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MINUTES

Thirty-fifth Meeting of the General Advisory Committee
to the U. S. Atomic Energy Commission

May 14, 15, and 16, 1953
Washington, D. C.

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FIRST SESSION
(May 14, 1953)

The Committee met in executive session at 9:30 a.m. All members, the Secretary, and Mr. Tomei were present.

The Chairman reviewed the invitation from the Joint Congressional Committee on Atomic Energy for the GAC to meet with them. He also reviewed his invitation to the Military Liaison Committee to meet with the GAC and discuss weapon carriers and light weight weapons. There was considerable discussion about the meeting with the JCAE, mainly with respect to what subjects might come up and what policies the Committee should follow in its dealings with agencies other than the AEC. It was felt that the Minutes of the GAC should not be made available to the JCAE (in line with the general policy of severely restricting circulation of the Minutes). It was also felt that the GAC should not enter into any commitment to advise or make a report to the JCAE, since the GAC advises and reports to the Commission and to the President.

Meeting with JCAE

Minutes of the GAC

Dr. Rabi called attention to Appendix C of the Minutes of the 34th Meeting (his letter to the President dated March 25, 1953) and asked if there were any objections to its classification (Secret). There was none. Dr. Rabi read the President's reply.

At 10:10 a.m. Dr. Smyth, Mr. Dean and Mr. Boyer joined the meeting.

Mr. Dean said that the Commission was confronted by real budget problems. Mr. Dodge had requested cuts in the budget which had been sent to Congress four months previously; a cut of \$165 million had been managed with no real harm to the program. Since then there had been a tendency to reduce budgeted expenditures (vs. commitments) in FY 54 and FY 55. The mobile reactor programs were under discussion for substantial reduction.

Meeting with the Commissioners and General Manager

Budget Cuts

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ANP
CVR

No firm military requirements existed for the aircraft carrier reactor, CVR, or the aircraft propulsion reactor, ANP. However, construction of the CVR reactor proper was still planned, with elimination of those features which were exclusively for carrier application. The Air Force was still interested in ANP, but the program was to be stretched out, with elimination of the flying test bed and the flat plate direct cycle power unit. The cut in the CVR program amounted to \$50 million. Dr. Rabi asked where the total cut of \$350 million had been applied; Dr. Smyth said here and there throughout the program. The possible elimination of the Portsmouth plant was discussed briefly. The AEC position was that this would be a grave mistake for the future of the program.

Ports-
mouth

Dr. Rabi mentioned the coming GAC-JCAE meeting and inquired as to the present relations between the AEC and JCAE. Mr. Dean said that there had been too little contact as yet with the revised JCAE to know, but that things seemed O.K. He said that Mr. Durham, Mr. Bricker, and Mr. Hickenlooper had recently been especially helpful to the Commission. He said that the JCAE was characterized by one real blind spot, namely with respect to the whole question of secrecy and information interchange -- they opposed giving "any information to anybody". On the Van Zandt bill (on atomic energy patent matters) he said the Commission had not analyzed it yet nor had its view been requested. It seemed to include most of the points favored by the Commission. The AEC had a bill of its own in preparation. In answer to a question from Dr. Fisk, Mr. Dean said that information was never withheld from the JCAE, that they had stockpile figures as of a year ago. He thought they might wish to discuss with the GAC the mobile reactor program and the expansion program. Dr. Smyth said that he was perfectly

Patents

ANP
CVR
SGR

happy with the ANP program "as it now stands". The CVR was now being regarded as a route to civilian power. The SGR (sodium cooled graphite moderated reactor) had been eliminated from the power program by the Bureau of the Budget, but might be considered for construction at Portsmouth to supply power for the diffusion plant.

Mr. Lewis L. Strauss joined the meeting at 10:50 a.m.

The discussion continued briefly on the general subject of budget cuts. Mr. Dean said the Administration had a stretch-out policy and hoped to balance the budget. He was worried about the serious effect of a cutback on the AEC program, which he felt should be considered as a special case.

Weapon
Matters

At 11:00 a.m. the Committee had the first of its sessions reviewing the weapon program. Those present were: Gen. K. E. Fields, Col. V. G. Huston, Dr. Paul Fine, Dr. D. F. Mastick, Dr. Norris Bradbury, Dr. Carson Mark, Dr. Herbert York, Dr. Edward Teller, and Dr. H. A. Bethe. Mr. Dean, Dr. Smyth, Mr. Boyer, and Mr. Strauss remained for this discussion.

Jpshot
Test
Results

Dr. Mark began by surveying the results of the recent weapon tests (Upshot series).

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At 12:30 p.m. this Session was adjourned for lunch.

SECOND SESSION
(May 14, 1953)

At 2:30 p.m. the Committee met with the Joint Congressional Committee Meeting in room F-88 of the Capitol. Mr. W. Sterling Cole, Chairman of the JCAE, with the JCAE presided. Others present from the JCAE and its staff were: Representative Hinshaw, Patterson, Durham; Mr. William L. Borden, Mr. Walter Hamilton, and Mr. J. K. Mansfield. Representatives Holifield and Price, and Senator Bricker entered during the meeting. All members of the GAC, the Secretary, and Mr. Tomei were present.

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DOE ARCHIVES

(Secretary's Note: The following is an abbreviated record of some of the principal topics discussed and views expressed at this meeting. A stenographic transcript of the meeting, JCAE document number 3510, is available in the files of the GAC.)

At Mr. Cole's request, Dr. Rabi began with some general remarks about the GAC -- its membership, how it operates, etc. He said that the Committee receives questions, in the fields of engineering and the physical sciences, from the Commission, receives information in the form of presentations by Commission staff, and after discussion may arrive at conclusions and recommendations which it transmits to the Commission. He mentioned that GAC members also develop information from individual visits to Commission sites, and in the course of their own normal professional activities. Besides considering questions referred to it by the Commission, the GAC may itself develop particular interest in some subject and request information from

Is the GAC kept fully advised by the AEC?

the Commission in the form of documents or presentations. JCAE members seemed quite interested in whether the GAC got complete cooperation from the AEC in regard to the information made available; and Mr. Hinshaw inquired whether the GAC had to make inquiries or whether substantially complete information was generally furnished. Dr. Rabi replied that whenever the GAC asked for information it got it, that it was very difficult to keep informed on all aspects of such a tremendous operation -- as far as practicable, he said, the GAC was kept fully advised.

Dr. Rabi said that the Committee's recommendations are embodied in reports, which go to the Chairman of the AEC after each meeting, and he mentioned the three occasions on which the Committee, on its own initiative, reported directly to the President. Mr. Cole inquired whether for any reason

GAC-
JCAE
Rela-
tionships

the GAC would not feel free to accept an assignment from the Congressional Committee or agreeable to receiving an assignment; he wondered whether there could not be a closer working relationship. In his answer Dr. Rabi said he did not know the legal ins and outs, but that he presumed that any question in an area of mutual interest could be put before the GAC by the Commission with the request that the Committee consider it and express its views.

GAC
Opinion
on AEC
Installations
and
Research

Mr. Durham asked the Committee's opinion of the Commission's installations, research work and its direction. Dr. Rabi, with similar expressions from other members, said the quality and standards are high. In comparison with other laboratories they, and especially Los Alamos, would stand very high. This matter was pursued for a while. Mr. Durham said that the Joint Committee needed such informed evaluations, and expressed himself as being greatly reassured by what he had heard.

Justifi-
cation of
Weapon
Tests

The question of weapon tests and their justification was brought up. If the tests were so uniformly successful, in the sense that the results were very close to what was expected, were the tests really needed or were they just a show? Dr. Rabi and Dr. von Neumann commented vigorously on this question. The tests, of course, do not always come out just as predicted, and they in fact furnish the basis for the next step of design (and prediction of the performance of the new design). The tests are a small price to pay in view of the great importance of atomic weapons to the national defense and security and the vast sums involved in our stockpile. Dr. Rabi mentioned the tests on the ~~SECRET~~ which may change the whole complexion of the utilization of fission weapons and make an enormous difference in the possibilities for further invention and design of weapons. The increased efficiency of utilization of fissionable material was also emphasized. The tests make possible design of improved weapons, which in

turn make possible the more efficient utilization of fissionable material; the improvements which have already occurred have probably doubled the efficiency of the fissionable material in our stockpile. The tests are absolutely a fundamental necessity and not a show.

Civil
Power

The aircraft and naval reactor cuts and their consequences were considered briefly. This led into a question whether the CVR, when stripped of its naval trappings, was the optimum route to civil power; and this, in turn, led to a lengthy discussion of the civil power program, proposed legislative changes, and patents. Mr. Murphree spoke on the lack of incentive for private enterprise and private capital to enter the field, which is a consequence of the present law, and which he viewed as very detrimental

Patents

to progress in the civil power field. Mr. Holifield seemed especially concerned by all aspects of changing the patent provisions and making technical information more widely available which would tend to confer advantage on a favored few industries, and give them a stranglehold on the atomic power industry at an early stage of its development. He seemed to be speaking in favor of government development of this field until the eventual time that it was turned over to all industries, not to a favored few who would profit by getting into the field early and turning to their own advantage developments which had been paid for with taxpayers' money in Commission laboratories.

Subsidy
of
Power
Develop-
ment

Mr. Cole asked Dr. Rabi whether it was the consensus of the GAC that if the Atomic Energy Act were changed appropriately private capital would come into the field in amount sufficient to develop it without Federal assistance. Dr. Rabi doubted there was any consensus, but said his view was that subsidy would be necessary as far as the near future was concerned. He described

Power
Only

his suggestion that the Government name a locality where nuclear power would be particularly desirable, open bidding to competitive industrial groups, and be obligated to accept the power for the time interval stated at the lowest competitive price. There was considerable discussion of single purpose (power only) versus double purpose (power plus plutonium) as the best route to economical civil power. Dr. Rabi developed the single purpose approach, saying that one should aim for the most efficient method of accomplishing the desired result, and that the dual purpose approach involved several features, e.g. chemical processing, which would tend to lead the design away from the target into side issues. With the competitive bidding plan he suggested earlier a company could of course make its power bid on a double purpose basis. If it made the right international and political forecast it could sell its plutonium; if it didn't, it couldn't.

Power
plus
Pluto-
nium

Dr. Wigner, "speaking as a dual purpose man", said that in the difficult transition from laboratory to plant scale competition is needed, and the incentive to do as well as possible. New blood is needed. But, if private companies are to enter the field soon they will need help and incentive. There are many possible ways of supplying this help and incentive, among which is Dr. Rabi's guaranteed fixed price for power. A guaranteed plutonium price is another; and, since plutonium will remain important and useful for the national defense for a long time to come, Dr. Wigner did not see anything wrong with guaranteeing plutonium purchase and price. Furthermore, dual purpose is a common experience in industry; most industrial establishments have several products which in some ways hamper and in other ways help each other's production.

Mr. Cole asked again whether it was the view of the GAC that some subsidy was necessary. Dr. Rabi said that its view would be that it didn't really know, that the chief difficulty had been to see a set of circumstances under which it would pay private capital to come into the business.

US-USSR Competition in World Opinion

Proposal to give Experimental Reactors outside the US

Mr. Cole asked what were the thoughts of the GAC on the possibility that the USSR might announce the successful development of civil power before the US. Dr. Rabi said it had been a constant source of worry to the GAC that Russia might get the jump on us in various ways in the international field, e.g. by such an announcement, or by proferring isotopes or experimental reactors. He quoted from the Chairman's report of the 34th Meeting of the GAC the section on the Technical Cooperation Program including the proposal that the US offer to make experimental reactors available to certain friendly countries. A Russian announcement of success in achieving economic nuclear power might not be too serious in itself because it would be skeptically received. However, if they would exhibit their development to foreigners and prove their contention, it would be of great moment indeed.

Pace of Russian Atomic Weapon Program

There was some discussion of the pace of Russian atom tests. Several members of the GAC said the pace seemed about normal, there was no reason to think that the Russians were being held back by shortage of materials, for example. Dr. Fisk cited experience of the past war, that the Russians did not appreciably lag us in producing and improving weapons in which they had great interest.

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Mr. Hinshaw asked about a shortcut to the H-bomb and whether the Russians might have hit on it. It developed that what he had in mind was "some of these various projects that have been going on at Livermore" involving mixed fission and fusion. Dr. Rabi said that radiation implosion will make a great difference in weapon development, that both Livermore and Los Alamos were pursuing this line, and that in the Nevada tests those by Los Alamos were very encouraging, those by Livermore very instructive. Dr. von Neumann said it was quite unlikely that anyone would start with such advanced designs, without going through the stages of development that the US went through.

Patents The discussion now returned for a time to the question of patents; Mr. Cole was particularly interested in whether anything in the present system encouraged the withholding of discoveries from the government, for the purpose of eventual private gain. Various GAC members, also Mr. Holifield, thought this very unlikely.

As a closing question, Mr. Cole asked whether the GAC had any criticism to make of AEC policies, practices, and programs. Dr. Rabi replied that the Committee had no profound dissatisfaction, although "we all wish we had been wiser earlier". The program has gone very well, with phenomenal progress in weapons. If the expansion program had been foreseen earlier it might have been done cheaper. The prospects seem bright, especially in weapons. The reactor program is settling down and taking on realistic form.

At this point Mr. Holifield inquired whether the GAC participated in the choice of the CVR design. Dr. Rabi said he didn't think so, but that the only doubts the Committee may have had were on the firmness of

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the military requirement, doubts which were now confirmed. Mr. Cole pointed out that the requirement had not been withdrawn, only the urgency.

At 5:00 p.m. the meeting was concluded, with expressions of thanks, pleasure, and of friendliness to the idea of having such meetings in the future, by the chairmen of the JCAE and the GAC.

Weapon
Matters

The members of the GAC returned to the AEC building and there met at 5:45 p.m. with: Dr. Bradbury, Dr. Mark, Dr. Bethe, Dr. York, Dr. Fine, Col. Huston, Dr. Teller, and Gen. Fields. All members of the Committee, the Secretary, and Mr. Tomei were present. Dr. Smyth and Mr. Zuckert joined the meeting a little later.

The rest of the session was largely devoted to comments by Dr. Bethe on various weapon matters.

Small
Weapons

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There has been little evidence of military interest in the 22" weapon. At this point Gen. Fields said that a requirement had just been received showing increased interest in the 22" weapon and a slackening interest in the 45".

Another question is how to have a small weapon and at the same time save on fissionable material, for applications involving large numbers of weapons, e.g. air defense. The Nike ground-to-air missile would not require a big yield; ~~SECRET~~ has been considered. It would be of interest to see how little fissionable material could be used with the

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DOE ARCHIVES

Still smaller diameters have been considered. Dr. Mark mentioned a Los Alamos study on a 12-14" diameter device, which according to calculation might give about [REDACTED]

Lithium-6, Dr. Bethe continued, is useful mainly for large weapons, Lithium-6 and for all thermonuclear devices. Lithium-7 won't work because it doesn't give tritium. The threshold for $\text{Li}^7\text{-n,nT}$ is 3-4 Mev and the reaction probably cannot compete with the slowing down of the fast neutrons. Dr. Bradbury said that one of the objects of Castle is to see what normal lithium will do.

Dr. Bethe said there are three devices in which calculations say Li-6 is of interest: [REDACTED]

In [REDACTED] the question is whether the thermonuclear reaction will propagate in LiD. According to Matterhorn, propagation seems reasonably well assured at [REDACTED] and at diameters usually considered little is to be gained by greater enrichment. (With high concentration of Li-6 the diameter of the [REDACTED] might be reduced enough to save [REDACTED])

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At 6:55 p.m. this Session was adjourned.

THIRD SESSION
(May 14, 1953)

The Committee met at 8:40 p.m. All members except Mr. Whitman were present. Also present were the Secretary, Mr. Tomei, and the following visitors: Dr. Fine, Dr. Bradbury, Gen. Fields, Dr. York, Col. Huston, Dr. Mark, and Dr. Teller. The general subject for discussion was small weapons.

Dr. Bradbury began with some general remarks on small weapons. For

Spectrum
of Im-
plosion
Weapons

Radiation
Implosion

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Two-stage,

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Exploitation of Boosting

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Geometry

~~SECRET~~

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lithium-6 might be required.

In general, Dr. Teller felt, lithium-6 should be produced in amounts
Li-6 of the same order as or alloy, on a weight basis, perhaps on an equal
Production weight basis or perhaps 1/2 as much Li-6.

This Session was adjourned at 10:00 p.m.

FOURTH SESSION

(May 15, 1953)

The Committee met in executive session at 9:10 a.m. All members, the Secretary, and Mr. Tomei were present.

The conversation was confined to remarks about the meeting with the JCAE, and to the general question of patents. Dr. Buckley said the whole patent situation would be a mess until secrecy is lifted, that the present Act is about as good as can be done without declassification. Mr. Murphree said that nevertheless many private industries want improvements in the patent provisions of the law. Various points of view were exchanged, but no conclusions were reached.

At 9:40 a.m. Dr. T. H. Johnson joined the meeting to report on the high energy accelerator situation and university contract policy. Dr. Smyth was also present.

Dr. Johnson mentioned the study groups at BNL, Harvard, MIT, and Princeton. He said that the Midwest group had a tentative proposal, 20

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High Energy Accelerator Situation involving about 26 people, to make a preliminary study. This effort would center at the University of Chicago, under the Stagg Field stands. It would cost about 400,000/year. Sentiment favored a site, for the actual machine, near the University of Wisconsin campus. The Madison site was preferred over ANL apparently because the scientists were disturbed by the security measures and other red tape at Argonne and by the unattractive living conditions. Dr. Rabi was somewhat concerned by the number of different study contracts, feeling it was odd to tackle a unified problem like this with four or five distinct groups. The matter of site preference gave rise to some discussion. Some felt it would be a pity not to put it at Argonne because the Laboratory needs a shot in the arm; specifically it might stimulate university cooperation which has never worked well at ANL. An opposite opinion was based on the belief that Argonne would always be a sensitive security area, and it would just be buying trouble to put an important unclassified research tool there.

This led into a conversation about the quality of the laboratory and its work. Dr. Wigner brought up the general idea of sabbatical leaves for the laboratory directors (say every 4 or 5 years). The possibility of rotation of directors was mentioned. Dr. Smyth said the Commission had thought of rotating senior people in and out of Washington.

At 10:10 a.m. Dr. Johnson and Dr. Smyth left; and the Committee met with Mr. Dean and Dr. Hafstad. The topic for consideration was the request from the Belgians for reactor information. Dr. Smyth, Gen. Fields, Mr. Boyer and Mr. Francis J. McCarthy entered during the discussion.

Mr. Dean said that the original agreement with Belgium, entered into before the Act of 1946, provided that when atomic energy became useful fo

Belgian
Request
for
Reactor
Tech-
nology
Informa-
tion

industrial purposes, Belgium would be "treated as a partner". The agreement had the force of a treaty. The Act prohibits the release of information which would be necessary to fulfil the agreement. The agreement is to be renegotiated. Belgium wants an across the board interchange of information in the field of power reactors. This reflects a natural interest; Belgium is a high cost fuel country, we get their uranium, they are interested in power. Similar developments may be anticipated in Canada, South Africa, and Australia. In reply to an AEC inquiry the Belgians have submitted a detailed and lengthy list of items of information in the field of reactor technology which they want. Mr. Dean phrased the question to the GAC as "in view of our ore supply and of our previous commitment, and in consideration of national security and broad national policy, what is our obligation and what should we do".

Under section 10 of the Act, two certifications are required as necessary conditions for information exchange, (1) advantage to the United States, and (2) adequacy of security provisions in the other country. The Belgian security situation is being reviewed and the Commission will probably be able to make the certification. The request might be handle-able under section 10, but it is really much too broad.

Dr. Hafstad proposed that we give the Belgians a block of about 3/4 of the requested information, and "reduce its classification to something like military confidential, thus giving our own program a shot in the arm". Mr. Dean and others pointed out that too much declassification of the information exchanged would have serious political consequences in making the Belgians feel cheated. There was a great deal of discussion on the matter, but no conclusions were reached at this time.

Proposal
to Down-
grade
Classi-
fication
on Belgian
Items

At 10:40 a.m. the Committee met with Mr. Boyer, Mr. Dean, Mr. Zuckert, Dr. Smyth and Mr. McCarthy to consider the budget cuts.

Budget
Cuts

Mr. Boyer surveyed the situation in terms of a table listing budget items and cuts as of May 14, 1953. The Truman budget for FY 54 was \$1.5 billion. The figure was now down to about \$1.0 billion. The latest cut by the Bureau of the Budget, totalled about \$280 million. The cuts had no effect on the Portsmouth operation. Mr. Boyer said that the Commission planned to appeal to Mr. Dodge, Director of the Bureau of the Budget, for restoration of all but \$37 million of this, but was not very optimistic. Especially deplored were the cuts which had the effect of:

- (a) holding Los Alamos to its 1953 level
- (b) eliminating the CR&D effort on fast breeder development (while continuing some support of MTA)
- (c) cutting out Hanford improvements
- (d) reducing Project Whitney

Physical research was also to be held to the 1953 dollar level.

There were numerous expressions of feeling by GAC members that the cuts were very unfortunate. Dr. Rabi observed, however, that one has to go back to what the military requirements are in reaching conclusions about the appropriateness of the cuts. Dr. Smyth said that in that sense the entire discussion was unrealistic, since one did not know what the military requirements were going to be.

Dollar
level for
the Sup-
port of
Basic
Research
and
Development

Mr. Dean said that one of the toughest problems the Commission had was in fixing the dollar level for the support of basic research and development. Dr. Libby said you see how many good men you have and keep them all busy. Dr. Buckley demurred, as far as industrial laboratories are concerned, but said that basic research was the last thing to cut.

Mr. Dean said that the GAC might be helpful in this matter at a later point, after the Commission had met with the House Appropriations Committee, at the Senate hearings when things would be more definite and in the open.

At 11:50 a.m. Mr. McCarthy and Dr. Hafstad left the meeting.

Commenting on the meeting with the Military Liaison Committee, Mr. Dean said the MLC was a very able group of officers. However, they were not in a position to speak frankly or authoritatively for themselves or their services, and hence they were a frustrated group. This fact had had a very bad effect on the relations between the Commission and the DOD.

At 12:00 o'clock all visitors except Dr. Smyth left the meeting. For Dr. Smyth's benefit Dr. von Neumann reviewed the session of the previous evening. He said that Teller's [redacted] device was expensive in fissionable material, and one should be skeptical about its utility. He felt the [redacted] would work but was uncertain which was the optimum modification; about the [redacted] one could not be confident, it was a quite speculative venture.

Dr. Rabi summarized the character of the session by saying it concerned what you would do with an abundant supply of fissionable material, but there were no new ideas. Dr. Libby took exception, saying there had been quite a few new ideas, e.g. [redacted]

At 12:30 p.m. this Session was adjourned.

FIFTH SESSION
(May 15, 1953)

The Committee met in executive session at 1:45 p.m. All members, the Secretary, and Mr. Tomei were present. There was a short conversation about weapons before the Military Liaison Committee joined the meeting at 1:55 p.m.

Meeting
with the
MLC

The MLC representatives present were: Mr. Robert LeBaron, Brig. Gen. H. McK. Roper, Brig. Gen. K. F. Hertford, Rear Adm. G. C. Wright, Capt. J. S. Russell, Maj. Gen. H. G. Bunker, Maj. Gen. J. E. Briggs, Brig. Gen. A. R. Luedecke, Capt. R. P. Hunter, Lt. Col. M. L. Shoss, Lt. Col. C. E. Carson. Brig. Gen. Fields was also present. Mr. Tomei left this meeting at 2:15 p.m.

Dr. Rabi expressed pleasure at the renewing of collaboration between the GAC and MLC; Mr. LeBaron replied in kind; and the members of the committees were introduced. Captain Russell then took charge of an MLC presentation on the plans of the services for using atomic weapons.

The Army
and Atomic
Weapons

Gen. Roper said that the Army has less capability than the other services at present for using atomic weapons. He mentioned the number of 280 mm gun weapons and guns, and battalions employing them, which would be operational by summer '53. The Honest John Rocket, with same range as the gun, should be operational by spring '54, and, next, the Corporal missile, 75 mile range, should have operational capability by spring '54. For the future the Army should take advantage of any possibility that develops. An 8" diameter weapon which could be fired from the 8" howitzers, of which the Army has great store, would be very useful and psychologically advantageous. An atomic demolition charge is needed.

General Hertford said an important problem in the planning is to look ahead and make a proper balance between atomic and conventional weapon types. We can't keep going with a requirement for everything. He mentioned the LaCrosse guided missile, which carries a [REDACTED] warhead [REDACTED] miles. A [REDACTED] warhead, if it existed, might be carried by this. A diameter of up to 14" might be acceptable.

Dr. Rabi inquired how Soviet possession of atomic weapons reflects back on our own tactics. General Roper said "it does not decrease our manpower requirements", and that the necessity of dispersing troops leads to the necessity of maintaining fine communications in order to maintain control. We must have better communications.

At this point Mr. LeBaron interpolated some remarks. Boosting gun weapons "with deuterium" and radiation implosion are helping to get away from the [REDACTED] He said that Mr. Wilson's attitude is "what have we got that we can actually operate today", that the basic problem in the DOD at present is to get its house in order and put on an operational basis.

The Navy and Atomic Weapons to have general and local sea supremacy -- are threatened by (1) Russian naval surface forces, (2) Russian submarines (6½ times as many as Germany had at the start of World War II), and (3) Russian air forces, which are a very serious threat. Ships at sea must have air cover, and it will be necessary to strike heavily at air bases near the sea routes. The Navy likes the smaller bombs, and is interested in various types of delivery, dive and toss bombing, masthead bombing, and guided missiles. With respect to Navy guided missile development he mentioned: Regulus,

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essentially an unpiloted fighter aircraft with radar guidance, launching from cruiser, carrier, or submarine; and Talos, a ground-to-air, [redacted] carrying a Mkl2 warhead.

Admiral Wright amplified the picture of the Russian submarine threat. There were several great advances near the end of World War II, all made by Germans, and hence all now available to the Russians: snorkel, high capacity battery, higher speeds, homing torpedoes. The US nuclear-powered submarines Nautilus and Seawolf should become operational by April '54 and 1955 respectively. They will be able to cruise submerged at [redacted] for a month. He mentioned the Navy's interest in antisubmarine weapons. The "Alias Betty" bomb is a TX-7 to be dropped from helicopter or blimp at 2,000 ft; it should have a [redacted] lethal radius. Two other devices are Asroc for surface delivery and Astor, a high speed torpedo.

The Air Force and Atomic Weapons
General Briggs directed his remarks first to the increasing delivery capability of the Air Force. He mentioned as delivery airplanes the B29, B36, B45, B47, B50, B52, also the B57, and Fighter 105. The B52 will carry all the larger weapons. Four guided missiles are: Matador [redacted] range), Rascal (air-to-ground), Bomarc (antiaircraft or air-to-ground), Snark [redacted] range). General Briggs pointed out that the development cycle for aircraft is 8-10 years, about twice that for atomic weapons. Hence it is very desirable to get good, and forward looking, estimates of what future weapons can be like, if the carriers are to keep up with weapon development.

The Air Force is very pleased by the thermonuclear weapon development and the schedule for thermonuclear weapons. They are making preparations, including [redacted] at air bases, to be able to deliver the emergency capability units. Thirty-six B36's are being modified for delivery of thermonuclear weapons. He emphasized the need of simplifying the requirements for supporting facilities, and also for reducing the weight of the weapon.

With respect to long range planning, the Air Force is attempting to integrate its and the AEC's capabilities in the wedding of planes and bombs. The Air Force would like to see less conservatism in estimates on weapons.

With respect to the proper level of production of atomic weapons it was plain that none of the MLC members thought the present rate to be great enough, or favored cutting back Portsmouth. General Briggs said that each of the services could expend the entire stockpile surprisingly fast and not complete its job. Captain Russell said that the Navy would like to have [redacted] atomic depth bombs right now; he estimated that in a 24-month antisubmarine campaign against the Russians atomic weapons could save \$3 billion.

von
Neumann
Summer
Study
Proposal

The discussion now returned to long range planning and the need for a bolder study of weapon possibilities. Dr. von Neumann was asked to present his proposal that such a study be carried out as a summer project under DOD auspices. He went over the proposal, as previously discussed in the GAC. Mr. LeBaron commented that the MLC had had studies like that, that indeed he had considered it a personal responsibility to look after such matters; he would be happy to show the file of letters addressed to

the Secretary of Defense, etc. The study would be fine, but there is probably no clean-cut answer, things are changing so fast. However, it would be a good thing to take another look at the question. The best way to do it is not quite clear; it might very naturally fall to the MLC. It would be most important to foresee the route to implementation of such a study. After some further discussion of the matter it was agreed that Dr. Rabi and Mr. LeBaron together would review it later in detail.

Dr. Rabi asked for some general comment on the weapon tests, particularly on the ~~_____~~ and the possibility it opened of getting away from in-flight-insertion. The MLC exhibited sharp interest in this possibility as it was described to them by Dr. Rabi.

The meeting with the MLC was concluded at 4:10 p.m., and there was a short break. At 4:30 p.m. the Committee reconvened in executive session. Dr. Warner was absent.

University Contract Policy Since Dr. Johnson had not had the opportunity of reporting his latest proposal for a university contract policy, the Chairman reviewed what Dr. Johnson had told him before the meeting. It was essentially proposed that the form of the contracts be changed so that they contained no overhead statement, and there would be no auditing with respect to overhead. The university would state its contribution in its application. The scientific report would constitute fulfillment of the contract.

Dr. Libby brought up the question of having the appointment of the Director of the Research Division on a rotating basis. The Committee did not agree that rotation was a good general principle. There was, however

strong interest, especially on the parts of Dr. von Neumann and Dr. Libby, in the matter of a successor to Dr. Johnson.

Belgian
Request

The Committee devoted considerable time to studying the items of reactor information requested by the Belgians. The Chairman suggested that the Committee consider each item in the light of (1) how we might be affected security-wise, (2) the effect on US interest in decreasing the advantage of our competitive position in the nuclear power field. Dr. Fisk suggested phrasing the questions as follows: (1) what has it cost the US to get the answers, (2) what potential value these answers have to the Belgians. The items were gone over from one or more of these points of view. It became apparent that this approach was difficult and not very productive. Dr. von Neumann asked how, with ordinary standards of honesty, the Committee could recommend anything but the fulfillment of the firm Executive promise.

Counter-
proposal
to
Belgian
Request

Dr. Libby recalled a suggestion of Dr. Beckerley, who had said that the Belgians didn't know what they were getting into, that they would be satisfied with a small reactor, and that the best course of action would be not to answer their request for specific information but to offer them a particular pile design. This suggestion was considered pro and con. At first it was felt that this approach would not satisfy the Belgians. However, the Committee came to believe that it made considerable sense, from both the US and Belgian points of view. It was decided to suggest to the Commission that the Belgian request be countered with a proposal to give them design data on one of our own power reactors. The particular reactor design should not require materials which are not available to the Belgians. (Appendix B, item 7)

This Session was adjourned at 5:30 p.m.

SIXTH SESSION
(May 16, 1953)

The meeting was called to order at 9:40 a.m., with all members in attendance except Mr. Whitman, who joined the meeting at 10:55 a.m. The Secretary and Mr. Tomei were present.

(Secretary's Note: The entire morning was spent in executive session. It had been previously agreed to move the last three items on the Tentative Schedule, Appendix A, to 1:30 p.m., 2:00 p.m., and 3:00 p.m.)

There was some discussion about future meetings with the MLC, whether these should be on-a regular basis, perhaps twice a year. The Chairman, referring to the excellent impedance match between the GAC and the AEC, said it would be unfortunate to harm this by trying to do too much business with the MLC; and the question was left at that.

Next, Dr. Wigner raised a basic question about the reactor program, namely whether the various alternative paths of reactor development were Bases for well considered before decisions were taken. For example in the aircraft Decisions in reactor program the direct air cycle (GE-Lockland) and supercritical Reactor Program water (Pratt and Whitney) designs could be justified only under diametrically opposite assumptions, either that transfer of the heat to the air is the most difficult step and a real difficulty, or that it is easy. He was very doubtful about the decisions to continue the CVR reactor as a route to civil power and to discontinue SGR. Although he himself was inclined toward the water system rather than the sodium system, he thought this decision might be going too far. There is plenty of water reactor work being done. He suggested that the situation should be reviewed, not by a group new to the program (one of the troubles in the reactor business)

but by a competent and unbiased one. Du Pont's "Long Range Atomic Energy Group" might be a good one for the purpose.

Among the thoughts expressed in the discussion of this question were the following:

Many comparisons have been made and presented to the GAC.

But, the analyses have largely been made by interested groups, i.e. protagonists of particular designs.

It is doubtful whether the art is advanced enough for comparisons.

It is quite doubtful whether the Commission should build any reactor which is not for a military purpose. There are many better things to keep in the budget than these reactors.

There may be other background, e.g. Navy interest in future use, for the choice to continue CVR.

It is very unfortunate that adequate documentation on this choice has not been put before the Committee.

The Committee should request that comparative studies of direct cycle and supercritical water aircraft reactor systems be put before it.

It was agreed to inform the Commission that the GAC was not clear on the basis for choosing to build the CVR reactor nor was it clear on the basis of the present form of the aircraft program, and that it would like to see comparative technical studies of a thorough and objective character on these questions. (Appendix B, item 2)

The next subject considered was patents, with particular reference to the patent provisions of the Atomic Energy Act. Mr. Murphree and Dr. Buckley took leading parts in the discussion.

Among the thoughts expressed were the following:

Patent Questions - The Act is unclear in section 11(a)(1). Does "for a military weapon" modify everything before it, e.g. does this provision permit a patent for the production of fissionable material which is not for military purposes?

This is an important discouragement to private reactor development, since any pile produces fissionable material, and it means you can't get patents on your development work.

However, a company may have other objectives than to improve its patent position.

It does very definitely not prohibit patents on civil power.

The Act certainly requires clarification on what sort of inventions in the field are patentable.

It is an important question whether there should be compulsory licensing of patents in the field of atomic energy.

Compulsory licensing is bad in general for the patent system, but under secrecy it is almost a practical necessity.

There probably should be compulsory licensing for a limited number of years.

A much more germane and appropriate question for the GAC to ask is how is the Act working. What basic patents have been issued in the field of reactor technology?

In 11(a)(3) the 60-day disclosure requirement is a violation of fundamental human rights and unconstitutional. Disclosure of what is in one's mind cannot be compelled. The intent was apparently that disclosure must be made if one is to benefit by a patent.

It is doubtful that the Commission should have the right to condemn a patent, as long as there is compulsory licensing. The Commission must have this right so it can move quickly in the public interest.

The "cost to the owner" standard for determining reasonable royalty fee is irrelevant, unjust, and unworkable. Cost is not a proper element, has nothing to do with value, and often cannot be determined. But, it permits the Commission to take costs into account. The question is: which way round is the purpose -- to protect the inventor or to rob him?

Mr. Murphree summarized his position in the following terms: (1) If the law does not now permit patents on the production of fissionable material, it should be modified so that it does in order to stimulate research and development. (2) Although fundamentally against compulsory licensing, he favored it for the time being.

It was agreed that the Committee needed more information on the patent provisions of the Atomic Energy Act, and at its next meeting should meet with the Commission's General Counsel and Patent Counsel to discuss these matters. (Appendix B, item 3)

Approval
of Minutes
of 34th
Meeting

On Dr. Warner's motion, seconded by Dr. Libby, the Minutes of the Thirty-fourth Meeting were accepted as submitted.

It was agreed to have the next meeting on August 17, 18, and 19.

The meeting would be either in Washington or in Los Alamos (preferably the latter) depending on what had come up.

Site Visits
by Research
Sub-
committee

Referring to the fact that the Chairman had urged the Research Subcommittee to visit and study the research at AEC installations, Dr. Libby

announced a program of visits to AEC sites. He requested individuals to make visits according to the following plan.

	<u>Physics and Calculators</u>	<u>Chemistry and Metallurgy</u>
Brookhaven	Fisk	Not required
Oak Ridge	Wigner or Fisk	Whitman or Libby
Los Alamos	von Neumann, Wigner	Whitman
Argonne	von Neumann	Libby
UCRL	von Neumann, Wigner	
Whitney	von Neumann, Wigner	Libby
Knolls	Rabi	Warner
New Brunswick		Dodson
Hanford		Warner
Idaho		Warner
Ames		Warner

New York University (computer) and Battelle were also mentioned for possible visits. Dr. Libby said he hoped the Subcommittee could get together at the 36th Meeting of the GAC to consider the impressions reached on these visits.

Security Clearance Procedures

Next, the Chairman proposed for discussion the question of security clearances. He expressed his concern and that of many people in the National Laboratories over the slowness and difficulty of clearance (or "security approval") for unclassified work. This is especially irksome in cases of individuals who have some derogatory information in their records but who might contribute greatly to an unclassified program. A fundamental flaw in the present system is that there is no mechanism through

which the judgment of those really responsible for the research program can be brought to bear on these problems. Dr. Rabi set forth a proposal, for the purpose of discussion, to rectify this aspect of the situation. The proposal was that in questionable cases, where classified work is not involved, the Laboratory Director be permitted, in fact asked, to see the dossier and be asked for suggestions. If he felt the man would be a vital asset, he should be permitted to make suggestions as to how to handle the particular case in his organization. The intent of such a proposal would be to remedy the fact that clearance responsibility and authority are now completely separated from the operating groups, and to bring the positive side into consideration. The Committee agreed that this was a point on which more study would be appropriate, and that the Chairman should put the matter to the Commission in this way. (Appendix B, item 4)

Budget
Cuts

The Chairman next inquired whether the Committee wished to take any stand on the budget and program information which had been put before it by the Commissioners and General Manager. Dr. Libby, comparing the \$4.6 million cut in Physical Research and the \$5 million cut in the bevatron, said if there was a choice, he would choose to cut the bevatron; Dr. Warner agreed. Dr. Rabi did not agree, on the ground that research is more flexible, while to cut out the other would be closing a door. The GAC should not weaken the position on any research item and should fight very strongly for both. The Committee considered whether it could unanimously agree on what to cut out first, if something had to be cut out. The CR&D breeder project seemed to be a favorite contender for this designation. Dr. Wigner said that one difficulty in the reactor business has been the

tendency always to bring in a new company. Dr. Rabi said there were historical reasons for bringing in CR&D and that the Commission feels obligated to maintain that group. Dr. Buckley said firmly that he did not at all agree that this was a valid obligation. It was also brought up that the quality of the CR&D organization was not known to be first class. Dr. Rabi said that he would rather defend physical research and strong focussing machines than CR&D, and the Committee agreed. It also agreed that the two other most serious cuts were those in the Hanford reactor improvement program and in Los Alamos and Whitney operations. (Appendix B, item 1)

Mr. Murphree said that from now on if one is going to cut the budget he will have to drop things rather than go on a stretch-out basis. Dr. Wigner observed that it is surely better to build the CVR than nothing, but that the Commission's decision should be on a sound basis and that the GAC was ignorant of what was the basis.

It was agreed to bring up the following points in the meeting with the Commissioners.

(1) A general complaint that documentation is not made available to the Committee in a timely fashion. (This led to consideration of whether the GAC should maintain a staff in Washington. Dr. Libby and Dr. von Neumann favored the idea; Dr. Buckley said it would be a mistake; Dr. Wigner said it is an irreversible process and the Committee should think it over very carefully.)

(2) Circulation of Revised Ground Rules. Although the General Manager's "Ground Rules for Dealing with the GAC" were revised as suggested

by the Committee it was not clear that the revised version had been circulated to the Commission staff. The GAC itself had never received a clear copy of the revised document.

(3) Director of Research. Dr. Libby was to ask about a successor to Dr. T. H. Johnson.

(4) Lithium Production. Dr. von Neumann was to report on the visit which he and Dr. Wigner had made to Oak Ridge and what they learned about lithium-6 production.

This Session was adjourned at 12:30 p.m.

SEVENTH SESSION
(May 16, 1953)

The Committee reconvened at 1:30 p.m., with all members present

Meeting
with the
Commis-
sioners
and
General
Manager

except Mr. Whitman, who joined the meeting at 2:00 p.m. The Secretary and Mr. Tomei were present. Mr. Dean, Dr. Smyth, Mr. Walter J. Williams, and Mr. Boyer were also present.

Dr. Rabi began by reviewing the meetings with the JCAE and the MLC. Next he referred to Dr. Bethe's discussion of weapon possibilities and particularly to the arguments for use of lithium-6. He said that Dr. von Neumann and Dr. Wigner had visited Oak Ridge to look into the lithium-6 production questions, and asked Dr. von Neumann to give the details about what they had learned.

Li-6
Production
Esti-
mated
Costs

Dr. von Neumann began by saying that the impression received by the GAC at its 34th Meeting (March 23 and 24, 1953) that the new plant at Oak Ridge would cost \$150 million apparently reflected an earlier state of the art, since he was informed at Oak Ridge that a 10 lb/day orex plant was now expected to cost \$20-25 million. Mr. Dean explained that the \$150

million was not an estimate but just a budget figure; and Dr. Rabi rejoined that it had caused the GAC lots of worry and that it would have been nice to have known the significance of the figure.

Information obtained by Dr. Wigner and Dr. von Neumann from Dr. Clewett is summarized in the following table.

<u>Plant</u>	<u>Production Rate (lbs Li⁶/day)</u>	<u>Starting Date</u>	<u>Plant Cost</u>
1a Elex		August 1, 1953	\$35 million
1b Elex		Later	\$50 "
2a Orex 1		May 1, 1953	\$0.7-0.8 "
2b Orex 2		September 1, 1953	\$1.8 "
2c Orex 3		In 18 months	\$20-25 "

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Dr. Weinberg had informed them that the earlier \$150 million figure for orex-3 was based on reflux by the heat process, the quoted figure on the Mg-Na process, which was invented about 8 months ago. With orex the cost/lb of Li-6 would not be much greater for 95% material than for 30% material.

Dr. von Neumann said that it looks like enough Li-6 will be available on schedule for the Castle tests, but the schedule is tight. In answer to Dr. Rabi, Mr. Dean said that the orex-3 plant is in the proposed budget for FY 54 at a figure of \$140 million.

Li-6 Cost and Value Comparison with U-235

Remarking on the cost and value of lithium-6, Dr. von Neumann said that the above figures suggest that it will cost about 1/4 as much as uranium-235, whereas even with very conservative estimates (Carson Mark) it can certainly replace uranium [REDACTED]. Very likely it can replace uranium [REDACTED]. There is clearly a large factor to spare [REDACTED] (Appendix B, item 5)

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Dr. Rabi next reviewed the Committee's deliberations on the Belgian request and the counter proposal as described above. There was some discussion about whether it would be advantageous to make enriched material available to the Belgians. Possible advantages were (a) that this would make a big and favorable impression on the Belgians and (b) that it would make them dependent on us. Disadvantages were (a) it would be hard to get remission of the Act and (b) it would probably lead to trouble.

Mr. Dean reported the latest budget developments. The Bureau of Budget Cuts and Restorations the Budget had put back allowances for: Hanford improvements, pilot plant for flat plate fuel elements, Los Alamos divisional laboratory, \$4.6 million for Whitney, \$1 million for accelerator development (out of \$5 million requested). There was no restoration of the cuts in Raw Materials (\$17 million) and the CR&D part of the fast breeder program. Ten million was cut from the test program, and it had been decided to eliminate Domino.

Justification of Physical Research The cut in Biology and Medicine was restored; that in Physical Research was not. The presentation had been deficient in the latter case; no examples of the concrete value of the program in Physical Research had been forthcoming when requested. Dr. Smyth begged the GAC to supply definite examples of items in the physical research budgets of preceding years which had resulted in savings. A number were mentioned. Dr. Warner and Dr. Buckley said it was unfair to ask for applications so soon. However, Dr. Libby volunteered to supply at least six examples to Dr. Smyth by the following Monday. (Appendix C)

Dr. Rabi next mentioned the Committee's discussions on patent questions and their relation to the development of industrial power, and its wish to discuss these questions further at the next meeting with the General Counsel and Patent Counsel.

He said that the GAC had been very pleased by the tests, and especially by the success of the [redacted] (Appendix B, item 6)

Dr. Rabi next referred to the discussion on security clearance matters, and described the suggestion for bringing the Laboratory Director into the picture in borderline cases involving only unclassified research.

Mr. Boyer said his philosophy would be to require clearance for any man if there was danger of inadvertent access. Dr. Smyth strongly disagreed with this philosophy. Mr. Boyer then said perhaps the P approval system should be thrown out. At this point Mr. Williams mentioned that in the last nine months out of 53,338 P approval requests 205 had been rejected, these mostly for assault, fraud, bad checks, and rape. He said that "if we are the least bit concerned the man goes out". He pointed out that the P approval system had been designed to help on labor problems, and not for the employment of scientists. It was with the latter, where there are bound to be associations, that the difficulties arise. Dr. Smyth spoke at some length on these problems. He felt that it was nonsensical to start from the assumption that cleared people must never come in contact with dangerous characters, and a mistake to insist that everyone you hire must be Q cleared because you happen to have some classified work going on in the area. Of course people who could not be trusted to hold their tongues should not be hired. With respect to the proposal to bring the Laboratory Directors into the P approval mechanism there was even some

proposal about P Security Approvals

past precedent indicating that this might be a good thing. Mr. Dean said that he saw no difficulty about the proposal nor any reason why it could not be adopted. There would, of course, be some situations in which the General Manager would have to make the decision.

Ground
Rules

Dr. Rabi brought up the Ground Rules, and Mr. Boyer assured him that the revised copy would be circulated.

Documen-
tation
to the
GAC

Dr. Rabi next referred to the fact that the Committee has not found itself furnished with adequate documentation and background information on important technical matters before the Commission for policy decision. He mentioned the decision to have CR&D participate in a breeder development program with ANL. He observed that although the AEC had furnished the GAC with a thick volume of the reactor technology handbook as a "paper" for the current meeting, it had not seen fit to forward such important documents as the National Security Council papers bearing on the reorientation of the reactor program and entailing major policy decisions. He said that the Committee had found itself embarrassingly uninformed before the JCAE when asked about the CVR and ANP decisions. He was sure that the failure of the Commission to keep the Committee informed on such important matters was inadvertent, but it was most unfortunate.

Mr. Dean assured the Committee that there was certainly no intention to keep information from it and that the difficulty and remedy were probably just administrative matters. He promised that the Commission would set up a better channel for bringing information and documents to the attention of the Committee; and suggested that this could be put in the office of the AEC Secretariat where a running list of documents could be kept and kept up to date by frequent checking with the General Manager and Chairman of the Commission.

Dr. Rabi next turned to the Committee's questions and doubts about the decisions in the reactor development program as discussed in the preceding executive session. He first referred to the CVR decision, saying that this carried a military aura and asking whether the various possibilities for going toward civil power had been given a thorough comparative examination. Dr. Smyth answered that the decision was the result of a series of separate actions and an attempt to salvage what they could of the program. Mr. Dean added that the sodium-graphite design had had high level consideration two or three months ago in connection with NSC considerations and was definitely out for FY 1954 -- leaving the CVR. Dr. Smyth said that there was no discussion at that point of CVR and ANP.

Mr. Dean said that since the military requirements had been knocked out, it was necessary to reevaluate the various mobile reactors in terms of the reactor development program. ANP was to go forward strictly as a reactor development program without the goal of a flying test bed. Dr. Wigner brought out his concern about the two contradictory lines of technical effort in this program, and said that, while the two ends of the spectrum (referring to the question of heat transfer to the air) might turn out to be the most attractive possibilities, this could not be accepted without a thorough study of the technical basis for the conclusion and an evaluation of how well the technical suppositions were justified. Dr. Smyth mentioned that the protagonists of the direct cycle unit with wire type fuel elements believed that this design might really be a useful reactor for the ultimate job and was not merely a means of getting something into the air as soon as possible.

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Paraphrasing Dr. Wigner, Dr. Rabi said that in the aircraft reactor program there seemed to be the greatest concentration on two extremes of the technical possibilities, and that what one felt to be lacking was an overall evaluation and a concentration on what looked best. Dr. Smyth said he agreed an evaluation was proper. Mr. Dean said the situation obviously called for a complete re-evaluation of the whole program. All present agreed.

Returning to the CVR question, Mr. Dean said that the reactor would cost about \$100 million when stripped of its naval trappings, and that the Commission would have to re-evaluate the whole thing as to size, degree of naval gadgetry, etc. Dr. Rabi asked whether the intent here was to try to salvage something of the civil power program. Mr. Dean and Dr. Smyth affirmed this intent and said that the Commission would review and re-evaluate the decision to build this reactor. (Appendix B, item 2)

Dr. von Neumann brought up the subject of the Director of the Division of Research. Mr. Boyer said that Dr. Johnson did not have in mind leaving the Commission in the immediate future, would be happy to remain another year, and had been encouraged by Mr. Boyer to do so.

As a final matter, Dr. Rabi expressed to Mr. Dean the great pleasure which the Committee had had in working with him, and its hope that it had been of some help to him. Mr. Dean replied that it certainly had been of help, had been indispensable, and a great pleasure to work with. Dr. Rabi assured Mr. Dean that the members of the GAC thought that he had done a splendid job as Chairman of the Commission.

At 3:30 p.m. the visitors left, and the meeting continued in executive session. All members of the Committee were present except Dr. Wigner and Dr. Libby.

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Dr. Fisk moved that the GAC instruct its Chairman to write an official Mr. Dean letter to Mr. Dean commending him for his thoughtful, courageous, and effective leadership of the Commission throughout his term of office. Dr. Buckley seconded the motion, and all agreed. (Appendix D)

At 3:35 p.m. this last session of the 35th meeting was adjourned.

Richard W. Dodson
Secretary

Appendices (4)

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