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HANFORD PRODUCTION CUT-BACK STUDIES

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V. R. Chapman

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February 3, 1969

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Plant Waste Values

Item	Unit Price	Quantity	Total
PAW	76 gal/tn	240	18240
2AW	125 gal/tn	300	37500
CoProd	90 gal/tn	120	10800
			<u>9-16-7</u>

Unmarked West Story in Port 864

97-26

3000 3600

1-13

0029 0006

51-1

0005 00043

91-1

4000 5200

15000 gal
19400
17,100

11-20-68 R A Hultgren

00042

11-2 2,500

12-1 2:30
12-1 2:30

1944

1501h

Total

7387

5.1

58-2

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WMS

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~~ROUGH DRAFT~~

Distribution:

1. MK Harmon
2. Circulate/
VR Chapman

Date: November 21, 1968

To: M. K. Harmon

From: V. R. Chapman *VR Chapman*

This document consists of

4 pages, No. 2 of
2 copies.

Subject: PUREX - B PLANT SEQUENTIAL OPERATION

Attached you will find two tables and a figure that depict a first attempt (by me) to lay out an operating plan for the sequential operation of Purex and B Plant. To develop this plan, it has been necessary to develop assumptions relating to how much unneutralized waste can be accumulated from Purex before B Plant is forced to run, the time required to make transitions between Purex and B Plant, the mode of reactor operation, etc. The assumptions used are shown in Table I.

A fundamental assumption used is that N Reactor will continue to produce 12 percent Pu-240 grade plutonium and, in so doing, will process about 600 tons of enriched uranium per year. Production from the single-pass reactors was then adjusted to fill the Purex portion of the sequence that remains after N Reactor fuels are processed. This production is equal to the output of the two K reactors with power levels reduced about 12 percent below the nominal 4400 Mw level. Of the 3300 total tons available from the single-pass reactors (it is assumed that all the uranium will contain weapons grade plutonium), approximately 550 tons would be 94-enriched uranium.

It will be noted that under this plan (Table II and Figure I) Purex will operate 200 days per year. This is equivalent to 4800 tons per year average, based on the processing of Al-clad natural or 94-enriched uranium containing weapons grade plutonium.

VRC:rmb

Enclosures - 3

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TABLE I

ASSUMPTIONS

1. Waste Volume (Unneutralized):

PAW produced	70 gallons/ton U processed
ZAW produced	125 gallons/ton U processed

2. Unneutralized Waste Storage:

	<u>Gallons</u>
Purex Plant	15 000
B Plant	6 000
AR Vault.	<u>37 000</u>
Total	58 000

3. Average Processing Rates in Purex and B Plant:

Al-clad natural	24 T/D
Al-clad enriched	24 T/D
Zr-clad 94-125	10 T/D
ZAW & PAW as produced by Purex	3600 gal/D

4. Five-day transition for each turnaround between A & B Plants.

5. Length of average month: 30 days

6. NPR production:

12 percent Pu-240 grade plutonium from MK-I 94 with	
125 spike enrichment.	600 ton U/year.

7. Single-pass reactor production governed by time available after N Reactor fuels processed; will produce weapons grade Pu only.

8. No thorium processing

9. Two 94-enriched campaign/year; twelve-day turnaround allowed/year

VRC:rmb

11/21/68

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ROUGH DRAFT

TABLE II

PUREX - B PLANT PROCESSING SCHEDULE

<u>Tons</u>	<u>Source</u>	<u>Operation</u>	<u>Waste Gallon</u>	<u>Days Required</u>	<u>Accumulated Days</u>
300	NPR 94-125	Purex	37,500	30	30
		Transition to B Plant		5	35
	ZAW	B Plant	37,500	11	46
		Transition to A Plant		5	51
825	Natural	Purex	57,750	35	86
		Transition to B Plant		5	91
	PAW	B Plant	57,750	16	107
		Transition to A Plant		5	112
825	Natural 94 Enriched	Purex	57,750	35	147
		Turnaround		6	153
		Transition to B Plant		5	158
	PAW	B Plant	57,750	16	174
		Transition to A Plant		5	179
		Idle		1	180

Repeat above
cycle every
six months

SUMMARY

ANNUAL BASIS

	<u>Purex</u>		<u>B Plant</u>		<u>Transi- tion</u>	<u>Turn- around</u>	<u>Total Days</u>
	<u>Tons</u>	<u>Days</u>	<u>Gal Waste</u>	<u>Days</u>			
NPR Fuel	600	60	75,000	22	20	-	102
LP Reactor Fuel	3300	140	231,000	64	40	12	256
Idle	-	-	-	-	-	-	2
	3900	200	306,000	86	60	12	360

Purex equivalent capacity 200 op days x 24 T/day avg rate = 4800 T/yr

VR Chapman/rmb
11/21/68

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FIGURE I

PUREX - B-PLANT SEQUENTIAL OPERATION

SIX - MONTH SCHEDULE

	1	2	3	4	5	6
MONT H						
PUREX	30 days NPR	107/L 300T	35 Days Natural	35 Days + GTA Natural + 94E	35 Days + 6TA 825T	35 Days + 7 TA 16 Days 59,750 gal PAW
B PLANT						
CANVASIE						
GAUSSERY						

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Distribution:

1. M. K. Harmon
2. Circulate/
V. R. Chapman

Date: January 24, 1969

To: M. K. Harmon

From: V. R. Chapman

Subject: PUREX - B PLANT SEQUENTIAL OPERATION

This document consists of
4 pages, No. 2 of
2 copies. Series ~~SECRET~~

You have a secret rough draft copy of "Purex - B Plant Sequential Operation" which I issued on November 21, 1968. In the light of the recent developments, I've had second thoughts about the optimistic rates used for the processing of N reactor fuels through Purex. The optimistic rates were based on capital expenditures proposed in CAGE studies; these expenditures have little chance of taking place under present trends. As a result, I've reworked the production tables using Purex throughputs that we currently use in the Quarterly Production Forecast. This results in more days consumed in Purex for N reactor fuel processing with less time left to process LP reactor fuels.

The revised tables and charts, which are enclosed, are probably more interesting than they are useful, since they are based on N reactor producing 12 percent Pu-240 grade plutonium. After we get a little better fix on future reactor operating mode, I will rework the charts hoping to be closer to the real world. In the meantime, you may want to compare Figure I as it appears in this document and the previous one.

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Enclosures

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TABLE I
ASSUMPTIONS

1. Waste Volume (unneutralized) Produced

PAW	70 gallons/ton U processed
ZAW	125 gallons/ton U processed

2. Unneutralized Waste Storage

	<u>Gallons</u>
Purex Plant	15,000
B Plant	6,000
AR Vault	<u>37,000</u>
TOTAL	58,000

3. Average Processing Rates in Purex and B Plant

Al-Clad natural	24 T/D
Al-Clad enriched	24 T/D
Zr-Clad 94 combined with Spike	6.7* T/D
Unneutralized PAW and ZAW Wastes	3600 gal/D

* Average rate for 94 is 7.2 T/D; for 94-125 Spike, 5.2 T/D; combined, 6.7 T/D

4. Five-day transition for each turnaround between A & B Plants.

5. Average month 30 days or 360 days for year.

6. Production from N reactor assumed to be 600 tons/year containing plutonium with 12 percent Pu-240.

7. Single-pass reactor production adjusted to 3480 tons/year total uranium containing weapons grade plutonium.

8. No thorium processing.

9. Two 94-enriched processing campaigns per year requiring 12 days total turnaround time.

VRC:rmb
1/24/69

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TABLE II

PUREX - B PLANT PROCESSING SCHEDULE

<u>Tons</u>	<u>Source</u>	<u>Operation</u>	<u>Waste Gallons</u>	<u>Days Required</u>	<u>Accumulated Days</u>
300	NPR 94 + Spike	PUREX	37,500	45	45
		Transition to B Plant		5	50
	ZAW	B PLANT	37,500	11	61
		Transition to Purex		5	66
720	Natural	PUREX	50,400	30	96
		Transition to B Plant		5	101
	PAW	B PLANT	50,400	14	115
		Transition to Purex		5	120
720	Natural 94 Enriched	PUREX	50,400	30	150
		Turnaround		6	156
		Transition to B Plant		5	161
	PAW	B PLANT	50,400	14	175
		Transition to Purex		5	180

Repeat above cycle every six months

SUMMARY

ANNUAL BASIS

	<u>Purex</u>		<u>B Plant</u>				<u>Total</u>
	<u>Tons</u>	<u>Days</u>	<u>Gallons Waste</u>	<u>Days</u>	<u>Transition</u>	<u>Turnaround</u>	<u>Days</u>
NPR Fuel	600	90	75,000	22	20	-	132
LP Reactor Fuel	2880	120	201,600	56	40	12	228
TOTALS	3480	210	276,600	78	60	12	360

Purex available equivalent capacity: 210 operating days x 24 tons/day average rate = 5040 tons/year.

VRC:rb

1/24/69

7/12 P-4
90 3/12 B P-1
360 2/12 T-1

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1-27-66

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1-28-69

Sequential OperationCommittee

Costmell	Cuswell
Roberts	Chapman
Teal	

The initial meeting of this group was held in the Pures Conference room, starting at 1⁰⁰ PM and lasted almost two hours. Most of the time was spent in grasping for an approach and ended up on the note that each would think things over for a few days, and then we will meet again.

Items discussed

1. Consider lag storage for
Waste
UNH
Pu

2. Standby force requirements

3. What will be the function of this committee - Hooty staff should crank in quickly what they think and give us a charter and, hopefully, parameters. However, we suspect that the committee will have to propose parameters and directions.

4. Cuswell is receptive and favors continuing the Redox and Pures sales in R22-5.

5. The thought that 5-day week operation may be an initial cutback step for Pures - Five day week operation deserves testing in the plant

6. I went through some of my preliminary analysis of sequential operation

1-29-69

Harty's MeetingPermanenti - Meeting

1. 101AX has gone outside temperature spike - (Peterson resigned)
150C spike. 210C under fill line -
Is hot spot temporary - or shall it put ~~and~~ it out of business
Can hold 20,000 gallons in AR vault.
2. ITS study What are alternatives - can we mine
3. An encapsulation Show
4. SX air cooling - our evaluation is yes.
5. Deep well - Isaacson

McClung Jagg - to be here as Critical Mass - Int'l Miners Lab, Px 3rd Pw Cycle &
Scrap storage -

Sequential Operations

Too many studies might get generated -

Have received the basis for a production forecast study -
New forecast basis can't be given until a decision is made -
To come out end of March - and a 5-year forecast.
January forecast should be a basis for budget.

175 day cooling the AEC wants - (Elgent). Elgent data not
want us to come of 175 days unilaterally

What do ARHCO people think of sequential operation?

Basis for forecast shown by Elgent to Shultz - AEC does not
have ground rules. - We will go study forecast for budget

AEC

1. Sequential B&P
2. 5 day Px
3. Post operation Px (chase down bldg (stations) separation
4. Plant-wide vacation
5. Raising Maintenance
6. 1975 solidified - may be plus

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Manufacturing

1. Defining individual jobs
2. Insist plant hold up
3. Temporary shutdown crews.

- Waste, P₂ UNH } UO₃ to T & Tank Farm

Operation

1. WM left alone
2. WM Goals changed
3. Maintenance philosophy change
4. Organizational change.

1. P₂, UO₃ & 234-5 combinations } Seq Better his Recovery
P₂ B Plot seq -

Have to look at how

Look at NW Goals

Maintenance philosophy

5 day P₂ seq.

Sequencing - without and with Waste Management changed philosophy.

Party

Need a basic case for budget

Need to go thru design for Richards to meet Bann on 17th & 18th & 19th

1. Plant wide actions - use ^{August 1970} July because of accrual system.
show money ~~not~~ saved.

2. Raving Maint.

Backs

ROD returns -

2 PPR returns -

Activation of backlogged seq etc -

Change of feed to RF -

FF & FF schedules - Demand shift as this schedule shift.

1st Summary

We have to plow forward on study forecast

Budget on this forecast

Inputs for Bowman's visit inputs have to be developed

Case studies take time and work

" " plant will work on.

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Mr. Colingh

Need fundamental building blocks - Looking at various approaches - production work loads ignored - to find plans that could be adopted in case a load developed that will fit.

Smith

Neutralize assets and take off cesium - Sludge as Power can supply - reactor. 50 people

Laboratory

Consolidation or shifting people back & forth.

Dobbs

Shultz feels that Finance should act down progressively with rest.

Base case - Fin ~~also~~ feels they have already \$32.4 million = 1490 people
he thinks

(Navy thinks studies will be devoted to 1971 & 1972)

GAO has looked at spare parts and processed DEC

Spare parts catalog.

PROPOSAL - HARTY

TASK FORCE

1. List the types of studies that should be done and by whom. Keep listing and establishing priorities
2. If Finance agrees on what this looks like - send two copies to manager - one to be marked up, By Friday
3. Monday Individual Section Manager to Submit comments to Harty by Monday night
4. Sequential B as straw ^{man} ~~man~~

It's a difficult subject - Gets better defined as we go along.

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January 30, 1969

Task Force: Cartmell, Roberts, Teal, Curwell, Chapman

The following study recommendations were proposed after 4 hours of hard-wrestling this morning:

1. Waste Management program unchanged; reactor operation in accordance with January 1969 AEC announcement

- a. 5-day week Pwex plant operation
- b. Other Pwex sequencing possibilities - with VO_2 , 234-S, Lake etc.
- c. In house sequencing
- d. All vacations in August
- e. Examine services required for different operating schemes above
- f. Pwex - B Plant sequential after Waste Money (1974)

Study by

Pwex

Pwex & B Plant

Respective Plants

Respective plants - integrated

McCoy

Task Force

2. Waste Management program varied but reactor operation in accordance with January 1969 AEC announcement

- a. Sequential B plant and Pwex
- b. Five day Pwex and/or B Plant
- c. In house sequencing
- d. All vacations in August
- e. Examine services to fit each case

Pwex & B Plant

Pwex & B Plant integrated

All plants independent

All plants - integrated

McCoy

3. Waste Management program unchanged but Pwex load further reduced [to permit sequential operations]

Item 1 is logical first priority since it gets us on the way to making economies during production transition period and within the production plan stated by AEC in January 1969

Item 2 is next logical priority, since it would respond to a call to see how money could be saved by hard decisions but fixed Pwex load.

Item 3 is third logical priority since it is the way you go under - 10 -
other less desirable alternatives have been examined. Represents the type of studies that should have been made before basis for January AEC announcement

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Supply SRP - Duplicate
to be kept for processing

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Assume 100 tons/web throughput for 52 weeks/year
Capacity 5200 equivalent tons/year

Assume 110 tons/web throughput for 49 weeks/year
Capacity 5390 equivalent tons/year

Total 5220

Equivalent loads	Normal	2250
	Excluded	480
	NPP 314	2000
	NPP 5 Pika	490

Assume 100 tons/web throughput for 49 weeks/year
Capacity 4900 equivalent tons/year

5000X 5 tons/web throughput

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<u>Time</u>	<u>Source</u>	<u>Material</u>	<u>WAST = STRENGTH</u>	<u>DATA RATIO</u>	<u>ADDITIONAL DATA</u>
380	NPR 944 Spike	Purex	47 500	57	57
		TRANS		5	62
	ZAW	B Plant	47 500	14	76
		TRANS		5	81
740	500 Normal 240 Enriched	Purex	51 800	33 (incl 2TA)	114
		TRANS		5	119
	PAW	B Plant	51 800	15	134
		TRANS		5	139
625	Normal	Purex	43 750	26	145
		TRANS		5	170
	PAW	B Plant	43 750	12	182
		TRANS		5	187
380	NPRO 44 Spike	Purex	47 500	57	244
		TRANS		5	249
		B Plant	47 500	14	263
		TRANS		5	268
740	500 Normal 240 LWR	Purex	51 800	33 (incl 2TA)	301
		TRANS		5	306
		B Plant	51 800	15	321
		TRANS		5	326
625	Normal	Purex	43 750	26	352
		TRANS		5	357
		B Plant	43 750	12	369
		TRANS		5	374

1-31-69

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PUREX - B PLANT SEQUENTIAL OPERATION

1	2	3	4	5	6	7	8	9	10	11	12
57 DAYS NPR	6.7 T/D 380 T	14.7 T/D 33 EASY 240 T NOR & ENR 500 T 240 T	14.7 T/D 33 EASY 240 T NOR & ENR 500 T 240 T	14.7 T/D 33 EASY 240 T NOR & ENR 500 T 240 T	14.7 T/D 33 EASY 240 T NOR & ENR 500 T 240 T	57 DAYS NPR	6.7 T/D 330 T	14.7 T/D 33 EASY 240 T NOR & ENR 500 T 240 T	14.7 T/D 33 EASY 240 T NOR & ENR 500 T 240 T	14.7 T/D 33 EASY 240 T NOR & ENR 500 T 240 T	14.7 T/D 33 EASY 240 T NOR & ENR 500 T 240 T
47 500 GAL ZAW	51 800 GAL ZAW	43 750 GAL PAW	47 500 GAL ZAW	43 750 GAL PAW	47 500 GAL ZAW	47 500 GAL ZAW	47 500 GAL ZAW	57 500 GAL PAW	57 500 GAL PAW	43 750 GAL PAW	43 750 GAL PAW

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ASSUMPTIONS

1. Reactor Production
 - a. NPR: 600 T 9A - 160 T spike
 - b. LPR: 2250 NOR - 480 T ENR
 2. Purex Rates (Avg.)
 - a. A1-clad 24 T/D
 3. Purex Waste Production
 - a. PAW 70 GAL/TON
 - b. ZAW 125 GAL/TON
 4. B-Plant Rate
 - a. B-Plant Rate 3000 GAL/D
 5. Transition Between Purex & B
 - a. 5 day each transition
- NOTE: Purex operating not assumed to be 72% efficient, since repairs can be made during outage periods, perhaps 75-80% available during 2-3-69

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Purex Idle	<u>82</u>
B Plant Idle	232
Transition	<u>60</u>
Total (check)	374

Question: What use to make of idle time.

1. The first solution that will be offered: maintain full crew at B Plant - Rotate floaters between Purex and tank farm mining operations. This not very good because tank farm would get people only 82 days per year
2. A better approach but cumbersome to manage
 - a) Float a crew between Purex and B Plant to manufacture and process unneutralized PAW & ZAW; and
 - b) Float another crew between B Plant and tank farm mining during the 182 days Purex has the floating crew.

FOR CALCULATIONS, Need sound numbers for

Gal PAW/ton AI-clad U processed

Gal ZAW/ton 2r-clad U processed

B Plant rate / day processing PAW & ZAW as Purex unneutralized waste gallons.

Unneutralized PAW and/or ZAW storage capacity

A determination of Purex T/day average rate taking into account forecast outages during which maintenance can be performed. Is 90% annual reasonable?

At what Rate can PAS be retrieved?
At what Rate will B plant process PAS?

Manpower:

Purex

Waste Forms

B Plant

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2-3-69

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FLOATING CREW "A"

1. Add to Purex base crew to operate Purex. (232 Days)
2. Add to B Plant base crew to operate B Plant on P.O.W. & R.H.W. (82 days)

FLOATING CREW "B"

1. Add to TANK FARM base crew to remove sludge and do other work
2. Add to B Plant crew to process PAS
Approximately 232 days / year available
per year from which to select for PAS processing
and to take care of B Plant maintenance

How do you schedule and organize.

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2-4-69

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(For Distribution)

1. Sequential Process with CO ₂ and Z Plant
Waste Management not affected.	EW McCullough - LI Brocke
2. Sequential Process and Waste Management
Waste Management goals affected.	EW McCullough - TM Smith
3. Sequential S Plant, CO ₂ Plant, T Plant	LI Brocke (plus McIntosh's Sheet)
4. Internal Plant Sequencing	EW McCullough
A) Process	RW, N
1) Process - CO ₂	
2) 5-way operation	
3) Batch sequencing	
B) S Plant	LI Brocke
1) Bypass line - reculation	
C) Waste Management Current - Stored	TM Smith
D) Technical Services Lab Rx-Z ; RM	CW Melody
E) CTD Services Shops - T Plant	EA McCoy
5. Other Manufacturing Cost Reduction Studies	
A) Plant shutdown - vacation - August	SMs to MCL
B) Maintenance changes	EW McCullough - Joint process
1) Sequential	
2) Use of roving crews	
3) Limited roving crews	

SYSTEMS REPRESENTATIVE: Jenson
FINANCIAL REPRESENTATIVE: Colhoun

Agreements:

Necessity for studies still developing.

Basic for studies still developing.

One paragraph "feel" qualitative status due to WM Harris noon discussion.
2/18/69; include feasibility, timing, potential for savings (summary - 10),
critical inputs needed, problems, penalties, uncertainties, etc.

Studies will be minimum, modified, cancelled as required prior to 2/18/69
and following Baranowski visit.

W. Jenson
2-7-69

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TONS	SOURCE	OPERATION	WASTE (SAFETY)	DAYS ELAPSED	ACCUMULATED DAYS
380	NPR 944 Spill	PUREX	47,500	54	54
		TRANS		5	59
	ZAW	B Plant	47,500	14	73
		TRANS		5	78
740	500 NOD. 240 ENR	PUREX	51,800	29 (incl 2TA)	107
		TRANS		5	112
	PAW	B Plant	51,800	15	127
		TRANS		5	132
625	NORMAL	PUREX	43,750	23	155
		TRANS		5	160
	PAW	B Plant	43,750	13	173
		TRANS		5	178
		Idle		2	180
300	NPR 944 Spill	PUREX	47,500	54	234
		TRANS		5	239
	ZAW	B Plant	47,500	14	253
		TRANS		5	258
740	500 NOD. 240 ENR	PUREX	51,800	29 (incl 2TA)	287
		TRANS		5	292
	PAW	B Plant	51,800	15	307
		TRANS		5	312
625	NORMAL	PUREX	43,750	23	335
		TRANS		5	340
	PAW	B Plant	43,750	13	353
		TRANS		5	358
		IDLE		2	360

$$6.5 \times 1 = 6.5$$

$$9.0 \times 3 = 27$$

$$33.5$$

$$33.5 \div 4 = 8.4$$

$$8.4 \times 0.85 = 7.1$$

$$33\frac{1}{3} \times 85 = 28$$

$$33.5 \div 4 = 8.4$$

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2-11-67

~~SECRET~~

~~SECRET~~

23-

PUREX - B PLANT SEQUENTIAL OPERATION

Assumptions:

1. Reactor Production

a. NPR: 600 T 9A - 1600 T spk

b. LPR: 2250 NOR - 480 ENR

2. PUREX Rates (AWA)

a. A1-C10d 28 T/D

b. 24-C10d 7.1 T/D

3. PUREX WASTE PROD.

a. PAW 70 GAL/T

b. ZAW 125 GAL/T

4. B PLANT RATE

3500 GAL/D

5. TRANSITION BETWEEN A & B

5 days each transition

Note: Purex operating rate assumed to be 85% efficient on assumption that plant will be placed in sound mechanical condition during outage periods

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UNITED STATES
ATOMIC ENERGY COMMISSION

RICHMOND OPERATIONS OFFICE
P.O. BOX 550
RICHMOND, VIRGINIA 22304-0550

Atlantic Richfield Company
Richmond, Washington

Attention: Dr. Lawrence M. Nichols, President

ATTN: Mr. Nichols
Room: 101/102
Box: 101/102
As Requested

101-8000

D.H.D.

RECEIVED

You have recently been advised of anticipated cutbacks in the production of plutonium. For your FY-1970 budget preparation purposes, you should tentatively plan on being funded at \$22.25 million for the 02 Program and \$0.1 million for 03 Program. Included in the total is an expected \$2.1 million of Program development fund for AEC-sponsored research and development work. You should also expect additional funding under your related services charge for supplying nondefense plutonium. You should provide to me an estimate of the funds needed to prepare and produce nondefense plutonium based on the forecast of nondefense plutonium needs furnished you in my January 24, 1969 letter on assumptions for the five-year study forecast. More details for the FY-1970-1971 budget preparation will be provided later.

In view of the usual tight budget expected for the foreseeable future, the anticipated cutback in production, possibly additional and cutbacks for FY-1970, and the need for additional funds for these nondefense plutonium related purposes, we would appreciate your giving regarding your operations toward affecting economies. We recognize you already have commenced such studies. Consideration should be given to at least the following alternate modes of operations:

1. Reduced in-plant plutonium operation.
2. Five-day plutonium operation.
3. Plutonium operation of plutonium (complete dissolution before use).
4. Plant shutdown (to the extent possible) for plant-wide vacation at one time.
5. Longer time available for maintenance and the possible use of moving maintenance crews.

The five-year production study forecast assumptions should be used as a basis for your study. You should provide us an indication of the possible economies realizable in a reactor remaining on non-defense production in the future.

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25-8

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Dr. L. M. Richards
ARMCO

-2-

JAN 30 1969

You should consider the effect of extending the solidification of stored liquid wastes past CY-1975. The U-233 separations campaign should be completed as expeditiously as possible, but if significant economies could be realized by a slower campaign, these should be pointed out.

Information needed is the feasibility of the various modes of operations, the economies which could be realized and the approximate time the changed operations could be initiated. You should be prepared to discuss alternate modes of operation in a qualitative manner during the Midyear Q2 Program budget review on February 18 through 20. You should incorporate possible operating economies in your FY-1970 and FY-1971 budgets due for submission to RL in April, 1969.

We expect the assessment pool charges to ARMCO to increase in FY-1970 and FY-1971. This problem is now under study and the RL Budget Division will provide you guidelines at a later date.

I will be glad to discuss these matters with you at any time.

Very truly yours,

ORIGINAL SIGNED BY
O. J. ELGERT

O. J. Elgert, Director
Chemical Processing Division
(Contract Administrator)

B:CJE

UNCLASSIFIED

-24-

~~-24-~~

~~SECRET~~

March 13, 1970

To MK Harmon
From VR Chapman

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Sequential Operation

Attached are 1) DMCD's forecast of the forecast; 2) the plant load in a sequential mode imposed by the forecast; 3) the plant load if only 75% of the forecast is processed; and 4) a chart which models operations if only 75% of the load is processed. This will be used this afternoon as the committee discusses the model and the soundness of rates assumed.

RECEIVED

You will note that

MAR 13 1970
OFFICE OF
M. K. HARMON

1. UO₃ plant is added
2. The way the 234-5 bottom line will probably fit in is added - This about convinces me that a Perex - Bottom line sequence will not fit. (A 14kg/day rate was assumed)
3. All the 94 fuel produced by KE reactor is processed in a single campaign each year. Thus we will be losing 644 t Normal and 143 tons NPR fuel excess each year.
4. By using the single KE 94 campaign, we don't develop enough time to accumulate a sixth full PAS run; however the 18th run occurring in the first half FY 1975 cleans up what is theoretically left.

This is a test only since I don't have written-in-blood commitments on some of the plant rates

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3-12-70

TYPICAL YEAR

N Reactor @ 61% TOE - 8.8% Pu-240
KE Reactor @ 75% TOE - 3.9% Pu-240

	<u>U</u>	<u>Pu</u>
NOR AL-Clad	2185 T	801 kg
94 AL-Clad	416 T	175 kg
94 2a-Clad	573 T	745 kg

(KE 94 421 g/£)
(KE NOR 366.6 g/£)

THE PLANT LOAD FROM THE ABOVE FORECAST

	<u>CAMPAIGNS</u>	<u>TONS</u>	<u>DAYS</u>	<u>PU</u>
DAS	6	-	54	-
NOR AL-CLAD	3	2185	102	801
94 AL-CLAD	1	416	20	175
94 2a-CLAD	3	573	86	745
PAW-Ma 144,213 gal	3	-	72	
PAW-94 27,450 gal	1	-	14	
2AW 148,987 gal	3	-	75	
TA 14(24yr each)	-	-	<u>28</u>	

TOTAL 451

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7-12-91

WEAPON SPEC. IN ORDER TO MEET WEAPON SPEC. WHEN BLINDING AT 254-5
ADJUST BLINDING NORMAL SO THAT GARD 3.2% PU MAINTAINED
TO MEET WEAPON SPEC. WHEN BLINDING AT 254-5

	<u>CAMPAIGNS</u>	<u>TONS</u>	<u>DAYS</u>	<u>PU</u>	<u>TONS</u>
PAS	6	-	54	-	1166
MORAL-CLAD $70 \times 175 = 12250$ $565/260 = 2.17$	2	1541	72	565	1552
94 AL-CLAD	1	416	20	175	432
94 2R-CLAD 573×275	3	430	65	559	1404
PAW-NOR $1541 \times 66 = 101,706 \text{ CAL}$	2	-	51	-	1101
PAW-94 $416 \times 66 = 27,456 \text{ CAL}$	1	-	14	-	302
ZAW-94 $430 \times 260 = 111,800 \text{ CAL}$	3	-	56	-	1210
TA	12	-	24	-	518
TOTAL			356		7685

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OPERATING MODEL FOR FYs 1972, 1973 & 1974

3-12-70

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PUREX

T-A

B PLANT

PLS PREP

ESSENTIALLY CONTINUOUS

100% PLANT

PU PROD

100% IMPROVED

PU BOTTOM LINE

~~SECRET~~

ARHCO BASES AND KEY ASSUMPTIONS
N TRANSFER STUDY

1

- o All DUN reactor discharges to be processed in Purex
- o AEC waste management goals to be met by 12-31-75
- o Waste Encapsulation Plant to be in production early FY 1974
- o Partial sequential Purex-B Plant operation to be started in FY 1972 for Case 1 and Case 2
- o Full sequential Purex-B Plant operation to be started in FY 1976 for Case 1
- o K Reactor and N Reactor Pu to be blended in Z Plant
- o Fuel-grade and scrap Pu work to be continued as required at Z Plant
- o Base Case built from April 5-year forecast and January ARHCO Program 02 Planning report

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-31-

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SEQUENTIAL OPERATION

ASSUMPTIONS

- Three complete cycles per year
- Purex process campaigns limited by

- CAW storage capacity	55,000 gal
- UEN storage capacity	500 TU

- Average processing rates

- Al-clad fuel in Purex	21.6 TU/day
- Zr-clad fuel in Purex	6.7 TU/day
- CAW in B Plant	2,000 gal/day
- PAS in B Plant	1,600 gal/day
- Pu button line	17 K/day
- UO ₃ Plant	40 TU/day

- All available Al-clad 9% uranium processed each year in one Purex campaign

- Estimated buildup basin inventory

	<u>7-1-71</u>	<u>12-31-71</u>	<u>Increase</u>
KE, KW, B & C	2055	3545	1490
B Reactor	360	910	550

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(a) Begin end of 1st Quarter FY 1972
(b) Begin end of FY 1971

Partial sequential operations of Purax and
B Plant solvent extractions:

Year	Case	Base	Case	Base	Case	Base	Case	Base
1971	1805	1805	1805	375	375	375	375	375
1972	2043	2043	1805	335	415	605	605	605
1973	2390	2035	-	600	445	645	645	645
1974	2500	2035	-	600	445	545	545	545
1975	2500	2655	-	600	345	-	-	-
1976	2500	1640	-	600	-	-	-	-

Purax Processing Loads
(Tons Weekly)

~~SECRET~~

PUREX - UO_3 - B PLANT SEQUENTIAL OPERATION

NOTES

PUREX - B PLANT
SEQUENCE

UO_3 PLANT
PROCESSING

SEPARATED PU

PU BLENDING

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BUREX - A PLANT SEQUENTIAL OPERATION VS FORECAST
(TYPICAL YEAR)

	<u>URANIUM-TON</u>		<u>PLUTONIUM-KG</u>		<u>CURRENT ACID WASTE</u>	
	<u>KE</u>	<u>M</u>	<u>KE</u>	<u>M</u>	<u>KE</u>	<u>M</u>
Processed	190	465	750	605	128,700	120,900
Unprocessed	550	135	210	175	36,300	35,100

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ARHCO MANPOWER LEVELS
(averages)

<u>Fiscal Year</u>	<u>Base Case</u>	<u>Case 1</u>	<u>Case 2</u>
1971	1511	1509	1506
1972	1511	1423	1394
1973	1539	1444	1246
1974	1548	1420	1136
1975	1545	1407	964
1976	1510	1201	770

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SEQUENTIAL OPERATION

MANUFACTURING DEPARTMENT MANAGER
(FP ENCAPSULATION EXCLUDED)

	FY 1972 REVISED BUDGET	SEQUENTIAL OPERATION	DECREASE
ADMINISTRATION (INCLUDES PRODUCTION PLANNING)	13	13	0
PLANT OPERATIONS	529	582	47
OPD SERVICES	213	193	20
TECHNICAL SERVICES	<u>235</u>	<u>212</u>	<u>23</u>
TOTAL	1090	1000	90

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SEQUENTIAL OPERATION

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Manufacturing Department Cost Reduction
(FP Encapsulation Excluded)

(\$ in thousands)	FY 1972 Revised Budget	Sequential Operation	Decrease
Personnel	1090	1000	90
<u>Accumulation of Cost</u>			
Salary & C/S	\$14 491	\$13 397	\$1 094
Essential Materials	2 764	2 184	580
Other Materials	1 691	1 679	12
Other Incurred Cost	541	541	-
Work Order Charges	970	970	-
Other Cost	2 323	2 234	89
Allocated Services	<u>1 372</u>	<u>1 226</u>	<u>146</u>
Total Accumulation of Cost	<u>\$24 052</u>	<u>\$22 231</u>	<u>\$1 821</u>
<u>Distribution of Cost</u>			
02 Production	\$22 328	\$20 507	\$1 821
Other Accounts	<u>1 724</u>	<u>1 724</u>	-
Total Distribution of Cost	<u>\$24 052</u>	<u>\$22 231</u>	<u>\$1 821</u>

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-38-

\$175,000

\$25,000

\$50,000

\$12,000

\$20,000

\$52,000

Annual

TOTAL

500 by March 1, 1976

200 by January 1, 1976

Expense for Added Fuel Storage Buckets

TOTAL

Water Treatment and Pumping

Labor

Continued B & C Basin Operation

POWER AS LIMITED NUCLEAR APPROP COSTS

SEQUENTIAL OPERATION

~~SECRET~~
SEQUOP

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Px

3600

(Px)
4000

N 650 → 2150
KK 4200
6350

$$3600/6350 = 57\% (63\%)$$

KK @ 5% 4200

$$3600/4200 = 86\% (95\%)$$

KK @ 6% 3400

$$3600/3400 = 106\% (117\%)$$

N @ 8% 660 → 2380
K @ ~4.5% 2300
4680

$$3600/4680 = 77\% (85\%)$$

N @ 9% 580 → 2080
K @ ~3.8% 2760
4840

$$3600/4840 = 74\% (83\%)$$

* N @ 9% 600 → 2150
K @ 6% 1700
3850

$$3600/3850 = 93\% (104\%)$$

* The 9% could be shipped to RFP and/or SRP and
blended into weapons-grade. (Vick Smith)

** N @ 18% 225 → 800
KK @ 6% (low prod) 3000
(Seg Disch and
Reduced Pwr)

$$3600/3800 = 95\% (105\%)$$

3800

** VVJ - DUN would like to sell this plan for FY71 and beyond

~~SECRET~~ ROUGH DRAFT

6-20-69

CASE NO.	CASE	90 Pu 240		REACTOR	TONS
		K	N		
I (1)	N and 1K - All weapons	4	9	K N TOTAL	2720 640 3360
I (2)	N and 1K - K weapons N 12%	6	12	K N TOTAL	1740 450 2190
II (1) (a)	N and 2K - All weapons	5.35	8	K N TOTAL	3970 740 4710
II (1) (b)	N and 2K - All Weapons	5	9	K N TOTAL	4290 640 4930
II (2)	N and 2K - 1/2 Weapons 1/2 Fuel	6 8.5	12	K K N TOTAL	2500 635 450 3585

Equilibrium year - E metal used at K reactors and spike (1.25) at N reactor for standard enrichment.

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DMC

~~SECRET~~ ROUGH DRAFT

PUREX - B PLANT SEQUENTIAL OPERATION

WEAPONS GRADE PU FROM N AND ONE K BLEND

Month	1	2	3	4	5	6	7	8	9	10	11	12
PUREX (Tons)	NPR 250		LPR 910		NPR 260		LPR 910		NPR 250		LPR 910	
B PLANT (Gallons)		ZAW 60,000		PAW 54,600		ZAW 62,400		PAW 54,600		ZAW 60,000		PAW 54,600
TURNAROUND

N REACTOR NONDEFENSE PU - ONE K REACTOR WEAPONS PU

Month	1	2	3	4	5	6	7	8	9	10	11	12	
PUREX (Tons)	NPR 200		LPR 635		NPR 200		LPR 640		NPR 200		LPR 635		
B PLANT (Gallons)		ZAW 48,000		PAW 38,100		ZAW 48,000		PAW 38,400		ZAW 48,000		PAW 38,100	
TURNAROUND
IDLE

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UNITED STATES
ATOMIC ENERGY COMMISSION
RICHLAND OPERATIONS OFFICE
P. O. BOX 550
RICHLAND, WASHINGTON 99352

SEP 11 1969

Atlantic Richfield Hanford Company
Richland, Washington

AEC NO: 1175
Action: WMH/BMD
Signature: RPC
Due: 9/26/69
Info: LMR
RPC
JMS
WCC
WGS
JHW
Ref. Doc: DUN-6151

Attention: R. P. Corlew, Vice President, Operations

Subject: SEQUENTIAL OPERATION OF PUREX AND WASTE MANAGEMENT

Gentlemen:

- References:
1. ARH-1302, "Quarterly Production Forecast, July 1, 1969 Through June 20, 1974," dated July 28, 1969
 2. DUN-6151, "Availability of Reactor Basins for Long Term Irradiated Fuel Storage," dated August 13, 1969, by O. C. Schroeder

RECEIVED

SEP 11 1969

R. P. CORLEW

Please submit by September 30, 1969 a study of sequential operation of Waste Management and the Purex Plant Operations. The study should conclude the earliest date that sequential operations could start based upon the following assumptions:

1. (a) Reactor production scheduled in the July forecast (Ref. 1). Separations schedules modified to benefit sequential operation.
(b) The present Waste Management Program schedules.
2. (a) Same as 1 (a) above.
(b) The Waste Management schedules would be extended as necessary to optimize sequential operation.
3. (a) Reactor production reduction necessary to facilitate sequential operation. Any reduction should be required no sooner than FY-71.
(b) The present Waste Management schedules.

When separated from enclosure, handle
this document as ~~RESTRICTED~~
(Insert Proper Classification)

Document transmitted herewith
contains RESTRICTED DATA.

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-43-

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R. P. Corlew, ARHCO

- 2 -

SEP 11 1968

Please include in each assumption that the U-233 separation schedule will be adhered to and that reactor basin storage will be utilized to the extent of the basin capacities determined by the DUN study (Ref. 2), a copy of which is attached. Consider the case for about one year's storage, utilizing the K, B, C, D, and W basins.

Very truly yours,

O. J. Elgert
O. J. Elgert, Director
Chemical Processing Division
(Contract Administrator)

DC:JTC

Enclosure:
DUN-6151, cy 3A

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~~SECRET~~

- 37 -
- 44 -

~~SECRET~~
Date: September 15, 1969

To: D. McDonald

From: V. R. Chapman *VR Chapman*

Subject: SEQUENTIAL OPERATION

Meeting: September 14, 1969, 6:00 p.m. to 8:00 p.m. in
Federal Building.

Attended: M. K. Harmon, B. M. Dobbs, V. R. Chapman

General

The incremental cost savings will be examined for the various cases. To develop these costs and to time phase them, we will have to determine when we start laying off, how many and the rate at which this will be accomplished. Also, the cost of separating people from the payroll.

Additional buckets for metal is a DUN cost. Although not discussed, I assume it is also DUN's responsibility to fix up basins to handle overflow from the K reactors.

It is presently Harty's position that we cannot risk running thorium with green operating crews.

Case I

Since the Th-U-233 schedule and the Waste Management goals for removal of stored waste are firm in this case, we cannot go sequential until the mining operation is completed. However, it is believed the following should be examined to defend against questions sure to arise.

1. What would happen if Purex ceased processing January 1, 1970?

- Basin inventory at start of thorium run and at the end of the run.
- Effect on Brecke's operation
- Effect on known request for fuel-grade Pu
- What would we do with the people held for the thorium run?

The saving would be mainly essential materials, steam, electricity.

~~SECRET~~
DECLASSIFIED

~~SECRET~~

D. McDonald
September 15, 1969
Page 2

2. What would be the effect of running at maximum possible rate until the start of the thorium run, bringing the basin inventories to the lowest possible level.
 - Basin inventory at beginning and at the end of the thorium run
 - Iodine problems
 - Pu storage problems
 - UO_3 handling(This would increase costs and out-of-pocket expenditures for FY 1970).
3. How much ahead of the start of sequential operations can Purex operation be stopped and the payroll reduced, assuming that in the interim period before sequencing advantage will be taken of the excess basin storage capacity. As part of this, the date when all basin capacity becomes full and DUN cut back has to be determined.
 - a. When do we train people for sequential operation?
 - b. When do basins become full and force DUN to cut back?
 - c. Any other problems.

VRC:mk1

cc: File

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~~SECRET~~

Can go ahead with -

~~SECRET~~

DECLASSIFIED

1. Assume 1-1-70 Power shutdown.

Basin inv at start of Th run

Basin inv at end of Th run

Date basins are full

Effect on fuel grade delivery program

234-5 Bldg program

UO₃ plant program

Cost differential for FY 70, 71

2. Run all cost until Th campaign - down to 120 day cooling.

Basin inv at start of Th run

Basin inv at end of Th run

Leave Power down

Date basins are full

Effect on 234-5 Bldg Storage

UO₃ handling - Enriched

Cost differential 70, 71, etc

Actions and Cost of rodin Central

3. Assume that we follow forecast and that B-Plant achieves stored waste removal goal

- Back off from the B plant goal date to date that Power could resume operations and crew reductions started in anticipation of sequential operations.

Assumption that basins will be essentially full when sequential operations start

4. Determine the maximum load of N-reactor plus the K-reactors will permit the sequencing of Power and B plant

This is the first thing that needs pinning down.

9-15-60

~~SECRET~~

~~SECRET~~

CASE 2

ASSUMPTIONS

1. SLUDGE MINED 7-1-71 24,000 GAL
2. SLUDGE MINED AFTER 7-1-71 42,000 GAL
3. COMPLETE SLUDGE REMOVAL 7-1-78

SLUDGE REMOVAL & TREATMENT

MIXING RATE 2500 GAL/DAY - 50T PUREX U-235
VOLUME REDUCED IN TREATMENT TO 200 GAL - 50T U-235
TURNAROUNDS - TWO DAYS EACH TRANSFER OF MINERAL CREW
B PLANT SOLV. EXT. FEED STORAGE

PAW OR ZAW 53,000 GAL
HETREATER PAS 12,000 GAL

PUREX RATES

AL-CLAD 24,000
ZAW 300 GAL/DAY
ZAW 300 GAL/DAY

B PLANT RATES

POSTERIOR SOLV. EXT. 13000 GAL/DAY
ZAW - 1000 GAL/DAY 25000 GAL/DAY

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
PUREX	675T AL-CLAD 28 DAY 33	5000T AL-CLAD 22 DAY 33	185T ZR-CLAD 28 DAY 53	675T AL-CLAD 25 DAY 17	675T AL-CLAD 25 DAY 145	675T AL-CLAD 25 DAY 171	675T AL-CLAD 25 DAY 171	575T AL-CLAD 25 DAY 137	575T AL-CLAD 25 DAY 202	195T ZR-CLAD 28 DAY 283	195T ZR-CLAD 28 DAY 316	180T AL-CLAD 25 DAY 342
TURNAROUND												
B PLANT	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33	5000T AL-CLAD 22 DAY 33
PAS FEED	2250T (EQU) 11,000 GAL 45 DAY 39			55,000T ZAW 22 DAY 93	55,000T ZAW 22 DAY 149	55,000T ZAW 22 DAY 167	2250T (EQU) 11,000 GAL 45 DAY 201	5000T AL-CLAD 22 DAY 253	5000T AL-CLAD 22 DAY 250	5000T AL-CLAD 22 DAY 318	5000T AL-CLAD 22 DAY 318	5000T AL-CLAD 22 DAY 318
SR FEED												

CONTINUOUS THROUGH END FY 1972 - 15 day

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ANNUAL PRODUCTION	TOTAL
MATERIAL	
ZR-CLAD	370
AL-CLAD	2850
PAS	6000 (EQU)

IV Basin full 1-1-74 or 3 1/2 years
K-2 & C full 1-1-74 2nd month
1410T could go to D-2001.
Time for 1350T before for K-2001
per year.

12 VRL
12 VRL
12 VRL

Colman

~~SECRET~~

CASE 3

PUREX RATES

AL-CLAD 20 T/D
2R-CLAD 6.7 T/D
PAW 80 GAL/T
ZAW 300 GAL/T

B PLANT RATES

PAS TAYLOR SOLV. EXT. 1300 GAL/D
HE T PLATED PAS 2500 GAL/D

SLUDGE REMOVAL & TREATMENT

MIXING RATE 2000 GAL/DAY - 50T PUREX URGY
VOLUME REDUCED IN HE TO 200 GAL - 50T EGV

TURNAROUND: TWO DAYS EACH TRANSITION OF MIGRANT CREW

B PLANT SOLV EXT FEED STORAGE

PAW OR ZAW 50000 GAL
HE T PLATED PAS 19000 GAL

ASSUMPTIONS

1. SLUDGE MINED 7-1-77
2. SLUDGE MINED 11-1-75
3. COMPLETE SLUDGE REMOVAL

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
PUREX	120 T 2R-CLAD 18 DAY 11 29	435 T AL-CLAD 18 DAY 56	435 T AL-CLAD 18 DAY 72	120 T 2R-CLAD 18 DAY 101 119	435 T AL-CLAD 18 DAY 146	435 T AL-CLAD 18 DAY 104	435 T AL-CLAD 18 DAY 191 209	435 T AL-CLAD 18 DAY 232	435 T AL-CLAD 18 DAY 258	120 T 2R-CLAD 18 DAY 251 259	435 T AL-CLAD 18 DAY 320 322	
TURNAROUND												
B PLANT												
EXT. BATTERY												
PAS FEED	11,700 GAL 45 DAY	34800 PAW 14 DAY 51 45 53	34800 PAW 14 DAY 76 90 94	34800 PAW 14 DAY 117,000 GAL PAS 9	34800 PAW 14 DAY 117,000 GAL PAS 9	34800 PAW 14 DAY 117,000 GAL PAS 9	34800 PAW 14 DAY 117,000 GAL PAS 9	34800 PAW 14 DAY 117,000 GAL PAS 9	34800 PAW 14 DAY 117,000 GAL PAS 9	34800 PAW 14 DAY 117,000 GAL PAS 9	34800 PAW 14 DAY 117,000 GAL PAS 9	34800 PAW 14 DAY 117,000 GAL PAS 9
12V EXCHANGE												
CONTINUOUS THROUGH END FY 1974												

ANNUAL PRODUCTION

MATERIAL TONS

2R-CLAD 360

AL-CLAD 2175

PAS 18000 (EGV)

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CASE 7 (UNCLASSIFIED)

PUREX RATES

AL-CLAD 24T/D
 ZR-CLAD 5T/D
 PAW 60 GAL/D
 ZAW 300 GAL/D

SLUDGE REMOVAL & TREATMENT

MIXING RATE 250 GAL/DAY - 50T PUREX U₂F₆
 VOLUME REDUCED IN HE TREATMENT TO 260 GAL-50T U₂F₆

TURNAROUND: TWO DAYS EACH PERIODICITY OF MIGRANT CREW

ACCOMPLISHMENTS

1. SLUDGE MINED 7-1-71
2. SLUDGE MINED OVER 24-71
3. COMPLETE SLUDGE REMOVAL

24-71
 42,300
 9-1-71

B PLANT RATES

PAS THRU 50T/D 1300 GAL/D
 ZAW-PAS 11 " " 2520 GAL/D (2000)

B PLANT SOLV. EXT. FEED STORAGE

PAW 50T 50,000 GAL
 HE TREATED PAS 12,000 GAL

MONTH

PUREX

TURNAROUND

B PLANT
 EXT. BATTERY

PAS FEED
 PREPARATION

1	2	3	4	5	6	7	8	9	10	11	12
30	63	91	120	150	180	210	242	272	310	341	374
185 T ZR-CLAD 28 DAY		675 T AL-CLAD 28 DAY		675 T AL-CLAD 28 DAY		675 T AL-CLAD 28 DAY		185 T ZR-CLAD 28 DAY		575 T AL-CLAD 28 DAY	
15	63	91	120	154	180	217		252	280	315	341
55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY	55,500 GAL PAW 22 DAY
30	52	61	73	115	124	135	175	184	219	247	250
2250 T 11,700 GAL 45 DAY		11,700 GAL 45 DAY		11,700 GAL 45 DAY		11,700 GAL 45 DAY		11,700 GAL 45 DAY		11,700 GAL 45 DAY	
CONTINUOUS THROUGH END OF 1974											

ANNUAL PRODUCTION

MATERIAL	TON
ZR-CLAD	370
AL-CLAD	2600
PAS	13500

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REACTOR BASINS

CASE 2

N REACTOR BASIN WILL BE FULL 1-1-74
KE, KW, B & C BASINS WILL BE FULL 1-1-74
(NOTHING STORED IN D BASIN)
2295 NEW BUCKETS @ \$250 EACH \$573,750
IN STA END OF PERIOD
LP 6750
N 900
14107

CASE 3

N REACTOR BASIN WILL BE FULL 11-1-73
KE, KW, B, C & D BASINS WILL BE FULL 11-1-73
3728 NEW BUCKETS @ \$250 EACH \$932,000
REOPENING OF D BASIN 85,000
TOTAL \$1,017,000
Instg
LP Buckets 7470
N Buckets 900

CASE 3 ALTERNATE

N REACTOR BASIN WILL BE FULL 1-1-74
KE, KW, B & C BASINS AND 1/2 OF D BASIN 1-1-74
D BASIN WILL BE FULL
2961 NEW BUCKETS @ \$250 EACH \$740,250
REOPENING OF D BASIN 85,000
TOTAL 825,250

IN STA
LP 67457
N 900

1-1-74
14107

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#2-51-

- 7-1-71

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When will basins KE, KW, B, C, & D be filled,
keeping current with E-milal but storing Material

	Case 2	Case 3	Case 3(a)
Zr Clad	370	360	370
AL Clad	2250	2175	2600
How many tons stored for each case?			
Total tons K matl. + NPR STORED 900T	900T	900T	900T
WHEN NPR WAS FULL 6060T	7170T	6745T	NPR K

Case 2 - N reactor basin will be full 1-1-74

To do this requires:

\$573,750. for 2295 more buckets @ \$250 each

KE, KW, B & C basins will be completely full on 1-1-74
No material stored in D basin

If we fill D basin, how many more tons? 1410 TONS NORMAL (NO E)

Case 3 - N reactor basin will be full 11-1-73
KE, KW, B, C, & D basins will also be full 11-1-73

To do this requires:

\$85,000 for D basin
\$932,000. for 3728 more buckets @ \$250 each
\$1,017,000.

Case 3(a) N reactor basin will be full 1-1-74
KE, KW, B & C basins will be completely full and
D will be 1/2 full on 1-1-74

If we fill D basin,
how many more tons? To do this requires:

705

\$85,000. for D basin
740,250 for 2961 more buckets @ \$250 each
\$825,250

52

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9-22-69

Request -

When will basin be filled?

Schedule 7-1-71 and beyond for Purex

2r clad 555 tons

A1 clad 2175 tons

Answer -

KE, KW, B, C, D, and DR basins will be filled at the end of FY1974.

To do this will require:

\$ 85,000.	for D
35,000	for DR
\$ 1,295,000.	for 5180 more buckets @ \$250 each
	for NPR costs
<hr/>	
\$ 1,415,000.	TOTAL COSTS

[Signature]

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KE, KW, B, C, D & DR BASIN CAPACITY

Basis

1. Situation visualized for end FY 1974, assuming Puror-B Plant sequential operation with KKN Reactor operation
2. Processing of LPR 94 enriched uranium kept current so that KE & KW basins only are used to store this material
3. Thorium irradiation for shield protection only; no chemical processing of thorium after the FY 1971 campaign
4. Irradiated thorium and natural uranium buckets are stacked, two buckets high, in the basins; LPR 94 enriched are not stacked

	Available Spaces	94 Enr		Spaces for Normal and Thorium	Buckets for Normal and Thorium	Thorium		Buckets for Normal	Normal Tons	Total Tons
		T	Spaces			T	Spaces			
KE	1020	185	225	795	1590	64	80	1510	1419	1668
KW	1020	185	225	795	1590	64	80	1510	1419	1668
B	770	-	-	770	1540	-	-	1540	1447	1447
C	700	-	-	700	1400	-	-	1400	1314	1314
D	750	-	-	750	1500	-	-	1500	1410	1410
DR	<u>835</u>	-	-	<u>838</u>	<u>1676</u>	-	-	<u>1676</u>	<u>1575</u>	<u>1575</u>
Total	5095	370	450	4648	9296	128	160	9136	8584	9082
NPR	905	900	905	-	-	-	-	-	-	900

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9-26-69

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React Operation

N 4000 70% 9% Pu-240 0.85 T/Yr 4.18 Pctd
 1E 4000 3.8% Pu-240 2860 T/Yr
 7c Blend Pu to weapons grade Run 0.24 T N to Tank

Campaigns

24day 24day 54000 gal waste
 2x Clad 675 45000 gal waste
 100 34day
 PAS 5 Days
 Many 45 Days

1	2	3	4	5	6	7	8	9	10	11	12
30	60	90	120	150	180	210	240	270	300	330	360
675 T AL Clad 28 Day	100 T 2x Clad 24 Day	675 T AL Clad 28 Day	100 T 2x Clad 24 Day	675 T AL Clad 28 Day	100 T 2x Clad 24 Day	675 T AL Clad 28 Day	100 T 2x Clad 24 Day	675 T AL Clad 28 Day	100 T 2x Clad 24 Day	675 T AL Clad 28 Day	100 T 2x Clad 24 Day
25	53	83	114	147	182	210	237	268	301	335	367
PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9	PAW PAS 22 9
30	52	89	108	149	171	208	237	268	327	346	355
2250 T 12700 Gal PAS											

ANNUAL RATES

AL Clad 3 X 675 = 2025
 2x Clad 3 X 100 = 480
 Total 2505

This is about the way the program should have been set

VRG
 9-30-64

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The following is a summary of the data received from the various sources.

Water Handcarried to Ranch	50	575
Water Pumped to Ranch	20	200
Water Pumped to Ranch	20	200
Water Pumped to Ranch	20	200
Water Pumped to Ranch	20	200
Total	90	1175

Water Pumped to Ranch	600
Water - A' d'ad 1930 T & 1935	180
Water - 2nd d'ad 225 T & 800	200
Total	1080

Water Pumped to Ranch - Variation of Data Throughout
 160 81 per gallon

Total Estimated Savings 2185

rounded to 2200

RWC
 9-25-69

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W. Chapman

~~SECRET~~

SEP 29 1969

U. S. Atomic Energy Commission
Richland Operations Office
Richland, Washington

Attention: Mr. O. J. Elgert, Director
Chemical Processing Division

Subject: SEQUENTIAL OPERATIONS OF PUREX AND WASTE MANAGEMENT
Contract AE(45-1)-2130

References: (1) ARM-1302 (secret), July 28, 1969, Compiled
by the staffs of: Douglas United Nuclear,
et al., "Quarterly Production Forecast -
July 1, 1969 through June 30, 1974"

(2) DUN-6151 (secret), August 13, 1969, O. C.
Schroeder, "Availability of Reactor Basins
for Long-Term Irradiated Fuel Storage"

(3) Letter, September 11, 1969, O. J. Elgert to
R. P. Corlew, "Sequential Operations of
Purex and Waste Management", (DC:JTC)

Gentlemen:

In response to your letter (reference 3) we have continued
our studies of Purex - B Plant sequential operation in an effort
to determine the earliest date that such operation could be
started, based on the assumptions in your request and the
reactor data furnished as reference 2. We have summarized your
three cases in the following manner.

The stipulated need to adhere to the current U-233 campaign
schedule means that in no case can sequential operation be
started before July 1, 1971.

Case 1

This is a case that cannot be made to fit. The reactor produc-
tion (reference 1) is high enough that no modification of the

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U. S. Atomic Energy Commission
Attention: Mr. O. J. Elgart
Page 2
SEP 29 1969

separations schedule can be made which will permit equilibrium operations in sequential mode. Nevertheless, if sequential operation were to be started about July 1, 1971, and if the reactor production were to continue unchanged, the KE, KW, B, C, D and N storage basins would be filled within two and a half to three years, depending on actual Purex capacity.

Case 2

This is another case that cannot be made to fit. Analysis shows that regardless of the length of time by which achievement of the waste management goal is extended, separations capacity cannot keep pace with forecast reactor production on sequential operation. Again, as in Case 1, should sequential operation be started about July 1, 1971, and should the waste management goal date be changed from July 1, 1974 to July 1, 1978, this would give an increase in Purex capacity equivalent to only about six months' additional reactor basin storage time (over Case 1) for K Reactor output and no significant increase in N Reactor basin fill time.

Case 3

Sequential operations could be started about July 1, 1971. On the basis of an operating plan which would meet the waste management goals, we have estimated the equilibrium year Purex Plant capacity as follows:

- a) Approximately 63 percent of the reference 1 forecast combined N and KE-KW Reactor outputs; or
- b) Approximately 115 percent of the KE-KW combined outputs if both reactors were producing weapons-grade product, and N Reactor were shut down or transferred to WPPSS; or
- c) Approximately 65 percent of the combined output of one K Reactor plus N Reactor, operated to produce weapons-grade plutonium blend.

If sequential operation were started on July 1, 1971 and no reduction in forecast reactor production were made, the N Reactor basin would be filled approximately January 1, 1974. At this time, the KW, KE, B, and C basins and half of D basin would be filled.

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Attention: Mr. O. J. Elgert
Page 3
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We have made a preliminary estimate of ARHCO operating costs under Case 3. Based on an assumed equilibrium year, an annual reduction of about \$2.2 to \$2.7 million below the FY 1971 budget would result from a decrease of about 100 employees, lower essential materials usage, and other related costs.

We want to emphasize that due to limitations in time and lack of appropriate operating experience the above study results and conclusions must be considered preliminary and highly tentative.

Very truly yours,

ORIGINAL SIGNED BY
R. P. CORLEW

R. P. Corlew
Vice President - Operations

RPC:MEH:rar

bcc: SJ Beard
LI Brecke
RW Calhoun
VR Chapman/D McDonald
RP Corlew
EM Dobbs
MK Harmon
WM Harty
CW Malody
TA McCoy
RW McCullugh
LM Richards
JM Schultz
HP Shaw
AE Smith/EH Hopkins, Jr.
WG Smith/AD Garrett
RE Smith
RE Tomlinson
JH Warren
ARHCO Central File

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C. Sequential Operation of Purex and B Plant

We have looked at sequential Purex and B Plant operation and find it is possible if total fuel throughput is less than about 40 percent purex capacity and completion of in-tank solidification can be deferred several years. This is possible with the 9-5 blend reactor mode operation and either reduced reactor power (K's at 3,000 MW, N at minimum power for electric power production) or shutdown of one additional reactor within about the next year. ARHCO, however, recommends this course of action not be taken until completion of Thoria Campaign at the end of CY 1970, Because of the added training requirement and need to resolve certain waste management problems. Purex and B Plant would be operated on approximately alternate months as dictated by acid waste storage capacity. Some sluicing of stored wastes would be continued but at a very low rate. Preliminary study based on 9-1-69 decision; six months transition and training period, manpower reduction 100-150 on March 1, 1970 with some addition reduction about one year later. Savings in FY 1971 would approximate \$2.2M. Possible penalties are:

1. Extension of Waste Management solidification date by an additional 3-5 years. Thus increasing potential for additional leakers.
2. Waste Management operations needs about one year to work out sluicing, settling, sludge processing, solids problems, and some equipment problems. Initiating sequential operation now would result in an inability to solve these problems in a reasonable length of time thereby further delaying solidification of wastes.
3. Incureased risks of operating incidents due to complicated training required to qualify operators for three jobs; i.e., Purex Plutonium, Waste Management, and Purex Thorium.
4. Inability to meet WSEP requirements for sulfate-free wastes and possible cerium.

at
Hamm
Smith
The
Hobby

Co Signal

9/1/69

6 Months
Transition and Training

Sequential Effects

3/1/70

Manpower Reduced
100-150

Savings

FY 70	\$ 0.6 MM
FY 71	\$ 2.2 MM
FY 72	\$ 2.9 MM
FY 73	\$ 3.3 MM
FY 74	\$ 4.2 MM

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-2-

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Proven
Yield Problems

Unproven
Yield Problems

180
40
280

10055
AS 65
B 130
10055
30

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55-

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U.S.A.

to 400 (500 feet)

Power down Power down

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Penalties

- 1A) Stop mining wastes (Safety)
- 1B) Neutralize to shore current Porox waste (Exp. 42)
- 1C) Porox less than 50% capacity
No catch-up capability
Continue to build
pagan inventory indefinitely
Shutdown 1K at
completion of Th
irradiation (Early CY 1970)
or at specified inventory level.
- 2C) Slowdown mining operations
i.e., 6 months/year
extend completion of
mining operations 2-3 years.
- 3C) Suspend B Plant
operations six months
during Th run at
Porox (i.e., sequential
operations from horizon 3-5 mg)

40) Accept increased risks of operating in drafts. Min. personnel and training period should be 14 years.

50) Personnel to be trained on jobs, Power Pl. Waste Management, and other theories. ~~Summarized information~~ recommended supporting ~~information~~ ^{is over} operations ^(or lost).

60) Accept increased risk of achieving U-233 quality requirement.

70) B Plant needs a year to work out of its skimming, settling, sludge processing, problems; its solids handling, yield, and equipment problems; triggering sequential operations too soon will give waste management a black eye.

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- 7d) Loss of ability
- 7e) Scientific personnel reaction
- 7f) Employer & community reaction
- 7g) ARHCO - FIC - image

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Savings from B.Plt - Purex Separation
 Operation Commenced 2/1/70
 (Training from 1/1/67 - 1/1/70)

(In Thousands) FISCAL YEAR
 '70 '71 '72 '73 '74

Labor

100 @ 3 hrs	300	1240	1300	1340	1330
150 @ 12 hrs			550	550	550
200 @ 12 hrs				550	550
250 @ " "				550	550

Materials

Purex Chem.	100	200	250	250	250
Purex Coal	50	100	125	125	125
B.Plt - Chem	200	400	400	400	400
All Other	100	100	100	100	100

Other Contractors

100	150	175	200	250
-----	-----	-----	-----	-----

Less:-

Labor Separations
 Costs

(280)

Totals

570	2210	2900	3245	4215
-----	------	------	------	------

Revised (Millions)

0.6	2.2	2.9	3.2	4.2
-----	-----	-----	-----	-----

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To: V.R. Chapman

From: D. E. Larson

Subject: B-PLANT CAPACITY

1. D. J. Larson, "B-Plant Ion-Exchange Processing",
Schematics, AR4-1317 RD, September 8, 1969
Ref: 2. D. E. Larson, "B-Plant - Phase III Flowsheets",
ISO-986, August 31, 1967.

The following B Plant capacity information is provided
to assist you in determining the operating conditions
for which Purex and B Plant may be operated sequentially.

Current Acid Wastes

<u>Case</u>	<u>Assume</u>	<u>Capacity</u> gal/day 100% eff.
Centrifuge	1. CAW solids treatment in centrifuge	2000
↑		
Solids Treat. (Present)	2. HEDTA leach solids treatment	
	3. Solids treatment capacity limiting	
Tank	1. CAW solids treatment in tank	3500
Solids Treat.	2. HEDTA or caustic-carbonate solids treatment	
	3. Solids treatment and solvent extraction about matched. The solids treatment time cycle could probably be cut to make solvent extraction limiting.	
	4. Contracting efficiency and solids- liquid separations problems require resolution.	
No solids Treatment	1. Less than 5% strontium on solids	5000
	2. Only solids treatment would be their removal by centrifuging.	
	3. Purex would make appropriate pro- cess changes to avoid strontium association with solids. Such changes could be:	
	a. Reduction in CAW-SO ₄	
	b. Reduction in CAW-Si	
	c. Reduction in CAW-Al	
	d. Reduction in CAW-Fe	

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4. The 1AF pump and flow meter would be changed such that the column capacity is limiting.

If the caustic-carbonate solids treatment process were performed in the centrifuge, B Plant CAW capacity would be re-

duced to about 1600 gal/day. *Other processing problems require resolution to achieve Waste Management goal strontium and cesium recovery.*

Ion exchange processing can proceed almost independently of

CAW or PAS processing at the following capacities:

Material	Processing Rate (gal/day), 100% Eff. (Res.)	
	Present	Targeted
PSN	16,000	20,000
PSS	Not processed yet	40,000
RSN	Not processed yet	23,000 (Dil. 1:1)
CAW-Cs	1,500	1,800

The inter ties between ion exchange and other processes are the following: PSS must be processed at a rate of 1,400,000 gallons per year in order to process the sludge through B Plant from ^{two} the tanks per year. There is only 500,000 gallons of lag storage for PSS in TK-106-C in the C Tank Farm, which sets the maximum PSS accumulation volume without affecting PAS processing. Steps may be implemented to increase this storage capacity.

For every 28, 000 to 32,000 gallons of CAW processed through B Plant which is treated for cesium removal by PTA processing, an ion exchange purification run is required. This run

V. R. Chapman
Page 3

campaign will require about 2 days. There is about 150 gallons of Cs-PTA product generated per 1500-gallon batch of CAW-diluted supernatant (1400 gal CAW supernatant and 100 gal water), and 3000 gallons of lag storage for this product. This frequency will vary in the future with changes in CAW-Cs concentrations and process technical advances. A different exchanger is required to process RSN than PSN, but PSS and PTA-Cs product may be processed on both exchangers.

There is not sufficient data on sludge processing in sluicing, AR Vault processing, and B Plant processing that throughput rates may be meaningfully established based on experience. Therefore the rates in the Reference² are still the best available. PAS processing may be performed independently of CAW and ion exchange processing to the following extent.

When 12,000 gallons of PAS metallic ion removal product has been accumulated, B Plant processing must cease until a campaign is initiated through solvent extraction. When

12,000 gallons of PAS metallic ion removal product is accumulated, ⁵⁶⁰⁰ 1400 gallons of PAS is in ^{B-Plant metallic ion removal} TK-31-B Plant;

~~4200 gallons of PAS is in metallic ion removal processing~~
processing in B Plant; 13,000 gallons of PAS in TK-003-CR; 4000 gallons of PAS in TK-004-AR; and TK-002-AR is full of sluiced sludge; all PAS processing and sluicing must stop until a B Plant solvent extraction campaign is initiated in B Plant. Also

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V. R. Chapman
Page 4

PSS must be processed through B Plant at such a rate as indicated in the reference so lag storage of 500,000 gallons in TK-106-C is not exceeded.

A reasonable over-all process operating efficiency is .72 percent. This efficiency is comprised of 90 percent operating efficiency and 80 percent mechanical efficiency.

DEL:jas

cc: DE Larson
PW Smith
File
LB

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JANUARY 30, 1975

~~SECRET~~

Not Issued

~~MR. HARRISON~~

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VRCHAPMAN

SEQUENTIAL OPERATION - 1KN MODE

The attached chart is a plan for operation of Reactor A and B Plant sequentially after the kW reactor is shut down. The schedule illustrated by the chart represents the 3-COPE Case 01-BX-101 load reduced by about one-third so that the load is compatible with the system capacity for sequential operation. Case 01-BX-101 assumed the Pu-240 content of N reactor plutonium to range from 7.45 percent in FY 1971 down to 7.3 percent in FY 1975 while K reactor plutonium will contain 5.0 percent Pu-240.

Tonnages of Uranium involved in this study

	<u>9-64 COPE 01-BX-101</u>	<u>01-BX-101 Reduced 33 1/3%</u>	<u>Reduced Load Est. Tons</u>
N Reactor fuel (T)	800	533	1723
K Reactor 24 (T)	348	232	232
K Reactor No 2 (T)	<u>1824</u>	<u>1216</u>	<u>1216</u>
Total	2972	1781	3176

The assumptions used for the construction of this chart are relatively conservative and are as follows:

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1. Purex plant average processing rates are limited by Day-Swing Shifts changing mode. Consequently average processing rates are:
K-reactor fuel (Normal as 91) 21.6 T/day
N-reactor fuel 6.7 T/day
2. Purex generated waste volume
ZAW 300 gal/ton U
PAW 80 gal/ton U
3. B Plant average processing rates
CAW through SX 2000 gal/day
Prepared PAS 1300 gal/day
4. Lag storage
Unneutralized CAW 55,000 gal
Prepared PAS 12,000 gal
5. PAS preparation rate
11,700 gal 45 days
6. Time lost from end of campaign in Purex as B Plant and start of campaign in B Plant or Power 2 days

For this particular study, the time available

per year in the Purex - B Plant SX System, would be as follows

	<u>DAYS</u>	<u>PUREX ENDY TONS</u>
K-reactor fuel processing in Purex	67	1447
N-reactor fuel processing in Purex	80	1728
PAW processing in B Plant	58	1252
ZAW processing in B Plant	80	1728
PAS processing in B Plant	54	1106
Transfers of crews between plants	<u>24</u>	<u>518</u>
Total	<u>363</u>	<u>7839</u>
	<u>365</u>	<u>7839</u>

~~SECRET~~ TEM CAPACITY

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NPR $800 \div 6.7 = 120$ day/yr to process
 K $2172 \div 21.6 = 101$ day/yr to process
 ZAW $140,000 \div 2000 = 120$ day/yr to process
 PAW $173,760 \div 2000 = 87$ day/yr to process
 TA $2AW \times 1.4 \times 2 = 8.8$
 $PAW \times 2.2 \times 2 = 4.4$
 $BPR \times 6.4 \times 2 = 16.8$

$800 \times 300 = 240,000$ gal ZAW
 $2172 \times 80 = 173,760$ gal PAW
 ~~$240,000 \div 2000 = 120$ day/yr to process~~

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PAS $8.8 \times \frac{79.2}{537.2}$
 Total 537.2 $\rightarrow$ days $\times 150\%$ load as system!

Reduce Load by $33\frac{1}{3}\%$

			<u>Eg Tons</u>
NPR	$533 \div 6.7 =$	80	1728
K	$1448 \div 21.6 =$	67	1747
ZAW	$159,900 \div 2000$	80	1728
PAW	$115,840 \div 2000$	58	1253
TA	68 campaigns	24	518
PAS	6×9	54	1166

$533 \times 300 = 159,900$ gal ZAW
 $1448 \times 80 = 115,840$ " PAW

2R campaigns / yr 3
 A1 Clad 3
 Total 6 campaigns A1/yr

TOTAL 363 ~~3776~~
 7840
 System Cap 360 7776
 365 7884

MONTHLY COPE CASE 01-BX-101 FOR A-B PLANT SECTORIAL OPERATION

K
 477
 40
 130
 173
 1438
 533

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
PUREX	180T 2R-CLAD 27 DAY		497T AL-CLAD 23 DAY		180T 2R-CLAD 27 DAY		497T AL-CLAD 23 DAY		173T 2R-CLAD 26 DAY		454T AL-CLAD 21 DAY	
TURBID												
B PLANT EXT. BATTERY		54,000 GAL 2A W 27 DAY		39,700 GAL PAW 20 DAY		54,000 GAL 2A W 27 DAY		39,700 GAL PAW 20 DAY		51,900 GAL 2A W 26 DAY		36,520 GAL PAW 18 DAY
PAS-FIELD THERMISTION	2520T (EQU) 11,700 GAL 45 DAY		2520T (EQU) 11,700 GAL 45 DAY		2520T (EQU) 11,700 GAL 45 DAY		2520T (EQU) 11,700 GAL 45 DAY		2520T (EQU) 11,700 GAL 45 DAY		2520T (EQU) 11,700 GAL 45 DAY	

1-29-70
 VRC

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~~SECRET~~

Hardy's present
to Barnowski Feb 20 1961

~~SECRET~~
Rough Draft

DECLASSIFIED

Bar Chart of the 1960-61

2 Shift Railroad Operation (1960)

Power Capacity
Tons/Year

% of Total

~~SECRET~~

5

Net 20%

KE ENR 387 314

$$387 \times \frac{0.75 \text{ MWDD} / \text{TC} 54}{0.30 \text{ MWDD} / \text{TC} 60} = 314$$

TOTAL

280

Remainder

20. 400 to 7 PMS Campaigns

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2-4-70

~~21~~
-28-

Bob Bown Suggestion

DECLASSIFIED

N Reactor 400 T/year
K Reactor 2500 T/year 4% Pu 240

	Tons	GAL	DAYS	
N Reactor fuel	400	-	60	
K Reactor	2500	-	116	
2AW	-	120,000	60	3 campaigns
PAW	-	200,000	100	4 "
TRANSITION	-	-	28	
TA	-	-	<u>2</u>	

TOTAL

366

Remainder

0

No PAS Campaigns

TRADE OFF N REACTOR OUTPUT FOR OTHER FUEL
GRADE THAT WOULD BE BLENDED TO WEAPONS GRADE
MATERIAL USING K REACTOR OUTPUT.

~~SECRET~~ DECLASSIFIED

FEBRUARY 16, 1970

REVIEWED WITH DON LARSON B-PLANT RATES AND GLEANED THE FOLLOWING:

<u>PUREX WASTE VOLUME (GAL/TON)</u>		<u>OLD FIG</u>	<u>NEW FIGURES</u>	
			<u>PRES. ENT</u>	<u>FUTURE</u>
PAW	AVG. RATES	80	88 (70-71)	66 (72 & beyond)
ZAW		300	330 (70)	260 (71 & beyond)
CAW	<u>RATES (GAL/DAY)</u>	2000	2000	*2500-3000 (71 & beyond)
RATE				

AVG. RATES

*INCREASED RATES DEPEND IN EFFECTIVE SOLIDS REMOVAL EITHER AT PUREX OR B-PLANT. DEPENDS ON PUREX THE CENTRIFUGATION OR B-PLANT GETTING LARGER CENTRIFUGE. ALSO HOPING FOR IMPROVEMENT BY ELIMINATION OF ALSI PROCESS. (A CHECK WITH WILLARD WRIGHT INDICATES THAT ALSI PROCESS WILL CONTINUE UNTIL ALSI COMPONENTS ARE ALL USED - THUS WE WILL NOT SEE CHANGE UNTIL 2 1/2 YEARS - HOWEVER, IT IS DOUBTFUL NOW IF HOT-DIE SIZE WILL BE USED.

PAS ~~RATE~~ RATES (GAL/DAY)

1300 (THIS FIGURE MAY BE IMPROVED BY BETTER AGITATION - BUT FIGURE BEST WE HAVE NOW. ON 2/25 NEW ~~PUMPING~~ AGITATION SYSTEM WILL BE READY - TEST IN MARCH. NEW RATE BY 4/15/70, MAYBE)

PAW VOLUMES GAL ~~7-1-71~~ ~~1,248~~

	<u>OLD*</u>	<u>NEW</u>	<u>Comparison</u>
Processed by 7-1-71	1,248,000	1,060,000	9.1
LEFT TO PROCESS 7-1-71	2,184,000	2,130,000	18.2

Calculated by VRC from following

	<u>Eqv Ton</u>	<u>GAL</u>	
PROCESSED 7-1-71	24,000	1,248,000	
TO B PROCESSED 7-1-71	42,000	2,184,000	

$$\frac{2400}{50} = 5.2 \text{ gal/TU eqv}$$

[REDACTED]

FY 1967

B PLANT

PURE

K Reactor fuel 21.6 TON/DAY AVG.

N Reactor fuel 6.7 Ton/Day Avg.

PAW 66 GALTU. PPOESSED

ZAW 260 GAL/TU PROCESS D

2000-2001/2002 AVG

1300 GAL/1000 A.Y.

in gal per day (headend controlled) avg.

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
2	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
3	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
4	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
5	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
6	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
7	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
8	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
9	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
10	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
11	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
12	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
13	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
14	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
15	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
16	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
17	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
18	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
19	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
20	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
21	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
22	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
23	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
24	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
25	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
26	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
27	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
28	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
29	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
30	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

1.32nd

7-22-50
BETH
2-2-51 (20)

B PLANT
SX CUL'S.

DISPATCH

PAS
PREPARATION

Atlantic Richfield Hanford Company

Date: February 18, 1970

To: S. J. Beard
W. M. Harty
H. P. Shaw
A. E. Smith
R. E. Tomlinson

From: J. H. Warren

Subject: FUTURE ACTION ITEMS

The recent discussions (February 9-10, 1970) with F. P. Baranowski and his staff brought out several areas where we need to take action. These are listed below along with the suggested responsibility for implementation. Please let me know if there are any questions or incorrect assignments.

1. A review of our forecasted position on in-tank solidification (essentially an updating of ARH-900, "B F Production Schedule and In-Tank Solidification Alternatives," by M. J. Kirkman, G. L. [redacted] and P. W. Smith). This phase of our waste management program should have a priority high enough to ensure operation of the three existing units at maximum boil-off rates as much of the time as possible. (SJ Beard and WM Harty)
2. The development of a sequential operation case which permits uninterrupted progress on sludge processing and in-tank solidification but uses the reactor storage basins for the most feasible time lag. The objective would be to allow processing in Purex with the normal sequential crew and might require basin storage equivalent to the annual output of one reactor. (WM Harty)

VRC -
Please
talk with
me
Feb 24 on this.

LJB
MKH
CWM
TJM
RWM
RES

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FEB 19 '70

OFFICE OF
M. K. HARMON

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Atlantic Richfield Hanford Company

S. J. Beard, et al .
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February 18, 1970

3. The immediate transmittal of detailed information to F. P. Baranowski on suspected fault lines in the 200 Areas. (RE Tomlinson)
4. The integration of development work for the removal and transfer of salt cake to deep underground storage, with planning of programs, costs and schedules. (HP Shaw and RE Tomlinson)
5. The development, with costs and schedules, of a deep well disposal R&D program suitable for discussion at the June budget meeting. (RE Tomlinson)
6. The immediate transmittal of expert opinion to F. P. Baranowski on the earthquake resistance of waste tanks. (HP Shaw)
7. An evaluation of a broad concept (suitable for discussion at the June budget meeting) which supports removal and relocation of tanked material, but not the waste material which is now stored in the soil. (RE Tomlinson and JH Warren)
8. In-depth waste management program review to determine if any other one to two million dollar projects are required to meet the December 31, 1975 goal. (RP Corlew's staff)
9. The latest date for adding a tank to the existing two-tank AZ project without introducing a delay in their completion. (HP Shaw)

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- 83 -
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10. Arrangements for the continuation of seismic studies without interruption, if the RDT program ceases.
(RE Tomlinson)
11. The development of data to support a policy on the use or replacement of direct buried lines.
(HP Shaw)

JHW:RWH:sj

cc: RP Corlew
RW Harvey
ET McIntyre
LM Richards
JH Warren - 2
Central File

85-
-87-

ROUGH DRAFT

Distribution

1. M. K. Harmon
2. H. H. Hopkins
3. V. R. Chapman

Date: March 2, 1970

This document consists of

To: M. K. Harmon

5 pages, No. 7 of

From: V. R. Chapman

2 copies.

Subject: POSSIBILITIES FOR B PLANT - PUREX SEQUENTIAL OPERATION
FROM JULY 1, 1971 THROUGH DECEMBER 31, 1974

References: 1) "Future Action Items," memo J.H. Warren to S.J. Beard,
et al, dated February 18, 1970.

2) DUN-AOP RD 1 (Secret), "9-69 COPE Studies,"
R.W. Bown, et al, dated October 10, 1969.

Item 2 of reference 1 requests the development of a sequential operation case which "permits uninterrupted progress on sludge processing but uses the reactor storage basins for the most feasible time lag." This report is an exercise which illustrates the approach that could be taken to study the feasibility of Purex - B Plant sequential starting with FY 1972 while PAS processing is still in progress, and to show how the inventory of the reactors' basins will increase during the three and one-half year period under consideration.

Since we still do not have production forecast quality numbers available on which to base a study, the 9-69 COPE case 01-BX-101 (reference 2) was used as the basis for this exercise. This particular COPE case assumes the operation of one K plus N reactor after June 30, 1970 to produce blended plutonium meeting weapons specifications. In this case, the K Reactor plutonium is produced with 5 percent Pu-240 while N Reactor plutonium Pu-240 content starts out at 7.45 percent but drops to 7.30 percent by FY 1975.

The following assumptions and tables should make clear the logic used in this study. A table was developed for FY 1976 (the first full year in which no PAS will be processed) to illustrate one important point, i.e., sequential operation is not a feasible scheme on a continuing basis so long as Hanford is on an N-K mode unless the N Reactor operating program is changed to substantially reduce the annual uranium throughput.

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GROUP 1

EXCLUDED FROM AUTOMATIC DOWNGRADING

M. K. Harmon
March 2, 1970
Page 2

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ASSUMPTIONS

1. As of July 1, 1971, there will be the equivalent of 2,130,000 gallons of unmined PAS feed remaining in the waste storage tanks. Since the B Plant head end treatment reduces this volume by a factor (arithmitic) of 10, this represents 213,000 gallons of SX extraction battery feed.
2. Approximately 45 days will be required to mine 117,000 gallons of PAS and to reduce it to 11,700 gallons of extraction battery feed. This is the capacity of the head-end treated PAS storage tank. Thus

$$\frac{213,000}{11,700} = 18.2 \text{ B Plant PAS campaigns}$$

for the period July 1, 1971 through December 31, 1974. As a starting point for this study, the 0.2 of a PAS run was ignored and the 18 campaigns remaining were distributed as follows:

<u>FY</u>	<u>Campaigns</u>	<u>B Plant Operating Days</u>	<u>Mining Days</u>
1972	5	45	225
1973	6	54	270
1974	5	45	225
1975 (1st half)	2	18	90
Total	18	162	810

3. Of the Purex process load shown in the COPE case, 77 percent is processed in this study. The remaining 23 percent of the load is accumulated in the reactor basins.

4. Purex Assumptions

Zr-clad average processing rate	6.7 T/day
Al-clad average processing rate	21.6 T/day
ZAW waste generated	260 gal/TU
PAW waste generated	66 gal/TU
CAW storage	55,000 gal/max

5. Waste Management Assumptions

Mining and acidifying 117,000 gallons
of PAS and head end treatment yielding
11,700 gallons solvent extraction feed 45 days

B Plant solvent extraction feed rates

1300 gal/day
2000 gal/day

RES

This document
defined
its trans-
content
person

-75-86

ROUGH DRAFT

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March 2, 1970
Page 3

6. Purex Campaigns/Year

FYs 1972, 1973 and 1974 3K, 3N
1975, 1st half 1K, 2N

7. Purex Turnaround

For Al-clad 94 metal 2 days per year

8. Transition of Floating Crew between Purex and B Plant

At completion of each Purex campaign 2 days
At completion of each B Plant campaign 2 days

OPERATING SCHEME

FY 1972

	<u>Gallons</u>	<u>Tons</u>	<u>Processing Days</u>	<u>Campaigns</u>	<u>Purex Eqv. Tons</u>
PAS (5 campaigns)	58,500	-	45	5	972
Zr-clad (733 x 0.77)	-	565	85	3	1836
Al-clad (2004 x 0.77)	-	1543	72	3	1555
ZAW (565 x 260)	146,900	-	74	3	1598
PAW (1543 x 66)	101,838	-	59-51	3	1274
Turnaround	-	-	2	-	43
Transition	-	-	24	12	518
Total	307,238		361		7796

Basin Inventory Increase

575
2602
N Reactor 733 - 565 168 10
K Reactor 2004 - 1543 461 1057
627 1267

FY 1973

PAS (6 campaigns)	70,200	-	54	6	1166
Zr-clad (695 x 0.77)	-	535	80	3	1728
Al-clad (2195 x 0.77)	-	1662	77	3	1663
ZAW (535 x 260)	139,100	-	70	3	1512
PAW (1662 x 66)	109,692	-	55	3	1188
Turnaround	-	-	2	-	43
Transition	-	-	24	12	518
Total	318,992		362		7818

Basin Inventory Increase

N Reactor (695 - 535) 160
K Reactor (2195 - 1662) 497

GRADING

-17-87-

ROUGH DRAFT

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March 2, 1970
Page 4

FY 1974

	<u>Gallons</u>	<u>Tons</u>	<u>Processing Days</u>	<u>Campaigns</u>	<u>Purex Eqv. Tons</u>
PAS (5 campaigns)	58,500	-	45	5	972
Zr-clad (725 x 0.77)	-	558	84	3	1814
Al-clad (2163 x 0.77)	-	1665	77	3	1663
ZAW (558 x 260)	145,080	-	73	3	1577
PAW (1665 x 66)	109,890	-	55	3	1188
Turnaround	-	-	2	-	43
Transition	-	-	24	12	518
Total	313,470		360		7775

Basin Inventory Increase

N Reactor (725 - 558)	160
K Reactor (2163 - 1665)	498

FY 1975 (1st half)

PAS (2 campaigns)	23,400	-	18	2	389
Zr-clad (507 x 0.77)	-	390	58	2	1253
Al-clad (721 x 0.77)	-	555	26	1	562
ZAW (390 x 260)	101,400	-	51	2	1101
PAW (555 x 66)	36,630	-	19	1	410
Turnaround	-	-	2	-	43
Transition	-	-	12	6	259
Total	161,430		184		4017

Basin Inventory Increase

N Reactor (761/2 - 390)	(10)
K Reactor (2173/2 - 555)	531

Basin Inventory Buildup

	<u>N Reactor</u>	<u>K Reactor</u>
COPE 12-31-74 inventory estimate	499	1449
FY 1972 buildup	168	461
FY 1973 buildup	160	497
FY 1974 buildup	160	498
One-half FY 1975 buildup	(10)	531
Study 12-31-74 inventory	977	3436

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FY 1976

	<u>Gallons</u>	<u>Tons</u>	<u>Processing Days</u>	<u>Campaigns</u>	<u>Purex Eqv. Tons</u>
PAS	0	-	0	0	0
Zr-clad	-	791	118	4	2549
Al-clad	-	2173	101	4	2182
ZAW (791 x 260)	205,660	-	103	4	2225
PAW (2173 x 66)	143,418	-	72	4	1555
Turnaround	-	-	2	-	43
Transition	-	-	32	16	691
Total	349,078		428		9245

Note: Reactor output for FY 1976 would have to be reduced about 9 percent before the annual output from one K and N reactors under COPE case 01-BX-101 would fit a Purex - B Plant sequential mode. This gives no capacity to reduce the basin inventory buildup which occurred over the course of the previous four years.

VRC:mkl

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-89-

7-1-71 AGING
AGED
7-1-71 BEARING
New Head Feed
AVAILABLE
JULY '71 PROD
END INV
N&F
I
AUG 71
EI
N&F
I
SEP '71
EI
N&F
I
OCT 71
EI
N&F
I
NOV 71
EI
N&F
I
DEC 71
EI
N&F
I
JAN 72
EI

para-ab
fanti

560131707 PRESENT STUDY

BASIN INVENTORY

210 DAY AGING

AL-CLAD NOR

94-2677-76

20.647.22

Nov 18/2 Mo for 11
 183/10
 For 34 Mo for 4
 34 Mo for 8
 40 Mo for 3
 40 Mo for 3

AL CLAD NOR

AL-CLAD 94

28-CLAD 94

EI

2053

552

474

NAF

1823548

I

2 235

587

522

FEB 72

000

EI

2 235

587

522

NAF

1823548

I

2417

622

570

MAR 72

00153

EI

2417

422

417

NAF

1823548

I

2599

657

480

APR 72

04160

EI

2599

241

465

NAF

1823548

I

2781

276

513

MAY 72

32400

EI

2457

276

513

NAF

1823548

I

2640

311

561

JUN 72

000

EI

2640

311

561

NAF

1823447

I

2822

345

608

JUL 72

00147

EI

2822

345

561

NAF

1823447

I

3004

379

508

AUG 72

000

EI

3004

379

508

NAF

1823447

I

3186

413

555

SEP 72

64800

EI

2538

413

555

NAF

1823448

I

2720

447

603

OCT 72

000

EI

2720

447

603

AL-CLAD NOR

AL-CLAD 34

ZR-CLAD 94

EI	2720	447	403
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	2902	482	650
NOV 72	<u>0</u>	<u>0</u>	<u>147</u>
EI	2902	482	504
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	3084	517	552
DEC 72	<u>0</u>	<u>0</u>	<u>0</u>
EI	3084	517	552
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	3266	552	500
JAN 73	<u>-648</u>	<u>0</u>	<u>0</u>
EI	2618	552	500
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	2800	587	648
FEB 73	<u>0</u>	<u>0</u>	<u>0</u>
EI	2800	587	618
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	2982	622	696
MAR 73	<u>0</u>	<u>0</u>	<u>-153</u>
EI	2982	622	543
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	3164	657	690
APR 73	<u>0</u>	<u>416</u>	<u>0</u>
EI	3164	241	594
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	3346	276	639
MAY 73	<u>-224</u>	<u>0</u>	<u>0</u>
EI	3022	276	639
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	3205	317	687
JUN 73	<u>0</u>	<u>0</u>	<u>0</u>
EI	3205	317	687
NAF	<u>182</u>	<u>34</u>	<u>47</u>
I	3387	345	734
JUL 73	<u>0</u>	<u>0</u>	<u>147</u>
EI	3387	345	587

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-121-

DECLASSIFIED

AL-CLAD 9A

AL-CLAD 9A

AL-CLAD 9A

EI
NAF
I
AUG 73
EI
NAF
I
SEP 73
EI
NAF
I
OCT 73
EI
NAF
I
NOV 73
EI
NAF
I
DEC 73
EI
NAF
I
JAN 74
EI
NAF
I
FEB 74
EI
NAF
I
MAR 74
EI
NAF
I
APR 74
EI

3387
182
3569-
0
3569-
182
3751-
648
3103-
182
3283-
0
3285
182
3467-
0
3467-
182
3649
0
3649
182
3831
648
3183
182
3365
0
3365
182
3547
0
3547
182
3729
0
3729

345
34
379
0
379
34
413
0
413
34
447
0
417
35
487
0
482
35
517
0
517
35
552
0
552
35
587
0
587
35
622
0
622
35
657
416
241

587
41
634
0
634
41
689
0
681
48
729
0
729
48
778
-147
630
48
678
0
678
48
726
0
726
48
774
0
774
48
824
48
837
153
669
48
717
0
717

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	<u>AL-CLAD NOR</u>	<u>AL-CLAD 94</u>	<u>ZR-CLAD 34</u>
EI	3729	241	717
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	3911	276	765
MAY 74	<u>-324</u>	<u>0</u>	<u>0</u>
EI	3583	276	765
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	3770	311	813
JUN 74	<u>0</u>	<u>0</u>	<u>0</u>
EI	3770	311	813
NAF	<u>182</u>	<u>34</u>	<u>47</u>
I	3952	345	860
JUL 74	<u>0</u>	<u>0</u>	<u>147</u>
EI	3952	345	713
NAF	<u>182</u>	<u>34</u>	<u>47</u>
I	4134	379	760
AUG 74	<u>0</u>	<u>0</u>	<u>0</u>
EI	4134	379	760
NAF	<u>182</u>	<u>34</u>	<u>47</u>
I	4366	403	807
SEP 74	<u>-648</u>	<u>0</u>	<u>0</u>
EI	3468	413	807
NAF	<u>182</u>	<u>34</u>	<u>48</u>
I	3850	447	855
OCT 74	<u>0</u>	<u>0</u>	<u>0</u>
EI	3850	447	855
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	4032	482	903
NOV 74	<u>0</u>	<u>0</u>	<u>147</u>
EI	4032	482	756
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	4214	517	804
DEC 74	<u>0</u>	<u>0</u>	<u>0</u>
EI	4214	517	804
NAF	<u>182</u>	<u>35</u>	<u>48</u>
I	4396	552	852
JAN 75	<u>-648</u>	<u>0</u>	<u>0</u>
EI	3748	552	852

3-20-70

FIGURE

SEQUENTIAL OPERATION STUDY
OPERATING MODEL FOR FYs 1972, 1973 & 1974

SECRET

SECRET

- 124- 95-

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2 of 2

FIGURE I

SEQUENTIAL OPERATION STUDY
OPERATING MODEL FOR FY 1975

3-20-70

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CONTINUOUS - NOT SEQUENCED

CONTINUOUS - NOT SEQUENCED

-44-96-

A) Cind

	<u>71</u>	<u>94</u>	<u>NPR</u>	<u>Pa</u>	
FY 71 ^{9/15} (474) ¹²³ 1680 (797)	415 ²⁴ (196) ^{9/12} (474)	463	603	1.3	
72 (391) 1888 (740)	515 (201) (377)	551	718	1.29	
73 (394) 1987 (777)	500 (194) (886)	577	751	1.3	
74 (390) 2013 (787)	506 (197) (389)	626	795	1.269	
75 (390) 2013 (787)	506 (197) (389)	649	814	1.25	

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7.5%
3.5%
3.5%

For each kg of NPR add 1.324 kg KE material

$$\begin{aligned} \text{NPR} & 4.16 \times 4.21 = 17.5 \\ & 2.185 \times 3.66 = 8.01 \\ & \hline & 9.76 \end{aligned}$$

$$\begin{aligned} \text{KE} & 9.4 \text{ g/t} = 4.21 \\ \text{KE} & \text{NPR g/t} = 3.66 \\ \text{NPR} & 1.3 \text{ kg/tan} \end{aligned}$$

$$\begin{aligned} & 745 \text{ kg} \\ & 986 \text{ kg} \\ & \hline & 1731 \text{ kg} \\ \text{Total} & - 6.00\% \text{ R240} - 0.84\% \text{ R241} \\ & \text{KE} \\ & \text{N} \end{aligned}$$

N/KE Ratio
1.323#
KE/N Ratio
0.755%

$$\begin{aligned} & 573 \text{ T} \\ & 2601 \text{ T} \\ & \hline & 3174 \text{ T} \\ \text{Total} & - 4.67 \text{ E} - 2.185 \text{ N} \\ & \text{KE} \\ & \text{N} \end{aligned}$$

$$\begin{aligned} & \text{Nuclear @ } 47\% \text{ TOE} - 8.8\% \text{ R240} \\ & \text{KE " @ } 75\% \text{ TOE} - 3.9\% \text{ R240} \end{aligned}$$

Tylvacat from

3-10-70

STRICTLY PRIVATE

Date: March 10, 1970
To: O. F. Beaulieu
J. D. McIntosh
O. V. Smiset
From: V. R. Chapman
Subject: SEQUENTIAL OPERATION STUDY

Attached is the outline M. K. Harmon used yesterday when he discussed with us the accomplishments expected from our task force.

I am sure that the word will get about soon that the task force is studying sequential operations. However, since statement 1 of the attached outline would serve to fuel rumors that are already floating about, I've marked this memo and the attachment "STRICTLY PRIVATE."

VRC:mkl

cc: VR Chapman ←

Enclosure

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98-
40

SEQUENTIAL OPERATION STUDY - MANUFACTURING, PHASE I

1. Save KE
 - a. By showing 200 Areas alternative and cost reduction
2. Bases
 - a. B Plant and Waste Management operations will control
 - b. Purex to run as much as possible within limits imposed by AR vault, etc.
 - c. Waste Management "goals" to be met (end CY 75)
 - d. "Excess" reactor production to be held in basins
 - e. Scheme to be operational July, 1971
 - f. Use D. McDonald numbers (FY 73 or 74) N ~ 9 percent;
K ~ 4 percent.
3. Schedule - Phase I
 - a. Lay out operating "model": by
 - b. Set up chemical operations staffing: by
 - c. Integrate maintenance, RM, analytical staffing: by
 - d. Integrate McCoy, DeJong, Cunningham: by
4. Schedule - Phase II
 - a. Integrate with Plutonium Finishing: by
 - b. Integrate with DUN: by
 - c. Establish budget base and integrate Finance: by
 - d. Complete package

3-9-70

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99-
111

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1.1. set up year with 6 campaigns
3 HI and 3 2r
A. keep the 94 HI dead down
and show Not HI dead record

$$\frac{521,300}{50,000} = 10 + \text{Campaigns}$$

$$\frac{600,798}{50,000} = 12 + \text{campaigns}$$

$$2005 \times 260 = 521,300 \text{ gal ZAU}$$

$$(1456 + 7647) \times 66 = 600,798 \text{ gal PAV}$$

$$942 \times \text{Clad } 573 \times 3\frac{1}{2} = 2005$$

$$\text{Noe HI Clad } 2185 \times 3\frac{1}{2} = 7647$$

$$94.91 \text{ Clad } 416 \times 3\frac{1}{2} = 1456$$

3-12-70

FROM DMD FORECAST OF FANTASIA

TYPICAL YEAR

N Reactor @ 67% TOE - 8.8% Pu-240
KE Reactor @ 75% TOE - 3.9% Pu-240

	<u>U</u>	<u>Pu</u>
NOR AL-Clad	2185 T	801 kg
94 AL-Clad	416 T	175 kg
94 Zr-Clad	573 T	745 kg

(KE 94 421 g/l)
(KE NOR 366.6 g/l)
NPR 1300 g/l

THE PLANT LOAD FROM THE ABOVE FORECAST

	<u>CAMPAIGNS</u>	<u>TONS</u>	<u>DAYS</u>	<u>PU</u>
PAS	6	-	54	-
NOR AL-CLAD	3	2185	102	801
94 AL-CLAD	1	416	20	175
94 ZR-CLAD	3	573	86	745
PAW-NR 144,212 gal	3	-	72	
PAW-94 27,456 gal	1	-	14	
ZAW 148,980 gal	3	-	75	
TA 14 24 gal		-	28	
<u>TOTAL</u>			451	

451	451	360
82	282	-54
<u>369</u>	<u>109</u>	<u>-24</u>
		282
369		
282		
<u>651</u>		

364	23
1870	
778	
<u>920</u>	

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3-12-70

- 3 -

Assume 75% of above load processed in year but not in 1971
 Adjust blend normal so that ratio of 8.3% & 3.9% is maintained
 To meet weapon spec. when blended at 24-5

Eqv	PO	DAYS	TONS	CAMPAIGNS	
TONS					
1105	-	54	-	6	PAS
1552	565	72	1541	2	NORAL-CLAD 740-175 = 565 565/3.9% =
432	175	20	416	1	94AL-CLAD
1404	559	65	430	3	94ZR-CLAD 573x.75
1101	-	51	-	2	PBW-NOR 1541x.66 = 101,706gal
302	-	14	-	1	PBW-94 416x.66 = 27,456gal
1210	-	56	-	3	ZAW-94 430x.260 = 111,800 gal
518	-	24	-	12	TA
7685		356			TOTAL

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OPERATING MODEL FOR FYS 1972, 1973 & 1974

3-12-70

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	2	3	4	5	6	7	8	9	10	11	12
30	60	90	120	150	180	210	240	270	300	330	360
<div>ZR-CLAD 143-T 22 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>ZR-CLAD 143-T 22 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>	<div>AL-CLAD MR 770-T 36 DAY</div>
<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>	<div>2AW PAS 37,180 9 19 DAY DY</div>
11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL	11,700 GAL

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ESSENTIALLY CONTINUOUS

PURE X

TA

B PLANT
SOLV EXT

PAS PREP.

345X3401X1

PLANT

PROD 11

3.9% (архивов)

Pe Bottom

212

125

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3-14-70

SEQUENTIAL OPERATION STUDY
OPERATING MODEL FOR FY 1975

	1	2	3	4	5	6	7	8	9	10	11	12
PUREX	2R-CLAD 143-T 22 DAY	AL-CLAD NOR 770-T 36 DAY			2R-CLAD 143-T 22 DAY	AL-CLAD NOR 771-T 36 DAY		2R-CLAD 144-T 22 DAY	AL-CLAD 94 416-T 20 DAY	2R-CLAD 143-T 22 DAY		
TA												
B PLANT SOLV. EXT.	ZAW 37,180 19 DAY			PAW PAS 50,520 9 26 DAY DY	ZAW 39,180 10 DAY		PAW 50,886 20 DAY	ZAW 37,440 19 DAY	PAW 27,456 14 DAY			ZAW 37,180 19 DAY
PAS PREP												
1 X 10N EXHG												

TERMINAL RUN

ESSENTIALLY CONTINUOUS

	N 94 143T 2CAL 11 DAY	KE NOR 770T 6 CAL 20 DAY	N 94 144T 2CAL 11 DAY	KE 94 144T 6 CAL 11 DAY	N 94 143T 2CAL 11 DAY							
UO ₃ PLANT												
PU PROD	8.8% 186 KG	3.9% 282 KG	8.8% 186 KG	3.9% 283 KG	8.8% 187 KG	3.9% 175 KG	8.8% 186 KG					
3.9% CARRIER												
PU BOTTOM LINE	BLEND 432 KG 31 DAY	BLEND 432 KG 31 DAY	BLEND 435 KG 31 DAY									

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MANAGER -
STAFF -
~~Analyst~~
~~CP Special Agent~~
CR DP
Secretary
Janitor
Truck Driver

42
-4
38
35
31
34
30
37
36

Sequence crew
7 types Personnel
Paved

108

21

crane 6
Power 6
Pl + hdy 1
Rem to ph 1
Acct book 2
Sec 1
Mgr 1
Jen 2
Truck 1

B Plant

Day Op 8
Shift Op 42
Jen 1
crane 6
Power 6
Plumer 1
Sec 1
Mgr 1

64

22
108
111
244
198
40
38

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UO3

Plumer 1
Sec + Jen 2
Mgr 1
Total 13 = 105

14
199

2/28/88
72 66 gpt

SECRET

CL-1

11 Clad

FY - 70, 71

88

Gall / TV

FY - 72 →

66

Gall / TV

22 Clad

FY - 70

320

Gall / TV

FY - 71 →

260

Gall / TV

PAW - Solids Treatment

FY - 71

2500 - 3000 gal/day
taking into account
efficiency.

PAS ?

Prot Agit + TK

2/25

Test

2-10

4/15

EQUIV TK - 800,000 gal
PA

Takes 6 m
to sluice

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C3 95%
Sr probably 80% Recovery

-107-
-105-

SECRET

12C

~~CONFIDENTIAL~~

Date: April 9, 1970

To: R. E. Roberts

From: Alex Smith *Alex Smith*

Subject: SEQUENTIAL OPERATION OF THE EXTRACTION COLUMNS
IN B PLANT WITH PUREX

Enclosed is a distribution of Waste Management Maintenance manpower as it is now and how it would be in sequential operation. No appreciable reduction in maintenance manpower can be achieved by operating sequentially with this portion of the building. All building services and cell monitoring equipment have to be maintained whether the cells are operating or not. Most of the equipment involved is maintained remotely and would have little or no bearing on B Plant maintenance forces.

It is much better, from a maintenance standpoint, to maintain a constant reduced force in each plant rather than rotating maintenance people from plant to plant for the intermittent operation and shutdown. The present method of exchanging manpower through the Maintenance Manpower Planning Meeting would be used to move people to do shutdown work as required. Assuming greater availability of manpower help from Purex, that portion of the maintenance forces assigned to B Plant can be reduced 10 percent as the result of sequential operation.

(i.e., from 34 to 31 = 3 people)
REL

AS:efg

Encl.

cc: JM Blackburn
OV Smiset
RE Smith
File

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~~CONFIDENTIAL~~

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-125-

April 8, 1970

B PLANT SEQUENTIAL OPERATION
WASTE MANAGEMENT MAINTENANCE

	B PLANT	EAST FARMS	REDOX WEST FARMS	222-S	TOTAL	B PLANT SEQUENTIAL PLANT	OTHER	TOTAL
Manager	1				1	1		1
Secretary	1				1	1		1
Planners		1	1		2		2	2
Engineers	1			1	2	1	1	2
Foremen	3	2		1	6	3	3	6
Millwrights	3	2	1	1	7	2	4	6
Pipefitters	9	4	1	1	15	8	6	14
Welders	1	1			2	1	1	2
Electricians	4	3	1	1	9	4	5	9
Instrument	9	3	2	2	16	8	7	16 15
Coordinators	1		1		2	1	1	2
Painters	1				1	1		1
Asbestos Wkrs.		1		1	2		2	2
Instrument Maker				1	1		1	1
	<u>34</u>	<u>17</u>	<u>7</u>	<u>9</u>	<u>67</u>	<u>31</u>	<u>33</u>	65 64

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-109-
L26

~~SECRET~~

Date: April 13, 1970
 To: O. F. Beaulieu
 From: J. M. Blackburn *JMB*
 Subject: SEQUENTIAL OPERATION

Purex Maintenance manpower requirements for sequential operation are shown in the table below.

Craft	Present Work Force	Sequential Operation		Total	Excess
		Purex Operating	Purex Down		
Electricians	10	3 days+4 shift=7*	3 days+4 shift=7*	7	3
Instrument Specialist & Tech.	11	4 days+4 shift=8**	8 days+0 shift=8**	8	3
Millwrights	5	4***	4***	4	1
Pipefitters	11	4 days+4 shift=8****	4 days+4 shift=8****	8	3
Welders	2	1*****	1*****	1	1 (100%)
Painters	2	1*****	1	1	1
Asbestos Worker	1	1	1	1	
Material Coordinator	1	1	1	1	
Tool Crib Attendant	1	1	1	1	
Secretary	1	1	1	1	
Clerk	1	1	1	1	
Foremen	4	4*****	4	4	
Maintenance Engineers	2	1	1	1	1
Planner	1	1	1	1	1
Manager	<u>1</u>	1	1	<u>1</u>	<u>1</u>
Total	54			41	13

*meeting
Boyer*

Jay - 003

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O. F. Beaulieu
Page 2
April 13, 1970

- * UO3 will provide an electrician to Purex 50 percent of the time when the Purex Plant is operating and when it is down. Purex shift electricians will continue to provide shift coverage to all plants in 200E and 200W Areas.
- ** UO3 will provide an instrument tech. to Purex 50 percent of the time when the Purex Plant is operating. When the Purex Plant is down, shift instrument tech. will be reassigned to day shift.
- *** Purex will provide millwright help to UO3 as needed when the UO3 Plant is operating and when it is down.
- **** Purex will continue to provide shift pipefitter coverage for all B Plant operations when the Purex Plant is operating. When the Purex Plant is down and the UO3 Plant is operating, Purex shift pipefitters will be stationed in the UO3 Plant during off hours; and they will provide shift coverage for all B Plant operations and Purex.
- ***** UO3 will provide welder help to Purex and Waste Management.
- ***** UO3 will provide a painter to Purex 50 percent of the time when the Purex Plant is operating and when it is down.
- ***** Presently, four foremen are required to supervise four separate crews. Under the sequential operation plan three foremen will be required to supervise separate crews. The extra foreman will perform relief work at Purex and UO3 Plants, supervise shop craftsmen that report to the Purex Plant, provide constant supervision to Purex craftsmen engaged in complex or hazardous work and perform special assignment work.

JMB:ssa

cc: File

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<u>Craft</u>	<u>Present Work Force</u>	<u>Panel Operating UO₃ Down</u>	<u>Panel Down UO₃ Operating</u>	<u>Excess</u>
Elect.	11	8	8	3
Inst.	12	9	9	3
Millwrights	7	5	5	2 (1)
Pipefitters	16	11	11	5 (1)
Welders	3	2	2	1
Painters	3	2	2	1
Asbestos Workers	2	2	2	
Material Coordinator	2	2	2	
Tool crib attendant	1	1	1	
Secretary	1	1	1	
Clerk	1	1	1	
Foremen	5	5	5	
Maint. Engineers	2	1	1	1
Maint. Planner	1	1	1	
Manager	1	1	1	
	<u>68</u>	<u>52</u>	<u>52</u>	<u>16</u>

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-PUREX ANALYTICAL LABORATORY -

Sequential Operation Study - Pure - B Plant Solvent Extraction UO_3

Effective date - 3/30/70 -

Now - Sequential
Present Pay Roll.

Purex Operating - B Plant Sol.
Extraction UO_3 Down
Purex Down - B Plant Sol
Extraction UO_3 Operating

Day Shift -

MANAGER	-1 EX	1 EX	1
SECRETARY	1	1	1 EX
SUPERVISOR (Day Shift)	1 EX	1 EX	1 EX
CHEMISTS	4 EX	3 EX	1 EX
PLM (Lead) Chemist	1 EX	1 EX	

Senior Chem. Tech.	2	2	2
Chemical Tech.	2	1	1
CHEMICAL ANALYST	5	4	3

Shifts (ABCD)

SUPERVISOR	4 EX	4 EX	4
Senior Chem. Tech.	4	4	4
Chemical Tech.	4	4	4
CHEMICAL ANALYSTS	<u>16</u>	<u>16</u>	<u>16</u>

TOTAL 45 (11 ex + 34) 43

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* Floating Personnel.

NLM
4/24/76

222-S ANALYTICAL LABORATORY - PERSONNEL ESTIMATE.

	AS OF MARCH 1970	PLANT 5X OP. UO ₃ OP. PUREX DOWN	PLANT 5X AND NO. DOWN PUREX-OP	SEQ. CREW CONTR
✓ MANAGER	1	1	—	1
✓ SECRETARY	1	1	1	
✓ PROCESS & TECH. LIAISON	1	1	1	
✓ SUPV - DAY	0	1	1	
✓ SUPV - STDs LAB	1	1	1	
✓ SUPV - BUILDING SERV - UO ₃	1	1	1	
✓ SUPV - TRAINING	1	1	1	
✓ SUPV - SHIFT	4	4	—	4
✓ CHEMIST - ENVIRONMENT	1	1	1	
✓ CHEMIST - ACCOUNTING ROOM	1	1	1	
✓ CHEMIST - STDs LAB	—	1	1	
✓ CHEMIST - PROC. METHODS	2	2	2	
✓ CHEMIST - ANALYTICAL	2	4	2	2
✓ SR. CHEM. TECH. - SHIFT LL.	4	4	4	
✓ " " " - DAYS	—	1	1	
✓ " " " - ENVIRON.	—	1	1	
✓ " " " - BUILD. SERV.	1	1	1	
✓ " " " - COUNT. Rm.	5	5	5	
✓ CHEM. TECH. - SHIFT	4	4	4	
✓ " " " - DAYS	1	4	3	
✓ " " " - ENVIRON.	—	2	2	
✓ " " " - BUILD. SERV.	2	2	2	
✓ " " " - STDs LAB	4	4	4	
✓ CHEM. ANALYST - SHIFT	24	20	8	12
✓ " " " - DAYS	6	8	4	4
✓ " " " - ENVIRON.	1	2	2	
✓ " " " - UO ₃	2	2	1	1
✓ " " " - C.R.	0	1	1	
✓ " " " - TRAIN.	1	1	1	
✓ JANITOR	1	1	1	
TOTAL - NON EX	58	64	46	18
TOTAL - EXEMPT	15	19	12	7
TOTAL	72	83	58	25

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Date: April 16, 1970
To: T. Prudich
From: V. R. Chapman
Subject: SEQUENTIAL OPERATION STUDY
REACTOR BASIN INVENTORY

Attached is a table which shows the estimated total basin inventory of discharged uranium we would expect at various dates in the future if we, ARHCO, should start sequential operations in July 1971 and the N and KE reactor discharges follow the April 1970 issue of the Quarterly Production Forecast (ARH-1546)

We will need from DUN the following information to include in our study.

1. A statement concerning capability to build the basin inventories to these levels.
2. The added costs (annual) to store the quantities shown.
3. Costs for reactivation of now idle basins should this be required for the loads shown.

VRC:mkl

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ROUGH DRAFT

SEQUENTIAL OPERATION STUDY
INVENTORY OF UNPROCESSED URANIUM STORED
IN REACTOR BASINS

<u>Date</u>	<u>Al-Clad 71</u>	<u>Al-Clad 94</u>	<u>Zr-Clad</u>
6-30-71	1347	710	362
12-31-71	1369 1531	402 4112	480 488
6-30-72	1664 1823	781** 664	457 464
12-31-72	1841 2017	521 400	583 602
6-30-73	2213 2357	775** 652	507 596
12-31-73	2381 2563	521 400	687 747
4-30-74	2581	568	800
6-30-74	2791 2915	775** 652	657 749
8-31-74	3103	232	859
12-31-74	3133 3140	521 400	806*** 913
6-30-75	3474*	773**	780

* Peaks at 3467 at end of February 1975 when there are 605 tons Al-clad 94 in basins.

** Peaks for Al-clad 94.

*** Peak for Zr-clad material for time period covered.

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RES.

This document is classified "Secret" and its contents are exempt from automatic downgrading and declassification. No person is permitted to release its contents without prior approval of the originating agency.

SECRET

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-122-

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Date: April 23, 1970

To: W. C. Calhoun
O. F. Beaulieu
J. D. McIntosh
R. E. Roberts
O. V. Smiset

From: V. R. Chapman

Subject: SEQUENTIAL OPERATION STUDY
FINAL REPORT OUTLINE

Attached is a proposed outline for the final report of the Sequential Operation Study. Please review this carefully and critically to determine what is being overlooked and whether you think this will adequately cover our work.

I have used the April Quarterly Production Forecast as a basis to rework the sequential mode tentative production schedule. It appears that we could operate sequentially until about July 1975 before the basin inventories would force a new reactor operation course.

Rather than drawing up a detailed operating model for each fiscal year, I propose one general purpose chart which merely indicates approximately what is processed when. The annual throughput of each material (three types of irradiated uranium, two types of Purax waste plus the Purax acid sludge) will be shown in a table covering the four years broken down by quarters. In this way, anyone who thinks he needs to go further into detail, which cannot be predicted accurately, can get an idea of where each type campaign will fall. The basin inventory status will be shown in a table similar to the one used in our interim report.

T. Prudich has the basin inventory numbers and is now accumulating estimates of the costs that will be involved. At this point, he does not expect them to be prohibitive.

Gurvell and Madeen will have their manpower figures available this week, as will McCoy and McMurray. I am waiting to see what will develop for Case I of the N Reactor transfer study for the other ARHCO departments. These should fit our study.

I would appreciate those of you in operations asking if we have done all we can with the exempt payroll. I think Purax and B Plant should question also the continued use of twelve crane operators.

VRC:mk1

cc: MK Harmon

VR Chapman - File

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SEQUENTIAL OPERATION STUDY

OUTLINE FOR FINAL REPORT

INTRODUCTION

Discuss reason for study and composition of task force.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

1. Feasible but with certain risks, particularly for N Reactor.
2. Does not interfere with Waste Management goals.
3. ARHCO Manufacturing payroll can be reduced by X number of people.
List by Sections, exempt and nonexempt.
4. Annual operating costs reduced by X dollars below FY 1971 level.
5. Basin backlog would increase X tons for aluminum-clad fuel and Y tons of zirconium-clad fuels between June 30, 1971 through June 30, 1975 under sequential plan. Z dollars would be required some time in the future to process this excess.
6. Recommend adoption.

DISCUSSION

General

Explain which portion of CPD operations are included in the study and why certain operations are excluded.

Sequential Operation Model

Description - and production assumptions used - assumption in an Appendix Production capacity of model.

Effect on reactor basin inventories.

Risks.

Manpower Requirements for Sequential Operations

Plant Operations

Operator Training

Plant Maintenance

CPD Services - Discuss Power, Special Services and Shop Services separately

Technical Services - Analytical Labs, Radiation Monitoring

Facilities Engineering

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Manpower Requirements for Sequential Operations - contd.

Operations Support Engineering

Research and Engineering

Other - Industrial Relations, Business Management

Combined effect on ARHCO manpower

Budgetary Effect of Sequential Operation

Show comparison of budgetary pattern for sequential versus nonsequential mode; to yield estimate of annual savings that would result.

Added DUN Costs

Acknowledgments

References

Reub

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MLM
4/24/70

222-S ANALYTICAL LABORATORY - PERSONNEL ESTIMATE

	AS OF MAR 30, 1970	PLANT SX OP. NO ₃ OP. <u>PUREX DOWN</u>	PLANT SX AND NO ₃ DOWN <u>PUREX-OP</u>	SEQ. CREW CONTR
MANAGER	1	1	—	1
SECRETARY	1	1	1	
PROCESS & TECH LIAISON	1	1	1	
SUPV - DAY	0	1	1	
SUPV - STDS LAB	1	1	1	
SUPV - BUILDING SERV - NO ₃	1	1	1	
SUPV - TRAINING	1	1	1	
SUPV - SHIFT	4	4	—	4
CHEMIST - ENVIRONMENT	1	1	1	
CHEMIST - COUNTING ROOM	1	1	1	
CHEMIST - STDS LAB	—	1	1	
CHEMIST - PROC. METHODS	2	2	2	
CHEMIST - ANALYTICAL	2	4	2	2
SR. CHEM. TECH. - SHIFT LL.	4	4	4	
" " " - DAYS	—	1	1	
" " " - ENVIRON.	—	1	1	
" " " - BUILD. SERV.	1	1	1	
" " " - COUNT. Rm.	5	5	5	
CHEM TECH. - SHIFT	4	4	4	
" " " - DAYS	1	4	3	1
" " " - ENVIRON	—	2	2	
" " " - BUILD. SERV.	2	2	2	
" " " - STDS LAB	4	4	4	
CHEM ANALYST - SHIFT	24	20	8	12
" " " - DAYS	6	8	4	4
" " " - ENVIRON.	1	2	2	
" " " - NO ₃	2	2	1	1
" " " - C.R.	0	1	1	
" " " - TRAIN.	1	1	1	
JANITOR	1	1	1	
TOTAL - ACCEX	58	64	46	18
TOTAL - EXEMPT	15	19	12	7
TOTAL	72	83	58	25

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ROUGH DRAFT

Distribution

1. R. W. Calhoun
2. V. R. Chapman

Date: May 14, 1970

To: R. W. Calhoun

From: V. R. Chapman

Subject: SEQUENTIAL OPERATION STUDY

This document consists of

~~2~~ pages, ~~1~~ copy
~~2~~ copies

Production statistics for the first three-and-one-half years under the sequential operations study plan are as follows:

FY	Uranium - tons			Pu-kg		CAW - gallons	
	KE 71	KE 94	N 94-125	WG	FG	PAW	ZAW
1972	1408	550	450	1200	250	129,230	117,000
1973	1446	504	450	1330	-	128,700	117,000
1974	1446	504	465	1330	-	128,700	120,900
1975(1/2)	771	504	160	70	-	84,150	41,800

Uranium unprocessed over the period July 1, 1971 through December 31, 1974 due to sequential operation, i.e., deferred processing:

Tons

Aluminum-clad
Zirconium-clad

2015
540

Manufacturing manpower reductions resulting from sequencing:

	After Sequencing			Reduction
	Present	Purex Oper.	UO ₃ & B Plant SX Operating	
Purex-Beaulieu & his org. (1)	104	113	67	
UO ₃ -McIntosh & his operators (2)	20	9	25	
B Plant-SX-Smiset & his people (3)	109	81	111	
TOTAL	233	203	203	30
Purex Laboratory (4)	45	43	18	
Redox Laboratory (4)	72	58	83	
TOTAL	117	101	101	16

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Total manpower reduction	<u>87</u>
--------------------------	-----------

- From all that goes before, I need an impressive table which shows (1) the reductions in annual budget resulting from sequencing, and (2) the costs deferred as a result of the basin inventory buildup, i.e., 2015 tons of aluminum-clad and 540 tons Zirconium-clad.

Purex	180 days;	B Plant	185 days
Purex	275 days;	UO ₂ Plant	90 days

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A large, dark, irregularly shaped object, possibly a piece of wood or a large rock, with a rough, textured surface. It is positioned horizontally and occupies a significant portion of the frame. The lighting is dramatic, with strong highlights and deep shadows, emphasizing its rugged texture. The background is dark and indistinct.

422~

[illegible]

100-925-2000 4/12, 15/1000

NOT INCLUDE ENCASULATION MATERIALS OF JOBS AND CHIMNEYS 31 10.

Phormium tenax DES (FRAN)

1950-51 Income Tax 1350/yr. Acc. Bldg - Road plus 1/2 of 1950 Tax and Medical

100

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Estimated Processing Cost

(1) WASTE MANAGEMENT

WASTE MANAGEMENT

WASTE MANAGEMENT

201 T x 6.5 GAL = 1327.0 GAL x \$1.50/GAL
520 T x 2.60 GAL = 1352.0 GAL x 1.30/GAL

\$ 124
153

TOTAL WASTE MANAGEMENT

277

PIPER

20 ST x \$120/TON
50 ST x \$220/TON

\$ 240
1100

TOTAL PIPER

1340

DEFERRED PROCESSING COST

2.500 TONS x \$60/TON

\$ 153

TOTAL DEFERRED PROCESSING COST

\$ 971

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KE reactor
N reactor

1500
525

585
450

U-Tons

Pu kg

* It appears that this is about the point at which we would be forced to quit unless production were cut back. The mutual agreement over the period July 1, 1971 through January 1, 1975, due to sequential operation would be

FY		U-Tons		KE 71		KE 94		N 94-125		W/G FG		PAW		CHW - gallons	
1972	1538	550	480	1515	250	137,808	124,800	137,808	124,800	137,808	124,800	137,808	124,800	137,808	124,800
1973	1538	550	480	1560	-	137,808	124,800	137,808	124,800	137,808	124,800	137,808	124,800	137,808	124,800
1974	1584	504	495	1450	-	137,808	128,700	137,808	128,700	137,808	128,700	137,808	128,700	137,808	128,700
1975 1/2	1584	504	495	1450	-	137,808	128,700	137,808	128,700	137,808	128,700	137,808	128,700	137,808	128,700
* 1975 1/2	888	504	330	967	-	91,872	85,800	91,872	85,800	91,872	85,800	91,872	85,800	91,872	85,800

Production

Subject: Sequential Operation Study - Revised

VR Chapman

RW Calhoun

JUNE 16, 1970

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TABLE IX

Manufacturing and Distribution Expenses
Summary of Operating Costs

(in 000's)

	Fiscal 1970	Fiscal 1971	Adjusted Fiscal 1972
Operating Costs:			
Salary and benefits of Service	\$14,491	\$1,118	\$13,373
Essential Materials	2,744	303	2,461
Other Materials	1,681	21	1,670
Other Incurred Costs	541		541
Work Order Charges	173		173
Other Cost	2,322	77	2,346
Allocated Service	1,272	32	1,240
Total operating cost	\$24,052	\$1,551	\$22,501
Distribution:			
02 Production	\$22,328	\$1,551	\$20,777
Other	1,724	-	1,724
Total Distribution	\$24,052	\$1,551	\$22,501
Deferred Production Cost	\$2,000		

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5-22-70 to 6-18-70

6-18-70

From T Prudich by Phone 1 ³⁰/_p

KE, KW & B Basins present in operation

To keep on operation for sequenced Op. backlog build-up
need

4 people at \$13,800

per year
52,000

Water pumping & treatment chemicals (B&C)

20,000

Total

\$72,000

Buckets

By 3rd Quarter FY 74 need 200 more SS buckets
@ 250,000

\$50,000

Additional ^{beginning} (500) by 4th Qtr FY 74

125,000
100,000

Galvanized buckets are used continue to
deplete.

Could avoid bucket by sticking
natural like cordwood.
Two more people would
be needed to handle

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[REDACTED]

T. Prudich

6-1970

300 Maximum Insects needed

200 at Laguna 4th Qtr FY 74

100 at 3rd Qtr FY 75

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[REDACTED]

Assessment

For Hasty

- Three complete cycles / year
 - 3 X nuclear campaign
 - 1 ME 94 + small ME 10 campaign
 - 2 ME 10 campaigns
- Future campaign size limited by
 - current and waste storage ~ 55,000 t
 - UNH storage ~ 600 TV
- Average processing rates
 - A1 clad fuel at PWR 24 TV/day
 - 2. clad fuel at PWR 17 TV/day
 - C1U in B Plant 8,000 kg/day
 - PAS in B Plant 1,200 kg/day
- Average processing rate (additional for chert)
 - Pu button line 17 kg/day
 - UO₃ plant 40 TV/day
- All available A1-clad 94 uranium processed in one campaign / year
- Cash and transportation around the clock 7 days / week

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PURCHASER'S PLANT SEQUENTIAL ORIGINATOR'S REPORT

(TYPICAL YEARS)

Current Year (1970)		Previous Year (1969)		Two Years Ago (1968)		Three Years Ago (1967)	
KE	N	KE	N	KE	N	KE	N
2088	495	820	430	160	115	24172	24172
134 238	134 238	134 238	134 238	134 238	134 238	134 238	134 238
135 200	135 200	135 200	135 200	135 200	135 200	135 200	135 200

6-9-70

2

This mean loss
for Dec APR 16-16

$$\frac{696}{650} = 107\%$$

$$150 \times 107 = 160$$

Sequential Study

Scale up factor from
prev study

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FY	1972	1973	1974	1975
Campaigns	696 KE	696	696	696
	160 N	160	165	165
KE-94	550	550	504	504
Comps on 71	144	146	192	192
KE 71	29	29	29	29
N	23	23	24	24
Cubits	23	23	24	21
	7	7	8	8

2088

Waste	137 808	137,808	137,800	137,808
	69	69	69	69
	23	23	23	23
	480	480	495	495
	124800	124800	127,700	127,700
	63	63	64	64
	21	21	22	22

25049 funds

1972 550 - 308 @ 12% = 242 km
 242 + 1538 = 1780 1780 x .5 = 890 kg
 480 x 1.3 = 624
 024 + 890 = 1514 kg weapon

1975 #12 888 + 504 = 1392 T
 1392 x .4 = 556.8 KE
 330 x 1.3 = 429 N
 TM 986

1973 2088 x 425 = 939
 480 x 1.3 = 624
 624 + 1039 = 1563

1974 2088 x 0.4 = 835
 495 x = 643
 1478

	9/E	
1971	414	1972 Cap
2	414	308 T KE W 7 252 Fuel
3	582	
4	582	
5	500	
1974	888	
1975	700	

6-9-70

FY

1971 Apr-June

Aug-Dec

6-30-71 Inv

Dischg

July 71

Dischg

Aug

Dischg

Sept

Dischg

Oct

Dischg

Nov

Dischg

Dec

Dischg

JAN 72

Dischg

Feb

Dischg

Mar

AI-Clad 195 AI-Clad 195 2r Clad

754	201	340
573	509	22
1347	710	302
157	42	46
1504	752	408
0	-550	0
1504	202	408
157	42	46
1661	244	454
-146	0	0
1515	244	454
157	42	46
1672	286	500
0	0	-160
1672	286	340
157	42	46
1629	328	386
0	0	0
1824	328	386
157	42	46
1986	370	432
-686	0	0
1290	370	432
157	42	46
1441	412	478
0	0	0
1447	412	478
157	42	46
1604	454	524
0	0	-160
1604	454	364
157	42	46
1761	496	410
0	0	0
1761	496	410
157	42	46
1918	538	456
-996	0	456
1222	538	0

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This was basis for report as finally issued

PAY 23	23
TA 2	25
PX 7	32
TA 2	34
PAW 23	57
PAS 7	64
TA 2	66
PX 23	89
TA 2	91

ZAW 21	112
PAS 7	119
TA 2	121
PX 29	150
TA 2	152

PAW 23	175
PAS 7	182
TA 2	184

PX 23	207
TA 2	209

ZAW 21	230
PAS 7	237
TA 2	239

PAY 29	268
TA 2	270

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<u>FY</u>	<u>ALC. ad.</u>						
	1222	538	456				
	<u>157</u>	<u>42</u>	<u>46</u>				
	1379	580	502				
Disch	<u>0</u>	<u>0</u>	<u>0</u>	PAW	23	293	
Apr	1379	580	502	PAS	7	300	
	<u>157</u>	<u>42</u>	<u>46</u>	TA	2	302	
	1536	622	548				
Disch	<u>0</u>	<u>0</u>	<u>-160</u>	PX	23	325	
May	1536	622	388	TA	2	327	
	<u>157</u>	<u>42</u>	<u>46</u>				
Disch	1693	664	434				
	<u>0</u>	<u>0</u>	<u>0</u>	ZAW	21	348	
JUN	1693	664	434	PAS	7	355	
	<u>165</u>	<u>41</u>	<u>48</u>	TA	2	357	
Disch	1858	705	487				
73 July 72	<u>0</u>	<u>-550</u>	<u>0</u>	PX	23	23	
	1858	155	482	TA	2	25	
	<u>165</u>	<u>41</u>	<u>48</u>				
Disch	2023	196	530	PX	7	32	
	<u>-146</u>	<u>0</u>	<u>0</u>	TA	2	34	
Aug	1877	196	536	PAW	23	57	
	<u>165</u>	<u>41</u>	<u>48</u>	PAS	7	64	
Disch	2052	237	578	TA	2	66	
	<u>0</u>	<u>0</u>	<u>-140</u>	PX	23	89	
SEP	2042	237	418	TA	2	91	
	<u>165</u>	<u>41</u>	<u>48</u>				
Disch	2207	278	466				
	<u>0</u>	<u>0</u>	<u>0</u>	ZAW	21	112	
OCT	2207	278	466	PAS	7	119	
	<u>165</u>	<u>41</u>	<u>48</u>	TA	2	121	
Disch	2372	319	514				
	<u>-696</u>	<u>0</u>	<u>0</u>	PX	29	150	
NOV	1676	319	518	TA	2	152	
	<u>165</u>	<u>41</u>	<u>48</u>				
Disch	1841	360	562				
	<u>0</u>	<u>0</u>	<u>0</u>	PAW	23	175	
Dec	1841	360	562	PAS	7	182	
	<u>165</u>	<u>41</u>	<u>48</u>	TA	2	187	
Disch	2006	401	610				

FY	ALC Ind 71	ALC Ind 74	ALC Ind 77			
1973	2000	401	610			184
TAN 73	0	0	-150	PX	23	207
	2006	401	460	TA	2	209
Dischg	165	41	48			
	2171	442	508			
Feb	0	0	0	2AW	21	230
	2171	442	508	PAS	7	237
Dischg	165	41	48	TA	2	239
	2336	483	556			
Mar	-696	0	0	PX	29	268
	1640	483	556	TA	2	270
Dischg	165	41	48			
	1805	524	604			
Apr	0	0	0	PAW	23	293
	1805	524	604	PAS	7	300
Dischg	165	41	48	TA	2	302
	1970	535	655			
May	0	0	-160	PX	23	325
	1970	565	492	TA	2	327
Dischg	165	41	48			
	2135	606	542			
JUN	0	0	0	2AW	21	348
	2135	616	540	PAS	7	355
Dischg	167	42	52		2	357
	2302	648	592			
1974 JUL 73	0	-504	0	PX	21	321
	2302	144	592	TA	2	23
Dischg	167	42	52	PY	8	31
	2469	196	644	TA	2	33
Aug	-192	0	0	PAW	23	50
	2277	196	644	PAS	7	60
Dischg	167	42	52	TA	2	62
	2454	238	696			
SEP	0	0	-165	PX	24	81
	2444	228	531	TA	2	91
Dischg	167	42	52			
	2611	270	583			
Oct	0	0	0	2AW	22	111
	2611	290	583	PAS	7	12
Dischg	167	42	52		2	12
	2778	312	635			

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1974

Nov 73

Dischg

Dec

Dischg

JAN 74

Dischg

Feb

Dischg

MAR

Dischg

Apr

Dischg

May

Dischg

JUN

Dischg

1975

Jul 74

Dischg

Aug

Dischg

Actual 71

Actual 74

2nd 11/67

2778

096

2082

167

2249

0

2249

167

2416

0

2416

167

2583

0

2583

167

2750

-696

2054

167

2221

0

2221

167

2388

0

2388

167

2555

0

2555

167

2742

0

2722

167

2889

-192

2697

167

28611

31.2

0

312

42

354

0

354

42

396

0

396

42

438

0

438

42

480

0

480

42

522

0

522

42

504

0

504

42

666

0

666

42

648

-504

144

42

186

0

186

42

228

635

0

635

52

687

0

687

52

739

-165

574

52

626

0

626

52

678

0

678

52

730

0

730

52

782

-165

617

52

669

0

669

54

723

0

723

54

777

0

777

54

831

PX 29

TA 2

PAW 23

PAS 7

TA 2

PX 24

TA 2

ZAW 22

PAS 7

TA 2

PX 24

TA 2

PAW 23

PAS 7

TA 2

PX 24

TA 2

ZAW 22

PAS 7

TA 2

PX 21

TA 2

PX 8

TA 2

PAW 23

PAS 7

TA 2

122

151

153

176

183

185

209

241

233

240

242

271

273

296

303

305

329

331

353

360

363

21

23

31

33

56

63

65

SEP 74

Dischg

OCT

Dischg

NOV

Dischg

Dec

Dischg

Jan 75

Dischg

Feb

Dischg

Mar

Dischg

Apr

Dischg

May

Dischg

June

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AL 121

2264

0

2864

167

3031

0

3031

167

3198

-696

2502

167

2669

0

2664

167

2836

0

2836

167

3003

0

3003

167

3170

-696

2474

167

2641

0

2641

167

2608

0

2808

167

2475

0

2475

-5

AL 121

228

0

288

42

270

0

270

42

312

0

312

42

354

0

354

42

396

0

396

42

438

0

438

42

480

0

480

42

522

0

522

42

564

0

564

42

606

0

606

2RCM

831

-165

666

54

720

0

720

54

774

0

774

54

828

0

828

54

882

-165

717

54

771

0

771

54

825

0

825

54

879

0

879

54

933

-165

768

54

822

0

822

86

908

R 24

TA 2

2AW 22

PAS 7

TA 2

PX 24

TA 2

PAW 23

PAT 7

TA 2

55

89

91

11.3

120

122

151

153

176

183

185

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-136-

-154-

+ 86

908

Used

<u>FY</u>	<u>Uranium - Tons</u>			<u>Plutonium - Kg</u>	
	<u>KE 71</u>	<u>KE 94</u>	<u>N 94-125</u>	<u>Weapon Grade</u>	<u>Fuel Grade</u>
1972	1538	550	480	1515	250
1973	1538	550	480	1563	—
1974	1584	504	495	1475	—
7/12 1975	888	504	330	985	—

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OBJECTIONABLE FEATURES OF SEQUENTIAL
OPERATION OF PUREX-UO₃ & WASTE Mgmt

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1. TRAINING OF MANPOWER

Assuming decision to go to sequential operation in FY 1969 is made November 1, 1967

- We have a maximum of 8 months in which to retrain X-number of Waste Management employees in Purex & UO₃
- We have a maximum of 6 months in which to train X-number of Purex & UO₃ employees in Waste Management. During this period, everybody running B-Plant are in effect training because it's a new operation

Question: When can we spring Purex and UO₃ people loose for this training

2. Waste Management Objectives

Sequential operation slows down ^{most} ~~the~~ phases of the waste Management program

Question: Does this not run counter with the objectivity to immobilize radioactive materials as quickly as possible?
Is this not counter to national posture on pollution control?

3. Risks are increased

- UO₃ plant relatively low in significance because of absence of critical mass control problems and low order radiation problems. Errors would cause production loss and possible loss of high priced material.
- Waste Management extremely high. Error could easily result in spread of radioactive materials setting up radiation fields almost impossible to cope with. No critical mass control problems
- Purex Plant high. Errors in Pu tail-end equipment could result in critical mass incident. Some potential for spreading extremely high radioactive contamination

4. Increased First Line Supervision

It is quite probable that the ratio of first line supervision to craftsmen would be increased in an effort to compensate for decreased total knowledge, content and skill of work force. This certainly is the prudent action. Additionally, Waste Management and Pures must be supervised during the idle periods. Since Waste Management will be idle twice the time Pures will be, waste of talent will take place in an area we should be pressing forward in rather than curtailing.

5. Decreased Challenge to Technical Type Individuals

The pressing of the Waste Management program is probably the highest challenge area within ARHCO today. Deceleration of this program, removes much of the challenge. This curtailment along with the curtailments that result from 5 or 10% cutback would probably ~~not~~ increase the exodus of younger engineers.

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July 20, 1970

To: M.K. Harmon

From: V.R. Chapman

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Copy 1. MK Harmon
2. VR Chapman

Page 1

Alternatives for Reduction of ARHCO Costs

Once we are past the thorium-²³³U processing campaign and have reduced the reactor basin uranium inventories to a normal level, the time requirement for Purex to process reactor output will be about as follows:

4.0 CF @ 72% Efficiency

	<u>Days</u>	<u>Total</u>
2000 T KE71 ÷ 24 T/D	84	
500 T KE94 ÷ 24 T/D	21	
600 T N94-125 ÷ 7 T/D	86	
Turnaround	38	
Idle	<u>131</u>	360

3.6 CF @ 72% Efficiency

2000 T KE71 ÷ 21.6 T/D	93	
500 T KE94 ÷ 21.6 T/D	24	
600 T N94-125 ÷ 6.7 T/D	90	
Turnaround	38	
Idle	<u>115</u>	360

4.0 CF @ 60% Efficiency

2000 T KE71 ÷ 20 T/D	100	
500 T KE94 ÷ 20 T/D	25	
600 T N94-125 ÷ 6 T/D	100	
Turnaround	38	
Idle	<u>97</u>	360

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[REDACTED]
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[REDACTED]
Page 2

3.6 CF @ 60% Efficiency

	<u>Days</u>	<u>Total</u>
2000 T KE71 ÷ 18 T/D	112	
500 T KE94 ÷ 18 T/D	28	
600 T N94-125 ÷ 5.8 T/D	104	
Turnaround	38	
Idle	<u>78</u>	
		360

Following is a list - not very original - of actions that might be considered to reduce ARHCO costs when the low processing load develops after recovery from the effects of the thorium-²³³U processing campaign:

- Partial sequential operation followed by full sequential operation
- Five-day week operation of Purex -- and possibly B plant
- 10 days on and 4 days off at Purex
- Vacation shutdown
- Reorganization of effort
- Deliberate "de-fatting"

Sequential Operation

We have been over this ground pretty thoroughly. After the Th-²³³U campaign is completed and Purex becomes about one-third idle, I suspect both the AEC and ARHCO will start considering the sequential mode more seriously -- not "can we get to it," but rather, "what is required to get it going."

Five-day Week Operation of Purex

If Purex can perform at a 60 percent efficiency on a 5-day week plan, then, at 4.0 CF, this might go. The third table above shows 97 idle days per year. For a 365 day year, the idle time is 102 days. This is almost equal to the 52x2=104 days down time per year that would be experienced with the 5-day week operation. Shouldn't Purex test move? [REDACTED]

Although the Waste Management program is presently under great [REDACTED] - 141 -

pressure, a 5-day week for Waste Management may not be unreasonable two or three years from now.

10 Days on, 4 Days off at Purex

This may not be the worst proposal in the list. I do not believe serious consideration can be avoided. However the savings may be small.

Vacation Shutdown

The above tables show that Purex can in the future shut down for a month for vacations. In theory, every twelfth man (assuming 4 week vacation) could be removed from the payroll. This plan plus a less generous provision of replacements for absences of other types could result in some savings that may be worthwhile. We can risk a little more overtime work for each \$12,000 we reduce the payroll.

Reorganization of Effort and Deliberate De-fatting

These two items amount to the same thing and raise these questions:

- How long ^{have} has it been since the basic organizational concepts of CPD^{have} been thoroughly examined and analyzed? Is the job we do the same as when GE decentralized everything? Have the adjustments made from time-to-time to accommodate change been thoroughly integrated into a unified concept?
- Would all jobs that exist still exist if closely examined for necessity and justification? Are we getting the best use from those that exist?
- Does the business in its decline justify all the technical effort it gets? Do we already know enough to continue efficiently to the end?

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- Are two chains of command still justified for Waste Management?
- What are the incentives for ARHCO to improve efficiency?
Are they enough to go beyond establishing an image and being hard-nosed?

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1. M. K. Harmon
2. M. D. Alford
3. V. R. Chapman

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Subject: B PLANT-PUREX SEQUENTIAL OPERATION

In summary, the 360 days of the year are used as follows:

	<u>Tons</u>	<u>Gal</u>	<u>Days</u>
Purex			
K Reactor fuels	1 200	-	44
N Reactor fuels	352	-	44
B Plant			
PAW	-	79 200	40
ZAW	-	84 480	40
PAS	-	<u>336 960</u>	144
Turnaround (24)	<u>-</u>	500 640	<u>48</u>
TOTAL	1 552	500 640	<u>360</u>
Acid sludge mining		166 680	360

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Page 2

It is obvious from these data that the sequential operation plan is out until one of the following occurs:

1. PAS processing is completed,
2. The load from either K Reactor or N Reactor disappears, or
3. SX processing rates are significantly increased and a successful head-end process (which reduces volume) is developed for PAS.

VRC:mk1

Attachment

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S. B. T.

B PLANT - PUREX SEQUENTIAL OPERATION CAPACITY WITHOUT PAS CLASSIFICATION

ASSUMED RATES

PUREX (WHILE OPERATING)

ACID SLUDGE PROD. 463 gpd

K REACT. FUEL 27 T/D

PAS PRODUCTION 936 gpd

N REACT. FUEL 8 T/D

PAW PRODUCTION 66 gal per TU

SX COLUMNS (72%)

ZAW PRODUCTION 240 gal per TU

CAW 2000 gpd

TURNAROUND 2 days at each change

PAS 2000 gpd

TURNAROUND 2 days at each change

9-10-70

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END