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Volume 3: Appendix C

NP-1000, Volume 3
Research Project 620-25

Interim Report, November 1979

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EPRI PERSPECTIVE

PROJECT DESCRIPTION

A hypothetical core disruptive accident (HCDA) and the impact it might cause, particularly on the underside of the head of a liquid metal fast breeder reactor (LMFBR) is a controversial issue. The debate is how much capability for safe absorption of impact energy must be designed into the reactor vessel and head. Neutronics and thermo-hydraulics analysts and core designers are the ones to whom this report is directed. Reactor vendors of early large-size LMFBRs can use this work as a sound starting base for improvements. The immediate application of this work is to provide the core design for the prototype large breeder reactor design studies conducted under EPRI Research Project 620.

This work, "Optimization of Radially Heterogeneous 1000-MW(e) LMFBR Core Configurations," is presented in four volumes. These are as follows:

- Volume 1: Design and Performance of Reference Cores
- Volume 2: Appendix A--Design Assumptions and Constraints
Appendix B--Radially Heterogeneous Core Configurations
- Volume 3: Appendix C--Optimization of Core Performance Parameters
- Volume 4: Appendix D--Optimization of Core Configurations
Appendix E--Component Designs

PROJECT OBJECTIVES

The objective of the work reported here is to make the characteristics of large cores such that the impact energy of an HCDA would approach zero. Without special provisions, an LMFBR vessel and head will have greater impact resistance than would be needed by such a core, thus relieving the controversy and assuring a safe design feature.

This report presents the results of the second of three phases of effort to optimize a radial heterogeneous 1000-MW(e) LMFBR core design that will minimize energetics in

an HCDA and yet have highly desirable breeding gain and core performance. The final results of the three phases are intended to establish a reference core design that will be safe, licensable, reliable, and efficient.

PROJECT RESULTS

Although not reflected in the work reported, doubling time is not the simple figure of merit that it originally appeared to be. A minimum compound system doubling time is quite desirable when the U.S. utility industry is plutonium limited, i.e., all of the available Pu (owned by the utilities) is being fully utilized in breeder plants. However, this is not the case and probably will not be true until well after the year 2010. Emphasis will be shifted to maximize total net plutonium produced rather than doubling time. In-core inventory will optimize at a somewhat higher quantity of Pu.

As stated in the text there are too many uncertainties in the fuel costs to make them a figure of merit between designs. However, on a consistent basis of estimating, the promising core designs show only small differences in costs. It is highly probable that costs can be significantly improved over those listed in the text.

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ABSTRACT

A parameter study was conducted to determine the interrelated effects of: loosely or tightly coupled fuel regions separated by internal blanket assemblies, number of fuel regions, core height, number and arrangement of internal blanket subassemblies, number and size of fuel pins in a subassembly, etc. The effects of these parameters on sodium void reactivity, Doppler, "incoherence," breeding gain, and thermohydraulics were of prime interest. Trends were established and ground work laid for optimization of a large, radially-heterogeneous, LMFBR core that will have low energetics in an HCDA and will have good thermal and breeding performance.

APPENDIX C: OPTIMIZATION OF CORE PERFORMANCE PARAMETERS

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APPENDIX C: OPTIMIZATION OF CORE PERFORMANCE PARAMETERS

1.0 INTRODUCTION

The evaluation of radially heterogeneous core configurations showed (see Appendix B) that loosely coupled cores at a core height of 40 inches were capable of achieving sodium void reactivities in the \$2.00 - \$2.50 range. For those cores, no clear advantage in performance could be identified for center core vs. center blanket configuration except that center blanket configuration showed less sensitivity in regard to power peaking for slight enrichment changes.

All tightly coupled cores required core heights of less than 40 inches to achieve sodium void reactivities in the \$2.00 - \$2.50 range. Here again, no clear performance advantage could be identified for center core vs. center blanket configuration even though the center blanket configuration showed also less sensitivity in power peaking for small changes in enrichment split.

For further analysis, the following configurations were selected:

<u>Coupling</u>	<u>Configuration</u>	<u>No. of Core Zones</u>	<u>No. of Pins/Fuel Assembly</u>
LC	CB	2	271
LC	CB	3	271
LC	CC	3	271
TC	CB	3	331
TC	CB	4	331
TC	CC	4	331

TC - tightly coupled, LC - loosely coupled, CB - center blanket
CC - center core

The purpose of this analysis is to:

1. determine required core heights
2. identify optimum pin diameters
3. assess center core vs. center blanket configurations
4. select two promising basic core configurations

The results of this study will then feed into another study which narrows down the choice of core configurations to two.

2.0 APPROACH

The previous analysis reported in Appendix B had shown that the tightly coupled cores required core heights of less than 40 inches to achieve the required sodium void reactivity. Therefore, to determine trends in sodium void reactivity the tightly coupled cores were analyzed for two core heights, i.e. 32 inches and 36 inches. The fuel pin o.d. was varied from 0.24 inches to 0.28 inches to determine optimum doubling times.

The loosely coupled cores were analyzed for core heights of 40 inches and 48 inches. The fuel pin diameters for those cores were varied from 0.26 inches to 0.30 inches. Different fuel pin o.d. ranges were selected for the different core heights reflecting the fact that a decrease in core height shifts the optimum size for the fuel pin to smaller diameters.

The design of the fuel assemblies was constrained by a p/d ratio of 1.18 and a fuel bundle pressure drop of 75 psi. For the 32 inches and 36 inches cores, the p/d constraint limited the design. For the taller cores, the lattice had to be opened up past a p/d of 1.18 to stay below the pressure drop limit of 75 psi. For each core height and pin diameter, clad thickness, axial blanket thickness and plenum length were adjusted (Table I). The fuel cladding thickness to diameter ratio was kept constant at 0.050. The fuel to plenum length ratio was kept at 1.0. As the core height decreased the axial blanket thickness was increased at the rate of 1 inch per 4 inch reduction in core height down to 36 inches. The 32 inch core had an 18 inch axial blanket compared to a 16 inch blanket for the 36 inch core.

To keep the assembly duct diameter in the 6 inch range, the 40 inch and 48 inch cores have assemblies with 271 pins per assembly compared to 331 pin assemblies for the shorter cores. Details of the fuel and blanket assembly design are shown in Appendix C-A.

The fuel and internal blanket residence time were two years at a 70% capacity factor. The radial blanket assemblies stayed in the reactor for five years. Every year, one-half of the fuel and internal blanket assemblies and one-fifth of the radial blanket assemblies were discharged. The equilibrium cycle burnup analysis was conducted in r-z geometry. Figures of merit were:

- a. sodium void reactivity
- b. doubling time
- c. breeding ratio
- d. specific inventory
- e. maximum change in linear heat rating in fuel assemblies over one cycle

Sodium void reactivity was the major constraint in so far as the voiding of the flowing sodium could not add more than \$2.50 of reactivity to the system.

Attention was given to the power shift in each core region. These shifts are important because they further aggravate the overcooling problem in heterogeneous cores coming mainly from the power rise in internal blanket assemblies. Even though no quantitative analysis was carried out at this stage how these power shifts affect clad temperature, one has to expect that the greater the power swing in the fuel assemblies, the greater the clad temperature penalty. The magnitude of the power shift is also indicative of the sensitivity of the power shape to reactivity perturbations.

By fixing the fuel residence time to two years, a large spread in peak burnup has to be expected for the different pin diameters. Furthermore, the peak fast fluences will vary from design to design. This implies a penalty in performance for the large-size pins. If all designs were fluence- or burnup-normalized, then the residence times would be the longer for the larger the pin diameters. This would lead to a reduction in out-of-pile fuel inventory and, therefore, affect doubling time. Estimates on doubling time will be made for those conditions. Previous analyses had shown that the extension of the fuel residence time by one year increases the sodium void reactivity by approximately 80¢. For the cores with extended residence time, the sodium void reactivities will be estimated. It should be noted that an adjustment of doubling time for a longer fuel residence time by modifying only the out-of-pile factor gives a lower bound for the doubling time for as long as the capacity factor is the same. In reality, an extended residence time increases the BOEC fissile inventory and reduces the fissile gain per year. Both effects tend to increase doubling time.

Fuel cycle cost were also calculated using HEDL's N-factor formula to calculate fabrication cost. Since none of the designs is cost-optimized at this stage, the fuel cycle cost show only qualitative differences between different designs.

3.0 CONFIGURATION

Based on the characteristics of the cores described in the introduction, specific core layouts for the center core and center blanket configurations were developed for both tightly and loosely coupled cores. Whenever the core height was changed another core layout was needed to maintain the power level in the core. Figures 1-12 show the different core configurations. The loosely coupled cores had 366 fuel assemblies at 40 inches core height and 306 fuel assemblies at 48 inches core height. With the exception of the center core configurations, the tightly coupled cores had 372 fuel assemblies for 32 inch high cores and 354 fuel assemblies for 36 inch high cores. The ratio of internal blanket assemblies to fuel assemblies ranged from 0.45 to 0.50. The tightly coupled center core configuration had relatively fewer internal blanket assemblies.

4.0 PERFORMANCE CHARACTERISTIC

For the performance analysis, two assumptions were made. For one, an average fuel pin rating of approximately 8 kW/ft and secondly a power split between core and blanket regions of 40/10 were assumed in setting the reactor power. For all calculations, the enrichments were selected such that for each core region the peak ratings during fuel life were the same.

4.1 INVENTORY

Equilibrium cycle inventories and specific inventories are listed in Tables II and III for tightly and loosely coupled cores. As the fuel pin diameter increases, so does the fissile inventory. Even though the core layouts change somewhat when the core height is changed, the taller tightly coupled cores have still lower specific fissile inventories than the shorter cores. For those cores, the center core configurations have 1-8% lower fissile inventories than the center blanket cores. For loosely coupled cores, the differences in specific inventory for the center core and center blanket configurations are less than 4% and the taller cores have slightly higher specific inventories than the smaller cores. The reason for the different trend is the increased pressure drop for the taller cores which in some instances requires an opening of the lattice to stay below a 95 psi pressure drop. The limiting constraint for the 32 inch and 36 inch cores is the p/d ratio of 1.18. For those cores, the resulting pressure drop is well below 75 psi. For the 40 inch and 48 inch cores, however, the design limiting constraint for most cores is the 75 psi limit and the resulting p/d ratios are greater than 1.18 thus leading to a reduction in fuel volume fraction which adversely affects performance.

4.2 BURNUP AND BURNUP SWING

Tables II and III show the fissile inventories at BOEC and EOEC for the different reactor regions. For both tightly and loosely coupled cores the gain in fissile material over an equilibrium cycle (fissile gain) is approximately 300 kg. As the fuel pin diameter increases the fissile gain increases slightly.

Increases in core height lead to a slight reduction in fissile gain. In all cases, the loss in fissile material over an equilibrium cycle in the driver fuel assemblies is more than offset by the fissile gain in the internal blanket assemblies. The core region encompassing the driver fuel and internal blanket assemblies shows a fissile gain which can be as low as 5 kg or as high as 84 kg. The former is seen in the loosely coupled CB-2C configuration with a 0.26 inch fuel pin while the latter is the gain in the loosely coupled CB-3C configuration with a 0.30 inch fuel pin. The combined fissile gain for radial and axial blanket regions varies from 241 kg to 286 kg for loosely coupled cores and from 269 kg to 313 kg for tightly coupled cores. Most of the combined gains for the loosely coupled cores are in the 250 kg range and those for the loosely coupled cores are in the 280 kg range.

Increasing the core height reduces the buildup of fissile material in the axial blanket but increases the buildup in the radial blanket. However, an increase in core height always leads to a net reduction in the combined axial and radial blanket fissile gain.

Tables IV and V list burnup parameters for loosely and tightly coupled cores. The burnup swings range from 2.47% (\$6.77) to 0.52% (\$1.42). As the pin diameter increases, the burnup swing decreases. In general, tightly coupled cores show lower burnup swings than loosely coupled cores. The highest burnup swings are observed for a 2-core region loosely coupled reactor. As the number of core regions increases, the burnup swing tends to decrease. Without exception, the taller cores among the loosely and tightly coupled cores have lower burnup swings than the shorter cores.

Because of the fixed residence time, the peak and average discharge burnups ranging from 84 MWd/kg to 57 MWd/kg and 60 MWd/kg to 41 MWd/kg, respectively, reflect mostly the difference in fuel pin diameter. The tightly coupled cores show higher peak burnups than the loosely coupled cores. Only small differences in burnup exist between different cores with the same coupling.

4.3 POWER SWING

The larger the change in assembly power over a cycle the greater is the penalty in thermal performance of the reactor. While it is impossible to design a reactor which runs at constant assembly power, it is always desirable to keep the change in assembly power as low as possible. Tables VI and VII show for loosely and tightly coupled cores how the peak power density in each core zone

changes over an equilibrium cycle. Among both the loosely and tightly coupled cores, the center core configurations show the highest swing in power density. In all cores, the highest swing is observed in the outermost core zone. While the power density in the other core zones can rise or fall over a cycle, it always decreases for the outermost core zone. In general, the loosely coupled cores show a higher power swing than the tightly coupled cores. An exception, however, is the 2-core zone loosely coupled system. Here the peak power density changes very little, and is comparable to the change one observes in homogeneous reactors.

While the center core configuration shows the highest power swing, it should be noted that the tightly coupled center core configuration shows a lower swing than even the loosely coupled center blanket 3-core region configuration. Typical for the center core configurations is that they show larger power variation in two core regions while the center blanket configurations have a large variation in power only in one core zone.

Tables VI and VII also show the beginning-of-equilibrium cycle (BOEC) and end-of-equilibrium cycle (EOEC) peak ratings. In all cases, the extrapolated beginning-of-life rating would be well below the design base of 13.5 kW/ft used in the assembly design. To bring the reactor power output in line with this peak rating would reduce the doubling time for all cores. However, because of the small spread in peak rating among all cores this normalization was not carried out at this stage since it is not the absolute but the relative performance which is of interest. For two test cases (the tightly and loosely coupled configurations CB-3C) a power renormalization showed a reduction in doubling time of less than one year and an increase in sodium void reactivity by approximately 15¢.

4.4 FAST FLUENCE

As shown in Tables IV and V the fluence for all the heterogeneous cores analyzed is substantially lower than that for homogeneous cores. The fluence ranges from 1.48×10^{23} to 1.05×10^{23} nvt depending on pin size, core height and coupling. The fluence is the lower the larger the fuel pin, the taller the core and the greater the coupling. Center core configurations have the highest fluences.

4.5 BREEDING

To properly investigate the breeding performance, the fuel pin diameter was varied for each configuration as well as the core height. The fuel and internal blanket residence time was fixed at two years. The radial blanket assemblies stayed in the reactor for five years. Tables VIII and IX list the breeding performance of the 36 cores which were analyzed. The breeding ratios range from 1.33 to 1.46. As the fuel pin diameter increases the breeding ratio also increases. The resulting increase in breeding gain, however, is for all cores more than offset by the increase in fissile inventory thus leading to an increase in reactor and also compound system doubling time. The compound system doubling times range from 15.0 years to 20.2 years. The tightly coupled cores have usually lower doubling times than the loosely coupled cores. As the core height increases, the doubling time also increases. However, since different core heights meant also different core configurations, no general conclusion about the correlation doubling times vs. core height can be drawn.

The analysis showed that the 0.24 in. fuel pin gave the lowest doubling times for the tightly coupled 32 inch and 36 inch cores. The 0.26 inch fuel pin showed the best breeding performance in loosely coupled 40 inch and 48 inch cores.

To assess the bias toward smaller pins built into the analysis by fixing the residence time for all pin sizes to 2 years, the following analysis was carried out. All designs were fluence-normalized. For example, the tightly coupled center blanket configurations with three core zones had the following fluences and doubling times:

Height, in.	o.d., in.	Fluence $\times 10^{23}$ nvt	Full Residence Time, yrs.	CSDT, yrs.
32	0.24	1.44	2.0	15.0
	0.26	1.27	2.0	16.1
	0.28	1.08	2.0	17.2
36	0.24	1.36	2.0	16.4
	0.26	1.22	2.0	17.3
	0.28	1.06	2.0	18.3

In the fluence-normalization process the residence time for the larger pins was extended to match the fluence of the small pin. It was assumed that the reactor doubling times and the capacity factor remain unchanged. This leads to new fuel residence times and doubling times:

Height, in.	o.d., in.	Fluence $\times 10^{23}$ nvt	Full Residence Time, yrs.	CSDT, yrs.
32	0.24	1.44	2.0	15.0
	0.26	1.44	2.27	15.3
	0.28	1.44	2.67	15.3
36	0.24	1.36	2.0	16.4
	0.26	1.36	2.23	16.4
	0.28	1.36	2.57	16.6

The same process was carried out for the other configurations and the same trend was observed. While the doubling times decreased for the larger size fuel pins, they never dropped below the doubling time for the smallest fuel pin sizes used in this study. Furthermore, the doubling time estimates so obtained are low estimates since they only reflect the change in the out-of-pile inventory but do not reflect the increase in fissile inventory and reduction in fissile gain which result from an increase in residence time.

4.6 SODIUM VOID REACTIVITY

The results of the sodium void reactivity perturbation calculations are shown in Tables VIII and IX. An increase in core height always led to an increase in sodium void reactivity. For the loosely coupled 40 inch and 48 inch cores, the increase in sodium void reactivity with core height ranged from 3¢ - 5¢ per inch core height. The tightly coupled 32 inch and 36 inch cores showed increases in sodium void reactivity ranging from 6¢ - 14¢ per inch in core height. At this time, it cannot be determined to what an extent the different rates in sodium void reactivity increase can be attributed to the difference in coupling or the relative significance of axial leakage at the different core heights.

With few exceptions, an increase in fuel pin diameter leads to a reduction in sodium void reactivity. The exceptions are observed for the tall cores where in some instances the design limiting constraint was the bundle pressure drop and not the p/d ratio of 1.18. Since the configurations were selected such that about the same sodium void reactivity is obtained for the 40 inch loosely coupled cores and 34 inch tightly coupled cores based on simplified design procedures, it is not surprising that a more detailed assembly and pin design does not increase significantly the spread in sodium void reactivity between the different cores.

The 48 inch loosely coupled cores are either very close or slightly above the sodium void reactivity limit. For the selection of suitable designs one has to keep in mind that the difference between perturbation and direct eigenvalue calculations for the sodium void reactivity of those cores is $\sim 10\%$. Furthermore, the necessary readjustment of power level to be consistent with a peak nominal rating of 13.5 kW/ft leads to an increased fission product inventory as well as higher fissile enrichments in the internal blankets. This in turn increases the sodium void reactivity by approximately 15%. Therefore, the cut-off limit for the sodium void reactivity for the cores listed in Tables VIII and IX is approximately \$2.25. Voiding the internal blanket assemblies adds between \$0.29 and \$1.19 to the reactor. By far the lowest sodium void worth is obtained for the loosely coupled 2 core region configuration. The large center blanket is mostly responsible for the low void worth. Typically the worth for the other configuration is between \$0.80 and \$1.00.

4.7 FUEL CYCLE COST

Fuel cycle cost calculations were carried out in the hope to use this cost information as an additional figure of merit. Appendix C-B gives the details of those calculations. They show in general that larger pins have higher fuel cycle cost than smaller pins. However, no clear trend is visible in regard to fuel cycle cost sensitivity to core height changes. The latter is a consequence of the HEDL N-factor formula for the calculation of fabrication cost. Increasing the residence time for the fuel and blanket assemblies in order to normalize the design to the fluence will reduce the cost for the cores with larger pins. However, since heterogeneous cores have higher fissile inventories, the net fuel cost (i.e. inventory charge minus plutonium credit) are sizable (several mills/kWh) and depend strongly on the assumed plutonium cost. Because of the uncertainties in all cost information (interest charge, plutonium price, fabrication and reprocessing cost) and the relatively small differences between different core designs the fuel cycle cost is not a meaningful figure of merit for the selection of a design. However, generic trends in fuel cycle cost should guide the design (i.e. the lower the inventory, the lower the heavy metal loading, the higher the fissile gain, etc., the lower the fuel cycle cost).

5.0 SELECTION OF DESIGN PARAMETERS AND CONFIGURATIONS

The preceeding analyses have shown that center core configurations have doubling times and sodium void reactivities which are comparable to those obtained in center blanket configurations. No clear advantage of center core configurations in specific fissile inventory could be identified. However, those configurations show substantially higher power swings than the center blanket configuration. This feature together with the earlier identified higher sensitivity in power shape to small changes in enrichment split (Appendix B) makes center core configurations less desirable than center blanket configurations. Therefore, center core configurations were eliminated from further analysis.

The loosely coupled cores permitted a core height of 40 inches and fuel assemblies with 271 fuel pins. Tightly coupled cores required core heights of less than 40 inches and 331 fuel pins per assembly. The latter feature was required to keep down both fabrication cost and refueling time. By increasing the number of fuel pins from 271 to 331 the number of fuel assemblies could be reduced by 22%. Therefore, both tightly and loosely coupled cores with respective heights of 36 inches and 40 inches have approximately the same number of fuel assemblies. An exception is the tightly coupled center core configuration where the number of fuel pins was kept at 271 to permit a core layout with four driver regions yielding a low sodium void reactivity.

By increasing the number of fuel pins per assembly for the shorter cores it was also possible to keep the number of control rods and control rod drives the same as for the taller cores.

To keep the outside assembly dimension approximately the same and thus assuring approximately the same core size, the fuel pin diameters for the tightly coupled cores are somewhat smaller than for the taller loosely coupled cores. The design change is in line with the observation that the optimum pin diameter is smaller for a shorter core. In other words, by keeping the coolant temperature rise the same, a shorter core requires less coolant area per pin than the taller core. This would yield a larger than optimum fuel volume fraction for the same pin size. By reducing the pin size optimum conditions can be maintained.

A clear disadvantage of assemblies with a large number of fuel pins is the greater bundle-duct interference for the same temperature and fluence conditions as in an assembly with a small number of fuel pins. The smaller size of the fuel pin in the tightly coupled core also leads to higher burnups than in the loosely coupled cores.

On the other hand, the loosely coupled cores have a greater sensitivity in power shape to changes in enrichment split and a greater power swing than tightly coupled cores. Furthermore, the doubling times for the loosely coupled cores are generally higher than those for the tightly coupled cores. Therefore, none of the cores analyzed so far could be identified as a clear favorite.

None of the loosely coupled cores came close to the desired doubling time target of 15 years. However, the sodium void reactivities were low enough to allow for some margin in improvement in configuration to reduce doubling time at only a small penalty in sodium void reactivity. The configuration selected for further improvement is the center blanket 3-core configuration. It allows for more flexibility in design modification than the two-core region arrangement which has only very little margin for improvement.

Among the tightly coupled systems the 3-core region configuration was given preference over the 4-core region arrangements. In term of doubling time, the 3-core region configuration and the configuration with 4-core regions show approximately the same good performance. On the other hand, the latter configuration had a slight edge in sodium void reactivity over the former configuration. The main argument in favor of the 3-core region configuration is that only 2-3 different enrichments are needed compared to 3-4 for the 4-core region configurations. With all other performance data about equal (there are advantages in specific inventory and fuel cycle cost but they are too small to be significant) design simplicity has been favored.

The design modifications needed for the loosely coupled core are to tighten the coupling and at the same time to reduce the core region sizes to keep the sodium void reactivity below \$2.50. The modifications for the tightly coupled core will concentrate on a reduction of the center blanket size to reduce overall core dimensions.

6.0 SUMMARY AND CONCLUSIONS

The burnup analysis of 36 cores which differed with respect to neutronic coupling, core height, and fuel pin diameter showed the following results:

- a. To achieve sodium void reactivities of \$2.50 or less, tightly coupled cores required core height of 36 inches or less. For the loosely coupled cores, heights of less than 48 inches are required.
- b. As fuel pin size increases, the sodium void reactivity decreases.
- c. The tightly coupled cores had generally lower doubling times than the loosely coupled cores.
- d. Among the tightly and loosely coupled cores, the fuel pin sizes of 0.24 inches and 0.26 inches, respectively, showed the lowest doubling times.
- e. For the cores analyzed, no clear advantage in regard to specific inventory and sodium void reactivity could be identified for either tightly or loosely coupled systems.
- f. Because of the high power swing over an equilibrium cycle observed for the center core configurations, they were eliminated from further analysis. Earlier analysis had shown that those configurations showed also a higher sensitivity in power peaking for small enrichment split changes. They always performed equal to or worse than the center blanket configuration.
- g. Loosely coupled systems showed a greater power swing than tightly coupled systems.

- h. A loosely coupled and a tightly coupled 3-core zone center blanket configuration were recommended for further study.

None of the systems analyzed was a clear favorite. The optimum configurations, however, will be tilted toward the tightly coupled systems. The analysis was carried out in r-z geometry. The more circular the core configuration, the better is the representation when compared to hexagonal geometry models. However, since these analyses were carried out with the control rods fully withdrawn it needs to be determined to what an extent a configuration is more desirable which creates power peaks by employing broken rings of internal blanket assemblies and then position the control rods in those peaks. This will determine to what an extent, for example, the tightly coupled center blanket configuration with three core regions needs to be modified.

Fig. 1. Configuration CB-2C-H40LC

Fig. 2. Configuration CB-2C-H48LC

Fig. 3. Configuration CB-3C-H40LC

Fig. 4. Configuration CB-3C-H48LC

Fig. 5. Configuration CC-3C-H40LC

Fig. 6. Configuration CC-3C-H48LC

Fig. 7. Configuration CB-3C-H32TC

Fig. 8. Configuration CB-3C-H36TC

Fig. 9. Configuration CB-4C-H32TC

Fig. 10. Configuration CB-4C-H36TC

Fig. 11. Configuration CC-4C-H32TC

Fig. 12. Configuration CC-4C-H36TC

TABLE I. Design Parameters

	Tightly Coupled Cores						Loosely Coupled Cores					
Core Height, in.	32			36			40			48		
Pin o.d., in.	0.24	0.26	0.28	0.24	0.26	0.28	0.26	0.28	0.30	0.26	0.28	0.30
Clad Thickness, mils	12	13	14	12	13	14	13	14	15	13	14	15
No. Pins/Assembly	331						271					
Axial Blanket Thickness, in.	18			16			15			14		
Plenum Length, in.	32			36			40			48		

TABLE II. Inventories for Tightly Coupled Cores

Height, in.		o.d., in.		CONFIGURATION											
				CB-3C				CB-4C				CC-4C			
				Power, MWt	Fissile Inventory, kg		Fissile Gain, kg	Power, MWt	Fissile Inventory, kg		Fissile Gain, kg	Power, MWt	Fissile Inventory, kg		Fissile Gain, kg
					Spec. Inv., kg/MWt	BOEC			EOEC	Spec. Inv., kg/MWt			BOEC	EOEC	
32.0	0.24	Core	3000	3547	3243	-304	2942	3702	3392	-310	3216	3803	3510	-293	
		Internal Blanket	1.37	175	492	317	1.45	189	531	342	1.35	174	489	315	
		Radial Blanket		308	451	143		292	428	136		281	410	129	
		Axial Blanket		80	233	153		73	215	142		80	235	155	
		Total		4110	4419	309		4256	4566	310		4338	4644	306	
		0.26	Core	3000	4040	3742	-298	2942	4195	3892	-303	3216	4326	4040	-286
	Internal Blanket		1.54	174	493	319	1.62	193	547	354	1.51	179	508	329	
	Radial Blanket			314	462	148		289	425	136		277	407	130	
	Axial Blanket			82	240	158		76	221	145		83	242	159	
	Total			4610	4937	327		4753	5085	332		4865	5197	332	
	0.28		Core	3000	4561	4269	-292	2942	4735	4438	-297	3216	4893	4611	-282
		Internal Blanket	1.71	174	497	323	1.80	197	563	366	1.69	180	516	336	
		Radial Blanket		319	469	150		282	416	134		280	413	133	
		Axial Blanket		85	248	163		78	228	150		85	249	164	
		Total		5139	5483	344		5292	5645	353		5438	5789	351	

TABLE II. Inventories for Tightly Coupled Cores (Cont.)

		CONFIGURATION											
		CB-3C				CB-4C				CC-4C			
		Power, MWt	Fissile Inventory, kg		Fissile Gain, kg	Power, MWt	Fissile Inventory, kg		Fissile Gain, kg	Power, MWt	Fissile Inventory, kg		Fissile Gain, kg
Height, in.	o.d., in.	Spec. Inv., kg/MWt	BOEC	EOEC		Spec. Inv., kg/MWt	BOEC	EOEC		Spec. Inv., kg/MWt	BOEC	EOEC	
36.0	0.24												
		<u>3000</u>	3762	3460	-302	<u>3150</u>	3869	3546	-323	<u>3234</u>	3720	3443	-277
		1.44	179	505	326	1.41	201	565	364	1.31	166	466	300
			318	465	147		321	470	149		284	415	131
			67	196	129		66	194	128		70	205	135
			4326	4626	300		4457	4775	318		4240	4529	289
	0.26												
		<u>3000</u>	4200	3916	-284	<u>3150</u>	4302	3998	-304	<u>3234</u>	4147	3888	-259
		1.59	175	498	323	1.55	202	571	369	1.44	167	470	303
			314	461	147		314	461	147		278	409	131
			69	201	132		68	199	131		72	210	138
			4758	5076	318		4886	5229	343		4664	4977	313
	0.28												
		<u>3000</u>	4740	4462	-278	<u>3150</u>	4866	4566	-300	<u>3234</u>	4694	4440	-254
		1.77	176	504	328	1.73	206	586	380	1.61	169	480	311
			316	465	149		313	462	149		285	419	134
			71	208	137		70	204	134		73	215	142
			5303	5639	336		5455	5818	363		5221	5554	333

TABLE III. Inventories for Loosely Coupled Cores

Height, in.		o.d., in.		CONFIGURATION												
				CB-2C					CB-3C				CC-3C			
				Power, MWt	Fissile Inventory, kg		Fissile Gain, kg	Power, MWt	Fissile Inventory, kg		Fissile Gain, kg	Power, MWt	Fissile Inventory, kg		Fissile Gain, kg	
					Spec. Inv., kg/MWt	BOEC			EOEC	Spec. Inv., kg/MWt			BOEC	EOEC		Spec. Inv., kg/MWt
40	0.26	Core	3000	3874	3595	-279	3000	4108	3807	-301	3000	3935	3654	-281		
		Internal Blanket	1.48	154	438	284	1.56	193	546	353	1.50	175	495	320		
		Radial Blanket		346	506	160		315	461	146		323	472	149		
		Axial Blanket		60	174	114		54	160	106		57	168	111		
		Total		4434	4713	279		4670	4974	304		4490	4789	299		
		0.28	Core	3000	4280	4020	-260	3000	4562	4275	-287	3000	4382	4114	-268	
	Internal Blanket		1.61	150	431	281	1.71	194	552	358	1.65	171	489	318		
	Radial Blanket			344	504	160		308	453	145		329	483	154		
	Axial Blanket			62	182	120		56	165	109		60	173	113		
	Total			4836	5137	301		5120	5445	325		4942	5259	317		
	0.30		Core	3000	4744	4498	-246	3000	5095	4815	-280	3000	4883	4624	-259	
		Internal Blanket	1.77	147	424	277	1.88	195	559	364	1.81	171	490	319		
		Radial Blanket		344	505	161		304	448	144		326	480	154		
		Axial Blanket		65	190	125		58	171	113		61	180	119		
		Total		5300	5617	317		5652	5993	341		5441	5774	333		

TABLE III. Inventories for Loosely Coupled Cores (Cont.)

Height, in.		o.d., in.	CONFIGURATION											
			CB-2C				CB-3C				CC-3C			
			Power, MWt	Fissile Inventory, kg	Fissile Gain, kg		Power, MWt	Fissile Inventory, kg	Fissile Gain, kg		Power, MWt	Fissile Inventory, kg	Fissile Gain	
			Spec. Inv., kg/MWt	BOEC	EOEC		Spec. Inv., kg/MWt	BOEC	EOEC		Spec. Inv., kg/MWt	BOEC	EOEC	
48.0	0.26	Core	3000	4039	3741	-298	3000	4193	3886	-307	3000	4065	3770	-295
		Internal												
		Blanket	1.54	167	475	308	1.59	193	545	352	1.55	179	505	326
		Radial												
		Blanket		370	541	171		348	510	162		361	528	167
		Axial												
	0.28	Blanket		44	130	86		41	121	80		43	126	83
		Total		4620	4887	267		4775	5062	287		4648	4929	281
		Core	3000	4386	4116	-270	3000	4584	4300	-284	3000	4434	4163	-271
		Internal												
		Blanket	1.65	162	464	302	1.72	191	542	351	1.67	175	497	322
		Radial												
	0.30	Blanket		361	529	168		340	499	159		353	518	165
		Axial												
		Blanket		46	134	88		42	124	82		44	129	85
		Total		4955	5243	288		5157	5465	308		5006	5307	301
		Core	3000	4788	4540	-248	3000	5030	4762	-268	3000	4846	4596	-250
		Internal												
		Blanket	1.78	158	455	297	1.87	189	540	351	1.80	172	491	319
		Radial												
		Blanket		354	521	167		336	494	158		345	508	163
		Axial												
		Blanket		47	139	92		44	128	84		45	133	88
		Total		5347	5655	308		5599	5924	325		5408	5728	320

TABLE IV. Burnup Parameters for Tightly Coupled Cores

Configuration	Height, in.	Fuel Pin o.d., in.	Δk , %	Burnup, MWd/kg		Fast Fluence 10^{23} , nvt
				Peak Discharge	Average	
CB-3C	32	0.24	1.63	84.0		1.44
		0.26	1.45	68.7		1.27
		0.28	1.35	58.8		1.08
	36	0.24	1.33	78.8		1.36
		0.26	1.09	66.9		1.22
CB-4C	32	0.28	0.99	57.5		1.06
		0.24	1.22	79.1		1.32
		0.26	1.02	68.5		1.16
	36	0.28	0.89	61.3		1.05
		0.24	0.91	78.4		1.39
		0.26	0.64	72.1		1.25
CB-4C	32	0.28	0.55	60.0		1.09
		0.24	1.22	81.0		1.48
		0.26	1.07	70.6		1.32
	36	0.28	1.04	58.9		1.18
		0.24	0.86	80.4		1.53
		0.26	0.63	71.8		1.41
		0.28	0.61	62.1		1.18

TABLE V. Burnup Parameters for Loosely Coupled Cores

Configuration	Height, in.	Fuel Pin o.d., in.	Δk , %	Burnup MWd/kg		Fast Fluence 10^{23} , nvt
				Peak Discharge	Average	
CB-2C	40	0.26	2.47	74.5		1.38
		0.28	2.26	65.2		1.27
		0.30	2.08	57.4		1.16
	48	0.26	2.29	77.7		1.33
		0.28	2.03	72.5		1.24
		0.30	1.85	61.0		1.15
CB-3C	40	0.26	1.11	75.7		1.29
		0.28	1.02	67.9		1.19
		0.30	1.03	61.0		1.09
	48	0.26	0.68	73.4		1.24
		0.28	0.57	64.9		1.15
		0.30	0.52	57.3		1.05
CC-3C	40	0.26	1.50	79.1		1.47
		0.28	1.56	67.8		1.25
		0.30	1.58	61.3		1.12
	48	0.26	1.39	77.9		1.42
		0.28	1.30	68.7		1.25
		0.30	1.23	61.3		1.18

TABLE VI. Ratings and Power Swings for Tightly Coupled Cores

Configuration	Height, in.	o.d., in.	Rating, kW/ft		Peak $\Delta P/P$, %			
			BOEC	EOEC	Core 1	Core 2	Core 3	Core 4
CB-3C	32	0.24	10.2	9.7	-5.4	-7.2	-12.9	
		0.26	10.5	9.2	-3.8	-3.8	-12.2	
		0.28	10.2	9.3	-0.7	-3.6	-9.6	
	36	0.24	10.4	9.3	-10.0	-7.1	-10.9	
		0.26	9.9	8.7	-6.6	-4.9	-12.4	
		0.28	10.3	8.9	-4.0	-2.3	-13.2	
CB-4C	32	0.24	9.6	9.4	-2.8	-2.4	-8.3	-15.3
		0.26	9.8	9.6	-2.1	-0.2	-6.3	-15.8
		0.28	10.0	10.1	-0.9	+1.1	-5.3	-16.0
	36	0.24	10.1	9.1	-3.9	-4.9	-9.6	-15.3
		0.26	10.1	9.3	-2.7	-2.7	-7.4	-14.6
		0.28	10.2	8.8	-2.6	-0.2	-5.5	-14.3
CC-4C	32	0.24	10.4	9.8	+5.4	+3.8	-8.1	-19.4
		0.26	10.5	10.3	+9.4	+6.4	-7.7	-19.1
		0.28	10.9	10.7	+14.6	+10.7	-5.5	-20.6
	36	0.24	10.4	10.0	+1.5	+1.5	-10.3	-15.7
		0.26	10.6	10.5	+6.1	+5.4	-8.6	-17.0
		0.28	11.3	10.5	+12.7	+10.5	-7.1	-18.2

TABLE VII. Ratings and Power Swings for Loosely Coupled Cores

Configuration	Height, in.	o.d., in.	Rating, kw/ft		Peak $\Delta P/P$, %		
			BOEC	EOEC	Core 1	Core 2	Core 3
CB-2C	40	0.26	11.3	9.9	-3.8	-12.8	
		0.28	11.6	10.2	-0.8	-12.0	
		0.30	11.9	10.6	0.0	-11.3	
	48	0.26	11.5	10.9	-5.4	-12.5	
		0.28	11.8	11.2	-4.7	-11.3	
		0.30	12.0	11.5	-3.8	-10.5	
CB-3C	40	0.26	10.8	11.0	+9.0	+0.9	-20.8
		0.28	11.0	11.5	+11.8	+3.2	-21.3
		0.30	11.2	11.9	+14.9	+4.0	-21.8
	48	0.26	10.8	10.4	+4.9	-4.2	-17.7
		0.28	11.2	10.7	+8.4	-1.9	-17.8
		0.30	11.5	10.9	+10.5	-0.2	-17.3
CC-3C	40	0.26	11.5	9.9	+16.0	+1.4	-20.0
		0.28	11.8	9.4	+30.6	+7.5	-20.6
		0.30	12.1	8.8	+38.5	+7.0	-20.3
	48	0.26	11.7	9.0	+25.9	+11.3	-22.8
		0.28	12.3	8.9	+38.6	+16.6	-23.4
		0.30	12.8	8.7	+47.1	+20.3	-23.4

TABLE VIII. Breeding Performance and Sodium Void Reactivities for Tightly Coupled Cores

Configuration	Height, in.	Fuel Pin o.d., in.	BR	RDT, yrs.	CSDT, yrs.	$\beta_{\text{eff}} \times 10^4$	Sodium Void Reactivity			
							Core + Upper AB		Internal Blanket	
							%	\$	%	\$
CB-3C	32	0.24	1.387	13.2	15.0	36.44	0.698	1.91	0.297	0.82
		0.26	1.409	14.1	16.1	36.62	0.697	1.90	0.287	0.78
		0.28	1.433	14.9	17.2	36.84	0.680	1.85	0.267	0.72
	36	0.24	1.371	14.4	16.4	36.42	0.785	2.16	0.320	0.88
		0.26	1.393	15.0	17.3	36.61	0.791	2.16	0.312	0.85
		0.28	1.417	15.8	18.3	36.85	0.780	2.11	0.296	0.80
CB-4C	32	0.24	1.391	13.8	15.4	36.5	0.659	1.80	0.348	0.95
		0.26	1.424	14.2	16.0	36.5	0.643	1.76	0.338	0.93
		0.28	1.450	15.0	17.0	36.5	0.622	1.70	0.326	0.89
	36	0.24	1.369	14.1	15.7	36.5	0.811	2.22	0.371	1.02
		0.26	1.401	14.3	16.0	36.5	0.794	2.18	0.362	0.99
		0.28	1.428	14.9	16.9	36.5	0.783	2.15	0.351	0.96
CC-4C	32	0.24	1.41	14.2	16.2	36.5	0.796	2.18	0.359	0.98
		0.26	1.45	14.7	16.9	36.5	0.772	2.12	0.338	0.93
		0.28	1.48	15.5	18.0	36.5	0.738	2.02	0.315	0.86
	36	0.24	1.39	14.7	16.9	36.5	1.010	2.77	0.397	1.09
		0.26	1.43	14.9	17.1	36.5	0.970	2.66	0.385	1.05
		0.28	1.46	15.7	18.2	36.5	0.944	2.59	0.356	0.98

TABLE IX. Breeding Performance and Sodium Void Reactivities for Loosely Coupled Cores

Configuration	Height, in.	Fuel Pin o.d., in.	BR	RDT, yrs.	CSDT, yrs.	$\beta_{\text{eff}} \times 10^4$	Sodium Void Reactivity			
							Core + Upper AB		Internal Blanket	
							%	\$	%	\$
CB-2C	40	0.26	1.352	15.9	18.3	36.26	0.741	2.04	0.175	0.48
		0.28	1.380	16.1	18.6	36.55	0.739	2.02	0.142	0.39
		0.30	1.403	16.6	19.4	36.79	0.754	2.05	0.107	0.29
	48	0.26	1.331	17.3	20.2	36.01	0.824	2.29	0.213	0.61
		0.28	1.360	17.2	20.0	36.33	0.832	2.29	0.183	0.50
		0.30	1.386	17.4	20.2	36.61	0.831	2.27	0.187	0.40
CB-3C	40	0.26	1.409	15.4	17.1	36.5	0.766	2.10	0.365	1.00
		0.28	1.442	15.8	17.6	36.5	0.752	2.06	0.335	0.92
		0.30	1.468	16.6	18.6	36.5	0.738	2.02	0.299	0.82
	48	0.26	1.385	16.7	18.6	36.5	0.944	2.59	0.434	1.19
		0.28	1.417	16.8	18.8	36.5	0.899	2.46	0.390	1.07
		0.30	1.445	17.2	19.3	36.5	0.890	2.44	0.362	0.99
CC-3C	40	0.26	1.371	15.0	17.2	36.37	0.791	2.17	0.300	0.82
		0.28	1.396	15.7	18.0	36.64	0.760	2.08	0.253	0.69
		0.30	1.418	16.4	19.0	36.85	0.743	2.02	0.204	0.55
	48	0.26	1.345	16.5	19.1	36.17	0.897	2.48	0.348	0.96
		0.28	1.372	16.6	19.2	36.46	0.884	2.42	0.310	0.85
		0.30	1.397	16.9	19.6	36.77	0.812	2.37	0.270	0.74

APPENDIX C-A: FUEL ASSEMBLY DESIGNS

The nomenclature used in the assembly design is the following. For the loosely coupled cores, the abbreviation, "CB-2Z-H40-P26" means:

CB - center blanket configuration

2Z - 2 core zones

H40 - 40 in. core height

P26 - pin o.d. of 0.260 in.

For the tightly coupled cores the abbreviation, "Fuel Assembly TC-CB3C-1 32 in. core height 0.24 in. Pin" means:

TC - tightly coupled

CB - center blanket configuration

3C - 3 core regions

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^8
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.1
Average Core Coolant Velocity, ft/sec	20.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.500×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.260
Fuel Cladding Thickness, mils	13.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.6150
Duct Outside Width across Flats, in	5.426
Duct Inside Width across Flats, in	5.194
Duct Wall Thickness, in	0.116
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,691.
Nominal Stress in Duct Corner, psi	28,230.
Sodium Gap between Assemblies, in	0.189
Unit Cell Area, sq in	27.3038
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.310
Fuel Pin Diameter, in	0.260
Fuel Pin Pitch/Diameter	1.193
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.C.	0.426842
Coolant	0.309143
Interassembly Gap	0.066187
Total Sodium	0.375330
Clad	0.100123
Spacer	0.019556
Duct	0.078148
Total Structural	0.197828
Fuellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg 24,192.504

Weight of Pin Bundle, kg

Fuel	128.750
Clad	39.132
Spacer	7.643
Duct (110.0 inch section)	31.313
Total Structural	78.088
Axial Reflector	0.000
Total	206.838

CB-2Z-H40-P26

Radial Blanket Assembly Design

Lattice Pitch, in	5.6150
Duct Outside Width across Flats, in	5.426
Duct Inside Width across Flats, in	5.194
Duct Wall Thickness, in	0.116
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.189
Unit Cell Area, sq in	27.3038
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.453
Fuel Pin Diameter, in	0.424
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.	0.591765
Coolant	0.196756
Interassembly Gap	0.066187
Total Sodium	0.262944
Clad	0.063930
Spacer	0.003213
Duct	0.078148
Total Structural	0.145291
Sum	1.000000

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	23.7
Average Core Coolant Velocity, ft/sec	18.7
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	61.6
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	61.6

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.320×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.280
Fuel Cladding Thickness, mils	14.0
Fuel Cladding Composition	SS-316
Peak linear Power in Fuel, kW/ft	13.5
Average linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.9392
Duct Outside Width across Flats, in	5.753
Duct Inside Width across Flats, in	5.531
Duct Wall Thickness, in	0.111
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,520.
Nominal Stress in Duct Corner, psi	28,490.
Sodium Gap between Assemblies, in	0.186
Unit Cell Area, sq in	30.5485
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.330
Fuel Pin Diameter, in	0.280
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.442456
Coolant	0.303388
Interassembly Gap	0.061654
Total Sodium	0.365041
Clad	0.103786
Spacer	0.017698
Duct	0.071019
Total Structural	0.192503
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg 28,057.579

Weight of Pin Bundle, kg

Fuel	149.320
Clad	45.383
Spacer	7.739
Duct (110.0 inch section)	31.883
Total Structural	85.006
Axial Reflector	0.000
Total	234.326

CB-2Z-H40-P28

Radial Flanket Assembly Design

Lattice Pitch, in	5.9392
Duct Outside Width across Flats, in	5.753
Duct Inside Width across Flats, in	5.531
Duct Wall Thickness, in	0.111
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.186
Unit Cell Area, sq in	30.5485
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.483
Fuel Pin Diameter, in	0.451
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.599831
Coolant	0.199438	
Interassembly Gap	0.061654	
Total Sodium		0.261092
Clad	0.064802	
Spacer	0.003257	
Duct	0.071019	
Total Structural		0.139077
Sum		1.000000

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	20.7
Average Core Coolant Velocity, ft/sec	16.3
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	44.7
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	44.7

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.160×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.300
Fuel Cladding Thickness, mils	15.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.3193
Duct Outside Width across Flats, in	6.128
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.101
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	32,649.
Nominal Stress in Duct Corner, psi	28,346.
Sodium Gap between Assemblies, in	0.191
Unit Cell Area, sq in	34.5836
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.354
Fuel Pin Diameter, in	0.300
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.448659
Coclant	0.307641
Interassembly Gap	0.059536
Total Sodium	0.367177
Clad	0.105241
Spacer	0.017946
Duct	0.060977
Total Structural	0.184164
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	32,208.955
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Weight of Pin Bundle, kg

Fuel	171.413
Clad	52.098
Spacer	8.884
Duct (110.0 inch section)	31.041
Total Structural	92.023
Axial Reflector	0.000
Total	263.437

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Radial Blanket Assembly Design

Lattice Pitch, in	6.3193
Duct Outside Width across Flats, in	6.128
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.101
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.191
Unit Cell Area, sq in	34.5836
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.517
Fuel Pin Diameter, in	0.483
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.608240
Coolant	0.202234	
Interassembly Gap	0.059536	
Total Sodium		0.261770
Clad	0.065710	
Spacer	0.003302	
Duct	0.060977	
Total Structural		0.129989
Sum		1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Rows in Core	11
Number of Core Lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.6
Average Core Coolant Velocity, ft/sec	20.9
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.550×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smear Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.260
Fuel Cladding Thickness, mils	13.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.8307
Duct Outside Width across Flats, in	5.626
Duct Inside Width across Flats, in	5.386
Duct Wall Thickness, in	0.120
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,746.
Nominal Stress in Duct Corner, psi	28,379.
Sodium Gap between Assemblies, in	0.205
Unit Cell Area, sq in	29.4424
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.321
Fuel Pin Diameter, in	0.260
Fuel Pin Pitch/Diameter	1.235
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.395838
Coclant	0.337605
Interassembly Gap	0.069081
Total Sodium	0.406686
Clad	0.092851
Spacer	0.026890
Duct	0.077734
Total Structural	0.197475
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	23,894.152
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Weight of Pin Bundle, kg

Fuel	139.786
Clad	44.112
Spacer	12.775
Duct (124.0 inch section)	37.786
Total Structural	94.674
Axial Reflector	0.000
Total	234.460

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Radial Blanket Assembly Design

Lattice Pitch, in	5.8307
Duct Outside Width across Flats, in	5.626
Duct Inside Width across Flats, in	5.386
Duct Wall Thickness, in	0.120
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.205
Unit Cell Area, sq in	29.4424
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.470
Fuel Pin Diameter, in	0.439
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.590050
Coolant	0.196186	
Interassembly Gap	0.069081	
Total Sodium		0.265267
Clad	0.063745	
Spacer	0.003204	
Duct	0.077734	
Total Structural		0.144683
Sum		1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Rows in Core	11
Number of Core Lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.0
Average Core Coolant Velocity, ft/sec	20.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.360×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.280
Fuel Cladding Thickness, mils	14.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.0702
Duct Outside Width across Flats, in	5.885
Duct Inside Width across Flats, in	5.635
Duct Wall Thickness, in	0.125
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	34,081.
Nominal Stress in Duct Corner, psi	28,605.
Sodium Gap between Assemblies, in	0.185
Unit Cell Area, sq in	31.9102
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.336
Fuel Pin Diameter, in	0.280
Fuel Pin Pitch/Diameter	1.201
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.423575
Coolant	0.317730
Interassembly Gap	0.060025
Total Sodium	0.377756
Clad	0.099357
Spacer	0.021149
Duct	0.078164
Total Structural	0.198669
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	27,711.561
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Weight of Pin Bundle, kg

Fuel	162.119
Clad	51.160
Spacer	10.890
Duct (124.0 inch section)	41.223
Total Structural	103.272
Axial Reflector	0.000
Total	265.391

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Radial Blanket Assembly Design

Lattice Pitch, in	6.0702
Duct Outside Width across Flats, in	5.885
Duct Inside Width across Flats, in	5.635
Duct Wall Thickness, in	0.125
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.185
Unit Cell Area, sq in	31.9102
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.492
Fuel Pin Diameter, in	0.460
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.596016
Coolant	0.198170	
Interassembly Gap	0.060025	
Total Sodium		0.258195
Clad	0.064390	
Spacer	0.003236	
Duct	0.078164	
Total Structural		0.145789
Sum		1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Fows in Ccore	11
Number of Core lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	24.8
Average Core Coolant Velocity, ft/sec	19.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	69.4
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	69.4

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.200×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.300
Fuel Cladding Thickness, mils	15.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.3533
Duct Outside Width across Flats, in	6.180
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.127
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,592.
Nominal Stress in Duct Corner, psi	28,287.
Sodium Gap between Assemblies, in	0.173
Unit Cell Area, sq in	34.9568
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.354
Fuel Pin Diameter, in	0.300
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.I.	0.443870
Coolant	0.304357
Interassembly Gap	0.053718
Total Sodium	0.358075
Clad	0.104118
Spacer	0.017755
Duct	0.076183
Total Structural	0.198055
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	31,811.740
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Weight of Pin Bundle, kg

Fuel	186.106
Clad	58.729
Spacer	10.015
Duct (124.0 inch section)	44.065
Total Structural	112.809
Axial Reflector	0.000
Total	298.915

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Radial Blanket Assembly Design

Lattice Pitch, in	6.3533
Duct Outside Width across Flats, in	6.180
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.127
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.173
Unit Cell Area, sq in	34.9568
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.517
Fuel Pin Diameter, in	0.483
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % I.D.		0.601748
Coolant	0.200075	
Interassembly Gap	0.053718	
Total Sodium		0.253794
Clad	0.065009	
Spacer	0.003267	
Duct	0.076183	
Total Structural		0.144459
Sum		1.000000

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.1
Average Core Coolant Velocity, ft/sec	20.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.390×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.260
Fuel Cladding Thickness, mils	13.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.6000
Duct Outside Width across Flats, in	5.426
Duct Inside Width across Flats, in	5.194
Duct Wall Thickness, in	0.116
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,691.
Nominal Stress in Duct Corner, psi	28,230.
Sodium Gap between Assemblies, in	0.174
Unit Cell Area, sq in	27.1581
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.310
Fuel Pin Diameter, in	0.260
Fuel Pin Pitch/Diameter	1.193
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.E.	0.429132
Coolant	0.310801
Interassembly Gap	0.061178
Total Sodium	0.371979
Clad	0.100661
Spacer	0.019661
Duct	0.078567
Total Structural	0.198889
Fellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	24,192.504
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Weight of Pin Bundle, kg

Fuel	128.750
Clad	39.132
Spacer	7.643
Duct (110.0 inch section)	31.313
Total Structural	78.088
Axial Reflector	0.000
Total	206.838

CE-3Z-H40-P26

Radial Blanket Assembly Design

Lattice Pitch, in	5.6000
Duct Outside Width across Flats, in	5.426
Duct Inside Width across Flats, in	5.194
Duct Wall Thickness, in	0.116
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.174
Unit Cell Area, sq in	27.1581
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.453
Fuel Pin Diameter, in	0.424
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.594940
Coolant	0.197812	
Interassembly Gap	0.061178	
Total Sodium		0.258990
Clad	0.064273	
Spacer	0.003230	
Duct	0.078567	
Total Structural		0.146070
Sum		1.000000

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	23.7
Average Core Coolant Velocity, ft/sec	18.7
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	61.6
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	61.6

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.220×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smear Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.280
Fuel Cladding Thickness, mils	14.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.9232
Duct Outside Width across Flats, in	5.753
Duct Inside Width across Flats, in	5.531
Duct Wall Thickness, in	0.111
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,520.
Nominal Stress in Duct Corner, psi	28,490.
Sodium Gap between Assemblies, in	0.170
Unit Cell Area, sq in	30.3842
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Fitch (Triangular), in	0.330
Fuel Pin Diameter, in	0.280
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.C.	0.444849
Coolant	0.305029
Interassembly Gap	0.056577
Total Sodium	0.361606
Clad	0.104347
Spacer	0.017794
Duct	0.071403
Total Structural	0.193544
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	28,057.579
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Weight of Pin Bundle, kg

Fuel	149.320
Clad	45.383
Spacer	7.739
Duct (110.0 inch section)	31.883
Total Structural	85.006
Axial Reflector	0.000
Total	234.326

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Radial Blanket Assembly Design

Lattice Pitch, in	5.9232
Duct Outside Width across Flats, in	5.753
Duct Inside Width across Flats, in	5.531
Duct Wall Thickness, in	0.111
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.170
Unit Cell Area, sq in	30.3842
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.483
Fuel Pin Diameter, in	0.451
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.C.		0.603076
Coolant	0.200517	
Interassembly Gap	0.056577	
Total Sodium		0.257094
Clad	0.065152	
Spacer	0.003274	
Duct	0.071403	
Total Structural		0.139830
Sum		1.000000

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	20.7
Average Core Coolant Velocity, ft/sec	16.3
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	44.7
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	44.7

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.070×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.300
Fuel Cladding Thickness, mils	15.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.3023
Duct Outside Width across Flats, in	6.128
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.101
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	32,649.
Nominal Stress in Duct Corner, psi	28,346.
Sodium Gap between Assemblies, in	0.174
Unit Cell Area, sq in	34.3978
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.354
Fuel Pin Diameter, in	0.300
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.451083
Coolant	0.309303
Interassembly Gap	0.054456
Total Sodium	0.363758
Clad	0.105809
Spacer	0.018043
Duct	0.061306
Total Structural	0.185159
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg 32,208.955

Weight of Pin Bundle, kg

Fuel	171.413
Clad	52.098
Spacer	8.884
Duct (110.0 inch section)	31.041
Total Structural	92.023
Axial Reflector	0.000
Total	263.437

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Radial Planket Assembly Design

Lattice Pitch, in	6.3023
Duct Outside Width across Flats, in	6.128
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.101
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.174
Unit Cell Area, sq in	34.3978
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.517
Fuel Pin Diameter, in	0.483
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.L.	0.611526
Coolant	0.203327
Interassembly Gap	0.054456
Total Sodium	0.257782
Clad	0.066065
Spacer	0.003320
Duct	0.061306
Total Structural	0.130692
Sum	1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Rows in Core	11
Number of Core Lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.6
Average Core Coolant Velocity, ft/sec	20.9
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.470×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smear Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.260
Fuel Cladding Thickness, mils	13.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.8187
Duct Outside Width across Flats, in	5.626
Duct Inside Width across Flats, in	5.386
Duct Wall Thickness, in	0.120
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,746.
Nominal Stress in Duct Corner, psi	28,379.
Sodium Gap between Assemblies, in	0.193
Unit Cell Area, sq in	29.3213
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.321
Fuel Pin Diameter, in	0.260
Fuel Pin Pitch/Diameter	1.235
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.397473
Coolant	0.338999
Interassembly Gap	0.065238
Total Sodium	0.404237
Clad	0.093234
Spacer	0.027001
Duct	0.078055
Total Structural	0.198291
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	23,894.152
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Weight of Pin Bundle, kg

Fuel	139.786
Clad	44.112
Spacer	12.775
Duct (124.0 inch section)	37.786
Total Structural	94.674
Axial Reflector	0.000
Total	234.460

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Radial Blanket Assembly Design

Lattice Pitch, in	5.8187
Duct Outside Width across Flats, in	5.626
Duct Inside Width across Flats, in	5.386
Duct Wall Thickness, in	0.120
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.193
Unit Cell Area, sq in	29.3213
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.470
Fuel Pin Diameter, in	0.439
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.592486
Coolant	0.196996	
Interassembly Gap	0.065238	
Total Sodium		0.262234
Clad	0.064008	
Spacer	0.003217	
Duct	0.078055	
Total Structural		0.145280
Sum		1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Rows in Core	11
Number of Core Lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.0
Average Core Coolant Velocity, ft/sec	20.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.290×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.280
Fuel Cladding Thickness, mils	14.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.0592
Duct Outside Width across Flats, in	5.885
Duct Inside Width across Flats, in	5.635
Duct Wall Thickness, in	0.125
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	34,081.
Nominal Stress in Duct Corner, psi	28,605.
Sodium Gap between Assemblies, in	0.174
Unit Cell Area, sq in	31.7947
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.336
Fuel Pin Diameter, in	0.280
Fuel Pin Pitch/Diameter	1.201
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.425114
Coolant	0.318885
Interassembly Gap	0.056609
Total Sodium	0.375494
Clad	0.099718
Spacer	0.021225
Duct	0.078448
Total Structural	0.199391
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	27,711.561
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Weight of Pin Bundle, kg

Fuel	162.119
Clad	51.160
Spacer	10.890
Duct (124.0 inch section)	41.223
Total Structural	103.272
Axial Reflector	0.000
Total	265.391

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Radial Blanket Assembly Design

Lattice Pitch, in	6.0592
Duct Outside Width across Flats, in	5.885
Duct Inside Width across Flats, in	5.635
Duct Wall Thickness, in	0.125
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.174
Unit Cell Area, sq in	31.7947
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.492
Fuel Pin Diameter, in	0.460
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.L.		0.598182
Coolant	0.198890	
Interassembly Gap	0.056609	
Total Sodium		0.255499
Clad	0.064624	
Spacer	0.003248	
Duct	0.078448	
Total Structural		0.146319
Sum		1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Rows in Core	11
Number of Core Lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	24.8
Average Core Coolant Velocity, ft/sec	19.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	69.4
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	69.4

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.140×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.300
Fuel Cladding Thickness, mils	15.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.3433
Duct Outside Width across Flats, in	6.180
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.127
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,592.
Nominal Stress in Duct Corner, psi	28,287.
Sodium Gap between Assemblies, in	0.163
Unit Cell Area, sq in	34.8468
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.354
Fuel Pin Diameter, in	0.300
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.L.	0.445270
Coolant	0.305317
Interassembly Gap	0.050732
Total Sodium	0.356050
Clad	0.104446
Spacer	0.017811
Duct	0.076423
Total Structural	0.198680
Fuellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg 31,811.740

Weight of Pin Bundle, kg

Fuel	186.106
Clad	58.729
Spacer	10.015
Duct (124.0 inch section)	44.065
Total Structural	112.809
Axial Reflector	0.000
Total	298.915

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Radial Blanket Assembly Design

Lattice Pitch, in	6.3433
Duct Outside Width across Flats, in	6.180
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.127
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.163
Unit Cell Area, sq in	34.8468
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.517
Fuel Pin Diameter, in	0.483
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.603647
Coolant	0.200707	
Interassembly Gap	0.050732	
Total Sodium		0.251439
Clad	0.065214	
Spacer	0.003277	
Duct	0.076423	
Total Structural		0.144914
Sum		1.000000

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.1
Average Core Coolant Velocity, ft/sec	20.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.530×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.260
Fuel Cladding Thickness, mils	13.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.6190
Duct Outside Width across Flats, in	5.426
Duct Inside Width across Flats, in	5.194
Duct Wall Thickness, in	0.116
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,691.
Nominal Stress in Duct Corner, psi	28,230.
Sodium Gap between Assemblies, in	0.193
Unit Cell Area, sq in	27.3427
Number of Fuel Fins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.310
Fuel Pin Diameter, in	0.260
Fuel Pin Pitch/Diameter	1.193
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.426235
Coolant	0.308703
Interassembly Gap	0.067516
Total Sodium	0.376219
Clad	0.099981
Spacer	0.019529
Duct	0.078036
Total Structural	0.197546
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	24,192.504
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Weight of Pin Bundle, kg

Fuel	128.750
Clad	39.132
Spacer	7.643
Duct (110.0 inch section)	31.313
Total Structural	78.088
Axial Reflector	0.000
Total	206.838

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Radial Blanket Assembly Design

Lattice Pitch, in	5.6190
Duct Outside Width across Flats, in	5.426
Duct Inside Width across Flats, in	5.194
Duct Wall Thickness, in	0.116
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.193
Unit Cell Area, sq in	27.3427
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.453
Fuel Pin Diameter, in	0.424
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.	0.590923
Coclant	0.196476
Interassembly Gap	0.067516
Total Sodium	0.263993
Clad	0.063839
Spacer	0.003208
Duct	0.078036
Total Structural	0.145084
Sum	1.000000

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	23.7
Average Core Coolant Velocity, ft/sec	18.7
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	61.6
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	61.6

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.340×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.280
Fuel Cladding Thickness, mils	14.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.9422
Duct Outside Width across Flats, in	5.753
Duct Inside Width across Flats, in	5.531
Duct Wall Thickness, in	0.111
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,520.
Nominal Stress in Duct Corner, psi	28,490.
Sodium Gap between Assemblies, in	0.189
Unit Cell Area, sq in	30.5794
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.330
Fuel Pin Diameter, in	0.280
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.442009
Coolant	0.303081
Interassembly Gap	0.062601
Total Sodium	0.365682
Clad	0.103681
Spacer	0.017680
Duct	0.070947
Total Structural	0.192309
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	28,057.579
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Weight of Pin Bundle, kg

Fuel	149.320
Clad	45.383
Spacer	7.739
Duct (110.0 inch section)	31.883
Total Structural	85.006
Axial Reflector	0.000
Total	234.326

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Radial Blanket Assembly Design

Lattice Pitch, in	5.9422
Duct Outside Width across Flats, in	5.753
Duct Inside Width across Flats, in	5.531
Duct Wall Thickness, in	0.111
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.189
Unit Cell Area, sq in	30.5794
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.483
Fuel Pin Diameter, in	0.451
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.	0.599225
Coolant	0.199237
Interassembly Gap	0.062601
Total Sodium	0.261838
Clad	0.064736
Spacer	0.003253
Duct	0.070947
Total Structural	0.138937
Sum	1.000000

General Plant Data

Power, MWt	3,011
Core Arrangement	Hexagonal
Number of Rows in Core	12
Number of Core Lattice Positions	397
Number of Driver Assemblies	373
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.204×10^8
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	20.7
Average Core Coolant Velocity, ft/sec	16.3
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	44.7
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	44.7

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.180×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.300
Fuel Cladding Thickness, mils	15.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.3233
Duct Outside Width across Flats, in	6.128
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.101
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	32,649.
Nominal Stress in Duct Corner, psi	28,346.
Sodium Gap between Assemblies, in	0.195
Unit Cell Area, sq in	34.6274
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.354
Fuel Pin Diameter, in	0.300
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	110.0
Active Core Height, in	40.0
Axial Blanket Thickness, in	15.0
Axial Reflector Thickness, in	0.0
Plenum length, in	40.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.448091
Coolant	0.307252
Interassembly Gap	0.060726
Total Sodium	0.367977
Clad	0.105108
Spacer	0.017924
Duct	0.060900
Total Structural	0.183931
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	32,208.955
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Weight of Pin Bundle, kg

Fuel	171.413
Clad	52.098
Spacer	8.884
Duct (110.0 inch section)	31.041
Total Structural	92.023
Axial Reflector	0.000
Total	263.437

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Radial Blanket Assembly Design

Lattice Pitch, in	6.3233
Duct Outside Width across Flats, in	6.128
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.101
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.195
Unit Cell Area, sq in	34.6274
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.517
Fuel Pin Diameter, in	0.483
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	110.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.L.		0.607471
Coolant	0.201978	
Interassembly Gap	0.060726	
Total Sodium		0.262704
Clad	0.065627	
Spacer	0.003298	
Duct	0.060900	
Total Structural		0.129825
Sum		1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Rows in Core	11
Number of Core Lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.6
Average Core Coolant Velocity, ft/sec	20.9
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.630×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.260
Fuel Cladding Thickness, mils	13.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	5.8427
Duct Outside Width across Flats, in	5.626
Duct Inside Width across Flats, in	5.386
Duct Wall Thickness, in	0.120
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,746.
Nominal Stress in Duct Corner, psi	28,379.
Sodium Gap between Assemblies, in	0.217
Unit Cell Area, sq in	29.5637
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.321
Fuel Pin Diameter, in	0.260
Fuel Pin Pitch/Diameter	1.235
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.394214
Coolant	0.336220
Interassembly Gap	0.072901
Total Sodium	0.409121
Clad	0.092470
Spacer	0.026780
Duct	0.077415
Total Structural	0.196665
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg 23,894.152

Weight of Pin Bundle, kg

Fuel	139.786
Clad	44.112
Spacer	12.775
Duct (124.0 inch section)	37.786
Total Structural	94.674
Axial Reflector	0.000
Total	234.460

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Radial Blanket Assembly Design

Lattice Pitch, in	5.8427
Duct Outside Width across Flats, in	5.626
Duct Inside Width across Flats, in	5.386
Duct Wall Thickness, in	0.120
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.217
Unit Cell Area, sq in	29.5637
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.470
Fuel Pin Diameter, in	0.439
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.587629
Coolant	0.195381	
Interassembly Gap	0.072901	
Total Sodium		0.268282
Clad	0.063483	
Spacer	0.003190	
Duct	0.077415	
Total Structural		0.144089
Sum		1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Rows in Core	11
Number of Core Lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^8
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	26.0
Average Core Coolant Velocity, ft/sec	20.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	75.0
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	75.0

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.430×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin Bond	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.280
Fuel Cladding Thickness, mils	14.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.0812
Duct Outside Width across Flats, in	5.885
Duct Inside Width across Flats, in	5.635
Duct Wall Thickness, in	0.125
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	34,081.
Nominal Stress in Duct Corner, psi	28,605.
Sodium Gap between Assemblies, in	0.196
Unit Cell Area, sq in	32.0260
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.336
Fuel Pin Diameter, in	0.280
Fuel Pin Pitch/Diameter	1.201
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.422044
Coolant	0.316582
Interassembly Gap	0.063423
Total Sodium	0.380005
Clad	0.098998
Spacer	0.021072
Duct	0.077881
Total Structural	0.197951
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	27,711.561
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Weight of Pin Bundle, kg

Fuel	162.119
Clad	51.160
Spacer	10.890
Duct (124.0 inch section)	41.223
Total Structural	103.272
Axial Reflector	0.000
Total	265.391

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Radial Blanket Assembly Design

Lattice Pitch, in	6.0812
Duct Outside Width across Flats, in	5.885
Duct Inside Width across Flats, in	5.635
Duct Wall Thickness, in	0.125
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.196
Unit Cell Area, sq in	32.0260
Number of Fuel Pins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.492
Fuel Pin Diameter, in	0.460
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.593862
Coolant	0.197453	
Interassembly Gap	0.063423	
Total Sodium		0.260876
Clad	0.064157	
Spacer	0.003224	
Duct	0.077881	
Total Structural		0.145262
Sum		1.000000

General Plant Data

Power, MWt	2,974
Core Arrangement	Hexagonal
Number of Rows in Core	11
Number of Core Lattice Positions	331
Number of Driver Assemblies	307
Number of Control Rod Positions	24

Thermal Hydraulic Data

Reactor Inlet Temperature, deg F	595.
Average Temperature Rise across Reactor, deg F	280.
Average Reactor Outlet Temperature, deg F	875.
Total Reactor Coolant Flow, lb/hr	1.190×10^6
By-Pass Flow, % of Total	5.000
Penalty for Over-Cooling Blanket, deg F	70.
Average Temperature Rise across Core, deg F	365.
Maximum Temperature Rise across Core, deg F	365.
Average Driver Fuel Outlet Temperature, deg F	960.
Maximum Coolant Velocity, ft/sec	24.8
Average Core Coolant Velocity, ft/sec	19.5
Temperature Drop between Coolant and Duct, deg F	120.
Pressure Drop across Pin Bundle, psi	69.4
Estimated Remaining Pressure Drop, psi	0.0
Duct Design Pressure Drop, psi	69.4

Physics Data

Fraction of Power in Core, %	91.5
Fraction of Power in Axial Blanket, %	1.5
Fraction of Power in Radial Blanket, %	7.0
Peak to Average Power in Core	
Radial	1.270
Axial	1.300
Total	1.651
Peak Damage Fluence, nvt ($E > 0.1$ Mev)	1.260×10^{23}

Fuel Pin Data

Fuel Pellet Density, % T.D.	88.0
Diametric Gap, mils	0.0
Fuel Pin End	Helium
Smeared Fuel Density, Planar Nominal, % T.D.	88.0
Fuel Pin Outer Diameter, in	0.300
Fuel Cladding Thickness, mils	15.0
Fuel Cladding Composition	SS-316
Peak Linear Power in Fuel, kW/ft	13.5
Average Linear Power in Fuel, kW/ft	8.2

Fuel Assembly Design

Lattice Pitch, in	6.3633
Duct Outside Width across Flats, in	6.180
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.127
Duct Wall Composition	SS-316
Maximum Allowable Stress in Duct Wall, psi	18,000.
Peak Stress in Duct Corner, psi	33,592.
Nominal Stress in Duct Corner, psi	28,287.
Sodium Gap between Assemblies, in	0.183
Unit Cell Area, sq in	35.0669
Number of Fuel Pins per Assembly	271
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.354
Fuel Pin Diameter, in	0.300
Fuel Pin Pitch/Diameter	1.180
Length of Fuel Bundle, in	124.0
Active Core Height, in	48.0
Axial Blanket Thickness, in	14.0
Axial Reflector Thickness, in	0.0
Plenum Length, in	48.0
Plenum Position	Top

Volume Fractions at Beginning of Life

Fuel at 88.0 % T.D.	0.442476
Coolant	0.303401
Interassembly Gap	0.056690
Total Sodium	0.360091
Clad	0.103791
Spacer	0.017699
Duct	0.075943
Total Structural	0.197433
Pellet-clad Gap	0.0
Sum	1.000000

Total Heavy Metal in Core, kg	31,811.740
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Weight of Pin Bundle, kg

Fuel	186.106
Clad	58.729
Spacer	10.015
Duct (124.0 inch section)	44.065
Total Structural	112.809
Axial Reflector	0.000
Total	298.915

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Radial Blanket Assembly Design

Lattice Pitch, in	6.3633
Duct Outside Width across Flats, in	6.180
Duct Inside Width across Flats, in	5.926
Duct Wall Thickness, in	0.127
Duct Wall Composition	SS-316
Sodium Gap between Assemblies, in	0.183
Unit Cell Area, sq in	35.0669
Number of Fuel Fins per Assembly	127
Spacer Concept	Wire wrap
Pitch (Triangular), in	0.517
Fuel Pin Diameter, in	0.483
Fuel Pin Pitch/Diameter	1.070
Length of Fuel Bundle, in	124.0

Volume Fractions at Beginning of Life

Fuel at 90.0 % T.D.		0.599858
Coolant	0.199447	
Interassembly Gap	0.056690	
Total Sodium		0.256137
Clad	0.064805	
Spacer	0.003257	
Duct	0.075943	
Total Structural		0.144005
Sum		1.000000

FUEL ASSEMBLY TC-CB3C-1 32 IN CORE HEIGHT 0.24 IN PIN

GENERAL PLANT DATA

POWER, MWt	2,942
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12
NUMBER OF CORE LATTICE POSITIONS	397
NUMBER OF DRIVER ASSEMBLIES	373
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HR	1.177X10 ⁶
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	900.
MAXIMUM COOLANT VELOCITY, FT/SEC	25.6
AVERAGE CORE COOLANT VELOCITY, FT/SEC	20.1
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	75.0
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	75.0

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.580X10 ²¹

FUEL PIN DATA

FUEL PELLETT DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.240
FUEL CLADDING THICKNESS, MILS	12.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY TC-CH3C-1 32 IN CORE HEIGHT 0.24 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.6867
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.486
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.252
DUCT WALL THICKNESS, IN	0.117
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	34,264.
NOMINAL STRESS IN DUCT CORNER, PSI	28,270.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.201
UNIT CELL AREA, SQ IN	28.0063
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.284
FUEL PIN DIAMETER, IN	0.240
FUEL PIN PITCH/DIAMETER	1.184
WIRE SPACER DIAMETER, IN	0.044
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	32.0
AXIAL BLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	32.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.O.	0.433082
COOLANT	0.300024
INTERASSEMBLY GAP	0.069442
TOTAL SODIUM	0.369466
CLAD	0.101587
SPACER	0.013170
DUCT	0.077695
TOTAL STRUCTURAL	0.197452
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG	20,459.712
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WEIGHT OF PIN BUNDLE, KG

FUEL	129.286
CLAD	37.023
SPACER	6.622
DUCT (100.0 INCH SECTION)	29.109
TOTAL STRUCTURAL	72.754
AXIAL REFLECTOR	0.000
TOTAL	202.040

FUEL ASSEMBLY TC-CR3C-1 32 IN CORE HEIGHT 0.24 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.6867
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.480
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.252
DUCT WALL THICKNESS, IN	0.117
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.201
UNIT CELL AREA, SQ IN	26.0063
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.450
FUEL PIN DIAMETER, IN	0.424
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.030
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.O.		0.589928
COOLANT	0.196112	
INTERASSEMBLY GAP	0.069442	
TOTAL SODIUM		0.265554
CLAD	0.063721	
SPACER	0.003202	
DUCT	0.077695	
TOTAL STRUCTURAL		0.144618
SUM		1.000000

FUEL ASSEMBLY IC-CB3C-1 32 IN CORE HEIGHT 0.26 IN PIN

GENERAL PLANT DATA

POWER, MW	2,942
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12
NUMBER OF CORE LATTICE POSITIONS	397
NUMBER OF DRIVER ASSEMBLIES	373
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	575.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	240.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, L/H	1.177x10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL INLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	22.2
AVERAGE CORE COOLANT VELOCITY, FT/SEC	17.5
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS FIN BUNDLE, PSI	54.4
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	54.4

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, VT ($\phi > 0.1$ MEV)	1.350x10

FUEL PIN DATA

FUEL PELLETT DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN RUND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.260
FUEL CLADDING THICKNESS, MILS	13.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY TC-CH3L-1 32 IN CORE HEIGHT 0.26 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	6.0825
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.882
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.658
DUCT WALL THICKNESS, IN	0.107
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	33,325.
NOMINAL STRESS IN DUCT CORNER, PSI	28,176.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.201
UNIT CELL AREA, SQ IN	32.0405
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.307
FUEL PIN DIAMETER, IN	0.260
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.047
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	32.0
AXIAL PLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	32.0
PLENUM POSITION	TUP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.D.	0.444273
COOLANT	0.301942
INTERASSEMBLY GAP	0.064999
TOTAL SODIUM	0.360941
CLAD	0.104212
SPACER	0.017771
DUCT	0.066802
TOTAL STRUCTURAL	0.188786
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 24,011.745

WEIGHT OF PIN BUNDLE, KG

FUEL	151.731
CLAD	43.451
SPACER	7.409
DUCT (100.0 INCH SECTION)	28.687
TOTAL STRUCTURAL	79.547
AXIAL REFLECTOR	0.000
TOTAL	231.278

FUEL ASSEMBLY IC-CB3C-1 32 IN CORE HEIGHT 0.26 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	6.0825
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.882
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.668
DUCT WALL THICKNESS, IN	0.107
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.201
UNIT CELL AREA, SQ IN	32.0405
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIKE WRAP
PITCH (TRIANGULAR), IN	0.495
FUEL PIN DIAMETER, IN	0.462
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.032
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.D.		0.600434
COOLANT	0.199638	
INTERASSEMBLY GAP	0.064999	
TOTAL SODIUM		0.264637
CLAD	0.064867	
SPACER	0.003260	
DUCT	0.066802	
TOTAL STRUCTURAL		0.134929
SUM		1.000000

FUEL ASSEMBLY TC-CB3C-1 32 IN CORE HEIGHT 0.28 IN PIN

GENERAL PLANT DATA

POWER, MWt	2,942
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12
NUMBER OF CORE LATTICE POSITIONS	397
NUMBER OF DRIVER ASSEMBLIES	373
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HR	1.177x10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	19.2
AVERAGE CORE COOLANT VELOCITY, FT/SEC	15.1
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	38.5
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	38.5

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, MWt (E > 0.1 MEV)	1.200x10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.280
FUEL CLADDING THICKNESS, MILS	14.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY IC-CBSC-1 32 IN CORE HEIGHT 0.25 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	6.5085
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	6.295
DUCT INSIDE WIDTH ACROSS FLATS, IN	6.103
DUCT WALL THICKNESS, IN	0.096
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	32,783.
NOMINAL STRESS IN DUCT CORNER, PSI	28,399.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.213
UNIT CELL AREA, SQ IN	36.6853
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.330
FUEL PIN DIAMETER, IN	0.280
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.050
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	32.0
AXIAL BLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	32.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT B.B.D. & T.L.	0.450015
COOLANT	0.305845
INTERASSEMBLY GAP	0.064382
TOTAL SODIUM	0.370227
CLAD	0.105559
SPACER	0.018001
DUCT	0.050199
TOTAL STRUCTURAL	0.179758
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 27,847.941

WEIGHT OF PIN BUNDLE, KG

FUEL	175.972
CLAD	50.392
SPACER	8.593
DUCT (100.0 INCH SECTION)	27.680
TOTAL STRUCTURAL	86.672
AXIAL REFLECTOR	0.000
TOTAL	262.644

FUEL ASSEMBLY IC-CH3C-1 32 IN CORE HEIGHT 0.28 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	6.5085
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	6.295
DUCT INSIDE WIDTH ACROSS FLATS, IN	6.103
DUCT WALL THICKNESS, IN	0.090
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.213
UNIT CELL AREA, SQ IN	46.6853
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.533
FUEL PIN DIAMETER, IN	0.498
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.035
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.O.		0.608194
COOLANT	0.202219	
INTERASSEMBLY GAP	0.064382	
TOTAL SODIUM		0.266600
CLAD	0.065705	
SPACER	0.003302	
DUCT	0.050199	
TOTAL STRUCTURAL		0.125206
SUM		1.000000

FUEL ASSEMBLY TC-CB3C-1 36 IN CORE HEIGHT 0.240 IN PIN

GENERAL PLANT DATA

POWER, MW	3,150
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12(R)*
NUMBER OF CORE LATTICE POSITIONS	379
NUMBER OF DRIVER ASSEMBLIES	355
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, L/HM	1.260x10
RY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COILING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	26.3
AVERAGE CORE COOLANT VELOCITY, FT/SEC	20.7
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	75.0
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	75.0

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT (E > 0.1 MEV)	1.580x10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	86.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	86.0
FUEL PIN OUTER DIAMETER, IN	0.240
FUEL CLADDING THICKNESS, MILS	12.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY TC=CBSC-1 36 IN CORE HEIGHT 0.240 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.7958
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.590
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.352
DUCT WALL THICKNESS, IN	0.119
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CLIPPER, PSI	34,328.
NOMINAL STRESS IN DUCT CLIPPER, PSI	28,326.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.200
UNIT CELL AREA, SQ IN	29.0908
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE ARAF
PITCH (TRIANGULAR), IN	0.289
FUEL PIN DIAMETER, IN	0.240
FUEL PIN PITCH/DIAMETER	1.200
WIRE SPACER DIAMETER, IN	0.049
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	16.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TUP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.O.	0.410930
COOLANT	0.310090
INTERASSEMBLY GAP	0.069823
TOTAL SODIUM	0.365913
CLAD	0.097800
SPACER	0.021828
DUCT	0.077523
TOTAL STRUCTURAL	0.197151
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 21,900.154

WEIGHT OF PIN BUNDLE, KG

FUEL	129.285
CLAD	38.504
SPACER	8.594
DUCT (104.0 INCH SECTION)	31.354
TOTAL STRUCTURAL	78.450
AXIAL REFLECTOR	0.000
TOTAL	207.741

FUEL ASSEMBLY TC=CR3C-1 36 IN CORE HEIGHT 0.240 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.7958
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.590
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.352
DUCT WALL THICKNESS, IN	0.119
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.200
UNIT CELL AREA, SQ IN	29.0908
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.407
FUEL PIN DIAMETER, IN	0.437
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.031
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 90.0 % T.O.	0.589683
COOLANT	0.190064
INTERASSEMBLY GAP	0.069223
TOTAL SODIUM	0.265887
CLAD	0.063705
SPACER	0.003202
DUCT	0.077523
TOTAL STRUCTURAL	0.144430
SUM	1.000000

FUEL ASSEMBLY TC-CB3C-1 36 IN CORE HEIGHT 0.260 IN PIN

GENERAL PLANT DATA

POWER, MWt	3,150
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12(R)*
NUMBER OF COPE LATTICE POSITIONS	379
NUMBER OF DRIVER ASSEMBLIES	355
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/MR	1.260X10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	25.0
AVERAGE CORE COOLANT VELOCITY, FT/SEC	19.7
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	69.5
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	69.5

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.350X10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN ROND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.260
FUEL CLADDING THICKNESS, MILS	13.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY TC-CBSC-1 36 IN CORE HEIGHT 0.260 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	6.0905
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.910
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.668
DUCT WALL THICKNESS, IN	0.121
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	34,242.
NOMINAL STRESS IN DUCT CORNER, PSI	28,430.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.187
UNIT CELL AREA, SQ IN	32.1802
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.307
FUEL PIN DIAMETER, IN	0.260
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.047
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	16.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.D.	0.442235
COOLANT	0.300557
INTERASSEMBLY GAP	0.060406
TOTAL SODIUM	0.360963
CLAD	0.103734
SPACER	0.017689
DUCT	0.075379
TOTAL STRUCTURAL	0.196802
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 25,709.305

WEIGHT OF PIN BUNDLE, KG

FUEL	151.730
CLAD	45.188
SPACER	7.706
DUCT (104.0 INCH SECTION)	33.789
TOTAL STRUCTURAL	86.683
AXIAL REFLECTOR	0.000
TOTAL	238.413

FUEL ASSEMBLY TC-CB3C-1 36 IN CORE HEIGHT 0.260 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	0.0905
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.910
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.668
DUCT WALL THICKNESS, IN	0.121
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.187
UNIT CELL AREA, SQ IN	32.1802
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.495
FUEL PIN DIAMETER, IN	0.402
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.032
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 90.0 % T.O.		0.597679
COOLANT	1.198723	
INTERASSEMBLY GAP	0.069406	
TOTAL SODIUM		0.259128
CLAD	0.004569	
SPACER	0.003245	
DUCT	0.075379	
TOTAL STRUCTURAL		0.143193
SUM		1.000000

FUEL ASSEMBLY TC-CH30-1 36 IN CORE HEIGHT 0.280 IN PIN

GENERAL PLANT DATA

POWER, MW	3,150
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12(R)*
NUMBER OF CORE LATTICE POSITIONS	379
NUMBER OF DRIVER ASSEMBLIES	355
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HR	1.260x10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	21.5
AVERAGE CORE COOLANT VELOCITY, FT/SEC	17.0
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	49.2
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	49.2

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.200x10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN HUNG	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.280
FUEL CLADDING THICKNESS, MILS	14.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY TC-CESU-1 26 IN CORE HEIGHT 0.280 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	6.5185
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	6.321
DUCT INSIDE WIDTH ACROSS FLATS, IN	6.103
DUCT WALL THICKNESS, IN	0.109
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	33,322.
NOMINAL STRESS IN DUCT CORNER, PSI	28,343.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.197
UNIT CELL AREA, SQ IN	36.7981
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.330
FUEL PIN DIAMETER, IN	0.280
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.050
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	16.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.O.	0.448635
COOLANT	0.304907
INTERASSEMBLY GAP	0.059530
TOTAL SODIUM	0.364437
CLAD	0.165235
SPACER	0.017945
DUCT	0.063747
TOTAL STRUCTURAL	0.186928
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 29,816.709

WEIGHT OF PIN BUNDLE, KG

FUEL	175.971
CLAD	52.408
SPACER	8.937
DUCT (104.0 INCH SECTION)	32.728
TOTAL STRUCTURAL	94.073
AXIAL REFLECTOR	0.000
TOTAL	270.044

FUEL ASSEMBLY TC-CB3C-1 36 IN CORE HEIGHT 0.280 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	6.5185
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	6.321
DUCT INSIDE WIDTH ACROSS FLATS, IN	6.103
DUCT WALL THICKNESS, IN	0.109
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.197
UNIT CELL AREA, SQ IN	36.7981
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.533
FUEL PIN DIAMETER, IN	0.498
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.035
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.O.	0.600329
COOLANT	0.201599
INTERASSEMBLY GAP	0.059530
TOTAL SODIUM	0.261129
CLAD	0.065504
SPACER	0.003292
DUCT	0.063747
TOTAL STRUCTURAL	0.132542
SUM	1.000000

FUEL ASSEMBLY TC-CB4C-4 3D IN CORE HEIGHT 0.240 IN PIN

GENERAL PLANT DATA

POWER, MWT	2,942
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12
NUMBER OF CORE LATTICE POSITIONS	397
NUMBER OF DRIVER ASSEMBLIES	373
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	575.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LH/HR	1.177x10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	400.
MAXIMUM COOLANT VELOCITY, FT/SEC	25.6
AVERAGE CORE COOLANT VELOCITY, FT/SEC	20.1
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	75.0
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	75.0

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, MWT (E > 0.1 MEV)	1.480x10

FUEL PIN DATA

FUEL PELLETT DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.240
FUEL CLADDING THICKNESS, MILS	12.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY TC-CB4C-H 32 IN CORE HEIGHT 0.240 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.6717
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.480
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.252
DUCT WALL THICKNESS, IN	0.117
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	34,264.
NOMINAL STRESS IN DUCT CORNER, PSI	28,270.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.186
UNIT CELL AREA, SQ IN	27.8587
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIKE WRAP
PITCH (TRIANGULAR), IN	0.284
FUEL PIN DIAMETER, IN	0.240
FUEL PIN PITCH/DIAMETER	1.184
WIKE SPACER DIAMETER, IN	0.044
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	32.0
AXIAL BLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	32.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 88.0 % T.L.	0.435376
COOLANT	0.501613
INTERASSEMBLY GAP	0.064513
TOTAL SODIUM	0.366126
CLAD	0.102125
SPACER	0.018206
DUCT	0.078106
TOTAL STRUCTURAL	0.198498
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 20,459.712

WEIGHT OF PIN BUNDLE, KG

FUEL	129.286
CLAD	37.023
SPACER	6.622
DUCT (100.0 INCH SECTION)	29.109
TOTAL STRUCTURAL	72.754
AXIAL REFLECTOR	0.000
TOTAL	202.049

FUEL ASSEMBLY TC-CR4C-4 32 IN CORE HEIGHT 0.240 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.6717
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.486
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.252
DUCT WALL THICKNESS, IN	0.117
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.186
UNIT CELL AREA, SQ IN	27.8587
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.458
FUEL PIN DIAMETER, IN	0.428
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.030
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 90.0 % T.O.	0.592952
COOLANT	0.197151
INTERASSEMBLY GAP	0.064513
TOTAL SODIUM	0.261664
CLAD	0.064059
SPACER	0.003219
DUCT	0.078106
TOTAL STRUCTURAL	0.145384
SUM	1.000000

FUEL ASSEMBLY TC-CB4C-4 32 IN CORE HEIGHT 0.260 IN PIN

GENERAL PLANT DATA

POWER, MW	2.942
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF PINS IN CORE	12
NUMBER OF CORE LATTICE POSITIONS	347
NUMBER OF DRIVER ASSEMBLIES	373
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LH/HR	1.177X10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL INLET TEMPERATURE, DEG F	900.
MAXIMUM COOLANT VELOCITY, FT/SEC	22.2
AVERAGE COOLANT VELOCITY, FT/SEC	17.5
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	54.4
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	54.4

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.270X10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN ROND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.260
FUEL CLADDING THICKNESS, MILS	13.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY TC-CB40-1 32 IN CORE HEIGHT 0.260 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	0.0685
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.842
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.668
DUCT WALL THICKNESS, IN	0.107
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	33,325.
NOMINAL STRESS IN DUCT CORNER, PSI	28,176.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.187
UNIT CELL AREA, SQ IN	51.8932
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.307
FUEL PIN DIAMETER, IN	0.260
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.047
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	52.0
AXIAL BLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	52.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.D.	0.446325
COOLANT	0.303337
INTERASSEMBLY GAP	0.060680
TOTAL SODIUM	0.364017
CLAD	0.104694
SPACER	0.017853
DUCT	0.067111
TOTAL STRUCTURAL	0.189658
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 24,011.745

WEIGHT OF PIN BUNDLE, KG

FUEL	151.731
CLAD	43.451
SPACER	7.409
DUCT (100.0 INCH SECTION)	28.687
TOTAL STRUCTURAL	79.547
AXIAL REFLECTOR	0.000
TOTAL	231.278

FUEL ASSEMBLY TC-OR40-0 32 IN CORE HEIGHT 0.250 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	6.0685
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.882
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.668
DUCT WALL THICKNESS, IN	0.107
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.187
UNIT CELL AREA, SQ IN	31.8932
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.495
FUEL PIN DIAMETER, IN	0.462
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.032
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 90.0 % I.D.		0.603207
COOLANT	0.200561	
INTERASSEMBLY GAP	0.060680	
TOTAL SODIUM		0.261240
CLAD	0.063166	
SPACER	0.003275	
DUCT	0.067111	
TOTAL STRUCTURAL		0.135552
SUM		1.000000

FUEL ASSEMBLY TC-CH4C-4 33 IN CORE HEIGHT 0.240 IN PIN

GENERAL PLANT DATA

POWER, MWT	2,942
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12
NUMBER OF CORE LATTICE POSITIONS	397
NUMBER OF DRIVER ASSEMBLIES	373
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LHM/H	1.177x10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR FIVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	305.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	305.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	19.2
AVERAGE CORE COOLANT VELOCITY, FT/SEC	15.1
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	38.5
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	38.5

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT (E > 0.1 MEV)	1.120x10

FUEL PIN DATA

FUEL PELLETT DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.280
FUEL CLADDING THICKNESS, MILS	14.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY TC-CR40-1 32 IN CORE HEIGHT 0.280 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	0.4925
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	6.295
DUCT INSIDE WIDTH ACROSS FLATS, IN	6.103
DUCT WALL THICKNESS, IN	0.096
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	32,783.
NOMINAL STRESS IN DUCT CORNER, PSI	28,399.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.197
UNIT CELL AREA, SQ IN	36.5051
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCENT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.330
FUEL PIN DIAMETER, IN	0.280
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.050
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	32.0
AXIAL BLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	32.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 89.0 % T.O.	0.452236
COOLANT	0.307354
INTERASSEMBLY GAP	0.059765
TOTAL SODIUM	0.367119
CLAD	0.100080
SPACER	0.018089
DUCT	0.055476
TOTAL STRUCTURAL	0.180645
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 27,847.941

WEIGHT OF PIN BUNDLE, KG

FUEL	175.972
CLAD	50.392
SPACER	8.593
DUCT (100.0 INCH SECTION)	27.686
TOTAL STRUCTURAL	86.672
AXIAL REFLECTOR	0.000
TOTAL	262.644

FUEL ASSEMBLY TC-CB4C-D 12 IN CORE HEIGHT 0.200 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	0.4925
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	0.295
DUCT INSIDE WIDTH ACROSS FLATS, IN	0.103
DUCT WALL THICKNESS, IN	0.090
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.107
UNIT CELL AREA, SQ IN	36.5051
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.533
FUEL PIN DIAMETER, IN	0.498
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.035
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.O.		0.611195
COOLANT	0.203216	
INTERASSEMBLY GAP	0.059765	
TOTAL SODIUM		0.262981
CLAD	0.060029	
SPACER	0.003314	
DUCT	0.050476	
TOTAL STRUCTURAL		0.125824
SUM		1.000000

FUEL ASSEMBLY TC-CB4C-4 36 IN CORE HEIGHT 0.240 IN PIN

GENERAL PLANT DATA

POWER, MWt	3,150
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12(R)*
NUMBER OF CORE LATTICE POSITIONS	379
NUMBER OF DRIVER ASSEMBLIES	355
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, L/MHR	1.260X10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL INLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	26.3
AVERAGE CORE COOLANT VELOCITY, FT/SEC	20.7
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	75.0
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	75.0

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.480X10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.O.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.O.	88.0
FUEL PIN OUTER DIAMETER, IN	0.240
FUEL CLADDING THICKNESS, MILS	12.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY TC-CB4C-4 36 IN CORE HEIGHT 0.240 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.7808
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.590
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.352
DUCT WALL THICKNESS, IN	0.119
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	34,328.
NOMINAL STRESS IN DUCT CORNER, PSI	28,380.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.191
UNIT CELL AREA, SQ IN	28.9404
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.289
FUEL PIN DIAMETER, IN	0.240
FUEL PIN PITCH/DIAMETER	1.206
WIRE SPACER DIAMETER, IN	0.049
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	16.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % I.D.	0.419103
COOLANT	0.317732
INTERASSEMBLY GAP	0.064089
TOTAL SODIUM	0.382722
CLAD	0.098308
SPACER	0.021941
DUCT	0.077026
TOTAL STRUCTURAL	0.198175
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 21,906.154

WEIGHT OF PIN BUNDLE, KG

FUEL	129.285
CLAD	38.504
SPACER	8.594
DUCT (104.0 INCH SECTION)	31.359
TOTAL STRUCTURAL	78.456
AXIAL REFLECTOR	0.000
TOTAL	207.741

FUEL ASSEMBLY TL-CR4C-4 36 IN CORE HEIGHT 0.240 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.7808
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.590
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.352
DUCT WALL THICKNESS, IN	0.119
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.191
UNIT CELL AREA, SQ IN	28.9404
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.467
FUEL PIN DIAMETER, IN	0.437
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.031
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.D.	0.592747
COOLANT	0.197083
INTERASSEMBLY GAP	0.064989
TOTAL SODIUM	0.262072
CLAD	0.064036
SPACER	0.003218
DUCT	0.077926
TOTAL STRUCTURAL	0.145181
SUM	1.000000

FUEL ASSEMBLY TC-CH4C-4 36 IN CORE HEIGHT 0.260 IN PIN

GENERAL PLANT DATA

POWER, MW	3,150
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12(R)*
NUMBER OF CORE LATTICE POSITIONS	374
NUMBER OF DRIVER ASSEMBLIES	355
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTION INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HK	1.260X10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	900.
MAXIMUM COOLANT VELOCITY, FT/SEC	25.0
AVERAGE CORE COOLANT VELOCITY, FT/SEC	19.7
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	69.5
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE TEMP, PSI	69.5

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.270X10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN MAND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.260
FUEL CLADDING THICKNESS, MILS	13.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY 10-CF4L-4 36 IN CORE HEIGHT 0.260 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	6.0835
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.910
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.668
DUCT WALL THICKNESS, IN	0.121
DUCT WALL COMPOSITION	55-310
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	34,242.
NOMINAL STRESS IN DUCT CORNER, PSI	28,430.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.174
UNIT CELL AREA, SQ IN	32.0510
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.307
FUEL PIN DIAMETER, IN	0.260
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.047
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	16.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 88.0 % I.D.	0.444127
COOLANT	0.501843
INTERASSEMBLY GAP	0.056386
TOTAL SODIUM	0.358229
CLAD	0.104178
SPACER	0.017765
DUCT	0.075701
TOTAL STRUCTURAL	0.197644
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 25,709.305

WEIGHT OF PIN BUNDLE, KG

FUEL	151.730
CLAD	45.188
SPACER	7.700
DUCT (104.0 INCH SECTION)	33.789
TOTAL STRUCTURAL	86.683
AXIAL REFLECTOR	0.000
TOTAL	238.413

FUEL ASSEMBLY TC-CH4C-4 36 IN COPE HEIGHT 0.260 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	0.0835
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.910
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.668
DUCT WALL THICKNESS, IN	0.121
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.174
UNIT CELL AREA, SQ IN	32.0510
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIKE WRAP
PITCH (TRIANGULAR), IN	0.495
FUEL PIN DIAMETER, IN	0.462
FUEL PIN PITCH/DIAMETER	1.070
WIKE SPACER DIAMETER, IN	0.032
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 90.0 % T.O.		0.600230
COOLANT	0.199573	
INTERASSEMBLY GAP	0.050400	
TOTAL SODIUM		0.255950
CLAD	0.064845	
SPACER	0.003259	
DUCT	0.075701	
TOTAL STRUCTURAL		0.143805
SUM		1.000000

FUEL ASSEMBLY TC-CBUC-4 36 IN CORE HEIGHT 0.280 IN PIN

GENERAL PLANT DATA

POWER, MWt	3,150
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	12(R)*
NUMBER OF CORE LATTICE POSITIONS	379
NUMBER OF DRIVER ASSEMBLIES	355
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, L/HR	1.260×10^6
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL INLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	21.5
AVERAGE CORE COOLANT VELOCITY, FT/SEC	17.0
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	49.2
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	49.2

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.120×10^6

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMOOTHED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.280
FUEL CLADDING THICKNESS, MILS	14.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY TC-C64C-4 36 IN CORE HEIGHT 0.280 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	6.5035
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	6.321
DUCT INSIDE WIDTH ACROSS FLATS, IN	6.103
DUCT WALL THICKNESS, IN	0.109
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	33,322.
NOMINAL STRESS IN DUCT CORNER, PSI	24,393.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.182
UNIT CELL AREA, SQ IN	36.6289
NUMBER OF FUEL PINS PER ASSEMBLY	331
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.330
FUEL PIN DIAMETER, IN	0.280
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.050
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	16.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 88.0 % T.D.	0.450707
COOLANT	0.306315
INTERASSEMBLY GAP	0.055187
TOTAL SODIUM	0.361502
CLAD	0.105721
SPACER	0.010028
DUCT	0.064041
TOTAL STRUCTURAL	0.187791
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 29,816.709

WEIGHT OF PIN BUNDLE, KG

FUEL	175.971
CLAD	52.408
SPACER	9.937
DUCT (104.0 TICH SECTION)	32.728
TOTAL STRUCTURAL	94.073
AXIAL REFLECTOR	0.000
TOTAL	270.044

FUEL ASSEMBLY TC-CB4C-J 36 IN CORE HEIGHT 0.280 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	6.5035
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	6.321
DUCT INSIDE WIDTH ACROSS FLATS, IN	6.103
DUCT WALL THICKNESS, IN	0.109
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.182
UNIT CELL AREA, SQ IN	36.6289
NUMBER OF FUEL PINS PER ASSEMBLY	127
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.533
FUEL PIN DIAMETER, IN	0.498
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.035
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.L.		0.609129
COOLANT	0.202530	
INTERASSEMBLY GAP	0.055187	
TOTAL SODIUM		0.257716
CLAD	0.065806	
SPACER	0.003307	
DUCT	0.064041	
TOTAL STRUCTURAL		0.133154
SUM		1.000000

FUEL ASSEMBLY TC-CC4C-6 32 IN CORE HEIGHT 0.240 IN PIN

GENERAL PLANT DATA

POWER, MW	3,201
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF FLOWS IN CORE	14(R)*
NUMBER OF CORE LATTICE POSITIONS	529
NUMBER OF DRIVER ASSEMBLIES	505
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HR	1,304x10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	25.8
AVERAGE CORE COOLANT VELOCITY, FT/SEC	20.3
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	77.8
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	77.8

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.450x10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.240
FUEL CLADDING THICKNESS, MILS	12.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY TC=CL4C-6 32 IN CORE HEIGHT 0.240 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.1171
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	4.955
DUCT INSIDE WIDTH ACROSS FLATS, IN	4.741
DUCT WALL THICKNESS, IN	0.107
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	34,345.
NOMINAL STRESS IN DUCT CORNER, PSI	28,702.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.166
UNIT CELL AREA, SQ IN	22.6762
NUMBER OF FUEL PINS PER ASSEMBLY	271
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.285
FUEL PIN DIAMETER, IN	0.240
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.043
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	32.0
AXIAL BLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	32.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 88.0 % T.D.	0.437922
COOLANT	0.500279
INTERASSEMBLY GAP	0.062315
TOTAL SODIUM	0.362594
CLAD	0.102722
SPACER	0.017517
DUCT	0.079245
TOTAL STRUCTURAL	0.199464
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 22,678.972

WEIGHT OF PIN BUNDLE, KG

FUEL	105.850
CLAD	30.312
SPACER	5.169
DUCT (100.0 INCH SECTION)	23.976
TOTAL STRUCTURAL	59.457
AXIAL REFLECTOR	0.000
TOTAL	165.307

FUEL ASSEMBLY TC-C040-A 32 IN CORE HEIGHT 0.240 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.1171
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	4.955
DUCT INSIDE WIDTH ACROSS FLATS, IN	4.741
DUCT WALL THICKNESS, IN	0.107
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.162
UNIT CELL AREA, SQ IN	22.6762
NUMBER OF FUEL PINS PER ASSEMBLY	91
SPACER CONCEPT	WIPE WRAP
PITCH (TRIANGULAR), IN	0.447
FUEL PIN DIAMETER, IN	0.456
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.032
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.O.		0.590400
COOLANT	0.201045	
INTERASSEMBLY GAP	0.062315	
TOTAL SODIUM		0.263360
CLAD	0.063703	
SPACER	0.003206	
DUCT	0.079245	
TOTAL STRUCTURAL		0.146234
SUM		1.000000

FUEL ASSEMBLY TL-CC4C-6 32 IN CORE HEIGHT 0.260 IN PIN

GENERAL PLANT DATA

POWER, MWt	3,261
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	14(R)*
NUMBER OF CORE LATTICE POSITIONS	529
NUMBER OF DRIVER ASSEMBLIES	505
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HR	1.304x10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	22.0
AVERAGE CORE COOLANT VELOCITY, FT/SEC	17.3
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	53.5
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	53.5

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.250x10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN RUND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.260
FUEL CLADDING THICKNESS, MILS	13.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY TC-CC4C-B 32 IN CORE HEIGHT 0.260 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.4961
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.328
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.136
DUCT WALL THICKNESS, IN	0.096
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	14,000.
PEAK STRESS IN DUCT CORNER, PSI	33,064.
NOMINAL STRESS IN DUCT CORNER, PSI	28,372.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.168
UNIT CELL AREA, SQ IN	26.1605
NUMBER OF FUEL PINS PER ASSEMBLY	271
SPACER CONCEPT	WIKE WRAP
PITCH (TRIANGULAR), IN	6.307
FUEL PIN DIAMETER, IN	0.260
FUEL PIN PITCH/DIAMETER	1.180
WIKE SPACER DIAMETER, IN	0.047
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	32.0
AXIAL BLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	32.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.D.	0.445497
CONLANT	0.305473
INTERASSEMBLY GAP	0.060199
TOTAL SODIUM	0.365672
CLAD	0.104499
SPACER	0.017820
DUCT	0.060511
TOTAL STRUCTURAL	0.188830
Pellet-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 26,616.293

WEIGHT OF PIN BUNDLE, KG

FUEL	124.227
CLAD	35.574
SPACER	6.066
DUCT (100.0 INCH SECTION)	23.250
TOTAL STRUCTURAL	64.897
AXIAL REFLECTOR	0.000
TOTAL	189.124

FUEL ASSEMBLY TC-CC4C-6 32 IN CORE HEIGHT 0.260 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.4901
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.320
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.130
DUCT WALL THICKNESS, IN	0.090
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.160
UNIT CELL AREA, SQ IN	20.1605
NUMBER OF FUEL PINS PER ASSEMBLY	91
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.520
FUEL PIN DIAMETER, IN	0.494
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.035
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % F.L.		0.600619
COOLANT	0.204523	
INTERASSEMBLY GAP	0.060199	
TOTAL SODIUM		0.264722
CLAD	0.064887	
SPACER	0.003201	
DUCT	0.060511	
TOTAL STRUCTURAL		0.134659
SUM		1.000000

FUEL ASSEMBLY TC-CC4C-6 32 IN CORE HEIGHT 0.280 IN PIN

GENERAL PLANT DATA

POWER, MW	3.261
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	14(R)*
NUMBER OF CORE LATTICE POSITIONS	529
NUMBER OF DRIVER ASSEMBLIES	505
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HF	1.304×10
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	19.0
AVERAGE CORE COOLANT VELOCITY, FT/SEC	14.9
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	37.9
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	37.9

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1 \text{ MEV}$)	1.100×10

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN RING	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.280
FUEL CLADDING THICKNESS, MILS	14.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

* (R) INDICATES THAT 3 SUBASSEMBLIES ARE REMOVED FROM EACH CORNER OF THE OUTER ROW

FUEL ASSEMBLY TC-CC4C-6 32 IN CORE HEIGHT 0.280 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.8802
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.705
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.531
DUCT WALL THICKNESS, IN	0.087
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	31,998.
NOMINAL STRESS IN DUCT CORNER, PSI	28,047.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.175
UNIT CELL AREA, SQ IN	29.9446
NUMBER OF FUEL PINS PER ASSEMBLY	271
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.330
FUEL PIN DIAMETER, IN	0.280
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.050
LENGTH OF FUEL BUNDLE, IN	100.0
ACTIVE CORE HEIGHT, IN	52.0
AXIAL BLANKET THICKNESS, IN	18.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	52.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.O.	0.451379
COOLANT	0.309506
INTERASSEMBLY GAP	0.058636
TOTAL SODIUM	0.368142
CLAD	0.105879
SPACER	0.018055
DUCT	0.050545
TOTAL STRUCTURAL	0.180479
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 30,868.600

WEIGHT OF PIN BUNDLE, KG

FUEL	144.074
CLAD	41.258
SPACER	7.035
DUCT (100.0 INCH SECTION)	22.672
TOTAL STRUCTURAL	70.965
AXIAL REFLECTOR	0.000
TOTAL	215.039

FUEL ASSEMBLY TC-CC4C-6 32 IN CORE HEIGHT 0.280 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.8802
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.705
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.531
DUCT WALL THICKNESS, IN	0.087
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.175
UNIT CELL AREA, SQ IN	29.9446
NUMBER OF FUEL PINS PER ASSEMBLY	91
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.509
FUEL PIN DIAMETER, IN	0.532
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.031
LENGTH OF FUEL BUNDLE, IN	100.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.O.	0.608549
COOLANT	0.207223
INTERASSEMBLY GAP	0.058636
TOTAL SODIUM	0.265859
CLAD	0.065744
SPACER	0.003304
DUCT	0.058545
TOTAL STRUCTURAL	0.125592
SUM	1.000000

FUEL ASSEMBLY TO-COOL-6 3/4 IN CORE HEIGHT 0.240 IN PIN

GENERAL PLANT DATA

POWER, MW	3,233
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	13
NUMBER OF CORE LATTICE POSITIONS	469
NUMBER OF DRIVER ASSEMBLIES	445
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HR	1.293×10^6
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	26.2
AVERAGE CORE COOLANT VELOCITY, FT/SEC	20.6
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS PIN BUNDLE, PSI	75.0
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	75.0

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.450×10^6

FUEL PIN DATA

FUEL PELLETT DENSITY, % T.O.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.O.	88.0
FUEL PIN OUTER DIAMETER, IN	0.240
FUEL CLADDING THICKNESS, MILS	12.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY TC-0040-n 34 IN CORE HEIGHT 0.240 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.2295
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.060
DUCT INSIDE WIDTH ACROSS FLATS, IN	4.844
DUCT WALL THICKNESS, IN	0.108
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	33,774.
NOMINAL STRESS IN DUCT CORNER, PSI	28,334.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.169
UNIT CELL AREA, SQ IN	23.6634
NUMBER OF FUEL PINS PER ASSEMBLY	271
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.249
FUEL PIN DIAMETER, IN	0.240
FUEL PIN PITCH/DIAMETER	1.204
WIRE SPACER DIAMETER, IN	0.049
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	16.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 84.0 % T.O.	0.419297
CLAD	0.318879
INTERASSEMBLY GAP	0.063589
TOTAL SODIUM	0.382468
CLAD	0.098354
SPACER	0.021648
DUCT	0.078233
TOTAL STRUCTURAL	0.198235
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 22,482.214

WEIGHT OF PIN BUNDLE, KG

FUEL	105.850
CLAD	31.524
SPACER	6.939
DUCT (104.0 INCH SECTION)	25.699
TOTAL STRUCTURAL	64.161
AXIAL REFLECTOR	0.000
TOTAL	170.011

FUEL ASSEMBLY TC-0040-A 36 IN CORE HEIGHT 0.240 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.2295
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.060
DUCT INSIDE WIDTH ACROSS FLATS, IN	4.844
DUCT WALL THICKNESS, IN	0.108
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.169
UNIT CELL AREA, SQ IN	23.6834
NUMBER OF FUEL PINS PER ASSEMBLY	91
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.498
FUEL PIN DIAMETER, IN	0.466
FUEL FIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.033
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.O.	0.590225
COOLANT	0.200983
INTERASSEMBLY GAP	0.063589
TOTAL SODIUM	0.264573
CLAD	0.063764
SPACER	0.003205
DUCT	0.078233
TOTAL STRUCTURAL	0.145202
SUM	1.000000

FUEL ASSEMBLY TC-CC4C-4 3/4 IN CORE HEIGHT 0.260 IN PIN

GENERAL PLANT DATA

POWER, MWT	3,233
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF ROWS IN CORE	13
NUMBER OF CORE LATTICE POSITIONS	464
NUMBER OF DRIVER ASSEMBLIES	445
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HR	1.293x10 ⁶
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	900.
MAXIMUM COOLANT VELOCITY, FT/SEC	24.8
AVERAGE CORE COOLANT VELOCITY, FT/SEC	19.5
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS FJN BUNDLE, PSI	68.4
ESTIMATED REMAINING PRESSURE DROP, PSI	6.0
DUCT DESIGN PRESSURE DROP, PSI	68.4

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK IN AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT (E > 0.1 MEV)	1.250x10 ²¹

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN BOND	HELIUM
SMOURED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.260
FUEL CLADDING THICKNESS, MILS	13.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY TC-CC4C-6 3A IN CORE HEIGHT 0.200 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.5101
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.354
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.136
DUCT WALL THICKNESS, IN	0.109
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT CORNER, PSI	33,683.
NOMINAL STRESS IN DUCT CORNER, PSI	28,404.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.150
UNIT CELL AREA, SQ IN	26.2939
NUMBER OF FUEL PINS PER ASSEMBLY	271
SPACER CONCEPT	WIKE WRAP
PITCH (TRIANGULAR), IN	0.307
FUEL PIN DIAMETER, IN	0.260
FUEL PIN PITCH/DIAMETER	1.180
WIKE SPACER DIAMETER, IN	0.047
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	10.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.O.	0.443236
COOLANT	0.303923
INTERASSEMBLY GAP	0.055821
TOTAL SODIUM	0.359744
CLAD	0.103969
SPACER	0.017729
DUCT	0.075321
TOTAL STRUCTURAL	0.197020
PELLET-CLAD GAP	0.0
SUM	1.000000

TOTAL HEAVY METAL IN CORE, KG 26,385.377

WEIGHT OF PIN BUNDLE, KG

FUEL	124.226
CLAD	36.997
SPACER	6.309
DUCT (104.0 INCH SECTION)	27.507
TOTAL STRUCTURAL	70.814
AXIAL REFLECTOR	0.000
TOTAL	195.040

FUEL ASSEMBLY TC-CC4C-F 36 IN CORE HEIGHT 0.260 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.5101
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.354
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.136
DUCT WALL THICKNESS, IN	0.109
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.156
UNIT CELL AREA, SQ IN	26.2939
NUMBER OF FUEL PINS PER ASSEMBLY	91
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.528
FUEL PIN DIAMETER, IN	0.494
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.035
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 90.0 % T.O.	0.597571
COOLANT	0.203485
INTERASSEMBLY GAP	0.055821
TOTAL SODIUM	0.259306
CLAD	0.064557
SPACER	0.003244
DUCT	0.075321
TOTAL STRUCTURAL	0.143123
SUM	1.000000

FUEL ASSEMBLY TC-104C-6 36 IN CORE HEIGHT 0.280 IN PIN

GENERAL PLANT DATA

POWER, MW	3,233
CORE ARRANGEMENT	HEXAGONAL
NUMBER OF RODS IN CORE	13
NUMBER OF CORE LATTICE POSITIONS	469
NUMBER OF DRIVER ASSEMBLIES	445
NUMBER OF CONTROL ROD POSITIONS	24

THERMAL HYDRAULIC DATA

REACTOR INLET TEMPERATURE, DEG F	595.
AVERAGE TEMPERATURE RISE ACROSS REACTOR, DEG F	280.
AVERAGE REACTOR OUTLET TEMPERATURE, DEG F	875.
TOTAL REACTOR COOLANT FLOW, LB/HR	1.293×10^6
BY-PASS FLOW, % OF TOTAL	5.000
PENALTY FOR OVER-COOLING BLANKET, DEG F	70.
AVERAGE TEMPERATURE RISE ACROSS CORE, DEG F	365.
MAXIMUM TEMPERATURE RISE ACROSS CORE, DEG F	365.
AVERAGE DRIVER FUEL OUTLET TEMPERATURE, DEG F	960.
MAXIMUM COOLANT VELOCITY, FT/SEC	21.4
AVERAGE CORE COOLANT VELOCITY, FT/SEC	16.8
TEMPERATURE DROP BETWEEN COOLANT AND DUCT, DEG F	120.
PRESSURE DROP ACROSS RT. BUNDLE, PSI	48.5
ESTIMATED REMAINING PRESSURE DROP, PSI	0.0
DUCT DESIGN PRESSURE DROP, PSI	48.5

PHYSICS DATA

FRACTION OF POWER IN CORE, %	91.5
FRACTION OF POWER IN AXIAL BLANKET, %	1.5
FRACTION OF POWER IN RADIAL BLANKET, %	7.0
PEAK TO AVERAGE POWER IN CORE	
RADIAL	1.270
AXIAL	1.300
TOTAL	1.651
PEAK DAMAGE FLUENCE, NVT ($E > 0.1$ MEV)	1.100×10^6

FUEL PIN DATA

FUEL PELLET DENSITY, % T.D.	88.0
DIAMETRIC GAP, MILS	0.0
FUEL PIN HUND	HELIUM
SMEARED FUEL DENSITY, PLANAR NOMINAL, % T.D.	88.0
FUEL PIN OUTER DIAMETER, IN	0.280
FUEL CLADDING THICKNESS, MILS	14.0
FUEL CLADDING COMPOSITION	SS-316
PEAK LINEAR POWER IN FUEL, KW/FT	13.5
AVERAGE LINEAR POWER IN FUEL, KW/FT	8.2

FUEL ASSEMBLY TC-CC4C-A 36 IN CORE HEIGHT 0.280 IN PIN

FUEL ASSEMBLY DESIGN

LATTICE PITCH, IN	5.8892
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.727
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.531
DUCT WALL THICKNESS, IN	0.098
DUCT WALL COMPOSITION	SS-316
MAXIMUM ALLOWABLE STRESS IN DUCT WALL, PSI	18,000.
PEAK STRESS IN DUCT UPPER, PSI	32,950.
NOMINAL STRESS IN DUCT CORNER, PSI	28,475.
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.162
UNIT CELL AREA, SQ IN	30.0363
NUMBER OF FUEL PINS PER ASSEMBLY	271
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.330
FUEL PIN DIAMETER, IN	0.280
FUEL PIN PITCH/DIAMETER	1.180
WIRE SPACER DIAMETER, IN	0.050
LENGTH OF FUEL BUNDLE, IN	104.0
ACTIVE CORE HEIGHT, IN	36.0
AXIAL BLANKET THICKNESS, IN	16.0
AXIAL REFLECTOR THICKNESS, IN	0.0
PLENUM LENGTH, IN	36.0
PLENUM POSITION	TOP

VOLUME FRACTIONS AT BEGINNING OF LIFE

FUEL AT 88.0 % T.O.	0.450001
COOLANT	0.308561
INTERASSEMBLY GAP	0.051259
TOTAL SODIUM	0.362820
CLAD	0.105556
SPACER	0.018000
DUCT	0.063624
TOTAL STRUCTURAL	0.187179
Pellet-clad gap	0.0
SIM	1.000000

TOTAL HEAVY METAL IN CORE, KG 30,600.792

WEIGHT OF PIN BUNDLE, KG

FUEL	144.073
CLAD	42.908
SPACER	7.317
DUCT (104.0 INCH SECTION)	26.587
TOTAL STRUCTURAL	76.812
AXIAL REFLECTOR	0.000
TOTAL	220.885

FUEL ASSEMBLY TI-0040-2 36 IN CORE HEIGHT 0.250 IN PIN

RADIAL BLANKET ASSEMBLY DESIGN

LATTICE PITCH, IN	5.8892
DUCT OUTSIDE WIDTH ACROSS FLATS, IN	5.727
DUCT INSIDE WIDTH ACROSS FLATS, IN	5.531
DUCT WALL THICKNESS, IN	0.098
DUCT WALL COMPOSITION	SS-316
SODIUM GAP BETWEEN ASSEMBLIES, IN	0.162
UNIT CELL AREA, SQ IN	30.0363
NUMBER OF FUEL PINS PER ASSEMBLY	91
SPACER CONCEPT	WIRE WRAP
PITCH (TRIANGULAR), IN	0.569
FUEL PIN DIAMETER, IN	0.532
FUEL PIN PITCH/DIAMETER	1.070
WIRE SPACER DIAMETER, IN	0.037
LENGTH OF FUEL BUNDLE, IN	104.0

VOLUME FRACTIONS AT BEGINING OF LIFE

FUEL AT 90.0 % T.D.		0.606691
COOLANT	0.206590	
INTERASSEMBLY GAP	0.054259	
TOTAL SODIUM		0.260849
CLAD	0.065543	
SPACER	0.003294	
DUCT	0.063624	
TOTAL STRUCTURAL		0.132460
SUM		1.000000

APPENDIX C-B: FUEL CYCLE COST CALCULATIONS

The fuel cycle cost program used was FUCOST¹ from General Electric Company. The value of plutonium was assumed to be 100 \$/gm. The total reprocessing cost was 595 \$/kg HM with the following breakdown: 350 \$/kg HM for reprocessing; 80 \$/kg HM for spent fuel shipping; and 165 \$/kg HM for waste shipping and storage. The fabrication cost model was the revised HEDL N-factor formula.²

The detailed fuel cycle cost components are listed in the following tables. The nomenclature used in the titles of these tables and in naming the zones in the tables are explained below:

Nomenclature:

CB	Center blanket
CC	Center core
3C	Three core zones
4C	Four core zones
H32	32 in. core height
TC	Tightly coupled
LC	Loosely coupled
Zone 1	All core zones
Zone 4	All axial blanket zones
Zone 7	All internal blankets
Zone 8	All radial blankets

REFERENCES

1. E. V. Neill, D. P. Johnson, "COROPT, A Computer Program for Finding Optimum LMFBR Mixed Oxide Fuel Cores," General Electric Company, FBRD, October, 1976.
2. Letter, R. P. Omberg to Distribution, "A Revised Fabrication Cost Equation for use in FBR Core Design," HEDL, June 27, 1978.

CB-4C-H32-TC 0.24" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.20510E 04	0.59500E 03	0.17700E-02
ZONE 2	0.20002E 01	0.20510E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.20510E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.20135E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.24797E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.10195E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.36302E 01	0.10531E 01	0.56489E 00	-0.74761E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.11980E 01	0.0	-0.85046E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.61992E 00	0.14754E 01	0.96464E-01	-0.10474E 00
ZONE 8	0.25488E 00	0.60661E 00	0.71913E-01	-0.10330E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.78773994E 01
REVENUE	=	-0.53353949E 01
CHARGE ON REVENUE	=	0.19289637E 00
LOSSES	=	0.32661361E 00
CARRY CHARGE ON LOSSES	=	-0.56851879E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.91038102E 00
TOTAL FUEL CYCLE COST	=	0.11348979E 02

CB-4C-H32-TC 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.17790E 04	0.59500E 03	0.20756E-02
ZONE 2	0.20002E 01	0.17790E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.17790E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.23623E-02
ZONE 5	0.20002F 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.28889E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11874E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.36925E 01	0.12350E 01	0.57458E 00	-0.87671E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.14055E 01	0.0	-0.99779E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.72224E 00	0.17189E 01	0.11238E 00	-0.12203E 00
ZONE 8	0.29684E 00	0.70647E 00	0.83753E-01	-0.12031E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.87933750E 01
REVENUE	=	-0.57670612E 01
CHARGE ON REVENUE	=	0.20850289E 00
LOSSES	=	0.36418724E 00
CARRY CHARGE ON LOSSES	=	-0.63326433E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10140591E 01
TOTAL FUEL CYCLE COST	=	0.12697009E 02

CB-4C-H32-TC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.15630E 04	0.59500E 03	0.24054E-02
ZONE 2	0.20002E 01	0.15630E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.15630E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.27404E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.33500E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13773E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.37597E 01	0.14312E 01	0.58503E 00	-0.10160E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.16306E 01	0.0	-0.11575E 00
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.83750E 00	0.19932E 01	0.13032E 00	-0.14150E 00
ZONE 8	0.34432E 00	0.81949E 00	0.97151E-01	-0.13956E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.97926245E 01
REVENUE	=	-0.60951271E 01
CHARGE ON REVENUE	=	0.22036380E 00
LOSSES	=	0.40487039E 00
CARRY CHARGE ON LOSSES	=	-0.70286654E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.11255140E 01
TOTAL FUEL CYCLE COST	=	0.14320276E 02

CB-4C-H36-TC 0.24" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.18830E 04	0.59500E 03	0.17418E-02
ZONE 2	0.20002E 01	0.18830E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.18830E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.15660E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.22466E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.98895E-03
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.32798E 01	0.10364E 01	0.51036E 00	-0.73571E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.93177E 00	0.0	-0.66146E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.56165E 00	0.13367E 01	0.87396E-01	-0.94893E-01
ZONE 8	0.24724E 00	0.58843E 00	0.69758E-01	-0.10021E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.77046032E 01
REVENUE	=	-0.51120901E 01
CHARGE ON REVENUE	=	0.18482298E 00
LOSSES	=	0.31922144E 00
CARRY CHARGE ON LOSSES	=	-0.55528171E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.88918418E 00
TOTAL FUEL CYCLE COST	=	0.10516471E 02

CB-4C-H36-TC 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.16310E 04	0.59500E 03	0.20418E-02
ZONE 2	0.20002E 01	0.16310E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.16310E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.18370E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.25192E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11089E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.33301E 01	0.12149E 01	0.51819E 00	-0.86242E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.10930E 01	0.0	-0.77590E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.62979E 00	0.14989E 01	0.97999E-01	-0.10641E 00
ZONE 8	0.27724E 00	0.65982E 00	0.78222E-01	-0.11237E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.84425716E 01
REVENUE	=	-0.55313787E 01
CHARGE ON REVENUE	=	0.19998205E 00
LOSSES	=	0.34964651E 00
CARRY CHARGE ON LOSSES	=	-0.60796067E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.97354031E 00
TOTAL FUEL CYCLE COST	=	0.11496697E 02

CB-4C-H36-TC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.14330E 04	0.59500E 03	0.23676E-02
ZONE 2	0.20002E 01	0.14330E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.14330E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.21305E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.29223E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.12864E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.33927E 01	0.14087E 01	0.52793E 00	-0.10000E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.12676E 01	0.0	-0.89989E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.73059E 00	0.17389E 01	0.11368E 00	-0.12344E 00
ZONE 8	0.32159E 00	0.76538E 00	0.90736E-01	-0.13034E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.94259558E 01
REVENUE	=	-0.58861609E 01
CHARGE ON REVENUE	=	0.21280885E 00
LOSSES	=	0.38975215E 00
CARRY CHARGE ON LOSSES	=	-0.67668781E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10835934E 01
TOTAL FUEL CYCLE COST	=	0.12965898E 02

CB-3C-H32-TC 0.24" PINS

	PRESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.21130E 04	0.59500E 03	0.16782E-02
ZONE 2	0.20002E 01	0.21130E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.21130E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.19440E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.23505E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.99844E-03
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.35460E 01	0.99851E 00	0.55178E 00	-0.70884E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.11567E 01	0.0	-0.82114E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.58761E 00	0.13985E 01	0.91437E-01	-0.99280E-01
ZONE 8	0.24961E 00	0.59407E 00	0.70427E-01	-0.10117E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.74565077E 01
REVENUE	=	-0.52491646E 01
CHARGE ON REVENUE	=	0.18977880E 00
LOSSES	=	0.30958909E 00
CARRY CHARGE ON LOSSES	=	-0.53957701E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.86403549E 00
TOTAL FUEL CYCLE COST	=	0.10728442E 02

CB-3C-H32-TC 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.18270E 04	0.59500E 03	0.19737E-02
ZONE 2	0.20002E 01	0.18270E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.18270E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.22810E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.27374E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11634E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.36059E 01	0.11743E 01	0.56110E 00	-0.83365E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.13572E 01	0.0	-0.96348E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.68435E 00	0.16288E 01	0.10649E 00	-0.11562E 00
ZONE 8	0.29084E 00	0.69221E 00	0.82062E-01	-0.11788E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.83656607E 01
REVENUE	=	-0.55370226E 01
CHARGE ON REVENUE	=	0.20018607E 00
LOSSES	=	0.34658152E 00
CARRY CHARGE ON LOSSES	=	-0.60282648E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.96531886E 00
TOTAL FUEL CYCLE COST	=	0.12174046E 02

CB-3C-H32-TC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.16000E 04	0.59500E 03	0.22920E-02
ZONE 2	0.20002E 01	0.16000E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.16000E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.26460E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.31760E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13497E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.36673E 01	0.13638E 01	0.57065E 00	-0.96813E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.15743E 01	0.0	-0.11176E 00
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.79400E 00	0.18897E 01	0.12355E 00	-0.13415E 00
ZONE 8	0.33741E 00	0.80304E 00	0.95201E-01	-0.13676E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.93238163E 01
REVENUE	=	-0.58418121E 01
CHARGE ON REVENUE	=	0.21120542E 00
LOSSES	=	0.38557035E 00
CARRY CHARGE ON LOSSES	=	-0.66949502E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10720758E 01
TOTAL FUEL CYCLE COST	=	0.13739408E 02

CB-3C-H36-TC 0.24" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.19110E 04	0.59500E 03	0.17976E-02
ZONE 2	0.20002E 01	0.19110E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.19110E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.16435E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.23572E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.10370E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.34351E 01	0.10695E 01	0.53453E 00	-0.75926E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.97786E 00	0.0	-0.69417E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.58931E 00	0.14026E 01	0.91700E-01	-0.99566E-01
ZONE 8	0.25926E 00	0.61704E 00	0.73151E-01	-0.10508E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.78484793E 01
REVENUE	=	-0.50967693E 01
CHARGE ON REVENUE	=	0.18426913E 00
LOSSES	=	0.32494509E 00
CARRY CHARGE ON LOSSES	=	-0.56485236E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.90450978E 00
TOTAL FUEL CYCLE COST	=	0.11050822E 02

CB-3C-H36-TC 0.26" PINS

	PESIDENCE TIME (YPS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.16500E 04	0.59500E 03	0.21134E-02
ZONE 2	0.20002E 01	0.16500E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.16500E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.19288E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.26443E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11634E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.34871E 01	0.12575E 01	0.54261E 00	-0.89266E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.11476E 01	0.0	-0.81470E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.66107E 00	0.15733E 01	0.10287E 00	-0.11169E 00
ZONE 8	0.29084E 00	0.69221E 00	0.82062E-01	-0.11788E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.86342363E 01
REVENUE	=	-0.53676939E 01
CHARGE ON REVENUE	=	0.19406414E 00
LOSSES	=	0.35696405E 00
CARRY CHARGE ON LOSSES	=	-0.61967671E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.99230158E 00
TOTAL FUEL CYCLE COST	=	0.12255864E 02

CB-3C-H36-TC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.14470E 04	0.59500E 03	0.24546E-02
ZONE 2	0.20002E 01	0.14470E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.14470E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.22378E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.30668E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13497E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.35518E 01	0.14605E 01	0.55269E 00	-0.10368E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.13315E 01	0.0	-0.94524E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.76669E 00	0.18247E 01	0.11930E 00	-0.12954E 00
ZONE 8	0.33741E 00	0.80304E 00	0.95201E-01	-0.13676E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.96214209E 01
REVENUE	=	-0.57063503E 01
CHARGE ON REVENUE	=	0.20630795E 00
LOSSES	=	0.39718729E 00
CARRY CHARGE ON LOSSES	=	-0.68854317E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.11025782E 01
TOTAL FUEL CYCLE COST	=	0.13787436E 02

CB-2C-H40-1C 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.16860E 04	0.59500E 03	0.19847E-02
ZONE 2	0.20002E 01	0.16860E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.16860E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.15308E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.22734E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.99979E-03
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.33462E 01	0.11809E 01	0.52069E 00	-0.83830E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.91085E 00	0.0	-0.64661E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.56835E 00	0.13527E 01	0.88439E-01	-0.96026E-01
ZONE 8	0.24995E 00	0.59488E 00	0.70523E-01	-0.10131E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.80444641E 01
REVENUE	=	-0.47411804E 01
CHARGE ON REVENUE	=	0.17141312E 00
LOSSES	=	0.33202410E 00
CARRY CHARGE ON LOSSES	=	-0.57547539E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.92152065E 00
TOTAL FUEL CYCLE COST	=	0.11416979E 02

CB-2C-H40-LC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.14730E 04	0.59500E 03	0.23064E-02
ZONE 2	0.20002E 01	0.14730E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.14730E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.17764E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.25782E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11342E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.33974E 01	0.13723E 01	0.52865E 00	-0.97421E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.10570E 01	0.0	-0.75032E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.64456E 00	0.15340E 01	0.10030E 00	-0.10890E 00
ZONE 8	0.28356E 00	0.67488E 00	0.80007E-01	-0.11493E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.87757788E 01
REVENUE	=	-0.50967693E 01
CHARGE ON REVENUE	=	0.18426913E 00
LOSSES	=	0.36204636E 00
CARRY CHARGE ON LOSSES	=	-0.62724724E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10044241E 01
TOTAL FUEL CYCLE COST	=	0.12490941E 02

CB-2C-H40-LC 0.30" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.13020E 04	0.59500E 03	0.26510E-02
ZONE 2	0.20002E 01	0.13020E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.13020E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.20389E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.29609E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13026E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.34517E 01	0.15774E 01	0.53710E 00	-0.11198E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.12131E 01	0.0	-0.86119E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.74023E 00	0.17618E 01	0.11519E 00	-0.12507E 00
ZONE 8	0.32564E 00	0.77503E 00	0.91880E-01	-0.13199E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.96159801E 01
REVENUE	=	-0.53846273E 01
CHARGE ON REVENUE	=	0.19467640E 00
LCSSSES	=	0.39627969E 00
CARRY CHARGE ON LOSSES	=	-0.68585724E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10982761E 01
TOTAL FUEL CYCLE COST	=	0.13850949E 02

CB-2C-H48-1C 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.14770E 04	0.59500E 03	0.19931E-02
ZONE 2	0.20002E 01	0.14770E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.14770E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.11947E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.22768E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.10919E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.29439E 01	0.11859E 01	0.45809E 00	-0.84188E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.71085E 00	0.0	-0.50463E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.56920E 00	0.13547E 01	0.88571E-01	-0.96169E-01
ZONE 8	0.27298E 00	0.64969E 00	0.77021E-01	-0.11064E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.83856220E 01
REVENUE	=	-0.45041218E 01
CHARGE ON REVENUE	=	0.16284245E 00
LCSES	=	0.34516567E 00
CARRY CHARGE ON LOSSES	=	-0.59672147E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.95554233E 00
TOTAL FUEL CYCLE COST	=	0.11397386E 02

CB-2C-H48-LC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.12900E 04	0.59500E 03	0.23149E-02
ZONE 2	0.20002E 01	0.12900E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.12900E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.13861E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.24927E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11956E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.29862E 01	0.13774E 01	0.46468E 00	-0.97778E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.82471E 00	0.0	-0.58545E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.62318E 00	0.14832E 01	0.96970E-01	-0.10529E 00
ZONE 8	0.29889E 00	0.71135E 00	0.84331E-01	-0.12114E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.89917240E 01
REVENUE	=	-0.48766432E 01
CHARGE ON REVENUE	=	0.17631060E 00
ICSSSES	=	0.37021422E 00
CARRY CHARGE ON LOSSES	=	-0.64019039E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10251493E 01
TOTAL FUEL CYCLE COST	=	0.12198098E 02

CB-2C-H48-LC 0.30" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.11410E 04	0.59500E 03	0.26595E-02
ZONE 2	0.20002E 01	0.11410E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.11410E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.15910E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.27577E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13229E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.30345E 01	0.15824E 01	0.47219E 00	-0.11233E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.94662E 00	0.0	-0.67200E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.68943E 00	0.16408E 01	0.10728E 00	-0.11648E 00
ZONE 8	0.33072E 00	0.78712E 00	0.93314E-01	-0.13404E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.97030830E 01
REVENUE	=	-0.52152987E 01
CHARGE ON REVENUE	=	0.18855441E 00
LOSSES	=	0.39940172E 00
CARRY CHARGE ON LOSSES	=	-0.69049709E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.11057072E 01
TOTAL FUEL CYCLE COST	=	0.13217471E 02

CC-3C-H40-1C C.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002F 01	0.16630E 04	0.59500E 03	0.20152E-02
ZONE 2	0.20002E 01	0.16630E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.16630E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.15308E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.21803E-02
ZONE 8	0.50005F 01	0.25000E 03	0.59500E 03	0.10015E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.33512E 01	0.11990E 01	0.52147E 00	-0.85118E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.91085E 00	0.0	-0.64661E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.54507E 00	0.12973E 01	0.84816E-01	-0.92092E-01
ZONE 8	0.25037E 00	0.59588E 00	0.70642E-01	-0.10148E 01
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.81478996E 01
REVENUE	=	-0.49951725E 01
CHARGE ON REVENUE	=	0.18059593E 00
LCSSSES	=	0.33670717E 00
CARRY CHARGE ON LOSSES	=	-0.58426671E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.93559855E 00
TOTAL FUEL CYCLE COST	=	0.11211805E 02

CC-3C-H40-1C 0.28" PINS

	RESIDENCE TIME (YFS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.14580E 04	0.59500E 03	0.23369E-02
ZONE 2	0.20002E 01	0.14580E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.14580E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.17755E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.24724E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11356E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.34072E 01	0.13905E 01	0.53019E 00	-0.98708E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.10564E 01	0.0	-0.74997E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.61810E 00	0.14711E 01	0.96180E-01	-0.10443E 00
ZONE 8	0.28390E 00	0.67568E 00	0.80103E-01	-0.11507E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.89681377E 01
REVENUE	=	-0.53338289E 01
CHARGE ON REVENUE	=	0.19283974E 00
LOSSES	=	0.37025040E 00
CARRY CHARGE ON LOSSES	=	-0.64189956E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10278873E 01
TOTAL FUEL CYCLE COST	=	0.12379204E 02

CC-3C-H40-1C 0.30" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.12920E 04	0.59500E 03	0.26815E-02
ZONE 2	0.20002E 01	0.12920E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.12920E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.20380E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.28382E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13036E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.34645E 01	0.15955E 01	0.53910E 00	-0.11326E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.12126E 01	0.0	-0.86083E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.70954E 00	0.16887E 01	0.11041E 00	-0.11988E 00
ZONE 8	0.32590E 00	0.77564E 00	0.91952E-01	-0.13209E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.98736582E 01
REVENUE	=	-0.56216860E 01
CHARGE ON REVENUE	=	0.20324695E 00
LCSSSES	=	0.40709788E 00
CARRY CHARGE ON LOSSES	=	-0.70490539E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.11287794E 01
TOTAL FUEL CYCLE COST	=	0.13789031E 02

CC-3C-H48-1C 0.26" FINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.14570E 04	0.59500E 03	0.20228E-02
ZONE 2	0.20002E 01	0.14570E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.14570E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.11947E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.21684E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.10936E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.29472E 01	0.12036E 01	0.45860E 00	-0.85440E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.71085E 00	0.0	-0.50463E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.54210E 00	0.12902E 01	0.84355E-01	-0.91591E-01
ZONE 8	0.27340E 00	0.65070E 00	0.77140E-01	-0.11081E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.84328079E 01
REVENUE	=	-0.47750463E 01
CHARGE ON REVENUE	=	0.17263752E 00
LOSSES	=	0.34763426E 00
CARRY CHARGE ON LOSSES	=	-0.60184970E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.96375448E 00
TOTAL FUEL CYCLE COST	=	0.11108016E 02

CC-3C-H48-LC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.12760E 04	0.59500E 03	0.23445E-02
ZONE 2	0.20002E 01	0.12760E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.12760E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.13852E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.23742E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11972E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.29916E 01	0.13950E 01	0.46552E 00	-0.99030E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.82420E 00	0.0	-0.58509E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.59354E 00	0.14126E 01	0.92359E-01	-0.10028E 00
ZONE 8	0.29931E 00	0.71236E 00	0.84451E-01	-0.12131E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.90824604E 01
REVENUE	=	-0.51137018E 01
CHARGE ON REVENUE	=	0.18488127E 00
LOSSES	=	0.37435275E 00
CARRY CHARGE ON LOSSES	=	-0.64800493E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10376635E 01
TOTAL FUEL CYCLE COST	=	0.11975667E 02

CC-3C-H48-LC 0.30" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.11300E 04	0.59500E 03	0.26900E-02
ZONE 2	0.20002E 01	0.11300E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.11300E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.15910E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.26256E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13239E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.30397E 01	0.16005E 01	0.47300E 00	-0.11362E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.94662E 00	0.0	-0.67200E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.65641E 00	0.15623E 01	0.10214E 00	-0.11090E 00
ZONE 8	0.33098E 00	0.78773E 00	0.93385E-01	-0.13415E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.98137798E 01
RFVENUE	=	-0.54184923E 01
CHARGE ON REVENUE	=	0.19590074E 00
ICSSSES	=	0.40426618E 00
CARRY CHARGE ON LOSSES	=	-0.69941022E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.11199808E 01
TOTAL FUEL CYCLE COST	=	0.13035319E 02

CB-3C-H40-LC 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.16940E 04	0.59500E 03	0.19872E-02
ZONE 2	0.20002E 01	0.16940E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.16940E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.15308E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.24343E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.10001E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.33664E 01	0.11824E 01	0.52383E 00	-0.83938E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.91085E 00	0.0	-0.64661E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.60857E 00	0.14484E 01	0.94698E-01	-0.10282E 00
ZONE 8	0.25003E 00	0.59508E 00	0.70547E-01	-0.10134E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.84745398E 01
REVENUE	=	-0.51306353E 01
CHARGE ON REVENUE	=	0.18549347E 00
LOSSES	=	0.35006648E 00
CARRY CHARGE ON LOSSES	=	-0.60722232E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.97235781E 00
TOTAL FUEL CYCLE COST	=	0.11598992E 02

CB-3C-H40-LC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.14820E 04	0.59500E 03	0.23081E-02
ZONE 2	0.20002E 01	0.14820E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.14820E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.17755E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.27611E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11342E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.34206E 01	0.13733E 01	0.53227E 00	-0.97492E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.10564E 01	0.0	-0.74997E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.69028E 00	0.16429E 01	0.10741E 00	-0.11663E 00
ZONE 8	0.28356E 00	0.67488E 00	0.80007E-01	-0.11493E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.92929602E 01
REVENUE	=	-0.54862242E 01
CHARGE ON REVENUE	=	0.19834948E 00
LOSSES	=	0.38357365E 00
CARRY CHARGE ON LOSSES	=	-0.66485479E-02
CREDIT FOR SALE AT PLANT BOL	=	-0.10646458E 01
TOTAL FUEL CYCLE COST	=	0.12774967E 02

CB-3C-H40-1C 0.30" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.13130E 04	0.59500E 03	0.26527E-02
ZONE 2	0.20002E 01	0.13130E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.13130E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.20389E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.31701E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13026E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.34830E 01	0.15784E 01	0.54198E 00	-0.11205E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.12131E 01	0.0	-0.86119E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.79252E 00	0.18862E 01	0.12332E 00	-0.13390E 00
ZONE 8	0.32564E 00	0.77503E 00	0.91880E-01	-0.13199E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.10258374E 02
REVENUE	=	-0.57571487E 01
CHARGE ON REVENUE	=	0.20814455E 00
LCSSSES	=	0.42278051E 00
CARRY CHARGE ON LOSSES	=	-0.73176846E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.11717949E 01
TOTAL FUEL CYCLE COST	=	0.14300039E 02

CB-3C-H48-LC 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.14830E 04	0.59500E 03	0.19948E-02
ZONE 2	0.20002E 01	0.14830E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.14830E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.11947E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.22759E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.10919E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.29584E 01	0.11869E 01	0.46034E 00	-0.84259E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.71085E 00	0.0	-0.50463E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.56899E 00	0.13542E 01	0.88538E-01	-0.96133E-01
ZONE 8	0.27298E 00	0.64969E 00	0.77021E-01	-0.11064E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.86668997E 01
REVENUE	=	-0.48427773E 01
CHARGE ON REVENUE	=	0.17508620E 00
LOSSES	=	0.35714561E 00
CARRY CHARGE ON LOSSES	=	-0.61808936E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.98975962E 00
TOTAL FUEL CYCLE COST	=	0.11346740E 02

CB-3C-H48-1C 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.12970E 04	0.59500E 03	0.23157E-02
ZONE 2	0.20002E 01	0.12970E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.12970E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.13861E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.24927E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11959E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.30035E 01	0.13779E 01	0.46737E 00	-0.97814E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.82471E 00	0.0	-0.58545E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.62318E 00	0.14832E 01	0.96970E-01	-0.10529E 00
ZONE 8	0.29897E 00	0.71155E 00	0.84355E-01	-0.12118E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.93601074E 01
REVENUE	=	-0.51983662E 01
CHARGE ON REVENUE	=	0.18794227E 00
LOSSES	=	0.38564301E 00
CARRY CHARGE ON LOSSES	=	-0.66729747E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10685558E 01
TOTAL FUEL CYCLE COST	=	0.12248871E 02

CB-3C-H48-LC 0.30" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.11310E 04	0.59500E 03	0.26620E-02
ZONE 2	0.20002E 01	0.11310E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.11310E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.15859E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.27569E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.13229E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.30108E 01	0.15839E 01	0.46850E 00	-0.11244E 00
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.94360E 00	0.0	-0.66986E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.68922E 00	0.16403E 01	0.10725E 00	-0.11645E 00
ZONE 8	0.33072E 00	0.78712E 00	0.93314E-01	-0.13404E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.19158566E 02
REVENUE	=	-0.55031567E 01
CHARGE ON REVENUE	=	0.19896168E 00
LOSSES	=	0.41824269E 00
CARRY CHARGE ON LOSSES	=	-0.72322115E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.11581078E 01
TOTAL FUEL CYCLE COST	=	0.13332067E 02

CC-4C-H32-TC 0.24" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.23770E 04	0.59500E 03	0.17180E-02
ZONE 2	0.20002E 01	0.23770E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.23770E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.19873E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.20102E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.85242E-03
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.40836E 01	0.10222E 01	0.63543E 00	-0.72564E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.11824E 01	0.0	-0.83941E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.50255E 00	0.11961E 01	0.78201E-01	-0.84909E-01
ZONE 8	0.21311E 00	0.50719E 00	0.60128E-01	-0.86373E-01
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.73402195E 01
REVENUE	=	-0.48493919E 01
CHARGE ON REVENUE	=	0.17532539E 00
LOSSES	=	0.30407929E 00
CARRY CHARGE ON LOSSES	=	-0.52886941E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.84688938E 00
TOTAL FUEL CYCLE CCST	=	0.11271120E 02

CC-4C-H32-TC 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.20490E 04	0.59500E 03	0.20197E-02
ZONE 2	0.20002E 01	0.20490E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.20490E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.23325E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.23601E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.10006E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.41383E 01	0.12017E 01	0.64395E 00	-0.85309E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.13878E 01	0.0	-0.98521E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.59003E 00	0.14043E 01	0.91813E-01	-0.99688E-01
ZONE 8	0.25015E 00	0.59536E 00	0.70580E-01	-0.10139E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.82323589E 01
REVENUE	=	-0.52442932E 01
CHARGE ON REVENUE	=	0.18960267E 00
LOSSES	=	0.34062022E 00
CARRY CHARGE ON LOSSES	=	-0.59174597E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.94757491E 00
TOTAL FUEL CYCLE COST	=	0.12553885E 02

CC-4C-H32-TC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.17930E 04	0.59500E 03	0.23451E-02
ZONE 2	0.20002E 01	0.17930E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.17930E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.27053E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.27377E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.11611E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.42048E 01	0.13953E 01	0.65429E 00	-0.99054E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.16096E 01	0.0	-0.11427E 00
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.68442E 00	0.16289E 01	0.10650E 00	-0.11564E 00
ZONE 8	0.29028E 00	0.69086E 00	0.81901E-01	-0.11765E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.92023611E 01
REVENUE	=	-0.55286226E 01
CHARGE ON REVENUE	=	0.19988239E 00
ICSSSES	=	0.38003963E 00
CARRY CHARGE ON LOSSES	=	-0.65906458E-02
CREDIT FOR SALE AT PLANT BOL	=	-0.10553732E 01
TOTAL FUEL CYCLE COST	=	0.14091979E 02

CC-4C-H36-TC 0.24" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.21250E 04	0.59500E 03	0.17130E-02
ZONE 2	0.20002E 01	0.21250E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.21250E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.15662E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.17075E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.83445E-03
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.36402E 01	0.10193E 01	0.56644E 00	-0.72357E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.93187E 00	0.0	-0.66153E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.42689E 00	0.10160E 01	0.66426E-01	-0.72124E-01
ZONE 8	0.20861E 00	0.49650E 00	0.58860E-01	-0.84552E-01
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.71357841E 01
REVENUE	=	-0.45237617E 01
CHARGE ON REVENUE	=	0.16355246E 00
LOSSES	=	0.29520154E 00
CARRY CHARGE ON LOSSES	=	-0.51276535E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.82110178E 00
TOTAL FUEL CYCLE COST	=	0.10380402E 02

CC-4C-H36-TC 0.26" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.18280E 04	0.59500E 03	0.20131E-02
ZONE 2	0.20002E 01	0.18280E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.18280E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.18379E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.19196E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.93844E-03
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.36799E 01	0.11978E 01	0.57262E 00	-0.85030E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.10936E 01	0.0	-0.77632E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.47990E 00	0.11422E 01	0.74676E-01	-0.81082E-01
ZONE 8	0.23461E 00	0.55837E 00	0.66195E-01	-0.95089E-01
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.78478479E 01
REVENUE	=	-0.49321575E 01
CHARGE ON REVENUE	=	0.17831767E 00
ICSSSES	=	0.32456672E 00
CARRY CHARGE ON LOSSES	=	-0.56362227E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.90254080E 00
TOTAL FUEL CYCLE COST	=	0.11271328E 02

CC-4C-H36-TC 0.28" PINS

	RESIDENCE TIME (YRS)	FABRICATION COST (\$/KG)	REPROCESSING COST (\$/KG)	USAGE FACTOR (KG/KWH)
ZONE 1	0.20002E 01	0.15970E 04	0.59500E 03	0.23382E-02
ZONE 2	0.20002E 01	0.15970E 04	0.59500E 03	0.0
ZONE 3	0.20002E 01	0.15970E 04	0.59500E 03	0.0
ZONE 4	0.20002E 01	0.0	0.59500E 03	0.21317E-02
ZONE 5	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 6	0.20002E 01	0.0	0.59500E 03	0.0
ZONE 7	0.20002E 01	0.25000E 03	0.59500E 03	0.22267E-02
ZONE 8	0.50005E 01	0.25000E 03	0.59500E 03	0.10886E-02
ZONE 9	0.60006E 01	0.25000E 03	0.59500E 03	0.0

	FABRICATION (MILL/KWH)	REPROCESSING (MILL/KWH)	FABRICATION CC (MILL/KWH)	REPROCESSING CC (MILL/KWH)
ZONE 1	0.37342E 01	0.13913E 01	0.58106E 00	-0.98765E-01
ZONE 2	0.0	0.0	0.0	0.0
ZONE 3	0.0	0.0	0.0	0.0
ZONE 4	0.0	0.12683E 01	0.0	-0.90039E-01
ZONE 5	0.0	0.0	0.0	0.0
ZONE 6	0.0	0.0	0.0	0.0
ZONE 7	0.55668E 00	0.13249E 01	0.86623E-01	-0.94054E-01
ZONE 8	0.27215E 00	0.64773E 00	0.76788E-01	-0.11031E 00
ZONE 9	0.0	0.0	0.0	0.0

CARRY CHARGE ON PU INVENTORY	=	0.87854834E 01
REVENUE	=	-0.52305994E 01
CHARGE ON REVENUE	=	0.18910760E 00
LCSSSES	=	0.36272126E 00
CARRY CHARGE ON LOSSES	=	-0.62886477E-02
CREDIT FOR SALE AT PLANT EOL	=	-0.10070143E 01
TOTAL FUEL CYCLE COST	=	0.12639925E 02