SAXTON NUCLEAR EXPERIMENTAL CORPORATION

Docket No. 50-146

License DPR-4

Change Request No. 17 to Technical Specifications

and

Amendment No. 16 to Operating License

1. Applicant hereby submits Change Request No. 17 to the Saxton Technical Specifications as provided for in 10 CFR 50.59.

2. Applicant submits Amendment No. 16 to Operating License to allow Saxton to receive, possess, and use the plutonium fueled subassembly described in change request No. 17.

SAXTON NUCLEAR EXPERIMENTAL CORPORATION

By /s/ R. F. BOVIER
Vice President

ATTEST:

/s/ R. E. Sypher
Secretary

(S E A L)

Sworn and subscribed to before me this 2nd day of April , 1965

(S E A L)

/s/ Charles J. Ausel
Notary Public
Muhlenberg Township, Berks County
My Commission Expires Oct. 14, 1966

1. Description of Change

In Supplement No. 1 to Technical Specifications, page 2, change Item F. 2. to read:

Uranium oxide (UO_2) enriched to 5.7% of U-235 shall be used in the fuel assemblies, except that the test fuel assemblies listed below having enrichments and other characteristics as described may be inserted in the reactor. In test fuel assemblies the fuel rods as described may be replaced with regular fuel rods, that is, enriched to nominal 5.7% U-235 and constructed as described in Technical Specification F.3.

Test Assembly No. 1

One 61 rod assembly containing rods of the numbers and types listed in the following table:

No. of Rods	Cladding	Clad Thickness(1)	Pellet Diameter	Enrichment	Peak Power
4(4)	304 SS	80.5 mils(11)	0.294 in.	0.[illegible] w/o	3.1 kw/ft
4(5)	304 SS	80.5	0.294	0.29 w/o	2.2
3	304 SS	15	0.357	(2)	16
3	304 SS	15	0.357	(2)	16
3	304 SS	15	0.357	(2)	16
3	304 SS	15	0.357	(2)	16
3	16-20 SS	15	0.357	(2)	16
3	348 SS	15	0.257	(2)	16
3	304 SS(9)	15	0.357	5.69 w/o	13.5
3	304 SS	15	0.357	5.69 w/o(3)	13.5
3	Zr-4(6)	23.7	0.337	5.69 w/o	12.0
5	Zr-4(6)	23.7	0.337	6.1 w/o	13.5
3	Zr-2(6)	23.7	0.337	(2)	14
3	Zr-2(6) (Ni free)	23.7	0.337	(2)	14
3	Zr-4(6)	23.7	0.337	(2)	14
3	Zr-4(10)	23.7	0.337	(2)	14
3	Zr-4(8)	23.7	0.337	(2)	14
3	Zr-4(7)	23.7	0.337	(2)	14
3	Zr-4(6)	23.7	0.337	7.3 w/o	16

Notes for Table

(1) All rods are free standing 0.391 in. O.D. nominal
(2) First 14 pellets 5.69 w/o
next 5 pellets 6.81 w/o
next 12 pellets 6.45 w/o
next 5 pellets 6.81 w/o
next 13 pellets 5.69 w/o
(3) Contains approximately 100 ppm boron as zirconium diboride
(4) RCC element with perforated guide tube
(5) RCC element with solid guide tube
(6) Autoclave pre-oxide on O.D.
(7) Autoclave pre-oxide on O.D. and I.D.
(8) Furnace pre-oxide on O.D.
(9) Compartmented rod, 3 sections
(10) As pickled, no pre-oxide treatment
(11) RCC Rod O.D. is 0.461 in. nominal

Test Assemblies ii and iii

	Test Fuel Assembly No. ii	Test Fuel Assembly No. iii
	9-Rod Sub-assembly	9-Rod Sub-assembly
First 14 pellets	5.69%	5.69%
Next 2 pellets	9.19%	7.30%
Next 3 pellets	8.57%	6.81%
Next 12 pellets	8.13%	6.46%
Next 3 pellets	8.57%	6.81%
Next 2 pellets	9.19%	7.30%
Next 14 pellets	5.69%	5.69%

NOTE: The 9-rod sub-assembly in the first column shall not be used at reactor power levels greater than 20 MWt.

Test Fuel Assembly No. iv

One 9-rod sub-assembly shall have four corner rods clad with Zircaloy-4 having a nominal thickness of 23.7 mils and shall contain uranium oxide (UO_2) enriched to 6.1% U-235. The other five rods shall be clad with Type 304 stainless steel having a nominal thickness of 9.5 mils and shall contain uranium oxide (UO_2) enriched to 5.7% U-235.

Test Fuel Assembly No. v

One 9-rod sub-assembly shall have four corner rods clad with Zircaloy-4 having a nominal thickness of 23.7 mils and shall contain uranium oxide (UO_2) enriched to 6.1% U-235. The other five rods shall be clad with Type 304 stainless steel having a nominal thickness of 9.5 mils and shall contain uranium oxide (UO_2) having the same enrichment as Test Fuel Assembly No. iii.

Test Fuel Assembly No. vi

One 4-rod sub-assembly shall have rods clad with Type 304 stainless steel having a nominal thickness of 23.5 mils and shall contain uranium oxide (UO_2) fuel pellets uniformly enriched to 8.3% U-235. One of these rods may contain up to 200 ppm boron as zirconium diboride.

Test Fuel Assembly No. vii

One 9-rod sub-assembly shall have four corner rods and the center rod clad with Zircaloy-4 having a nominal thickness of 23.7 mils and shall contain uranium oxide (UO_2) uniformly enriched to 7.3%. Two of the other rods shall be clad with Type 304 stainless steel having a nominal thickness of 15 mils and shall contain uranium oxide (UO_2) uniformly enriched to 5.7% U-235. One other rod shall be clad with Type 304 stainless steel having a nominal thickness of 16.1 mils, shall contain uranium oxide (UO_2) having a content of 0.29% U-235, and shall be concentrically located within a solid stainless steel guide tube. The remaining rod shall be clad with Type 304 stainless steel having a nominal thickness of 16.1 mils, shall contain uranium oxide (UO_2) having a content of 0.71% U-235 and shall be concentrically located within a perforated stainless steel guide tube.

Test Fuel Assembly No. viii

One 9-rod sub-assembly shall have three corner rods clad with Zircaloy-4 having a nominal thickness of 23.7 mils and shall contain vibrationally compacted uranium dioxide (UO_2) enriched to 7.2% U-235 and compacted to 86 ± 2% theoretical density. The fourth corner rod and the central rod shall be clad with Type 304 stainless steel having a nominal thickness of 15 mils and shall contain vibrationally compacted uranium dioxide (UO_2) enriched to 7.2% U-235 and compacted to 86 ± 2% theoretical density. Three of the remaining rods shall be clad with Zircaloy-4 and shall contain uranium dioxide (UO_2) pellets 0.337 inches in diameter which are enriched to 6.1% U-235. One of these rods shall have a previous irradiation exposure of ~7500 megawatt days per metric ton (MWD/MT) and shall contain a 15 mil diameter hole machined through the clad. The second of these rods shall have a previous irradiation exposure of ~7500 MWD/MT. The third of these rods shall have a 15 mil diameter hole machined through the clad. The final rod shall be clad with sensitized Type 304 stainless steel and shall contain uranium dioxide (UO_2) pellets enriched to 5.69% U-235 and the ten central pellets shall have 20 mil chamfers on both ends.

Following a period of irradiation, the two defected, Zircaloy-4 clad rods may be replaced by similar, defected unirradiated Zircaloy-4 clad rods.

Test Fuel Assembly ix

One 9 x 9 fuel assembly shall contain 51 rods clad with Type 304 stainless steel of 15 mils thickness and shall contain uranium dioxide (UO_2) fuel pellets of 5.69% U-235 enrichment. This assembly is made by removing the central 21 rods from a normal 9 x 9 fuel assembly. The space left by removal of the central 21 rods shall be filled by a plug consisting of a stainless steel tube 0.125 inches thick and 2.75 inches in diameter welded to perforated stainless steel end plugs. The end plugs shall be designed so that flow through the plug will experience the same enthalpy rise that is experienced by flow through a normal fuel assembly. The plug shall contain three concentrically mounted stainless steel pipes 0.125 in. thick and of 2.125, 1.50 and 0.75 in. diameters, respectively. Horizontal restraint for the plug shall be provided by the grids of the fuel assembly. Vertical support for the plug shall be provided by a 1.5 in. diameter stainless steel pipe extension of the reactor head port flange. When Change Request No. 16 has been approved by the Atomic Energy Commission this plug may be replaced by a fueled supercritical loop pressure tube assembly.

Test Fuel Assembly x

One 9-rod sub-assembly shall have eight rods clad with Zircaloy-4 having a nominal thickness of 23.3 mils. The fuel shall be mixed natural uranium-plutonium dioxide enriched to 6.6 w/o PuO_2. Four of the rods shall contain vibration compacted fuel and the remaining four shall contain sintered ceramic pellet fuel. The ninth rod position will be a flux thimble for use with in-core instrumentation.

Test Capsules

Test capsules containing non-fuel material may be inserted in any of the eleven dummy fuel locations adjacent to the reactor core region or in any of the eight irradiation sample tubes on the periphery of the core provided that:

1) Prior to irradiation, the design of the test capsule has been evaluated by the SNEC Safety Committee and found acceptable with regard to physical, thermal and hydraulic performance and effect on core reactivity, neutron flux and reactivity coefficients.

2) No foreseeable failure of a test capsule could result in mechanical damage to any core component or in any manner alter the ability of the control system to function.

2) Purpose of Change

The purpose of this change is to permit insertion of test fuel assembly x into the reactor. Test fuel assembly x is to be inserted in a peripheral location for the duration of Core I irradiation. Test assembly x is designed as a proof test experiment for the fabrication techniques of the plutonium enriched fuel rods for the central nine assemblies planned for Saxton Core II.

3) Safety Considerations

The design characteristics of the fuel in test assembly x is given in Table 1.

Operation of the plutonium fueled test assembly will present no new hazards in the absence of any gross manufacturing errors which might cause cladding failure. The purpose of the irradiation of this test assembly is to proof test the manufacturing techniques that are being employed in the construction of the Core II plutonium fuel rods. The health physics procedures employed at Saxton will be updated to include alpha detection capability by means of portable surface contamination and air particulate contamination monitors. These instruments will provide sufficient sensitivity to detect any plant site alpha contamination due to failure of this test assembly which might present a danger to operating personnel or the public.

4) Health and Safety of the Public

It is our conclusion that the health and safety of the public will not be endangered by this change.

TABLE 1
FUEL ROD DESIGN PARAMETERS
PLUTONIUM FUELED 3x3
TEST FUEL ASSEMBLY x

No. of Rods	Type	Clad Material	Clad I.D.	Clad Thickness	Fuel Form	Pellet Diameter	Fuel Enrichment	Peripheral Location Estimated Maximum Power Density - kw/f* 23.5 MWt
2	Removable	Zr-4	0.3445"	0.0233"	Vipac	-	6.6 w/o PuO_2	6.45
2	Removable	Zr-4	0.3445"	0.0233"	Pellet	0.3374"	6.6 w/o PuO_2	6.45
2	Non-Removable	Zr-4	0.3445"	0.0233"	Pellet	0.3374"	6.6 w/o PuO_2	6.45
2	Non-Removable	Zr-4	0.3445"	0.0233"	Vipac	-	6.6 w/o PuO_2	6.45

SAXTON NUCLEAR EXPERIMENTAL CORPORATION

Application for
Reactor Construction Permit and Operating License

Docket No. 50-146
Amendment No. 16

Saxton hereby requests that Section 2B of Operating License DPR-4 be amended to read as follows:

"B. Pursuant to the Act and Title 10 CFR, Chapter 1, Part 70 "Special Nuclear Materials," to receive, possess, and use at any one time 130 kilograms of contained Uranium-235 and 300 grams of contained Plutonium-239 as fuel for the operation of the reactor; and"

The purpose of this change is to permit the receipt, on-site storage, and irradiation at Saxton of a nine rod subassembly using Pu-239 as the fissile material. Present plans for the Saxton second core include the use of nine Pu enriched assemblies in the center nine positions of the core. This second core program includes irradiation of a removable nine rod 3x3 subassembly in a peripheral location of the present core as a proof test of the mechanical design