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Docket Nos.: 50-352/353

Mr. Edward G. Bauer, Jr.
Vice President & General Counsel
Philadelphia Electric Company
2301 Market Street
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Dear Mr. Bauer:

Subject: Request for Additional Information - Limerick

The Procedures and Test Review Branch has reviewed the initial test program described in Chapter 14 of the FSAR. This review has indicated the need for the additional information delineated in Enclosure 1. Please note that this information request was prepared prior to receipt of Revision 3 to the FSAR.

Please provide us, within 7 working days from receipt of this letter, with the date(s) on which you plan to respond to the above. Any questions concerning this information request should be directed to Dr. Harvey Abelson (301) 492-9774, the Licensing Project Manager.

Sincerely,

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosure:
As stated

cc: See next page

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DATE	5/19/82	5/ /82					

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ENCLOSURE 1

STAFF POSITIONS AND REQUESTS FOR ADDITIONAL INFORMATION

LIMERICK GENERATING STATION, UNITS 1 & 2

INITIAL TEST PROGRAM

640.1 (1.8) Regulatory Guide 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing," Section D, indicates that the NRC staff uses this guidance for evaluating submittals for operating license applications docketed after June 22, 1976, or construction permit applications docketed after June 22, 1976. Therefore, Regulatory Guide 1.20 is applicable to Limerick. Modify FSAR Section 1.8 accordingly.

640.2 (14.2.12) Modify test descriptions for post-accident ESF-related air filtration systems to include inplace filter testing.

640.3 (1.8) (14.2.7.2) The following exceptions to Regulatory Guide 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," (Revision 2, 8/78) as stated in FSAR Subsection 14.2.7.2 are not adequately justified.

(1) Exception (a) to Regulatory Guide 1.68, Section C.1: Section 14.2.7.1 and accompanying references do not adequately establish the alternative criteria for the selection of systems

requiring testing. Delete this exception or provide technical justification for not testing any system which meets the following criteria:

(a) Will be relied upon for safe shutdown and cooldown of the reactor under normal plant conditions and for maintaining the reactor in a safe condition for an extended shutdown period.

(b) Will be relied upon for safe shutdown and cooldown of the reactor under transient (infrequently or moderately frequent events) conditions and postulated accident conditions and for maintaining the reactor in a safe condition for an extended shutdown period following such conditions.

(c) Will be relied upon for establishing conformance with safety limits or limiting conditions for operation that will be included in the facility technical specifications.

(d) Are classified as engineered safety features or will be relied upon to

support or assure the operation of engineered safety features within design limits.

(e) Are assumed to function or for which credit is taken in the accident analysis for the facility (as described in the Final Safety Analysis Report).

(f) Will be utilized to process, store, control, or limit the release of radioactive materials.

(2) Exception (b) to Regulatory Guide 1.68, Section c.4: Delete this exception and modify FSAR Subsection 14.2.11 or provide an alternative schedule for submission of preoperational and startup test procedures which is acceptable to the Region I Administrator.

(3) Exception (c) to Regulatory Guide 1.68, Section C.9: Delete this exception; a Summary Startup Report will be required by Technical Specifications Section 6.9 for initial and reload startups.

(4) Exception (d) to Regulatory Guide 1.68, Appendix A: This is not an exception and should be deleted.

(5) Exception (e) to Regulatory Guide 1.68, Appendix C Paragraph 1.h: FSAR Section 14.2.9 as presently written does not constitute an exception; therefore, this exception should be deleted.

640.4 (14.2.7.2) Modify the listing for Regulatory Guide 1.68 to reflect the required revision; Revision 1, July 1978.

640.5 (14.2.7.2) Add a description of the extent of compliance with testing prescribed by NUREG-0554 "Single-Failure Proof Cranes for Nuclear Power Plants" and NUREG-0612 "Control of Heavy Loads at Nuclear Power Plants" to your statement in 14.2.7.2 regarding Regulatory Guide 1.104.

640.6 (14.2.7.2) Modify the regulatory guide listing to reflect the correct revision of Regulatory Guide 1.108 (Revision 1, August 1977).

640.7 (14.2.7.2) Provide the appropriate reference, in 14.2.7.2, for Regulatory Guide 1.140, "Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants" Position C.5.

640.8 (14.2.12) Certain terminology used in the individual test description does not clearly indicate the source of the acceptance criteria to be used in determining test adequacy, an acceptable format for providing acceptance criteria for test results includes any of the following:

Referencing technical specifications (Chapter 16),

Referencing accident analyses (Chapter 15),

Referencing other specific sections of the FSAR (e.g., 7.4.1.2) or topical reports,

Referencing vendor technical manuals and test specifications,

Providing specific quantitative bounds (only if the information cannot be provided in any of the above ways).

Preferably, test descriptions should discuss the sources or bases of acceptance criteria in lieu of identifying actual quantitative values.

Modify the individual test descriptions presented below to provide adequate acceptance criteria or, if applicable, add a paragraph to Subsection 14.2.12 that provides an acceptable description to each of the following unclear terms found in the identified tables.

(1) Operable, occurs properly, controlled properly, proper, normal, operate properly, function properly, perform properly,

Table 14.2-3 SUT-1, SUT-5, SUT-7, SUT-30, SUT-33.

Table 14.2-4 P-2.1, P-4.1 (4 times), P.5.1 (twice), P-6.1 (twice), P-13.1 (3 times), P-13.2 (3 times), P-13.3, P-13.4 (twice), P-14.1 (4 times), P-16.1 (6 times), P-17.1, P-18.1 (3 times), P-23.1 (twice), P-24.1 (4 times), P-25.1 (3 times), P-28.1 (4 times), P-28.2 (4 times), P-30.1 (5 times), P-30.2 (twice), P-31.1 (2 times), P-32.1 (6 times), P-34.1 (6 times), P-35.1 (twice), P-43.1, P-44.1 (4 times), P-45.1 (6 times), P-45.2 (3 times), P-49.1 (10 times), P-50.1 (5 times), P-51.1 (4 times), P-52.1 (5 times), P-53.1 (3 times), P-54.1 (3 times), P-55.1 (4 times), P-56.1 (3 times), P-57.1 (twice), P-58.1 (3 times), P-59.1, P-59.2 (4 times), P-60.1 (5 times), P-61.1 (4 times), P-64.1 (6 times), P-68.1 (3 times), P-69.1 (4 times), P-70.1 (twice), P-72.1 (twice), P-73.1 (3 times), P-78.1 (5 times), P-78.2 (twice), P-78.3 (3 times), P-78.4 (3 times), P-78.5 (twice), P-78.6 (3 times), P-79.1 (6 times), P-80.1 (twice), P-81.1 (4 times), P-83.1 (5 times), P-88.1, P-99.1, P-100.1.

(2) Acceptable, acceptable values, acceptable limits.

Table 14.2-3 SUT-19 (twice), SUT-20, SUT-26, SUT-28, SUT-32 (twice), SUT-36.

Table 14.2-4 P-2.1, P-4.1, P-5.1, P-6.1, P-13.1 (twice), P-13.3, P-14.1, P-16.1, P-17.1, P-23.1, P-25.1, P-30.2, P-35.1, P-43.1 (twice), P-44.1 (twice), P-49.1, P-51.1, P-52.1 (twice), P-53.1, P-54.1, P-55.1, P-57.1 (twice), P-59.3, P-61.1, P-62.1, P-64.1, P-70.1, P-73.1, P-88.1, P-99.1, P-100.1.

(3) Within acceptable values, within acceptable time, within acceptable tolerance, within acceptable limits, within acceptable margin, within the specified acceptable range, within the limits, within design limits, within specified limits, within applicable limits, within design values, witnin applicable guidelines, within the operating range.

Table 14.2-3 SUT-1, SUT-5 (twice), SUT-14, SUT-15, SUT-16, SUT-18, SUT-21, SUT-22, SUT-27 (twice), SUT-33.

Table 14.2-4 P-24.1, P-58.1 (twice), P-59.1 (twice), P-79.1, P-83.1.

(4) Rated, rated conditions, rated actuations time, nominal rated reactor pressure, designed range, design capacity, design reactor pressure, operating conditions.

Table 14.2-3 SUT-6, SUT-12 (twice), SUT-13 (twice), SUT-22 (twice) SUT-27, SUT-30 (twice).

Table 14.2-4 P-24.1 (twice).

(5) Required, design requirements, conform with plant requirement, design intent, applicable design criteria.

Table 14.2-3 SUT-1, SUT-6, SUT-8, SUT-28.

Table 14.2-4 P-56.1.

(6) Satisfactory, satisfactorily completed, satisfactory completion, satisfies the requirements of applicable criteria and calculations,

Table 14.2-3 SUT-4, SUT-9, SUT-11, SUT-29, SUT-31.

Table 14.2-4 P-100.1.

(7) Specified time, satisfies specified limits, specified flow, specified values, limits specified in the technical specifications.

Table 14.2-3 SUT-12, SUT-13, SUT-17, SUT-21, SUT-33.

Table 14.2-3 P-24.1.

(8) Sufficient, sufficiently.

Table 14.2-3 SUT-4, SUT-6, SUT-7. Table 14.2-4 P-18.1, P-69.1.

(9) Verify, verifies, verified.

Table 14.2-3 SUT-1, SUT-27.

Table 14.2-4 P-14.1.

(10) Adequate.

Table 14.2-3 SUT-28 (twice), SUT-34.

(11) Accordance with the procedures, established procedures.

Table 14.2-3 SUT-3, SUT-9.

(12) Accurate.

Table 14.2-3 SUT-7.

(13) Correct.

Table 14.2-3 SUT-30.

(14) Normal.

Table 14.2-4 P-2.1.

(15) Calculated core thermal power, not significantly greater than pre-analysis, means---reliable analysis.

Table 14.2-3 SUT-1, SUT-10, SUT-25.

(16) Process variable.

Table 14.2-3 SUT-18, SUT-19.

(17) Unexplainably worse.

Table 14.2-3 SUT-20.

(18) Listed modes, modes of operation.

Table 14.2-3 SUT-31.

Table 14.2-4 P-16.1.

(19) Capable.

Table 14.2-3 SUT-32.

(20) Possibility of damage is minimal.

Table 14.2-3 SUT-35.

(21) Various.

Table 14.2-4 P-54.1.

640.9 (14.2.12) Several of the acceptance criteria do not reflect complete accomplishment of the test objectives. Modification should be made so that when the acceptance criteria has been met, the test objective will have been achieved. Modify the individual test descriptions indicated below to provide consistency between the test objectives and the acceptance criteria.

(1) Table 14.2-3 SUT-7 Test objective is to demonstrate operation of water level instrumentation under various conditions. Acceptance criteria references only normal operating conditions.

(2) Table 14.2.3 SUT-16 Provide acceptance criteria for determination of core power distribution and for determination of core power symmetry.

(3) Table 14.2-3 SUT-17 Provide acceptance criteria for evaluation of principal thermal and hydraulic parameters.

(4) Table 14.2-3 SUT-20 Acceptance criteria is very broad and open to interpretation. Does not ensure that test objectives have been met. Acceptance criteria needs to be more specific.

(5) Table 14.2-3 SUT-23 The acceptance criteria could be met with the reactor shut down. The

acceptance criteria does not ensure that the objectives have been met.

(6) Table 14.2-3 SUT-26 Acceptance criteria does not address response to change in recirculating flow and the loading capability in master manual flow control mode.

640.10 (14.2.12) Review of the preoperational and startup test phase descriptions disclosed that the operability of several of the systems and components listed in Regulatory Guide 1.68 (Revision 2), Appendix A, may not be demonstrated. Expand your test descriptions to address the following items if applicable to your facility. (Where information regarding preoperational or startup testing is presented in another section of the FSAR, a cross-reference to that section may be provided in Chapter 14 in lieu of repeating that information.)

(1) Preoperational Testing

1.a(2)(d)	Relief valves
1.a(2)(i)	Safety valves
1.a(4)	Hydrostatic tests
1.d(3)	RHR relief valves

1.d(4)	RHR safety valves
1.e(5)	Steam extraction system
1.e(6)	Turbine stop, control, bypass and intercept valves
1.e(10)	Feedwater heater and drain systems
1.f(1)	Circulating water systems
1.f(2)	Cooling towers and associated auxiliaries
1.g(2)	Emergency lighting
1.h	ESF flood protection devices
1.h(1)(a)	ECCS expansion and restraint tests
1.h(1)(b)	ECCS operability using normal and emergency power supplies
1.h(1)(d)	ECCS overpressure protection interlocks
1.h(5)	Cold water interlocks
1.h(9)	Containment recirculation fans--Verify that fan motor current is within its design value at conditions representative of accident conditions. Address such issues as air density, temperature, humidity, fan speed, and blade angle.

1.i(8)	Secondary containment isolation initiation logic tests
1.i(9)	Containment purge systems
1.i(10)	Vacuum-breaker tests
1.i(11)	Containment leak collection and exhaust systems
1.i(12)	Containment air purification and cleanup systems
1.i(13)	Containment inerting systems
1.i(15)	Containment penetration pressurization systems
1.i(17)	Secondary containment ventilation systems
1.i(18)	Containment annulus ventilation and cleanup systems
1.i(21)	Containment penetration cooling systems
1.j(6)	Loose parts monitoring system
1.j(10)	Seismic instrumentation
1.j(12)	Failed fuel detection system or functional equivalent
1.j(14)	Instrumentation and controls that effect transfers of water supplies
1.j(15)	Automatic dispatcher control systems

1.j(16)	Hotwell level control system
1.j(17)	Feedwater heater temperature, level, and bypass control systems
1.j(18)	Auxiliary startup instrument tests
1.j(19)	Remote shutdown instrumentation and controls
1.j(20)	Flood detection systems
1.j(21)	Reactor mode switch
1.j(22)	Containment pressure indication; humidity monitors
1.j(24)	Annunciators
1.k(2)	Personnel monitors
1.k(3)	Lab equipment
1.l(5)	Isolation features for condenser offgas
1.l(8)	Plant sampling systems
1.m(1)	Antisiphon devices, high radiation alarms, and low water level alarms associated with the spent fuel pool.
1.m(3)	Operability and leak tests of fuel pool and refueling canal sectionalizing devices.
1.m(4)	Dynamic tests (100% rated load) and static tests (100% rated load) of refueling equipment.

1.m(6)	Fuel pool building ventilation systems
1.n(6)	Reactor coolant sampling systems
1.n(9)	Vent and drain systems for potentially contaminated areas
1.n(13)	Communication systems
1.n(14)(e)	Radwaste enclosure H&V system; Turbine enclosure H&V system
1.n(15)	Shield cooling systems
1.n(18)	Heat tracing and freeze protection systems
1.c(2)	Reactor component handling system protective interlocks
1.o(3)	Reactor component handling system safety devices

(2) Initial Fuel Loading and Precritical Tests

2.c	Final functional testing of the reactor protection system.
2.d	Final reactor coolant system leak rate test.

(4) Low Power Testing

4.k	Steam-driven engineered safety features

(5) Power-Ascension Tests

5.v	Main steam and feedwater systems
5.w	Shielding and penetration cooling systems. On those penetrations where coolers are not used, provide a startup test description that will demonstrate that concrete temperatures surrounding hot penetrations do not exceed design limits.
5.x	Auxiliary systems required to support the operation of engineered safety features.
5.f.f	Ventilation systems.
5.h.h	Plant dynamic response to load swings.
5.k.k	Plant dynamic response to loss of feedwater heater.

640.11 Revise your FSAR to describe additional testing and training discussed in your letter of March 6, 1981 to Robert L. Tedesco (NRR), in response to NUREG-0737 Item I.G.1. You should also provide a conditional commitment to the Simulated-Loss-of-All-A/C-Test requested in our letter to Mr. Bauer of January 14, 1981.

640.12 (14.2.12) Describe testing to be conducted in conformance with Regulatory Guide 1.41, "Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments." This testing must incorporate the following:

(1) Provide assurance that all sources of power supply to vital buses are capable of carrying full accident loads. If some portions of the power supplies cannot be full-load tested, provide justification.

(2) Verify achievement of stable operation during each test.

(3) Verify that testing is conducted with only one power source at a time.

(4) Verify that buses and equipment in load groups not under test are monitored to verify absence of voltage.

See Appendix A of BWR Owners' Group letter dated February 4, 1981 from D. B. Waters to D. G. Eisenhut.

640.13
(14.2.12) For DC Power System tests (P-2.1, P-88.1), state your plans to verify that individual cell limits are not exceeded during the design discharge test and to demonstrate that the DC loads will function as necessary to assure plant safety at a battery terminal voltage equal to the acceptance criterion that has been established for minimum battery terminal voltage for the discharge load test. Assure that each battery charger is capable of floating the battery on the bus or recharging the completely discharged battery within 24 hours while supplying the largest combined demands of the various steady-state loads under all plant operating conditions.

640.14 (14.2.12) Expand the Instrument Gas System Test (P-18.1) to address Regulatory Guide 1.80, "Preoperational Testing of Instrument Air Systems," Regulatory Positions C.1-11 for all station air systems.

640.15 (14.2.12) Expand the Standby Diesel Test (P-24.1) to include the items listed below. (Also, clarify whether this test is also the same test used to comply with Regulatory Guide 1.41).

(1) Demonstration of the full load-carrying capability for not less than 24 hours; 22 of which should be at the continuous load rating equivalent and two hours at the 2-hour load equivalent (refer to Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants (Revision 1, August 1977), Regulatory Position C.2.a.(3)).

(2) Demonstrate proper diesel operation during load shedding, verifying voltage levels and overspeed limits (refer to Regulatory Guide 1.108 Regulatory Position C.2.a.(4)).

(3) Demonstrate functional capability at full load temperature conditions (refer to Regulatory Guide 1.108 Regulatory Position C.2.a.(5)).

(4) Demonstrate the ability to:

a) Synchronize and transfer load between the diesel generator unit and offsite power.

b) Isolate and restore the diesel to standby status.

(Refer to Regulatory Guide 1.108 Regulatory Position C.2.a.(6)).

640.16
(14.2.12)

Provide test descriptions 1) that will verify that the plant's ventilation systems are adequate to maintain all ESF equipment within its design temperature range during normal operations; and 2) that will verify that the emergency ventilation systems are capable of maintaining all ESF equipment within its design temperature range with the equipment operating in a manner that will produce the

maximum heat load in the compartment. If it is not practical to produce maximum heat loads in a compartment, describe the methods that will be used to verify design heat removal capability of the emergency ventilation systems. Note that it is not apparent that post-accident design heat loads will be produced in ESF equipment rooms during the power ascension test phase; therefore, simply assuring that area temperatures remain within design limits during this period will probably not demonstrate the design heat removal capability of these systems. It will be necessary to include measurement of air and cooling water temperatures and flows and the extrapolations used to verify that the ventilation systems can remove the postulated post-accident heat loads.

640.17
(14.2.12) Expand the Residual Heat Removal (P-49.1) test objective to include verification that paths for the air-flow test of containment spray nozzles overlap the

water-flow test paths of the pumps to demonstrate that there is no blockage in the flow path.

640.18 (14.2.12) Our review of licensee event reports has disclosed several instances of RCIC pump failure to start on demand. It appears that many of these failures could have been avoided if more thorough testing had been conducted during the plant's initial test programs. In order to discover any problems affecting pump startup and to demonstrate the reliability of your RCIC system, state your plans to demonstrate cold, quick pump starts during your initial test program.

640.19 (14.2.12) Verify that sources of water and associated pumps used for long-term post-accident core cooling will have adequate NPSH and the absence of vortexing over range of basin level from maximum to the minimum calculated 30 days following LOCA.

640.20 (14.2.12) Verify operability of the solid and liquid radwaste systems (P-68.1, P-69.1) by testing with representative chemical waste streams. Equipment and systems described in FSAR Sections 11.2 and 11.4 should be tested. The acceptance criterion for the solid radwaste system should require that there be no free liquid in the solidification sample.

640.21 (14.2.12) Provide a description of a test which demonstrates that the MSIV-LCS components operate properly when handling steam and that the system can handle the amount of leakage that is present when the main steam system is at operating temperature.

640.22 (14.2.12) We have noted on other plant startups that the capacities of main steam relief valves (SUT-22) and turbine bypass valves (SUT-23) are sometimes in excess of the values assumed in the accident analyses for inadvertent opening or failure of these valves. Provide a description of the testing that demonstrates that the capacity of these valves is consistent with your accident analysis assumptions.

640.23 (14.2.12) Expand the Remote Shutdown System Test (SUT-24) to address Regulatory Guide 1.68.2, "Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants," Regulatory Positions C.1-4.

640.24 (14.2.12) Modify the Turbine Trip Demonstration (SUT-25) or provide abstracts of other tests that demonstrate that both turbine throttle valves and main generator breaker trips are conducted at full rated power, or provide technical justification that shows how the test purpose can be met without accomplishing both full power trips.

A sufficient technical justification would be if the turbine trip is initiated directly by all remote-manual openings or automatic trips of the generator main breaker, i.e., a direct electrical signal, not a secondary effect such as turbine overspeed. The method used for opening the main generator breakers (by simulating an automatic or

manual trip) should be selected such that the turbine-generator will be subjected to the maximum credible overspeed condition.

640.25
(14.2.12)

It is the staff's position that the Recirculation System Trip Demonstration (SUT-27) includes a two-pump trip initiated from approximately full rated power. Your FSAR should commit to a two-pump trip and provide acceptance criteria for this test or justify that a two-pump trip is not a credible event. This justification, if provided, should consider both loss of offsite power and a single human error during all surveillance tests or maintenance activities that will be conducted or allowed during plant operations. Confirm that the test is conservative with respect to assumptions made in Chapter 15 of your FSAR and provide stability criteria for process variables following planned trips.
Also, (a) provide acceptance criteria for speed of the recirculation pump (following trip of the normal supply breaker) when the

LFMG set breaker closes, (b) provide acceptance criteria for pump startup rates that are consistent with assumptions of FSAR Chapter 15, and (c) describe how you will verify that no cavitation occurs at allowable power and flow conditions.

640.26 (14.2.12) Expand your preoperational and startup test descriptions to describe (or cross-reference other appropriate FSAR Subsections) all expansion, vibration, and restraint testing prescribed by NUREG-0800 (Standard Review Plan) Section 3.9.2.I.1, and snubber testing prescribed by Section 3.9.3.

640.27 (14.2) Modify Figure 14.2-1 to have the notes subsection refer to the correct accompanying figure

(1) The first note should refer to Figure 14.2-6, not Figure 14.2-5

(2) The second note should refer to Figure 14.2-7, not Figure 14.2-6

(3) The third note should refer to Figure 14.2-5, not Figure 14.2-7.

640.28 (14.2.12) Modify the test titles shown in Figure 14.2-5 for SUT-25, SUT-35, and SUT-36 to correspond to those of Table 14.2-3.

640.29 (14.2.12) Provide a test description for any Confirmatory Inplant Tests of Safety-Relief Valve Discharges to be performed in compliance with NUREG-0763.

ERRATA

Section	Page		
14.2.6	14.2-14		"4.2.6" should be "14.2.6".
Table	**Page**	**Test**	
14.2-3	7	SUT-11	"Are the same" should be "Are in the same" (Acceptance Criteria, b.1)
		SUT-12	"System Performance" should be "System Performance Verification" (Title)
	12	SUT-20	"steady-state greater" should be "steady-state condition greater" (Prerequisites)
	19	SUT-35	"Steady State" should be "Steady-State" (Title)
14.2-4	6	P-18.1	" P18.1" should be " (P-18.1)" (Title)
	8	P-24.1	"Vage" should be "Voltage" (Acceptance Criteria a.)
	24	P-59.3	"relief values" should be "relief valves" (Test Method)

Figure
14.2-7

"Supresion Pool"
should be "Suppression
Pool"
"Hydralics" should be
"Hydraulics"
"99.11" should be "99.1"