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183 -14th Avenue
San Francisco,CA.94118
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Dr.Kenneth Carr
Chairman
Nuclear Regulatory Commission
Washington,D.C.

Dear Sir:

I would like to offer the following critical comment and contribution to your Maintainance Rulemaking (delayed to 1991) for PWR and BWR Plant Maintainance for public utilities. As former Chief Metallurgist for PSE&G (New Jersey) [fired for this work, which PSE&G lied to the NRC about-ref:Mr.Anthony Laws,CEO,N.D.T.Corp., Mannville,N.J. who worked for me at PSE&G on this project and knows exactly the facts!]

As I pointed out initially in 1978 [J.Mag.Mag.Mtls.,7,312(1978)-given at Intl.Conf.Mag.Alloys & Oxides,Haifa,Israel(1977) while an employee of the IAEA in both Indonesia & Vienna] , for INCO-182/82 ferritic (pressure vessel) - stainless steel or inconel (primary coolant loop piping), as did Lai [Met.Trans.9A,827(1978)-his second curve is unbelievable-the y-axis is the curve of catastrophic drop in Charpy-V impact-energy fracture-toughness!] for HASTELLOY-X (core components & jet engine combustion-chambers) <u>the</u> major problem is not some (i gather now NRC mandated) trivial post-weld (transition-weld) stress-relief heat-treatment, <u>but</u> the continuing on-going long-time chronic age-hardening embrittlement of INCO-182/82(nuclear power reactor world-wide "standard") transition-welds"as a cancer eating away at the guts of and safety of such plants". Kattus[Code#4112,DOD Aerospace Str.Mtls.Hdbk.,Battelle(Dec.,1983)] for Hastelloy-X repeatedly and pointedly warns of this potentially <u>catestrophic</u> embrittlement problem!

The NRC needs a mandatory utility scheduled-outage heat-treatment maintainance-program on a continuing on-going long-time chronic basis [which Thermalloy Technology (TAT) process is-see testimony given to U.S.F.A.A. Northeastern Region hearings on engine certification,Burlington,MA.about January-February,1987] to essentially "<u>rejuvenate</u>" these transition-welds metallurgically before their on-going chronic intrinsic age-hardening embrittlement in-service [INCO-A, which INCO-182/82 replaced, does not have this problem!] does finally indeed lead to a nuclear plant catastrophic pressure vessel-primary coolant loop piping transition-weld brittle fracture failure!

I suggest, as well, that you investigate early letters about this by Howard Richards, earlier (and deceased) Chief Metallurgist at PSE&G (Energy Laboratory, Maplewood,N.J.) which were kept from the NRC, Messrs. H.Obermaier,E.Packer,H.Erdmann and J.O'Grady at PSE&G (who were responsible for my firing over this matter after I wanted to go to the NRC [and Mr.G.Schnabl,PSE&G,Newark] & destroyed/suppressed all of my findings from NRC knowledge, former PSE&G technician Jim Murray(who also worker for me,Mr.A.Laws-affiliation currently above, and Mr.T.Stein or Stern,Sr.V.P. Westinghouse N.E.S.,who acknowledged to me a confirmatory repeat of my work circa 1985. Also the conditions of my leaving PSE&G smacking of coverup vs.NRC should be investigated (ref: Village Voice, Geiger Castle Column; Ann Hayes (~Sept. 1978)).

As a former Westinghouse,PSE&G and IAEA metallurgist,I cannot stress to you the urgency of this for consideration in Plant Maintainance Guidelines. Please R.S.V.P. Dr.E.Siegel

A Tale of Two Alloys:INCO-182 Nuclear Transition Welds & Hastelloy-X Jet Engine Combustion-Chambers:In-Service Ambient-Temperature Alloy Embrittlement Leading to Catastrophic Failure.

EDWARD SIEGEL, Thermalloy Technology Ltd., 183-14th Avenue, San Francisco,CA.94118.

Nuclear industry major structural alloys, INCO-182 transition welds and Hastelloy-X core components,the latter as well major jet engine combustion-chambers,are subject to in-service ambi-ent-temperature over-age-hardening embrittlement,discovered by Siegel[1] and Lai[2],leading to potential in-service catastrophic failure via over-ageing embrittlement,warned against by Kattus[3] but ignored by industry. INCO-182 = (old ductile)INCO-A+Nb+Ti ("to increase 'weldability'")and Hastelloy-X with W+Mo cations substitutional develop B1(NaCl)-structure brittle carbide pre-cipitate chains[(Nb,Ti)$_x$C in INCO-182;(W,Mo)$_x$C in Hastelloy-X] in Ni-based superalloy FCC/austenitic Ni-solute crystal lattice structure(versus hard non-brittle $M_{23}C_6$ non-aligned carbides in BCC Fe-solute tool & die steels). Kattus[3] D.O.D.unheeded by ind-ustry(nuclear,jet engine,petrochemical)fabrication-temperature range(1,000-2,000°F.)for Hastelloy-X "coincidentally"straddles nicely jet-engine metal-ambient-temperature in-service(1,200°F) for the huge jet-engine replacement parts industry,the verysame as initial jet-engine fabricators. For INCO-182 nuclear indus-try piping-to-pressure-vessel primary-coolant-loop,the sharp ageing peak(1,200°F.) on the shoulder of a broad(600°F.)ageing peak,"coincidentally"straddling ambient(600°F.)PWR nuclear rea-ctor ambient in-service water temperatures(& refinery/chemical plant ambients).INCO-182 & Hastelloy-X,too late must be anathema!

[1] J.Mag.Mag.Mtls.7,312(78) [2] Met.Trans.9A,827(78) [3] Code#4112,U.S. D.O.D.Aerospace Structural Mtls.Handbook,Battelle(Dec.1983)!