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## REVIEW AND STATUS REPORT ON THE RESEARCH AND DEVELOPMENT PROGRAM OF THE UNITED STATES - EURATOM AGREEMENT

Remarks delivered at the afternoon session of

THE ATOMIC INDUSTRIAL FORUM MEETING - November 4, 1959  
Sheraton-Park Hotel, Washington, D. C.

by

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The United States - Euratom agreement provides for a Joint Research and Development Program. Under present legislation, it is foreseen that funds up to 100 million dollars will be provided, equally shared by the two parties. This program is managed by a Joint Research and Development Board, while the relevant contracts are negotiated and placed by each of the Commissions in its own continent.

Ten months ago, the Joint Board issued within the Community and the United States the first invitation for the submission of proposals. The interest roused in industrial circles by the Joint Program has exceeded the most optimistic forecasts. To date, we have received 375 research proposals, made up as follows:

219 European Proposals

73 American Proposals

83 Joint Proposals from American and European Proposers

These figures in themselves are significant, but call for certain comments.

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First, the large number of proposals from European industry is proof of the latter's great interest in reactors that have been developed in the United States.

Furthermore, the number of joint proposals shows the extent to which contacts have been established between American and European companies. In many cases, agreements for cooperation have been signed. It is clear that implementation of the Joint Program has intensified industrial contacts between the two continents. This was one of the major aims of the Agreement for Cooperation and it is well on the way to being realized.

Maybe that the agreements reached do not make due allowances for the fact that, since January 1, 1959, the Nuclear Common Market has been fully attained in the six countries. Intercontinental agreements must not be allowed to conflict with concentrations in Europe.

The Research and Development Program has also led to closer contacts between certain industrial companies within the Community; but this movement is not as vigorous as the Commission could wish. The Commission is, of course, aware of the difficulties inherent in any industrial agreement, particularly in the field where short-term activities are not always evident; but on several occasions, European industry has shown the Commission its anxiety to coordinate research activities, in order to reduce unintentional overlapping to a minimum and to make the best use of the facilities afforded by Europe's research laboratories. The

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Commission is endeavoring to make this cooperation as effective as possible by helping forward contacts between industries working in the same fields and having submitted proposals to the Joint Board. -

In the first months of its activities, the Joint Board has settled its working methods and categorized all the final proposals under one of five main headings:

1. Fuel Cycle
2. Reactor Technology
3. New Reactor Concepts
4. Related and Supporting R & D
5. General Studies

The breakdown of submissions by heading and origin is given in table I below:

TABLE I

<u>Heading</u>	<u>Community</u>	<u>U. S. A.</u>	<u>Joint</u>	<u>Total</u>
1. Fuel Cycle	40	44	33	117
2. Reactor Technology	48	6	34	88
3. New Reactor Concepts	2	1	11	14
4. Related and Supporting R & D	5	13	2	20
5. General Studies	2	2	0	4
<b>Total</b>	<u>97</u>	<u>66</u>	<u>80</u>	<u>243</u>

The difference between the total number (375) of proposals submitted, as given at the start of this report, and that in Table I reflects the number of

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proposals sent to the Joint Board in the form of letters of intent, or as preliminary projects.

Analysis of the proposals concerning the Fuel Cycle brings out the extent to which industry is today interested in developing uranium oxide based fuel elements and in defining and studying new zirconium based alloys. At the same time, there are several companies engaged in the development of uranium carbide based fuels. The Joint Board has received a number of projects concerning different stages of the Fuel Cycle, such as procurement of the materials, studies on their physical, chemical and thermo-dynamic properties, the technology of the fabrication of fuel elements, chemical re-processing of irradiated fuels and the treatment of active wastes.

The proposals classed under heading 2 deal with studies concerning reactor physics, the control and regulation of power in water-moderated reactors, safety precautions, the development of methods of improving the heat exchange coefficient using water and organic fluids, and the development of structural materials and ancillary equipment.

Heading 3 deals with new reactor concepts and variants of proven type reactors. This includes the research proposals on nuclear superheating, organic reactors with fluidized bed, etc. -

It should be recalled that the Joint Board is looking for two types of projects:

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1. R & D projects tied specifically to one or another of the reactors to be built under the Joint Program
2. R & D projects of a somewhat general nature related to the types of reactors expected to be selected under the Joint Program and not excluding fundamental research directed toward the improving of fuel fabrication technology, chemical processing, instrumentation, etc. without this work being tied to any one specific reactor.

For obvious reasons, the Joint Board has, up till now, been able to consider only those proposals which belong to the second type. In the comparatively short time so far available, it has been mainly engaged in evaluating proposals under the Fuel Cycle heading, to the number of 117.

To date, the Joint Board has taken the following decisions:

- a. It has rejected 34 American proposals  
9 European proposals  
2 joint proposals

or more than one-third of the total number (see Table I)

- b. It has authorized the negotiation of a contract for the following 10 projects:

- Study on uranium oxide extrusion, submitted by CICE (France)
- Diffusion of fission gases in reactor materials, submitted by the Hahn-Meitner Institut für Kernforschung (Berlin)
- Zirconium alloys containing Nb or Si, in view of their utilization in water-cooled reactors, submitted by Metallgesellschaft (Germany)

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- Diffusion of fission gases through uranium oxide and fuel element claddings, submitted by Radiation Applications (USA)
- Improved zirconium alloys, submitted by Armour Research Foundation (USA)
- Development of clad-ceramic plate fuel elements by spray-coating techniques, submitted by American Standard (USA)
- Investigation of the technical feasibility of cold extrusion of Zr-2 tubing production, submitted by American Standard (USA)
- Study of phase relationship in the uranium-carbon-oxygen system, submitted by North Carolina State College (USA)
- Steam sintering of uranium dioxide, submitted by FIAT (Italy)
- Fission gas release from  $UO_2$ , submitted by FIAT, (Italy)

In addition, as a result of their particular interest, the Joint Board has authorized, with immediate effect, the negotiation of two projects, one concerning heading 2 (reactor technology) and one concerning heading 3 (new reactor concepts):

- Boiling heat transfer and void-distribution studies with water and organic-moderator-coolants, submitted by Battelle Memorial Institute (USA)
- Study of light water-steam mixtures as reactor coolants and their applicability mainly to water moderated reactors, submitted by CISE-Ansaldo (Italy) and NDA (USA)

The present position is that three contracts are now being executed and a research worker from Euratom is taking part in the study of the project entrusted to American Standard for the development of clad-ceramic plate fuel elements

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by spray coating techniques. The contracts for the other projects referred to above will be signed shortly.

The total of work supported by the Joint Board represents a commitment of \$1,650,000; \$880,000 of it in the United States and \$765,000 in the Community.

It is further expected that in the next few days additional projects, representing a value of some 3 million dollars will be examined and, in all probability, accepted by the Joint Board.

The Joint Board will then have committed roughly \$4,650,000., representing an expenditure to be made in 1960 on projects connected with the Fuel Cycle.

The Joint Board further considers that the re-cycling of plutonium is an important item of the Joint Program. It is expected that, in the Community, research on the use of plutonium will be undertaken in the Belgian and French national centers, the only ones which at present have the necessary equipment.

Before the end of the current year, the Joint Board hopes to have initiated an important research and development program for organic moderated reactors.

Probably \$2 to \$2.5 million will be devoted to this program during its first year.

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In the field of water moderated reactors, a large part of the proposals submitted is concerned with the study of heat-exchangers, the production of special steels and methods of making pressure vessels.

As the examination of these proposals is less advanced, it is as yet difficult to make an estimate of commitments which will be undertaken in this field.

By the beginning of 1960, the Joint Board will have authorized commitments to spend \$7 or \$8 million. This sum should be compared with the authorizations of commitments foreseen by the USAEC and by Euratom, namely, \$3 million for the financial year 1958/59 and \$7 million for 1959/60 for the USAEC, i. e., \$10 million up till July 1960, and for Euratom \$5 million up till 1 January 1960. It would, therefore, seem that the rate at which commitments are being undertaken corresponds fairly well with forecasts. During 1960, the effort will be stepped up considerably. For the budget year 1960/61, USAEC foresees credit authorizations for a further \$10 million and Euratom has placed on its draft budget for 1960 credit authorizations for \$17 million.

Broadly speaking, the Joint Board hopes to be able to examine, by the end of January 1960, all the proposals now put forward.

A start will then be made with the second phase of the Joint Program, covering the study of projects concerning power reactors, and a new invitation for proposals in a more closely defined field will be issued.