

31st January, 1963.

NI/GP/63/2

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

GENERAL PURPOSES COMMITTEE

Draft Five-Year Financial Forecast 1964/65 to 1968/69

Prepared by A. Miller

1. In this paper a draft five year forecast is submitted for consideration by the General Purposes Committee and later by the Governing Body.
2. The last five-year forecast (NI/62/2) was prepared in February, 1962 and was revised (NI/GP/62/29) at the request of the Treasury after the approval of the Electron Laboratory. It showed a pattern of expenditure consistent with the 2% p.a. rate of increase for research in nuclear physics which was set by the Treasury.
3. The present forecast (which like the revised form of the earlier one is at 1962/63 prices) shows that the pattern of expenditure can be held to the 2% rate of increase, but only by accepting very severe restrictions on the work. Quite apart from the need to obtain a satisfactory agreement on the base line for the 2% p.a. increase, and on the exclusion of reactor work from the 2% limitation, there are three distinct headings of expenditure which cannot be accommodated within the 2% pattern, if the Institute's work is to go ahead properly. The schedules in the appendix have been arranged so as to show the extent of these as clearly as possible. They are:-
 - (a) Future Major Schemes: These items do not represent a departure from the spirit of the Minister's letter which laid down the 2% limitation. They are the "new projects for which a sum of £800,000 is allowed in the N.I.R.N.S. forecast for 1967/68" which the Minister explicitly left open for later consideration separately from the 2% limit. The expenditure forecast for these items is substantially greater than the amount mentioned in the Minister's letter and starts earlier (£M):-

	1964/5	1965/6	1966/7	1967/8	1968/9
Minister's letter (NI/62/7)	-	-	-	0.8	-
Previous forecast NI/GP/62/29	-	0.03	0.57	1.05	-
This forecast (including non-capital)	0.03	0.28	0.81	1.96	3.08

On the other hand, in this forecast the items involved have been specified with more precision and they are indeed items for which refusal of approval, however unfortunate, would not interfere with the other projects already in hand.

(b) Additional costs for the proper exploitation of Nimrod

The present estimate is that the proper exploitation of Nimrod and the associated projects already approved can be contained within the 2% pattern for the next two years, but that in 1965/6 and later years it will require rather more people, and will cost rather more than previously forecast. The total increased requirement during the five years which were covered by the 2% dictum is £1.04M.

(c) Electron Laboratory: The forecast provides for a four-year construction period, with no delay in site acquisition. The effect of this on the forecast is mainly to increase the expenditure in early years and decrease it in the later years. However, the latest estimate of the total cost of the laboratory in the four relevant years has increased by £0.26M. The effect of these changes is that if the Electron Laboratory can be pressed forward vigorously without delays it will require an additional £0.82M in 1964/65.

4. A substantial increase in the cost of reactor support has been included. A large part of this increase covers the hire of U.K.A.E.A. reactor space for university use. These costs are not within the scope of the "2% pattern" since they are not for nuclear physics.
5. When these forecasts are submitted to the Treasury after the amendments required by the Committee and in suitably condensed form, the following points will be made in the covering letter.
 - (a) No provision has been made for major new scientific developments not at present foreseen.
 - (b) The cost of carrying out the approved programme in this field cannot be accurately assessed several years ahead.
 - (c) These are forecasts and not a five year budget.
 - (d) The restricted rate of progress imposed in September, 1961 and intensified in July, 1962 still dominates the present Rutherford Laboratory forecasts. Overall, however, it will be seen that a need to rise decisively above the present level of expenditure is expected sooner than was forecast a year ago.

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCEFinancial Forecasts - 1964/65 to 1968/69Reconciliation Statements - £M1. Treasury Grant with 1963/64 column of summary

<u>Grant</u>		<u>1963/64</u>	
Based on programme	6.85	Per summary	8.48
Hydrogen Bubble Chamber	.37	<u>Less</u> increase in Electron	
Atlas Computer Laboratory	1.22	Laboratory forecast	.04
	<u>8.44</u>		<u>8.44</u>
<u>Less</u> Appropriations in Aid	.14	<u>Less</u> cut by Treasury	.14
	<u>8.30</u>		<u>8.30</u>

2. Forecast in September, 1962 for the R.H.E.L. and the E.L. compared with the present forecast

	<u>1964/5</u>	<u>1965/6</u>	<u>1966/7</u>	<u>1967/8</u>	<u>Total</u>
"2%" forecast in paper NI/GP/62/29 (4b)	7.08	6.94	7.22	7.53	28.77
<u>Add</u> Additional costs for the proper exploitation of Nimrod	-	.25	.43	.36	1.04
Cost of Future Major Schemes	.03	.28	.81	1.96	3.08
Increased expenditure in these years for the Electron Lab.	+ .82	- .10	- .28	- .18	+ .26
Present forecast of Reactor Support	.25	.33	.34	.39	1.31
<u>Amended previous forecast</u>	<u>8.18</u>	<u>7.70</u>	<u>8.52</u>	<u>10.06</u>	<u>34.46</u>
R.H.E.L. forecast - Schedule I	6.41	6.19	6.96	8.54	28.10
E.L. forecast - Schedule I	2.37	1.62	1.54	1.52	7.05
	<u>8.78</u>	<u>7.81</u>	<u>8.50</u>	<u>10.06</u>	<u>35.15</u>
Deduct Shadow Cuts	.50	.10	-	-	.60
<u>Present forecast</u>	<u>8.28</u>	<u>7.71</u>	<u>8.50</u>	<u>10.06</u>	<u>34.55</u>

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCESummary of Financial Forecasts - 1964/65 to 1968/69£ Million

	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	
Rutherford Laboratory	6.88	6.41	6.19	6.96	8.54	9.49	Sched. 2
Electron Laboratory	1.12	2.37	1.62	1.54	1.52	1.53	Sched. 7
Atlas Computer Laboratory	1.22	1.46	1.15	.84	.71	3.06	Sched. 8
	9.22	10.24	8.96	9.34	10.77	14.08	
<u>Deduct</u> Shadow Cut	.60	.50	.10				
	8.62	9.74	8.86	9.34	10.77	14.08	
<u>Less</u> Receipts	.14	.27	.81	.84	.84	.84	
	8.48	9.47	8.05	8.50	9.93	13.24	

N.I.R.N.S.

RUTHERFORD HIGH ENERGY LABORATORY

£ million

	<u>1963/64</u>	<u>1964/65</u>	<u>1965/66</u>	<u>1966/67</u>	<u>1967/68</u>	<u>1968/69</u>
Summary - Present Programme						
Capital - Schedule 4	3.38	2.56	1.64	1.55	1.90	1.51
Non-Capital - Schedule 6	3.50	3.82	4.02	4.17	4.32	4.45
	6.88	6.38	5.66	5.72	6.22	5.96

Summary - Present Programme: Additional costs
for proper exploitation of Nimrod

Capital (minor items)			.20	.30	.20	.40
Non-Capital - Schedule 6			.05	.13	.16	.19
			.25	.43	.36	.59

Summary - Future Major Schemes

Capital - Schedule 5			.01	.37	1.33	2.14
Non-Capital - Schedule 6		.03	.27	.44	.63	.80
		.03	.28	.81	1.96	2.94

Summary - Combined

Capital	3.38	2.56	1.85	2.22	3.43	4.05
Non-Capital	3.50	3.85	4.34	4.74	5.11	5.44
	6.88	6.41	6.19	6.96	8.54	9.49
	.14	.12	.11	.12	.14	.18
Less Receipts	6.74	6.29	6.08	6.84	8.40	9.31

N.I.R.N.S.

CAPITAL EXPENDITURE - PRESENT PROGRAMME

RUTHERFORD HIGH ENERGY LABORATORY - £M

	Estimated Approval Date	Total Cost	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
<u>Nimrod and associated schemes</u>								
Nimrod Machine	-	11.10	.67	.15				
Nimrod Spares (major items only)	-	-	.06	.04				
National Hydrogen Bubble Chamber	-	.37	.37					
Heavy Liquid Bubble Chamber	-	.43	.13	.15				
Helium Bubble Chamber	-	.48	.10	.16				
* High Energy Physics Apparatus (major schemes)	1.9.63	.73	.01	.01	.18	.02	.34	
* High Energy Physics Apparatus	-	-	.07	.10	.15	.15	.30	.30
Track Analysis Equipment	-	-	.04	.05	.07	.10	.20	.20
Beam Handling Plant - Phase I	-	1.04	.39	.30	.08	.08	.30	
Beam Handling Plant - Phase II	-	.42	.03	.20	.10	.25		
* Special Beam Equipment and Magnets	-	-	.01	.05	.10			
Parasitic Area Extension (including shielding)	-	.21	.13	.04				
Building R.2 Extension	-	.21	.10	.03				
* Aux. Building for Nimrod Physics	1.9.63	.10	.01	.05	.04			
Minor Plant	-	-	.22	.27	.35	.35	.35	.35
			2.34	1.60	1.17	1.15	1.49	1.15

P.L.A. Schemes

* Machine Improvements	-		.01	.05	.02	.02	.02	.02
Analysing Magnets	-	.09	.07	.01				
* Building Improvements	1.9.63	.04	.01	.03				
Radio Chemistry Laboratories	-	.27	.02					
Minor Plant	-	-	.14	.15	.10	.10	.10	.10
			.25	.24	.12	.12	.12	.12

* Not yet approved.

N.I.R.N.S.

Rutherford High Energy Laboratory - £M

Capital Expenditure - Present Programme

Other schemes

	<u>Estimated Approval Date</u>	<u>Total Cost</u>	<u>1963/4</u>	<u>1964/5</u>	<u>1965/6</u>	<u>1966/7</u>	<u>1967/8</u>	<u>1968/9</u>
Orion Computer	-	.40	.10					
*Helium Liquifier	1.9.65	.09				.04	.05	
*Reactor Loops etc.	-	.10	.01	.05	.04			
Minor Plant	-	-	.15	.15	.15	.15	.15	.15
Heavy Lab. and Office Block	-	.22	.05					
*Electronics Labs. and Offices	1.4.63	.20	.11	.09				
*Heavy Plant and Metals etc. Store	1.9.63	.10	.01	.07	.02			
*Workshop & Remote Test Building	1.9.63	.09	.01	.07	.01			
*Cooling Towers Extension	1.9.63	.05	.01	.04				
Site Services and Roads	-	-	.06	.04	.04	.04	.04	.04
*Safety Store & First Aid Post	1.9.63	.05	.01	.03	.01			
*Low Background Laboratory	1.4.64	.02		.02				
Lecture Theatre	-	.05	.03	.02				
Abingdon & Chilton Houses	-	.22	.10	.08	.03	.05	.05	.05
Minor Building Works	-	-	.14	.06	.05	.05		
			.79	.72	.35	.28	.29	.24

Capital Summary - Present Programme

Nimrod								
P.L.A.								
Others								
	2.34	1.60	1.17	1.15	1.49	1.15	1.15	1.15
	.25	.24	.12	.12	.12	.12	.12	.12
	.79	.72	.35	.28	.29	.28	.29	.24
	3.38	2.56	1.64	1.55	1.90	1.55	1.90	1.51

*Not yet approved

N.I.R.N.S.Rutherford High Energy Laboratory - £MCapital Expenditure - Future Major Schemes
Not yet Approved

	<u>Estimated Approval Date</u>	<u>Total Cost</u>	<u>1963/4</u>	<u>1964/5</u>	<u>1965/6</u>	<u>1966/7</u>	<u>1967/8</u>	<u>1968/9</u>
<u>Nimrod</u>								
Machine Improvements	-	-			.01	.25	.25	.20
2nd Main Experimental Area	1.4.66	.29				.05	.20	.04
Beam Handling Plant - Ph. III	1.4.66	1.00				.05	.50	.45
Special Beam Equipment & Magnets	-	-					.01	.25
H.E. Physics Apparatus	-	-					.02	.20
Physics and Office Block	1.4.66	.25				.01	.15	.09
Power Supplies and Special Services	-	.15				.01	.08	.06
<u>P.L.A.</u>								
Machine Extension to Pion Energies	1.4.66	5.00					.06	.35
Associated Buildings	1.4.66	1.00					.05	.20
<u>Future Major Accelerator*</u>	1.4.66	21.00					.01	.30
					.01	.37	1.33	2.14

*Site unknown

Rutherford High Energy Laboratory - £M

N.I.R.N.S.

Non-Capital Expenditure

Present Programme

Salaries, Wages etc.
Administration Expenses
Stores, Materials and Services
University E.M.R. & Experimental Agreements
Reactor Support

	1963/4	1964/5	1965/6	1966/7	1967/8	1968/9
	1.27	1.39	1.41	1.43	1.45	1.47
	.13	.15	.16	.16	.16	.16
	1.88	1.95	2.00	2.10	2.20	2.30
	.18	.25	.30	.30	.30	.30
	.10	.16	.25	.30	.35	.40*
	3.56	3.90	4.12	4.29	4.46	4.63
	.06	.08	.10	.12	.14	.18
	3.50	3.82	4.02	4.17	4.32	4.45

Less Costs attributable to the Atlas Laboratory

Receipts

Staff Numbers

Staff in post at 31st March

	1963/4	1964/5	1965/6	1966/7	1967/8	1968/9
	.14	.12	.11	.16	.16	.16
	1964	1965	1966	1967	1968	1969
	995	1022	1022	1022	1022	1022

Present Programme - Additional costs for proper exploitation of Nimrod

Salaries, Wages etc.
Administration Expenses
Stores, Materials and Services

	1963/4	1964/5	1965/6	1966/7	1967/8	1968/9
			.02	.05	.06	.07
			-	.01	.01	.01
			.03	.07	.09	.11

Staff Numbers

Staff in post at 31st March

	1964	1965	1966	1967	1968	1969
	-	-	28	48	58	63

Future Major Schemes

Salaries, Wages, etc.
Administration Expenses
Stores, Materials and Services
University E.M.R. and Experimental Agreements

	1963/4	1964/5	1965/6	1966/7	1967/8	1968/9
		.01	.10	.15	.20	.25
		-	.01	.02	.03	.03
		.02	.15	.22	.30	.37
			.01	.05	.10	.15

Staff Numbers

Staff in post at 31st March

	1964	1965	1966	1967	1968	1969
	-	10	80	140	160	250

*plus £40,000 p.a. for minor plant

ELECTRON LABORATORY

£ Million

	Estimated Approval Date	Total Cost	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
<u>Capital Expenditure</u>								
NINA - 4 GeV E.S. (including buildings)		3.64*	.80	1.57	.68	.31		
External Electron Beam	1.4.65	.31			.01	.14	.15	.01
Physics Apparatus		-		.01	.03	.14	.30	.40
NINA Development	1.4.67	1.00					.01	.01
Storage Rings	1.4.68	3.00						
Hostel	1.4.64	.10		.05	.05			.01
Minor Works and Plant	-	-	.11	.18	.15	.15	.15	.15
			.91	1.81	.92	.74	.61	.58
<u>Non-Capital Expenditure</u>								
Salaries, Wages etc.			.09	.24	.30	.35	.40	.41
Administration, Expenses			.01	.03	.04	.05	.06	.06
Stores, Materials & Services			.09	.25	.31	.35	.40	.42
E.M.R.			.02	.04	.05	.05	.05	.06
			.21	.56	.70	.80	.91	.95
<u>Receipts</u>			-	-	-	-	-	-
<u>Summary</u>								
Capital Expenditure			.91	1.81	.92	.74	.61	.58
Non-Capital Expenditure			.21	.56	.70	.80	.91	.95
Net Expenditure before Shadow Cut			1.12	2.37	1.62	1.54	1.52	1.53
Staff Numbers			1963	1964	1965	1966	1967	1968
Staff in post 31st March			40	143	183	204	240	240

* It has been assumed that site work will start by 1.4.63.

N.I.R.N.S.

ATLAS COMPUTER LABORATORY

£ Million

	Est. Approval Date	Total Cost	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
Capital Expenditure								
Computer (including development and buildings)	-	3.33	.94*	1.01*	.54*	.18*	-	-
New Computer Stores etc.	-	-	-	-	.20	.20	.20	.20
Computer Extension	1.4.65	5.00	-	-	-	-	.01	2.25
Minor Schemes and Plant	-	-	.02	.02	.03	.04	.04	.05
Visual Display Output	1.4.64	.10	-	.10	-	-	-	-
			.96	1.13	.77	.42	.25	2.50
Non-Capital Expenditure								
Salaries Wages, etc.			.04	.06	.07	.08	.09	.12
Administration Expenses			.01	.01	.02	.02	.03	.04
Stores, Materials and Services			.06	.09	.14	.15	.15	.17
EMR			.05	.05	.05	.05	.05	.05
University Computer Support			.04	.04	-	-	-	-
Rutherford Laboratory overheads			.06	.08	.10	.12	.14	.18
			.26	.33	.38	.42	.46	.56
Receipts			-	.15	.70	.70	.70	.70
Summary								
Capital Expenditure			.96	1.13	.77	.42	.25	2.50
Non-Capital Expenditure			.26	.33	.38	.42	.46	.56
Deduct Receipts			1.22	1.46	1.15	.84	.71	3.06
				.15	.70	.70	.70	.70
Net Expenditure			1.22	1.31	.45	.14	.01	2.36
Staff Numbers			1963	1964	1965	1966	1967	1968
			26	39	49	55	60	90
Staff in post at 31st March								120

Schedule 8

* Provision has been made for an annual development payment of £140,000

Staff - Five Year Forecast 1963/64 to 1967/68

<u>In Post - 31st March</u>		<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
<u>R.H.E.L.</u>	Professional	320	365	380	430	470	490
	Ancillary	348	378	400	440	470	480
	Industrial	252	252	252	260	270	270
		920	995	1032	1130	1210	1240
<u>E.L.</u>	Professional	20	53	65	70	80	80
	Ancillary	10	50	70	82	100	100
	Industrial	10	40	48	52	60	40
		40	143	183	204	240	240
<u>ATLAS</u>	Professional	9	13	19	23	26	36
	Ancillary	17	23	27	29	31	48
	Industrial	-	3	3	3	3	6
		26	39	49	55	60	90
<u>TOTAL</u>	Professional	349	431	464	523	576	606
	Ancillary	375	451	497	551	601	628
	Industrial	262	295	303	315	333	336
		986	1177	1264	1389	1510	1570