

NOTE REGARDING JOINT EURATOM - U.S.  
INVITATION FOR PROPOSALS

1. Attached is a draft invitation for proposals regarding the EURATOM - U.S. Joint Nuclear Power Program which was formulated by representatives of the Euratom Commission and the United States Atomic Energy Commission. It is expected that when this invitation is put in final form it will be published in the official gazette of the European Atomic Energy Community and also will be published by the United States Atomic Energy Commission.

2. The invitation and its various attachments should be regarded as a preliminary draft and is still subject to a review and further approval by the appropriate authorities. It also is to be expected that informal discussions with industry on the program will take place. Prior to the passage of the Agreement for Cooperation and formal publication of the invitation it is expected that copies may be given to those enterprises who evidence an interest in the details of the program.

3. The invitation includes a fact sheet outlining the major details of the program. Appendix "A" is a draft short form to be employed by enterprises expressing their intention to participate in the program. Appendix "B" is still in provisional form. It will not be published at the time of the publication of the invitation but will be made available to prospective participants upon request.

4. In formulating the invitation the parties were agreed that all practicable steps must be taken by the EURATOM and the United States to encourage an equitable distribution of contracts among the maximum number of competent suppliers and, to the extent feasible, avoid an

undue concentration of contracts among a relatively few. To this end, unless specifically approved by the United States and EURATOM, proposers under the program will be expected to obtain their tenders on an "open, non-restrictive" basis. This term has been interpreted to mean that it will be expected that all eligible companies will be afforded an opportunity to respond and bid on the solicitation and that these bids shall be solicited sufficiently in advance of the closing date to allow bidders adequate opportunity to prepare and submit bids. To the extent practicable the specifications included in the solicitations should be in such terms as to permit full and free competition among all potential suppliers.

5. It should be noted that a number of the details regarding the terms of the program, including the conditions under which the benefits will be made available have still to be worked out. In addition, the nature and types of contractual arrangements to be entered into between the U.S. and EURATOM and between both of these parties with participants in the program must still be defined.

In the course of the discussions the question was raised as to whether it would be desirable to require the proposer to place a bond with the Community and the United States which would serve to guarantee that he would operate the plant for a 10-year period. This question is still to be resolved. The representatives of EURATOM believe there might be merit in requiring proposers to place a \$100,000 bond for such purposes.

6. Lastly, in view of the work that remains to be done and the probability that interested industries are apt to address many questions to the United States and EURATOM in the next few months that require a

coordinated response the representatives of the Joint Working Party are agreed that a Joint Project Selection Board should be constituted immediately. This Board would have the responsibility for affecting such coordination, for reviewing the proposals when submitted, and for making appropriate recommendations concerning selection to the Euratom Commission and the appropriate authorities in the U.S. It is understood that the final selection of projects will be contingent upon the approval of these authorities on both sides.

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DRAFT JOINT WORKING PAPER NO. 2 - INVITATION FOR PROPOSALS

INVITATION FOR PROPOSALS REGARDING UNITED STATES - EURATOM  
JOINT NUCLEAR POWER PROGRAM

The Commission of the European Atomic Energy Community (EURATOM) is prepared to receive proposals from private or governmental organizations within the Community engaged in the power industry or nuclear field who wish to participate in the joint nuclear power program that recently was formulated and reflected in the Agreement for Cooperation between the United States and EURATOM concerning Peaceful Uses of Atomic Energy. This agreement was signed on \_\_\_\_\_ and came into effect on \_\_\_\_\_. This program has as an objective the bringing into operation within the European Atomic Energy Community, of large-scale power plants using nuclear reactors of types on which research and development have been carried to an advanced stage in the United States, having a total installed capacity of approximately one million kilowatts of electricity by December 31, 1963, except that two reactors may be selected to be in operation by December 31, 1965. It is expected that the reactors involved will be brought into operation under conditions approaching the competitive range of conventional energy costs in Europe.

The nuclear power plants under the program will be built, owned, and operated by enterprises in the Community. In accordance with the Treaty establishing the European Atomic Energy

Community title to and control over the special fissionable material employed in the program will be retained by EURATOM.

Under the terms of the joint program the projects selected for participation will be eligible to receive a variety of special benefits. These will include financial guarantees for a 10-year operating period with respect to the cost and life of the fuel elements required; long-term assurance of an adequate nuclear fuel supply under terms that are analogous to those offered to domestic industry within the United States; assurance for a 10-year period of a defined market for the plutonium recovered from the reactors; long-term capital loans to cover costs associated with plant construction; and a long-term assurance by the United States that chemical reprocessing services will be available under terms comparable to those offered to licensees within the United States. It should be noted that, pursuant to the forementioned Agreement for Cooperation, specific ceilings have been placed on the total amount of nuclear fuel, to be provided, the extent of the fuel guarantees, the amount of the capital loans, and the quantity of plutonium to be purchased. These ceilings apply to the entire program, and, accordingly, projects will be evaluated as to the extent to which they draw on these resources.

The proposals for participation under the program will be jointly reviewed and selected by the Commission of the European Atomic Energy Community and the United States Atomic Energy Commission.

The criteria for acceptance of reactor projects will include a consideration of whether there is a reasonable assurance that the reactors involved can be completed by December 31, 1963, and thereafter operated for 10 years as a source of safe and reliable power; the need of EURATOM to arrive at a reasonable and equitable geographical distribution of the projects within the Community; the extent to which the project draws on funds, materials, and services available for the joint program; the extent to which the nuclear power plant involved is expected to approach conventional competitive power costs at the time of its completion, and its potential for improvement; the willingness of the prospective operator to make his facility available for research and development studies and for training purposes; the extent to which the proposal contributes to a reasonable diversity of plant types and designs; and, the extent to which the proposal contributes to a strong and competitive atomic equipment industry in the United States and the Community. Reactors now being planned or constructed in the Community will be eligible for consideration under certain conditions. Each project must, of course, be in compliance with applicable regulatory requirements of the country in which it is to be located.

Inasmuch as one of the purposes of the program will be to provide industry in Europe and the United States with important experience and certain data on capital and operating costs special

steps will be taken to assure the prompt exchange and dissemination of the information developed. The participants in the program will be required to make available data developed on designs, construction costs, operations and economics. Enterprises, however, will be free exchange information on manufacturing techniques and know-how under their own conditions.

Although the emphasis is to install as much capacity as is possible by December 31, 1963, the United States and EURATOM may come to the conclusion that it would be advisable to defer the inclusion of two reactors until a later date so that they will come into operation by December 31, 1965. If this decision is made proposals for these deferred projects will be solicited separately and at an appropriate time.

As an associated objective to the installation of the plants themselves and in order to obtain a further decrease in costs the European Atomic Energy Community and the United States Atomic Energy Commission also have established a joint 10 year research and development program centered on the reactors included in the program. This program will be aimed primarily at improving the performance of the types of reactors included in the program and at lowering fuel cycle costs. The information developed will be made available for the benefit of the respective industries in Europe and the United States. It is hoped that the enterprises operating the plants under the joint program will participate in this phase of the program by making their facilities available for research and training purposes.

Proposals for participation in the reactor program must be received by the EURATOM Commission by September 1, 1959. The EURATOM Commission will refer these proposals for joint consideration by EURATOM and the United States Atomic Energy Commission. Those who intend to submit proposals are requested to give notice to the EURATOM Commission of their interest by (45 days from day of invitation).

The details regarding the type of information desired for review, the types of assistance to be provided, the terms and conditions expected to govern participants in the program, and the criteria and prerequisites for consideration are set forth in the attached fact sheet. It should be noted that the EURATOM Commission and the United States Atomic Energy Commission reserve the right to reject any or all proposals at their discretion. In addition the terms of this invitation may be modified at any time prior to acceptance of proposals.

Prospective proposers may discuss their ideas with the staff of the EURATOM Commission and the United States Atomic Energy Commission before submitting their proposals and, indeed, they are encouraged to do so.



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FACT SHEET ON PROPOSALS FOR PARTICIPATION IN THE JOINT  
EURATOM COMMISSION-UNITED STATES POWER REACTOR PROGRAM

Submission Date for Proposals:

Proposals must be received no later than September 1, 1959.

Who May Submit Proposals:

Proposals may be submitted by any person or enterprise in the Community engaged or willing to engage in power production.

To Whom Proposals Must be Submitted:

Ten copies of each proposal should be addressed to

Euratom Commission  
51 Rue Belliard  
Brussels, Belgium

and marked: "Proposal submitted for Euratom-United States Program."

Proposals may be submitted in one of the four languages of the Community or in the English language. Submission in English will avoid translation delay.

Notification of Intent to Submit Proposals:

All parties intending to submit a proposal are requested to inform the Euratom Commission, in writing, by (45 days from issuance of invitation) and to provide the information set forth in Appendix "A". All such parties will automatically receive any additional information released in connection with the proposals under this program.

Locations of Proposed Power Reactor

Proposals must indicate the planned location of the reactor. The location must be within the Community.

Type of Proposed Power Reactor:

The proposed nuclear reactor shall be of a type on which research and development has been carried to an advanced stage in the United States. Furthermore there must be reasonable assurance that such a reactor will be reliable and safe in operation and will provide electrical energy at costs approaching the competitive range of conventional energy cost in Europe.

Any fissionable or fertile material may be used, and the reactor core may consist of several regions of differing composition.

Size of Proposed Power Reactor:

Ordinarily, it is preferred that proposals be for reactor plants having a nuclear capacity (that is, exclusive of the power contributed by any superheater using conventional fuel) of approximately 150 MWE net, or more.

Consideration may, however, be given to plants of somewhat smaller size where special justification can be made for such smaller size. Such justification should include evidence that the plant size selected, for the reactor type proposed, results in power costs which are in the range of nuclear power costs obtainable from a one reactor nuclear power plant of 150 MW capacity and which reasonably approach competitive conventional power costs.

While favorable weight will be given to plant capacity greater than 150 MWE, it is emphasized that increased requirements for materials and funds from the joint program, occasioned by very large size, will be a counterbalancing consideration. Accordingly, enterprises considering such projects may wish to give consideration

to a proposal for more limited participation in the benefits of the program.

Operation of the Power Plant:

Design and construction of the reactor shall permit operation in accordance with sound operating utility practice, and in particular as far as the permissible load variation rates, the minimum level of practical sustained power output and the total duration of stops for normal maintenance and reloading of the core are concerned.

Date of Operation of Proposed Power Reactor:

The proposal must contain reasonable assurance that the reactor can be brought into operation by December 31, 1963, and serve thereafter as a source of safe and reliable power when operated in accordance with sound utility practice.

Indication of Interest in Two Projects Which May be Deferred:

All parties who would be interested in bringing into operation, under the Euratom-U.S. program, power reactors by December 31, 1965 instead of December 31, 1963, are requested to so indicate, in writing, to the Euratom Commission by November 30, 1959.

Possible Deferral of Two Projects Under the Program:

If, in the combined judgment of the Euratom Commission and the United States Atomic Energy Commission, the program would be better served by deferring its completion until December 31, 1965, one or two reactors may be selected to be completed by that date, in which case the program to be completed by December 31, 1963, will be reduced accordingly.

If this decision is made, proposals for the deferred reactors will be solicited separately and at an appropriate time.

Eligibility of Existing Projects:

Power reactor projects now being planned or constructed in the Community are eligible for consideration under the established criteria and conditions for the program; provided, except as may otherwise be agreed, that the proposal does not relieve the manufacturers or suppliers from commitments already made.

In accordance with Article I, Paragraph A of the Agreement for Cooperation between the United States and EURATOM dated \_\_\_\_\_ the criterion requiring evaluation against other proposals may be waived.

Anticipated Date of Acceptance of Proposals:

The Euratom Commission and the United States expect to complete their review of proposals in time to reach a decision before April 1, 1960. Proposals must not be conditioned on acceptance prior to this date.

Method of Obtaining Proposal:

The proposal for participation shall be based on arrangements resulting from the solicitation, from within the Community and the United States, on an open, non-restrictive basis, of competitive tenders for the nuclear reactor, except as otherwise approved by the Euratom Commission and the United States Atomic Energy Commission.

### Alternate Proposals:

The Euratom Commission and the United States Atomic Energy Commission are interested in receiving alternate proposals for the same projects involving different manufacturers.

### Types of Assistance That May be Requested:

#### A. Fuel Cycle Guarantees

With the objective of assuring the success of the joint program, the United States Atomic Energy Commission will offer guarantees designed to limit certain financial risks associated with fuel cycles. (See Appendix "C" for details). <sup>1/</sup>

These guarantees will be extended in the form of maximum charges for fabrication of the fuel elements and minimum integrity of the fuel elements under irradiation. They will be offered only to the extent that equivalent or better guarantees are not available commercially.

The liability of the United States Atomic Energy Commission will be limited to meeting guaranteed maximum charges for fabricated fuel elements and to the adjustment of charges for fabrication, chemical reprocessing, and transportation of fuel elements when required by failure to meet guaranteed integrity.

The guarantees will provide for equitable sharing of decreases in costs realized through fuel performance in excess of guaranteed levels. The United States share not to exceed costs incurred by the United States Atomic Energy Commission under the guarantees.

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<sup>1/</sup> This Appendix to be made available at a later date.

The guarantees provided by the United States Atomic Energy Commission will be applicable to all loadings, meeting the specifications and conditions of Appendix "C", made in reactors under the joint program during ten years of operation or prior to December 31, 1973, (or December 31, 1975, for not more than two reactors selected under the program) whichever is earlier.

**B. Capital Loans**

Under the terms of the program the reactor projects selected will be eligible for special assistance in the financing of the capital costs.

(Further information will be available at a later date)

**C. Provision of Fuel and Other Special Nuclear Materials**

It is expected that the participants under the program will enter into long-term contracts with the Supply Agency of the European Atomic Energy Community which will provide them with an adequate assurance as to the availability of contained U-235 in uranium. This material will be made available to users by the Supply Agency on terms and conditions to be published as soon as possible. It should be noted that the uranium supplied may be

enriched up to 20 percent by weight in the isotope U-235. The Supply Agency will charge the user with a percentage (4% per annum<sup>1/</sup> plus administration and handling costs) of the value of the material. The fuel contract also will provide that user shall pay for burnup and losses on a current basis and shall provide for periodic settlements for the consumption of fuel for settlement upon the return of the material by the user to the Supply Agency. It is anticipated that the special nuclear material to cover the needs of the joint program will be made available by the United States to the Supply Agency acting for EURATOM under the terms of the Agreement for Cooperation.

D. Purchase of Plutonium

Under terms and conditions to be agreed the EURATOM Supply Agency will be prepared to enter into long-term contracts with reactor operators under this program under which it will reimburse these operators for the plutonium recovered from the reactors involved. No such contract shall be for a period greater than ten years of operation of such reactors or December 31, 1973 (or December 31, 1975 for not more than two reactors which may be selected on a deferred basis under the program).

E. Chemical Reprocessing

It is recognized that pending the coming into being of facilities in the Community and the United States to process fuel irradiated under the program the utilities and reactor operators

<sup>1/</sup>This percentage is based on the interest rate to be incorporated in the deferred payment arrangement outlined in Working Paper XII to be executed pursuant to Article III of the Agreement for Cooperation.

involved will require a long-term assurance that adequate facilities will be available to process their fuel. The United States Atomic Energy Commission, accordingly, will be prepared to perform, on terms and conditions to be agreed, reprocessing services with respect to any source or special nuclear material received by the European Atomic Energy Community from the United States under this program. Such reprocessing will be performed at established domestic prices in effect in the United States upon delivery of such material. It is anticipated that any withdrawal by the United States Commission of chemical reprocessing services will be based upon the availability of commercial facilities to meet requirements for such services at reasonable prices, including the requirements of projects in the joint program. The United States Atomic Energy Commission will give written notice of the non-availability of its chemical reprocessing services 12 months prior to such non-availability.



### Criteria for Acceptance of Proposals

After the date for submission of proposals, the EURATOM-U.S. will evaluate the proposals received against each other and against the following criteria:

- 1) The need of EURATOM to arrive at a reasonable geographical distribution of projects.
- 2) The extent to which the project draws on funds, materials, and services available for the joint program.
- 3) The extent to which the reactor is expected to approach conventional competitive power costs at the time of its completion, and its potential for improvement, including the plans of the operator to take advantage of this improvement.
- 4) The willingness of the operator to make his facility available for research and development studies and for training purposes and the terms and conditions of such availability.
- 5) The extent to which the proposal contributes to a reasonable diversity of plant types and designs.
- 6) The financial status and prospects of the proposer.
- 7) The extent to which there is reasonable assurance that the reactor involved can be completed by December 31, 1963.

## Other Conditions

### a. Proposals must:

- 1) Contain all of the technical, safety, financial and other information in the form and degree of detail specified in Appendix "B".<sup>1/</sup> (This Appendix will be furnished on request)
- 2) Contain a firm undertaking by the utility that a specified plant will be built. This should be evidenced by, among others, a binding commitment by a manufacturer, contingent only upon the availability of financial protection against third party liability.
- 3) Not be contingent on the award of any research and development contract under the program or the support by the United States or EURATOM of any experimental program associated with the proposal.
- 4) Contain assurance that the proposers will undertake to obtain all necessary licenses and permits and will comply with all pertinent laws, regulations and orders of appropriate authorities.
- 5) Indicate willingness to submit reports relating to the conduct of the work at such times, in such form and containing such technical, economic, financial, progress and other information as may be requested by EURATOM-U.S.
- 6) Indicate agreement that representatives of EURATOM-U.S. will be entitled to visit, at all reasonable times, the

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<sup>1/</sup> Appendix "B" will be available at a later date.

facilities, work and activities related to the project.

- 7) Indicate acceptance of the patent provisions described in Appendix "C".<sup>1/</sup> (This Appendix will be furnished on request)
- 8) Specify the terms and conditions under which the plant will be made available for research and development studies and for training purposes.

#### Security for Construction and Operation of the Power Plant

Successful proposers will have to undertake the obligation to build the plant by December 31, 1963, and to operate it for a period of 10 years. The Euratom Commission and the United States may require security that these commitments be fulfilled.

If a proposer is a subsidiary of a company or a member of an affiliate group, the principal or the group, as the case may be, may be required, jointly and severally, to guarantee full performance of the undertakings set forth in the proposal.

#### Rejection of Proposals

It should be noted that the Euratom Commission and the United States Atomic Energy Commission reserve the right to reject any or all proposals at their discretion.

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<sup>1/</sup> Appendix "C" will be available at a later date.

APPENDIX "A"

I. Identity of Proposer

Name

Address

Seat

Legal Status

II. Most Recent Financial Statement

Annual Report

Balance Sheet

Profit and Loss Account

Accountant's Report (if available)

III. Financial and/or other Relationship Between Proposer and Operator of Project, if these are different persons

IV. Brief Description of the Project Including

Location

Size of Plant (Net Electrical Capacity)

V. Details on How the Project May Be Financed

VI. Plans for the Distribution of the Electricity to be Generated

## APPENDIX "B"

### 1. Official Application

Official application from the Proposer to the Community submitted for acceptance of the proposed power plant project under the terms of the EURATOM - U.S. Agreement. The proposing party will undertake to abide by the clauses and conditions of the Agreement as well as by those of the present invitation.

### 2. Engagement

Confirmation of the formal engagement of the tendering party to construct the power plant within the stipulated time and to operate it for a period of at least ten years from the date of its entry into service in case of acceptance of the project under the terms of the Agreement.

### 3. Description of the Installation

Present all information contained in the contracts drawn up with the principal suppliers inasmuch as this information is necessary to give a clear, precise and complete picture of the installation. The not-all-inclusive list of questions to be dealt with is given below:

#### 3.1 Information Required for Initial Hazards Evaluation

##### 3.1.1. General

- A. General description of over-all project  
with particular emphasis on safety features,

such as use of containment, missile protection, shielding, provisions for unfavorable seismological conditions, etc.

- B. Description of reactor plant with particular emphasis on safety aspects such as inherent safety design characteristics, use of closed loops, controls and instrumentation, shielding, blast protection, failsafe features, waste disposal facilities, etc.

### 3.1.2 Site Data

A dossier justifying the choice of the site, and giving in particular, information on the following points:

- A. Plan or plans showing the boundaries and dimensions of the site, the location of the various parts of the plant, topographical features on and near the site, and nearby facilities either existing or anticipated, such as roads, railroads, factories, residential areas, schools, hospitals, etc.
- B. Population density including its variation and land usage within \_\_\_\_\_ kilometers of the site; both numerical information and a map showing urban area.

C. Natural environments of locality on general qualitative basis:

Meteorology - Wind velocities, directions and frequencies; amounts and frequency of precipitation; frequency and persistence of expected worst conditions; topographic features which might affect wind flow.

Hydrology - flow rates of nearby streams and sea currents, and use by public, location and use of wells, depth to ground water; sources of public drinking water in surrounding areas.

Natural Radioactivity

Geology - the existence of formations which might affect the escape of contaminants to surface or subsurface water bodies. Soil conditions and nearby test borings if available.

Seismology - history of earthquakes and their intensities in that region of the country; existence of geological features which might indicate the possibility of serious tremors.

- D. Explanation of present and intended future use of land upon which reactor is to be located; also, the land in the nearby vicinity. The proposer should prove that the project does not interfere with other economic and/or social projects.
- E. The proposer must submit a formal approval of the competent national or regional authorities regarding the selection of the site.

### 3.1.3. Reactor Plant

- A. Power level of reactor: initial design, ultimate possible contemplated without major revision, normal operation, and maximum operation.
- B. Fuel: type, cladding, quantity, geometry, and cycle.
- C. Reactor vessel: pressures, materials, shielding, safety features, and design codes.
- D. Containment vessel: material, design pressure, design leak rate, design codes, protection against gamma shine and missiles, procedures to seal container penetrations in event of accident, and earthquake-proof design features.
- E. Reactor physics: reactor parameters, i.e., temperature and void coefficients, neutron



spectrum, neutron lifetime, etc., and how estimated: results of any critical experiments or comparison with known reactors.

F. Reactor coolant: kind, amount, temperature, pressure, toxicity, possible chemical reactions.

#### 3.1.4. Release of Contaminants to Environment

A. Estimate of the amounts and source of gaseous, liquid and solid radioactive waste which are expected to be routinely released to the environment together with estimates of effects on the environment and procedures to monitor, dilute and control these releases.

B. Types of accidents considered credible, and preliminary estimate of frequency and consequences. Special features of reactor design to prevent these accidents.

C. Preliminary estimate of the maximum credible accident including amount and character of fission products released to containment vessel. Also, estimate of the potential doses from gamma shine and leakage of fission products including fallout at the site boundary and at nearby communities under adverse weather conditions. Assumptions and references used in these calculations are to be stated.

D. Possibility and safeguards against contamination of nearby streams or other water supplies from the fission products retained in the plant container or released following the maximum credible accident.

### 3.2 Technical Data on the Projected Installation

Complete explanation together with justification and technical references shall be given to the proposed installation, and more particularly on the nuclear aspects. The Dossier to be submitted shall comprise the following chapters:

3.2.1. Summary: A brief description and the most important data on the type and operation of the installation.

#### Type of Reactor

#### Power (MW)

- thermal (nuclear)
- thermal (conventional, if any)
- gross electric
- net electric

#### Number of turbines

#### Fuel Elements

- type of element
- material composition
- enrichment (wt %)

- fuel dimensions
- fuel density
- cladding material
- cladding thickness
- cladding OD
- lattice pitch

#### Moderator

- material
- max. temp.
- max. pressure
- volume fraction liquid
- mean density (gr/cm<sup>3</sup>)
- volume ratio liquid/fuel

#### Core (by regions)

- number of assemblies
- number of rods or plates per assembly
- active height
- effective diameter
- Kg U 238
- Kg U 233
- Kg U 235
- Kg Th 232
- Kg Pu 239
- Kg Zircaloy

- Kg stainless steel
- Kg Aluminum
- Kg moderator

#### Control rods

- number and type
- means of operation
- drive location

#### Pressure vessels

- inside diameter
- inside height
- side-wall thickness

#### Containment shell

- shape and dimensions

#### Coolant conditions

- material
- pressures
- $\Delta P$  through core
- temperature inlet
- temperature outlet
- Kg/sec

#### Steam conditions for each inlet of each turbine

- pressure
- tonnes/hr
- temperature

### Heat transfer conditions

- heat transfer surface
- heat flux: avg.  
max.  
burnout
- heat flux ratio max/avg.: radial  
axial  
over-all
- power density (KW/liter)
- specific power (MW/t)

### Maximum temperatures

- outside cladding
- fuel

### Fuel burnup

- MWD/t avg.
- MWD/t max.
- fraction of fuel discharge at one time
- interval between refuelling (months)

### Neutron flux

- thermal neutron flux: maximum  
average

### Neutron balance for neutrons absorbed in U 235 in fresh fuel

- Resonance absorption
- Production of thermal neutrons

- thermal leakage
- absorption by: U 235  
                           U 238  
                           Zr  
                           SS  
                           H Al  
                           Xe / Sm
- total consumption
- initial Keff
- initial conversion ratio

3.2.2 Reactor:

- A. Reactor vessel and internal parts (including a description of the design bases for the pressure vessel, such as thermal stress conditions, irradiation damage, etc.)
- B. Fuel elements: description, general method of fabrication, general methods of quality control and inspection of the elements and assemblies, maximum and average design burnup, guaranteed average burnup for the first loading, and for subsequent loadings; the most probable and most serious types of failure; method of fuel cycling, estimated maximum life in the core,

specific limitations on operating conditions as specified by the guarantees affecting fuel elements and safety. Detection of fuel element failure and location of the damaged fuel element.

C. Fuel Assembly after irradiation

a) Kg per assembly (averaged for each region for each core initially proposed and at equilibrium)

U 233 (at time of discharge)

U 235

U 236

U 238

Pa 233 (at time of discharge)

Th

Pu 239 (after cooling)

Pu 240

Pu 241

Pu 242

Np 237 (after cooling)

Fission products

B 10

b) Days cooling before shipment

c) Preparation for shipment (cleaning, extent of partial disassembly)

- d. Treatment of assembly with ruptured element (s)
- e. Length of assembly shipped
- f. Weight of assembly shipped, Kg.
- g. Schedule of shipping assemblies by year
- h. Number of assemblies per shipment and distance in Km (not per carrier)
- i. Estimated date of first shipment
- j. Total weight per shipment

D. Reactivity control system - characteristics

- 2.4.1 Description of control rods
- 2.4.2 Description of the control rod drive and scram mechanism
- 2.4.3 Description of other methods of flux-flattening
- 2.4.4 Description of safety systems using liquid poison, when appropriate. The effects of this liquid poison on the fuel elements and the core from the point of view of corrosion.
- 2.4.5 Information relating to the control characteristics including: initial excess reactivity and maximum reactivity of the reactor, effect of the control rods, including: maximum individual control rod worth, total worth of all control rods, maximum shim-safety rod worth, total worth of shim-safety rods; effect



of auxiliary control, reactivity after shut-down, pressure and temperature coefficients of reactivity, reactivity effect of xenon and of samarium, curves of formations of xenon on shut-down and power variation, void coefficient of reactivity, effect of burnup on reactivity, discussion of the special distribution of power.

E. Data on the moderator and reflector and blanket (if applicable)

Material

Volume and dimensions

Reason for choice

Related structural problems

Cooling problems, if any

Fabrication

F. Data on the Coolant

G. Data on the fuel: total mass of fissile fuel; total mass of fertile fuel; initial enrichment

H. Heat transfer and fluid flow in the core: data at full power, examination of the effect of partial loading on the data; examination and list of the hot spot factors; list of the limiting conditions and safety margin.

### 3.2.3 Primary circuit and steam generators

#### A. Heat exchanges

- a. construction materials
- b. pictorial illustration of construction of non standard
- c. heat transfer fluids
- d. compatibility of fluids and materials
- e. degree of confidence in design and in materials compatibility
- f. primary and secondary inlet and outlet coolant temperature
- g. pressure drops in system
- h. super heat source (if applicable)
- i. flow rates - both sides of H.E.
- j. pumping power
- k. inlet and outlet temperature

#### B. Generation

- a. type of steam produced
- b. steam flow rates

### 3.2.4 Auxiliary and emergency reactor systems

### 3.2.5 Corrosion and irrosion

### 3.2.6 Considerations on radiation

- a. biological shield: over-all design, functions and accessibility; reactivity level of the coolant; temperature rise in the shield

- b. Containment vessel
- c. decontamination: arrangements for the decontamination and maintenance of power equipment containing radioactive fluids; problems due to the possible contamination of the turbine by cobalt in the case of systems in which the reactor coolant is circulated to the turbine, etc.
- d. arrangements for radioactive waste disposal: radioactivity in the air, liquid and solid waste
- e. area and health monitoring

### 3.2.7 Operation and control instruments

- a. regulation of the complete installation
- b. control system of the reactor; instruments
- c. control of the primary and secondary circuits; instruments

### 3.2.8 Program of experiments, tests and measurements:

general description of testing program, list of measurements and all tests of precritical components and isolated systems; critical experiments and low power measurement or tests; partial power and short time full power tests; final acceptance test.

3.2.9 Functioning of the installation: analysis of over-all system with reference to dynamic stability; start up procedure; full power operation; normal and emergency shut down; fuel handling (including the damaged elements); number and types of operating personnel required; maintenance including accessibility of equipment and any special features facilitating maintenance

3.2.10 Possible accidents to the reactor and safety precautions:

- a. Chemical reactions with coolant and core materials
- b. Start-up accidents
- c. Rod withdrawal at full power
- d. Failure of pumps or circulators
- e. Introduction of cold water or insufficiently poisoned water
- f. Rupture in the primary circuit
- g. Consequences of rupture or extensive failure or melt-down of the fuel
- h. The most serious eventuality that the containment vessel (if present) is capable of handling
- i. Examination of uncontrolled release of radioactivity from ports and discharge valves
- j. Failure of the heat exchangers

3.2.11 Plant heat balance

3.2.12 Future improvement of the installation

- a. possibility of increasing the reactor and/or reducing the unit power cost after the first loading
- b. excess capacity (if any) provided in the various sections of the installation and/or possibility of adding additional units to take advantage of any future increase in the reactor heat output

3.2.13 Over-all work schedules

3.2.14 Spare parts

3.2.15 In addition, the tendering party shall furnish all the additional information which he may consider necessary for his offer to be properly evaluated. Offers not accompanied by adequate information will not be considered.

3.2.16 The conventional parts of the installation must also be described:

- superheating (if any)
- turbo-alternator group (or more groups)
- steam cycle, steam condensing plant
- electrical system
- civil work: plans; special construction equipment required; planning

- general services: protection against fire; communication systems; ventilation and air-conditioning; general purpose compressors and instrument compressors (if any); laboratory; repair workshop; lifting system and transport, etc.

### 3.3 Guarantees and warranties on the performance of the installation

All information concerning the general clauses of the guarantee, in particular clear and concise accounts on the scope of guarantees for the following sections:

- net electric output (measured on the low voltage side of the main transformer all the necessary auxiliary equipment for the production of this power bring in operation)
- rated thermal power of the core of the reactor (the overload permitted by the control instruments of the reactor and of the high flux level, the value of which shall be less than the maximum power permitted to safeguard the life of parts of the installation and shall be compatible with all the guarantees given)
- thermal power corresponding to the guaranteed net electric power
- guaranteed fuel element burnup (for the first core and for subsequent loadings). The latter shall include all the factors relating to the reactor and the possibility

of obtaining the guaranteed burnup, such as manufacture, damage by irradiation, reactivity, corrosion and erosion, etc.

- enrichment
- special long-term guarantees for parts or equipment in respect of which long-term experience has not been gained, either because of the use of new equipment or of new materials, or because of the use of standard material under new conditions. This applies mainly to parts of the circuits and in particular to parts of the core.
- plant availability factor
- completion date for carrying out final acceptance tests

#### 4. Fuel needs

Balance sheet of consumption with particular information (based on the guarantee) on:

- inventory for the initial fuel loading. Quantity, location and duration of all the fuel materials in stock
- programme for the replacement of fuel elements until such time as equilibrium conditions are obtained
- estimations for subsequent fuel loadings

## 5. FINANCIAL AND ECONOMIC DATA

### A. Proposal and Proposer

1. Summary description of proposal including
  - a) Schedule.
  - b) Contracting methods.
  - c) Statement of which organizations are proposed to undertake the different portions of the over-all project, such as, research and development, construction of the plant, fabrication of fuel elements and operation of the plant.
2. Regarding the proposer, a description of
  - a) History of organization.
  - b) Corporation or Company.
  - c) Existing capability.
  - d) Technical experience in nuclear energy field.

### B. Major Contractors including Reactor Design Agent and/or Construction Agent (including Fuel Fabrication

1. History of Company.
2. Corporate or company description.
3. Description of research and development and production facilities.
4. Description of existing contractual obligations in nuclear energy field.
5. Technical experience in nuclear energy field.
6. Description of project organization and personnel assigned to project.



7. Most recent statement of financial position and earnings.

8. Special license arrangements relating to the project.

C. Detailed Economic Justification of proposed increase in capacity including the following information

1. Output statistics of the last five years.

2. Description of the supply and demand for electricity in the region which is presently supplied by the power system with which the projected atomic power station will be connected.

3. Probable trend of power supply and power needs in the years to come.

4. Description of the rates which are charged in the region with which the above power station will be connected. What kind of government regulations exist regarding rates.

5. An estimate of the development of these rates in the years to come.

6. Transmission facilities with network diagram.

7. Projected demand curve over the next ten years.

D. Financial Background Data

A. General. Each proposal shall contain:

1. Name of proposing company

Date of incorporation and his charter

(same information of each company associated in ownership if operation is a new company)

2. Statement of financial interest of each participating organization in project and in companies formed or

planned for the project. (Show per cent of interest of the proposer and each contributor in the project and in each organization formed or to be formed.)

3. Limits of liability of each participating party, together with commitments made by each participant in excess of stated initial liability. Specify if these commitments or guarantees are expressed in writing.
4. Latest annual financial report for each participant in the project.
5. Statement of methods by which the proposer intends to assure meeting his commitment.
  - (1) to construct the project, including statements how and when available funds are to be used in constructing the project. This should be in accordance with construction schedule.
  - (2) to operate the project for ten years.
6. Proposed methods of financing the project
  - (1) by (a) own funds, (b) other borrowings (details)  
(c) Euratom.
  - (2) the amount of working capital which is necessary
  - (3) direct and indirect government assistance  
(as well as the guarantees and securities which the proposer may offer to obtain financial assistance.)

E. Current financial position and earnings. Each proposer of the project and each entity organized or to be organized or

associated with it, the project, shall furnish the date required in items 1, 2, 3, 4, 5, 6, and 7 of this paragraph.

1. a. Balance sheets of the last five years
- b. Profit and loss statements of the last five years
- c. Short account of the legal and financial links with financial or industrial groups or with the Government.

In case the proposer is a specially created legal entity, its balance sheet as of date of incorporation must be included.

2. Working capital (from latest financial statement - indicate date of statement):

	<u>Current</u>	<u>One Year previous</u>	<u>Two years previous</u>
Current Assets			
Current Liabilities			
Working capital			
Ratio			

3. Plant and equipment from latest financial statement:

Gross depreciable assets

Accumulated depreciation

Net book value

Annual depreciation charged (current year)  
(Statement of depreciation policy and methods)

Plans for expansion or replacement of plant in next five years and source of financing therefore.

4. Long-term and intermediate term debt:

Description and timing of the repayments

Security    Amount    Maturity Date    Interest Date    Rank

Describe any mortgage or other lien on the assets of the company.

5. Equity:

Total assets

Total liabilities

Equity

Major stockholding interest by interest.

Specify restrictions on dividends, borrowings, additional stock issuances, etc.

List significant financing through sales of stock, bonds, etc. in recent years.

6. Operations:

(a) Net sales and cost of sales (energy sales and cost of power sold for utilities) for each of past five years

<u>Year</u>	<u>Sales (\$)</u>	<u>Cost of Sales or Power Sold (\$)</u>

(b) Net income for each of past five years

<u>Year</u>	<u>Before income</u>	<u>Amount</u>	<u>After income</u>
	<u>taxes (\$)</u>		<u>taxes (\$)</u>

F. Proposed Method of Financing Cost of Research and Development Programs

Amounts to be Financed by

<u>Joint Program</u>	<u>Proposer</u>	<u>Total</u>

1. Research and Development costs in connection with:

a. Reactor Design and construction:

Design (Describe and list specific R & D programs)

Construction (Describe and list specific R & D programs)<sup>1</sup>

b. Operations (Describe and list specific items of an experimental nature for which Euratom assistance is required)

c. Fuel cycle

G. Estimated Capital Cost of Power Systems

1. Generation facilities:<sup>2</sup> Amount (by years)<sup>4</sup>

Land and land rights

Buildings and structures

Nuclear System

Reactor and associated equipment<sup>3</sup>

Other

Superheater

Turbo generators

Other (specify)

Total generation facilities

Cost per installed KW

2. Transmission and distribution facilities:

(Show principal items of plant required to tie in with existing system)

- 
- 1 Show amounts applicable to each year  
2 Show major types and units of building and equipment.  
3 Exclude cost of nuclear fuel and fabrication.  
4 Show amounts applicable to each year of construction.

Total transmission facilities

Total capital requirements excluding startup  
costs

Cost per installed KW

3. Startup costs

Total capital cost

4. Contingencies

5. Escalation

6. Interest during construction

Total cost 

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**B. Estimated Operating Cost Data of Proposed Nuclear Power Plant (7,000 hrs/year at full power)**

Revenue:	Cost for first 10 years of operation		Annual Steady- State costs	Cost of generating power by a conventional system	
Sale of power (no. of KWH or BTUs)					
Other (show source such as irradiation services isotopes, etc.)					
Total revenues					
Operations:	<u>Back year</u>	<u>Total</u>	C	<u>A/C</u>	<u>Amount</u>
Reactor and steam generator system expenses:	A	B		D	E
Fuel cost: <u>1/</u>	<p>Column A - Show costs for each year of operation</p> <p>Column B - Show total costs for first ten years of operation</p> <p>Column C - Show annual steady state generating costs</p> <p>Column D - Show cost categories for conventional type steam plant and turbo generator system having same capacity as nuclear plant including insurance, taxes, depreciation, etc.</p> <p>Column E - Show amounts at steady state</p>				
Fuel fabrication and assembly					
Material losses					
Burnup excluding fuel fabrication and assembly costs					
Transportation of fuel elements					
Waste storage					
Reprocessing of spent fuel elements					
Use charge					
Gross fuel cost					
Credit for plutonium					
Net fuel cost					
Depreciation					
Labor - Reactor and associated systems <u>2/</u>					
Insurance <u>3/</u>					
Taxes (other than income) <u>3/</u>					
Interest on borrowed capital <u>3/</u>					
Other expenses (list major items such as salaries, maintenance, etc.)					
Total reactor and steam generator expense (Mills per KWH or BTUs)					
Conventional system (turbogenerator):					
(show major expense categories including depreciation, insurance and taxes)					
Total turbogenerator expense (Mills per KWH or BTUs)					
Total generation expense (Mills per KWH or BTUs)					
Plant load factor					

1/ Show detail of calculation

2/ Indicate basis of labor estimate (no. of people, etc.)

3/ Indicate basis for cost (plant investment, rates, etc.)

## 6. Suppliers

The proposer must submit

- a) a list of the principal suppliers consulted, including a summary of the tenders received, as well as the basis on which the proposals submitted to Euratom have been selected
- b) a list of the principal suppliers selected, and the contracts (one original and one copy) signed by supplier and proposer.

## 7. Insurance and third party liability

- copy of all the insurance policies for risks characteristic of the project under consideration
- information on the present position of negotiations with insurance companies in connection with third party liability.

## 8. Research programme

Research and development programmes currently in existence or proposed having a bearing on the projects submitted.

## 9. Training of Personnel

Assistance needed by the utilities and the constructors for the training of their personnel. This information is necessary for each class of technicians, such as for example:

- design of reactors
- construction of reactors



- operation of reactors
- supervision and maintenance
- technology of chemical processing  
  manufacture and processing of fuel elements
- disposal of radioactive waste
- etc.