based on age.

Staff Response

PW 23a Detection of Aging Effects, paragraph b.iii

Comment

If in fact there are various degrees of susceptibility, there should also be varying degrees of inspection frequencies

Staff Response

PW 23b Detection of Aging Effects, paragraph b.iii

Comment

need a more precise and complete listing of locations more susceptible to degradation – absent from list, for example, are age component, flow rate, elbows, welds

Staff Response

PW 24 Detection of Aging Effects, paragraph b.iv

Comment

"Significant" needs to be defined

Staff Response

PW 25 Detection of Aging Effects, paragraph b.v

Comment

Omit - not all factors related to corrosion listed in iii and no specification of length component requiring inspection- if, for example, they had an "opportunity" to inspect a 1 foot section of a pipe's coating it does not mean that the remaining feet of the pipe are in the same condition

Staff Response

PW 26 Detection of Aging Effects, paragraph b.vi

Comment

The issue is the quality and frequency of the inspection of the pipe not what unit the pipe(s) belong

Staff Response

PW 27 Detection of Aging Effects, paragraph b.vii

Comment

This makes no sense. What does manual examination tell you about the embrittlement of the pipe.

Staff Response

PW 28 Detection of Aging Effects, paragraph b.ix

Comment

Flow test not tell degree degradation- wall thickness- it can detect hole at time of test not what will happen an hour or 5 months later. Flow tests will NOT test any leak unless it is >15% above the nominal flow through the pipe

Staff Response

PW 29 Detection of Aging Effects, paragraph b.x

Comment

"at least 25%" – specifics as to 25% need to be provided so that they are representative age component, configuration etc

Staff Response

PW 30 Detection of Aging Effects, Table 4a, footnote 1

Comment

Monel Bronze is used for some buried comments- is it covered by the program and more broadly what other materials may be not in list

Staff Response

PW31a Detection of Aging effects, Table 4a, footnote 2

Comment

It is curious that in various places, the document calls for backfill for non-metallic facilities to be consistent with certain sections of NACE SP0169. This document deals specifically with metallic structures- see the second reference on page 15. Similar references are made to SP0285; this document deals with CP for underground tanks and CP is not applicable to non-metallic facilities. Some non-metallic facilities, particularly fiberglass tanks require pea gravel for backfill, so some consideration must be given to backfill.

Staff Response

PW 31b Detection of Aging Effects, Table 4a, footnote 2

Comment

NACE SP0169-2007 needs to be provided in appendix – not available on line to non-member

Staff Response

PW 32 Detection of Aging Effects, Table 4a, footnote 2

Comment

Guidance has no enforcement – we need enforceable regulations

Staff Response

PW 33 Detection of Aging Effects, Table 4a, footnote 3, subparagraphs a - c

Comment

On what basis can NRC assume that 10 feet inspected, for example, represents the conditions in the remainder of the component? It would make more sense to require more frequent and more comprehensive inspections. Specifically a 100 percent internal visual inspection of all underground pipes must be implemented. The inspection cycle should be such that pipes within scope are inspected every ten years. The Applicant should be required to break the testing interval down such that one sixth of all pipes are inspected during each refueling outage. (This assumes 18 month refueling outages, or six every ten years.) The Applicant should be required to inspect one sixth of the lineal piping, one sixth of the elbows and flanges at each outage, even if such inspections lengthen the outage time

Staff Response

PW 34a Detection of Aging Effects, Table 4a, footnote 5

Comment

"To be considered hazmat, the concentration of radioisotopes within the pipe during normal operation must exceed established standards such as EPA drinking water standard" makes no sense. The definition is a snapshot of what is in the component at a particular time – it does not account for lower concentrations that leak and over time can be significant. It wrongly ignores the cumulative effect of leakage.

Staff Response

PW 34b Detection of Aging Effects, Table 4a, footnote 5

Comment

"In the absence of such standards, the concentration of radioisotope must exceed the greater of background or reliable level of detection." Games are typically played with so-called background – such as using the national average - not based on a site specific and site pre-operational determined number. As for "reliable level of detection" Liquid Release Task Force Recommendations Implementation Status as of November 19, 2007 stated at 2 that, "The Staff is revising Regulatory Guide 1.21 to incorporate the LLFT recommendation that "The NRC should revise radioactive effluent release program guidance to upgrade the capability and scope of in-plant monitoring system, to include additional monitoring locations and the capability to detect lower radionuclides (i.e., low energy gamma, weak beta emitters, and alpha particle." [Emphasis added]

Staff Response

PW 34c Detection of Aging Effects, Table 4a, footnote 5

Comment

How are "normal" and "abnormal" defined?

Staff Response

PW 34d Detection of Aging Effects, Table 4a, footnote 5

Comment

It would make sense to sort the components within scope that fall under this program into those that do/could contain radioactive liquids from those that do/could not.

Staff Response

PW 35a Detection of Aging Effects, Table 4a, footnote 5

Comment

Only 1 inspection is insufficient – it appears NRC priorities are reversed – public safety should be the priority not industry convenience

Staff Response

PW 35b Detection of Aging Effects, paragraph b.iii

Comment

Selection of locations to inspect appear to depend on a subjective assessment of likely corrosive conditions. I should think the nuclear industry would like to up be to date on how to find the best places to excavate for external inspection on buried pipe. This procedure, known as External Corrosion Direct Assessment (ECDA) and also Internal Corrosion Direct Assessment (ICDA) is practiced in the pipeline industry under the DOT rules for pipeline integrity. These assessments are based on detailed assessments of conditions, electrical and other measurements to locate corroding areas, and the excavations are based on these data. Experience has shown these procedures to be very accurate. To date, these practices have been used only on transmission lines, but similar rules are now coming out for distribution piping. Distribution piping has many resemblances to the piping in generating stations.

Staff Response

PW 36 Detection of Aging Effects, paragraph c.i

Comment

see comments Table 4b and accompanying footnotes

Staff Response

PW 37 Detection of Aging Effects, paragraph c.ii

Comment

10 years too infrequent

Staff Response

PW 38 Detection of Aging Effects, paragraph c.iii

Comment

More characteristics need to be listed – such as age, history repair

Staff Response

PW 39 Detection of Aging Effects, paragraph c.iv

Comment

UT detects both internal and external corrosion – separation is tricky but can be done.

Staff Response

PW 40 Detection of Aging Effects, paragraph c.v

Comment

Omit- explained above

Staff Response

PW 41 Detection of Aging Effects, paragraph c.vi

Comment

This makes no sense. Is it the pipe or site?

Staff Response

PW 42 Detection of Aging Effects, paragraph c.vii

Comment

This makes no sense. What does manual examination tell you about the embrittlement of the pipe

Staff Response

PW 43 Detection of Aging Effects, paragraph c.ix

Comment

Flow test not tell degree degradation- wall thickness- it can detect hole at time of test not what will happen an hour or 5 months later. Piping integrity is the main issue and flow test does nothing to identify integrity.

Staff Response

PW 44 Detection of Aging Effects, paragraph c.x

Comment

“at least 25%” – specifics as to 25% need to be provided so that they are representative age component, configuration etc

Staff Response

PW 45 Detection of Aging Effects, Table 4b, footnote 2

Comment

Where do these numbers come from? Is there any evidence that 2% is statistically the correct number? Provide rationale in footnote.

Staff Response

PW 46 Detection of Aging Effect, paragraph d.i

Comment

Tanks must include partially buried tanks such as SFP, CST and the drywell (it is a partially buried tank and the SFP is encased below in concrete); and see comments on Table 4C’s footnotes

Staff Response

PW 47 Detection of Aging Effect, paragraph d.ii

Comment

What evidence is there to justify a 10 year interval. This is the crux. One simply cannot squeeze all these situations into the same shoe box. 10 years is too infrequent period – especially in license renewal when components may well be entering the “wear-out” stage (Region C) of the Bath Tub Curve of degradation.

Staff Response

PW 48a Detection of Aging Effect, paragraph d.iv

Comment

UT can inspect both external and internal

Staff Response

PW 48b Detection of Aging Effect, paragraph d.iv

Comment

inspecting 25% one time in 10 years inadequate; as suggested for buried piping, specifically a 100 percent external visual inspection of tanks within scope must be implemented. The inspection cycle should be such that the whole tank is inspected every ten years. The Applicant should be required to break the testing interval down such that one sixth of the tanks surface is inspected during each refueling outage. (This assumes 18 month refueling outages, or six every ten years.)

Staff Response

PW 49 Detection of Aging Effect, paragraph d.v

Comment

This makes no sense. What does manual examination tell you about the embrittlement

Staff Response

PW 50 Detection of Aging Effect, paragraph d.vi

Comment

Opportunistic examinations should not be credited toward anything, rather they should be used to indicate and classify targeted examination

Staff Response

PW 51 Detection of Aging Effects, Table 4c, footnote 2

Comment

NACE RP0285-2002-provide copy

Staff Response

PW 52 Acceptance criteria, paragraph b

Comment

that “no evidence of coating degradation” be determined by a “NACE certified inspector” – inspector’s judgment calls vary all over the map, absent specific criteria by NRC this is not an acceptable way to provide reasonable assurance.

Staff Response

PW 53 Acceptance criteria, paragraph e

Comment

The goal is to prevent leakage not wait until leaking to fix.

Staff Response

PW 54 Corrective Actions

Comment

Looking at the list of outstanding corrective actions at reactors today that NRC has NOT looked at – what assurance is provided

Staff Response

PW 55 Operating Experience

Comment

Operating experience demonstrates that what is needed are NRC regulations that are enforced; not voluntary industry initiatives and NRC “guidance.”

Staff Response

PW 56 General Comment

Comment

I have not studied the XI.M41 document in detail … My review so far indicates to me that this document needs a lot of work to make it consistent with current corrosion control technology.

Staff Response