HILLMAN

COMMISSION OF THE EUROPEAN COMMUNITIES

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Conferment of joint undertaking status to the company "Schn ell-Bruter-Reinkraftwerksgesellschaft m.l.h."

(submitted to the Council by the Commission)

III/634/74-E

VOLUME I

Rating as Joint Undertaking of
"Schnell-Brüter-Kernkraftwerksgesellschaft m.b.H."(SBK)

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REASONED OPINION AND PROPOSALS FROM THE COMMISSION ON THE PROJECT FOR ESTABLISHING THE "SCHNELL-BRUTER-KERNKRAFTWERKSGESELLSCHAFT mbH" (SBK) AS A JOINT UNDERTAKING

I. INTRODUCTION

1.1 Importance of fast reactors

The concept of fast reactors emerged in the very first stages of the development of nuclear energy. Since its principal characteristic is breeding - the ability to produce more fissile material than it consumes - it quickly became a focus of extensive research.

The efforts devoted to the fast-reactor family are at the moment being mainly directed towards the variant using sodium cooling. In several countries a modest amount of activity has been initiated on the development of helium-cooled fast reactors.

Although the current trend in nuclear energy is more towards the use of thermal reactors (mainly light-water reactors and, potentially, high-temperature gas-cooled reactors), fast reactors have certain advantages justifying the large-scale development programmes under way throughout the world:

a fast reactor is capable of producing fissile material more quickly than a thermal reactor, hence more efficient use of available supplies of fissile material;

when the doubling time coincides with an increase in the demand for electricity a system of fast reactors is virtually self-sustaining, i.e., since it produces its own fuel it is independent of enrichment capacity. Only small amounts of natural uranium are needed to supply the system;

the surplus fissile material produced constitutes a credit item in the fuel cycle accounting, whereas the consumption of fertile material has a negligible effect, hence low fuel-cycle costs and potentially lower total production costs;

for the same reasons the fast reactor should to all intents and purposes never be affected by rises in the price of fissile material or natural uranium so that:

it enables extremely expensive uranium ore to be used without greatly influencing the total cost of production;

it acts as a stabilizing influence on trends in fuel costs, to the benefit of all types of reactor;

it puts at a premium plutonium produced in light-water reactors.

On the other hand, the main problems which arise during fast reactor development are as follows:

new coolant technology in view of the fact that sodium is used as the cooling liquid;

the development of a fuel comprising a plutonium compound exposed to a high burnup;

the development of new materials necessitated by the use of a new coolant and by the different neutron environment;

the solution of the safety problems arising from the neutron characteristics, from the point of view of both comprehension and the additional emergency structural measures to be taken in order to avoid an excessive increase in capital costs.

1.2 Achievements to date

The first stage in the development of fast reactors was the building and operation of various experimental reactors (Experimental Breeder Reactor I (EBR-I) and EBR-II in the United States, Rapsodie in France, Dounreay Fast Reactor (DFR) in the United Kingdom, KNK-II in Germany (commissioned in 1974) BOR 5 in the Soviet Union, etc.).

The main countries concerned in this development have reached or are entering into the second stage, which consists in the construction of a prototype reactor with a power in the 200-400 MWe range (often with the support of a considerable number of large experimental installations). This second stage would be followed by a third involving the building and operation of demonstration plants which are not fully competitive.

1.2.1 Achievements within the Community

(a) France

The Phénix (250 MWe) reactor at Cadarache went critical on 31 August 1973, was phased to the line in on 13 December 1973 and developed full power on 14 March 1974.

This success induced France to site at Malville (Isère) the 1200 MWe fast reactor planned as a joint venture with Italy and West Germany. The adoption by Parliament on 23 December 1972 of a law authorizing the setting-up of "Sociétés anonymes" in which EdF[1] would have a majority holding and whose object would be the construction of prototype nuclear power plants paved the way for the setting-up of an international group bringing together EdF, ENEL[2] and RWE[3].

A protocol on collaboration was signed by ENEL, EdF and RWE in July 1971 for the purpose of building in Europe large fast-neutron power plants of industrial stature.

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1 EdF Electricité de France.

2 ENEL Ente Nazionale per l'Energia Elettrica.

3 RWE Rheinisch-Westfälisches Elektrizitätswerk AG.

In January 1974 the three undertakings signed, under this protocol, an agreement for the construction, on a collaborative basis, of two sodium cooled, fast-neutron nuclear power plants developing over 1000 MWe. These undertakings envisaged the setting-up of the Société Centrale Nucléaire Européenne Neutrons Rapides S.A. (NERSA)[x] in which the EdF was authorized on 13 May 1974 to have a shareholding of FF25.5 million at the present time.

The shares of the three countries in the work are proportional to their shareholdings (France 51%, Italy 33%, West Germany 16%).

The design and site work on the first power plant by the three countries will be completed by about the end of 1974 or the beginning of 1975 and the plant should enter into service in 1980 or 1981.

An extrapolation of Phenix, this 1200 MWe "super Phénix" will be the culmination of the efforts made by the CEA[1] as regards research and development on the sodium-cooled reactor system.

The companies building Phenix - Compagnie Generale d'Electricité (CGE) and Babcock Atlantique - have concluded a fifteen-year cooperation agreement with the CEA involving the formation of the Société Technicatome. This company will be capable of building high-capacity nuclear power plants incorporating French-designed breeders. The Société Technicatome also proposes to develop a slightly uprated (450 MWe) version of Phénix.

(b) United Kingdom

The prototype 250 MWe Prototype Fast Reactor (PFR) built at Dounreay went critical on 28 February 1974, i.e., fairly far behind the initial schedule. This reactor will be used for irradiating fuel elements from other fast reactors, and in particular the SNR-300 (one fuel element to be irradiated as from 1976). Construction of the first high-power breeder (about 1300 MWe) would begin in about 1976, the date envisaged, depending on the successful operation of the PFR.

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[1] CEA Commissariat à l'Energie Atomique
x firm founded on May 18, 1974

The British Government considers the development of breeders as a vital factor in its long-term nuclear programme.

(c) West Germany

Construction of the SNR-300 reactor (Schneller Natriumgekühlter Reaktor 300 MWe) officially began on 24 April 1973. This reactor, which was built with the joint support of the governments of West Germany, Belgium and the Netherlands, is the one with which the present dossier is concerned.

The knowhow acquired with the SNR 300 reactor would enable the nuclear industry to envisage the marketing of a 1200-2000 MWe unit. The aforementioned EdF/ENEL/RWE group would begin work on this plant during the first half of the 1980s in accordance with a sequence similar to that followed by the French. The financing of the project would be shared as follows: Germany 51%, France 16%, Italy 33%.[x]

(d) Italy

Compared with the three large-scale programmes described above, the Italian programme is more limited and comprises the construction and operation of a PEC[*]-type test reactor (about 140 MWe) which is expected to enter into service around 1978. The aim of the construction and operation of this reactor is to develop industrial skill in fuel and large-component fabrication.

As already mentioned, the ENEL will provide 33% of the funds needed to finance the two large FBR power plants planned on a joint basis by ENEL, EdF and RWE.

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[*] PEC Progetto Elemento di Combustibile

x The firm Europaische Schnellbrüter Kernkraftwerksgesellschaft m.b.H. was founded at Essen in October 1974.

1.2.2 Achievements outside the Community

(a) USSR

The dual-purpose Soviet prototype (energy/desalination) developing power equivalent to 350 MWe, built at Shevchenko near the Caspian Sea went critical in November 1972 and the run-up to power began in May 1973.

An incident occurring in November 1973 was described by the Soviet authorities at an international conference held in March 1974: a sodium/water reaction took place in the reactor's secondary circuit as a result of leaks in three out of the six steam generators.

The construction of a 600 MWe reactor is under way.

(b) United States

The Project Management Corp. (PMC) (a private company formed by the Tennessee Valley Authority, Atomic Energy Commission (AEC) and Commonwealth Edison) has appointed Westinghouse prime contractor for the construction of the first 400 MWe fast-neutron, demonstration nuclear power plant at Oak Ridge, Tennessee (Clinch River Breeder Reactor - CRBR). The American Government has designated this a national, priority programme - the plant should enter into service in 1981 - and has provided massive financial assistance, which has been followed up by large contributions from the electricity producers. The result will be a speeding-up of the industrial-scale development of breeders in the United States. (The current target date for entry into commercial grid service is 1987.) The contract for the construction of this power plant, valued at about 90 million dollars, was signed by PMC and Westinghouse in November 1973. The Rockwell International Corporation and General Electric will assist Westinghouse on a sub-contract basis.

- Gulf General Atomic is also designing a gas-cooled fast reactor, developing 300 MWe, which could be in operation by the beginning of the 80's. In addition to various European centres and associations such as Jülich, the Nuclear Energy Agency(NEA) and the Gas Cooled Breeder Reactor Association, about 50 American companies are collaborating in this field. The GCBRA, comprising European organizations, is defining the performance of a 1 000 MWe plant of the GCFR family and is engaged in designing a demonstrator reactor for 1976.

(c) Japan

In Japan considerable sums have been invested in test assemblies. A 100 MWth test reactor should be finished by the end of 1975 and it is planned to start on the construction of a 300 MWe prototype during 1974.

2. Justification for building the SNR-300 power plant

2.1 Technical aspects

The SNR plant, which will be completed 5-7 years after the Phoenix and PFR prototypes, is the first important industrial step towards marketing the reactor system under the German-Benelux fast reactor development programme. This plant, the principal characteristics of which are set out in the "Report on the project for establishing Schnell-Brüter-Kernkraftwerksgesellschaft mbH (SBK) as a Joint Undertaking" is based (a) on an extensive, fundamental research and development programme, which has been implemented for about ten years by the national centres, and (b) a programme described as "industrial", which is more specifically linked with the SNR project and carried out mainly by Interatom, Neratoom and Belgonucléaire.

During 1963-67, the basic programme was pursued by a Community association in the same way as the French and Italian programmes.

The development of the reactor is backed by a considerable number of large experimental installations and by numerous smaller installations. A major irradiation programme related to fuel development is being carried out in the DFR, Rapsodie, BR-2 and FR-2 reactors.

In the continuation of this programme the aim of the prototype SNR plant will mainly be:

to demonstrate, on an industrial level, the reliability and feasibility of such a project;

to demonstrate that a reactor of this type can be operated under normal conditions when phased to the line with a satisfactory degree of safety and availability;

to determine at what point in time larger-scale projects could become competitive and be built in accordance with normal commercial practice.

In addition, the SNR plant will be the first large fast-neutron power plant belonging to the outside-loop branch of this reactor family. PFR and Phénix are both of the integrated type, i.e., the core, reheaters and primary pumps are located inside a large vessel.

2.2 Consolidation of the European nuclear industry

2.2.1 Power plant constructors

The SNR-300 power plant is the first European power plant of the fast-reactor type to be built on the responsibility of an industrial consortium comprising companies from several Community countries.

The Commission is naturally delighted to see European companies collaborating in the construction of a power plant which will play a leading role in the acquisition of the technical knowhow required for the introduction on the market of the SNR "sub-family".

It should also be emphasized that the fuel elements will be fabricated entirely within the Community.

2.2.2 Electricity utilities

(a) In May 1973, the Schnell-Brüter-Kernkraftwerksgesellschaft mbH (SBK), which was initially formed by three Community electricity utilities, namely, RWE, N.V. Samenwerkende Elektriciteits-Produktie Bedrijven and Synatom, agreed to allow the British Central Electricity Generating Board (CEGB) to join as a fourth shareholder.

(b) In 1971, RWE, EdF and ENEL signed an agreement for collaboration in the construction of two high-power (1 000-2 000 MWe) breeder reactors, the first embodying French technology and the second the process developed in Germany and put into practice via the construction of SNR-300. This was confirmed by the signature in January 1974 of an agreement between these same partners and by the creation of NERSA (as already mentioned above).

These agreements will certainly help to further the rationalization of the decisions made by European electricity undertakings on the utilization of fast reactors.

2.2.3 Access to industrial, technical and economic information Secondment of personnel

The SBK will pass on the industrial, technical and economic data acquired during the design, construction and operation of the SNR-300 nuclear power plant to the Commission, together with the information which the SBK is entitled to receive from its main supplier and which it is entitled to pass on under the terms of the contracts concluded with him. The Commission will disseminate this information throughout the Community pursuant to the provisions of Chapter II of the Euratom Treaty. It is desirable that, in implementation of the last part of Article 48 of the Euratom Treaty, the Council should instruct the Commission to set out the terms governing such dissemination, together with those relating to the secondment of those personnel whom the SBK will be called upon to accept.

2.3 Considerations regarding the profitability of the project

The capital needed to carry through the nuclear power plant project has been estimated at DM1 540 million (excluding plutonium). Details of this amount and of the relevant financing are given in section 6 of the "Report on the project for establishing SBK as a Joint Undertaking."

The project will be funded as follows:

Subscription by the SBK:	DM120	million
Contributions:		
(a) West Germany	DM990.5	million
(b) Belgium	DM212.25	million
(c) Netherlands	DM212.25	million
Balance (cost of phasing to the line)	DM5	million

In addition, other promotional activities are planned in the form of a contract covering participation by the Governments of the three countries concerned in the operating risks to a maximum amount of DM150 million (See Annex II to the "Report on the project for establishing SBK as a Joint Undertaking.")

Article 2 of this contract states that the Governments will bear, as to 100% during the demonstration period (envisaged in section 4) and subsequently as to 80%, the SBK's losses inherent in the operation of the SNR power plant, and will share the cost of closing it down should this prove expedient.

From an economic point of view the total cost of the plant on a turnkey basis, but excluding the first fuel change, is estimated at four or five times that of a commercial light-water nuclear power plant of equivalent power. Since the cost of the fuel is also greater than for light-water reactors, particularly owing to the considerably higher cost of fabricating the fuel elements, the prime cost of the electricity generated by this plant will be far in excess of that likely to be achieved by other nuclear power plants - even if it were to have a high degree of availability.

In view of certain duties and taxes relating to the construction and operation of the plant, the SBK has requested exemption under the head of the advantages requested, in line with the conferment of Joint Undertaking status. The German Government has delivered an opinion (set out in Part III of this dossier) on the conferment of advantages on the SBK and has defined their scope. Details of these duties and taxes are given in item 6 of the "Report on the project for establishing SBK as a Joint Undertaking". The financial contribution of the public authorities at this stage therefore remains considerable.

3. Procedure

3.1 Application by the SBK to be established as a Joint Undertaking and to receive tax concessions

In its letter of 26 April 1972 (Annex I to "Report on the project for establishing SBK as a Joint Undertaking"), the SBK submitted to the Commission of the European Communities an application for the grant of Joint Undertaking status in compliance with the provisions of Chapter V of the Treaty establishing the European Atomic Energy Community.

This request for the conferment of Joint Undertaking status was supported by two letters addressed to the Commission, one on 15 August 1972 from the West German Ministry of Education and Science and the other on 10 November 1972 from the Office of the Representative of the Kingdom of the Netherlands to the European Communities. (See Annex III to the

"Report on the project for establishing the SBK as a Joint Undertaking"). In these letters the two Governments explained the reasons which, in their view, justify the granting of Joint Undertaking status.

The tax exemptions requested by the SBK are listed in the "Report on the project for establishing the SBK as a Joint Undertaking".

3.2 Request for the opinion of the Member States

Pursuant to Article 46(1) of the Treaty establishing the European Atomic Energy Community, the Commission compiled a dossier which was sent off to the Member States on 6 July 1973 for their opinions.

3.3 Opinions of the Member States

The following Member States have delivered opinions favouring the conferment of Joint Undertaking status on the SBK. (These opinions are set out in Part III of this dossier.)

1. The Netherlands, which on 21 August 1973 confirmed its favourable opinion as already expressed in its letter on 10 November 1972 (see Annex III to the "Report on the project for establishing the SBK as a Joint Undertaking").

2. Ireland, on 30 August 1973.

3. West Germany, on 5 March 1974.

4. Luxembourg, on 18 March 1974.

5. Italy, on 19 March 1974.

6. Denmark, on 29 April 1974.

7. France, on 30 April 1974.

8. Belgium, on 20 May 1974.

Only West Germany has adopted a standpoint with regard to the advantages to be conferred upon SBK (see part III of this dossier). This country has expressed agreement on only certain of the advantages in question, and only for a limited period, i.e., initially up to the end of the third year of operation.

3.4 Amendment introduced by SBK to the list of advantages

In a letter dated 9 April 1974, the SBK informed the Commission that it was withdrawing its application for the conferment of the advantages provided for items 1a, 1b, 2, 6b and 8 of Annex III of the Treaty establishing the European Atomic Energy Community. These advantages had initially been applied for in the letter of 26 April 1972.

4. Opinion of the Commission

Chapter V (Article 45) of the Treaty establishing the European Atomic Energy Community stipulates that undertakings of fundamental importance to the development of the Community's nuclear industry can be set up as Joint Undertakings within the meaning of this Treaty.

The Commission feels that the European Atomic Energy Community is justified in conferring on the Schnell-Brüter-Kernkraftwerksgesellschaft mbH (SBK) the status requested, under the terms of Article 1 of the Treaty establishing the European Atomic Energy Community, this company being eligible since it fulfils the conditions of Article 45 of the Treaty.

The SNR-300 plant is the first European power plant of the fast-reactor type built by an industrial consortium comprising companies from several Community countries who will also operate the plant in the initial stages. Permanent operation of the plant will be the responsibility of the SBK and will be financed by four Community electricity utilities. The knowhow acquired during the construction and operation of the plant will also benefit the economies of the various countries via the participating States, and the Community via the Commission of the European Communities.

Such international cooperation originated in the early sixties, when the preliminary work was still carried out on the entire responsibility of the national research centres. The development of this type of reactor was subsequently given financial backing by the European Atomic Energy Commission as part of the second Euratom programme. Industry took over the work in 1966/67 and Siemens, Interatom, Belgonucléaire, Neratoom and Luxatom have continued development up to the industrial maturity stage.

The SNR-300 plant, which develops power comparable to the French Phénix and the British PFR reactors, possesses a distinctive feature in its loop-type construction, i.e., the primary sodium circulates through pipes and heat exchangers located outside the reactor vessel. Since this attractive configuration facilitates the use of various component arrangements, easier access and better adaptation to subsequent developments, it deserves to be tested so that its potential for extrapolation to higher-power reactors (1000 MWe and above) can be examined.

The plant will be used for large-scale development of fuel elements and components for fast breeders of the next generation.

The granting of tax concessions should be conditional upon free access by the Community to the economic, technical and industrial information generated by the activity in question (second paragraph of Article 48 of the Euratom Treaty). The Commission feels that as comprehensive an exchange of experience and knowhow as possible would be of considerable assistance to Community nuclear power plant constructors and operators.

The SBK would therefore be in a position of having to permit the large-scale dissemination of the experience acquired during the design, construction and operation of this new power plant, including the information which it is entitled to receive from its main supplier and pass on in compliance with the contracts concluded with the latter.

The granting of tax concessions is justified by the non-commercial nature of this power plant, which is the first large-scale demonstration of an advanced technology the importance of which for the development of the Community's nuclear industry seems considerable. As shown in the detailed breakdown of the financing plan (see pages 1-17 of the relevant document), a major proportion of the high cost of this plant must be borne by the public authorities, since private industry is unable to do so.

In conjunction with the aids granted by the Bund and the Land, the advantages proposed will serve as an incentive. The Commission feels that, since they are aimed at promoting an important project in the common interest from a European standpoint, these State aids can be considered compatible with the common market under the terms of Article 92 (3(b)) of the Treaty establishing the European Economic Community.

5. Proposals from the Commission within the meaning of Article 46(2), sub-paragraph 2 of the Euratom Treaty

5.1 The Commission has no particular proposals to make on sub-paragraphs (a), (b) and (c) of the second paragraph of Article 46(2) of the Treaty establishing the European Atomic Energy Community and therefore adopts those put forward by the SBK.

(a) Site of the SBK power plant

The site of the nuclear power plant is at Kalkar, Kreis Kleve (West Germany), to the north of Hönnepel on the left bank of the lower Rhine.

(b) Statutes of the Schnell-Brüter-Kerkraftwerksgesellschaft mbH (SBK)

The SBK, a limited liability company with a planned capital of of DM120 million, was formed on 25 January 1972 by

Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft, Essen, NV Samenwerkende Elektriciteits-Produktiebedrijven, Arnhem, and Synatom SA, Brussels. In May 1973 the Central Electricity Generating Board, London, joined the three original members, thereby increasing the planned capital to DM122 million.

The current capital of DM57 million comprises the following subscriptions:

Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft, Essen	DM3 500 000
	DM14 000 000
	DM21 000 000
NV Samenwerkende Elektriciteits-Produktiebedrijven, Arnhem	DM750 000
	DM3 000 000
	DM4 500 000
Synaton, Société Anonyme, Bruxelles	DM750 000
	DM3 000 000
	DM4 500 000
Central Electricity Generating Board, London	DM2 000 000

Article 13 of the company's statutes (see Annex I of the "Report on the Project for establishing the Schnell-Brüter-Kernkraftwerksgesellschaft mbH (SBK as a Joint Undertaking") contains the necessary provisions for the company to be established as a Joint Undertaking.

Accordingly:

- the amendments to the agreement for formation of the company can only come into force after approval by the Council of Ministers pursuant to Article 50 of the Treaty establishing the European Atomic Energy Community;

- in compliance with Article 171(3) of the Treaty establishing the European Atomic Energy Community, the company's profit and loss accounts and balance sheet for the preceding accounting period will be forwarded by the management, within a month from the date of their approval by the annual general meeting, to the Commission, which will place them before the Council of Ministers and the European Parliament. The estimates of revenue and expenditure will be forwarded in accordance with the same procedure not later than one month after the beginning of each financial year.

C. Volume and rate of financing

The capital needed to carry through the project for a nuclear power plant has been estimated at DM1 540 million (excluding plutonium).

The planned financing of the project is as follows:

subscription by the SBK	DM120 million
Contributions:	
(a) West Germany	DM990 5 million
(b) Belgium	DM212 25 "
(c) Netherlands	DM212 25 "
Balance (cost of phasing to the line)	DM5 "

In addition, other promotional measures are envisaged in the form of a contract under which the Governments of the three countries concerned would participate in the operating risks up to a maximum of DM150 million (see Annex II of the "Report on the Project for establishing the SBK as a Joint Undertaking").

Article 2 of this contract states that the Governments will bear the SBK's losses inherent in the operation of the SNR-300 power plant, initially in their entirety throughout the demonstration period (laid down for in Section 4), then up to 80%, and will share the cost of closing down the plant should this prove expedient.

The rate of financing is shown in Table I in the end of this Opinion.

5.2 The Commission makes the following proposals in respect of sub-paragraphs (d), (e) and (f) of the second paragraph of Article 46(2) of the Euratom Treaty:

(d) Participation by the Community in the financing of the Joint Undertaking

The Community will not participate in the financing of the Joint Undertaking.

(e) Participation by a third State

No third State, national of a third State or international organization will participate in the financing or management of the Joint Undertaking.

(f) Advantages

1. Conferment of advantages

The Commission proposes the conferment on the Schnell-Brüter-Kernkraftwerks-gesellschaft mbH (SBK), initially for a period expiring three years after the final acceptance of the plant by the company, of the following advantages as listed in Annex III of the Euratom Treaty:
- the advantages provided for in paragraph 3, i.e. exemption from Kapitalverkehrssteuer (Gesellschaftssteuer) (capital transaction tax - company tax on assets contributed to SBK by members (Stammeinlagen), up to a total of DM120 million.

Under paragraph 5 of the said Annex:

- exemption from tax on capital;
- derogation from the deadline set for the deduction of losses pursuant to Article 10d of the Einkommensteuergesetz (income tax law);
- exemption from that part of the industrial or commercial profits tax which is levied in pursuance of Article 8 point 1 of the Gewerbesteuergesetz (trade tax law) on the interest due on long-term financial commitments;
- derogation from the deadline set for the deduction of operating losses in pursuance of Article 10a of the Gewerbesteuergesetz;
- exemption from that part of the tax on operating capital which is levied in pursuance of paragraph 2, point 1 of Article 12 of the Gewerbesteuergesetz on long-term financial commitments;
- exemption from that part of the tax on operating capital which is levied on the pro rata value of the plant financed through public subsidies.

The advantages provided for in paragraph 6(a) of said Annex, i.e., exemption from all customs duties and taxes having an equivalent effect, and from all prohibition or restriction on imports and exports of an economic or of a fiscal nature with regard to scientific and technical equipment, excluding building materials and equipment for administrative purposes.

The advantages provided for in paragraph 7 of said Annex, i.e., the exchange arrangements referred to in Article 182(6).

In proposing that the above-mentioned advantages be conferred upon the Schnell-Brüter-Kernkraftwerksgesellschaft mbH (SBK), the Commission was guided by the following considerations:

the construction of the SNR-300 must in no way constitute a profit-making project. Repayment in full of the public subsidies is completely ruled out;

If the tax exemptions requested by the Schnell-Brüter-Kernkraftwerks-gesellschaft mbH (SBK), amounting to about DM12 million, were refused, the direct subsidies to be granted by the public authorities in favour of the project would have to be increased by an equivalent amount.

Under these conditions and in view of the technological importance of this project to the development of the Community's nuclear industry, the Commission is of the opinion that conferment of the advantages applied for by the Schnell-Brüter-Kernkraftwerksgesellschaft mbH (SBK) is justified.

2. Access to information

The advantages mentioned above would be conferred on the Schnell-Brüter-Kernkraftwerksgesellschaft mbH (SBK) on the following terms: the Commission would have to have access to all of the industrial, technical and economic information (including that relating to safety) acquired by the SBK in its capacity of prime contractor during the design, construction and operation of the nuclear power plant over 21 years. This information would include that which the SBK is entitled to receive from its principal supplier and which it is entitled to pass on in compliance with the contracts signed with the latter. The Commission could, pursuant to the powers which the Council would confer upon it on implementation of Article 124 of the Euratom Treaty, lay down the procedure for communicating such information. The information in question will be passed on to the Member States, persons and undertakings in compliance with the provisions of Chapter II of the Treaty establishing the European Atomic Energy Community.

TIMESCALE
(in millions of DM)

Essen 12 January 1973

	Total	Up to and incl. 1972	1973	1974	1975	1976	1977	1978	1979
Source of appropriations									
1. SBK's own capital	120.0	2.3	21.0	27.8	26.9	21.6	11.7	7.8	0.9-
2. Capital cost aids									
(a) Belgium	212.25	3.1	36.8	48.0	46.4	37.3	20.3	13.5	6.85
(b) Netherlands	212.25	3.8	36.1	48.0	46.4	37.3	20.3	13.5	6.85
(c) Germany									
(c1) subsidy	840.5	17.9	168.2	199.2	181.4	139.1	69.4	48.1	17.2
(c2) investment aids	150.0	-	-	25.0	35.0	35.0	25.0	15.0	15.0
	1 535.0	27.1	262.1	348.0	336.1	270.3	146.7	97.9	46.8
Use of appropriations									
Cost of supply contracts (including fuel-element fabrication and part contracts)	999.7	15.4	197.2	243.0	236.1	170.3	76.7	39.9	21.1
Prime contractor's costs (including licensing procedure and spares)	103.0	6.6	10.0	10.0	10.0	20.0	20.0	20.0	6.4
Increases for charges relating to licensing and other subsequent performances	74.0	-	20.0	20.0	15.0	10.0	5.0	3.0	1.0
Share in meeting supply contract-price variations	158.3	-	25.0	40.0	30.0	30.0	15.0	10.0	8.3
Price increases	200.0	-	15.0	35.0	45.0	40.0	30.0	25.0	10.0
	1 535.0	22.0	267.2	348.0	336.1	270.3	146.7	97.9	46.8

Table I (in millions of DM) Essen 12 January 1973

	Total	Up to and incl. 1972	1973	1974	1975	1976	1977	1978	1979
Aids for the purchase of plutonium and/or supply of fuel for the first core									
1. Belgium (25%); supply of equivalent Pu^{239}	375 kg	-	-	-	150 kg	225 kg	-	-	-
2. Netherlands (1%); supply of equivalent Pu^{239}	75 kg	-	-	-	30 kg	45 kg	-	-	-
3. West Germany (70%); aid	30 mio DM	-	10	10	10	-	-	-	-

REPORT ON THE PROJECT FOR ESTABLISHING THE "SCHNELL-BRÜTER-KERNKRAFTWERKSGESELLSCHAFT mbH" (SBK) AS A JOINT UNDERTAKING

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The Annexes to this report are also contained in Volume II of Doc. III/634/74-F.

REPORT ON THE PROJECT FOR ESTABLISHING THE "SCHNELL-BRÜTER- KERNKRAFTWERKSGESELLSCHAFT mbH" AS A JOINT UNDERTAKING (SBK)

1. SITE

The "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) is building and will operate a 300 MWe nuclear power plant, equipped with a sodium-cooled reactor (SNR-300), at Kalkar, in the Kleve area.

The Kalkar site is located on the left bank of the lower Rhine, between points 843.1 km and 842.5 km from the source to the north of Hönnepel.

2. LEGAL FORM AND SHAREHOLDERS

2.1 Legal form

The SBK, a company with limited liability, was formed on 25 January 1972 by the "Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft", Essen, "N.V. Samenwerkende Elektriciteitsproduktiebedrijven", Arnhem and "Synatom S.A.", Brussels (statutes in Annex I to this report).

The object of the company is to develop fast breeder reactors up to the marketing stage by building and operating a prototype nuclear plant with a sodium-cooled fast-breeder reactor, and by acquiring shareholdings in other companies operating nuclear power plants whose aim is to build and operate sodium-cooled fast breeders.

The seat of the company is at Essen.

The administrative organs of the company are:

(a) the general meeting of the members,

(b) the management.

A general meeting of the members is convened by the management, at least once a year. The members are notified two weeks before the appointed date by registered letter stating the place, hour and agenda of the meeting. Upon requisition by one of the members, the management must forthwith convene a general meeting.

Each fraction of DM 10 000 carries the right to one vote in the general meeting.

The general meeting is chaired by the representative of the Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft.

Unless otherwise provided for by law or these statutes, the meeting shall act by a simple majority of votes.

A 90% majority of persons entitled to vote is required to pass resolutions on building the prototype nuclear power plant equipped with a fast breeder reactor, amending the statutes, acquiring shareholdings in other companies operating nuclear power plants and winding up the company.

If the resolutions passed by the general meeting have not been executed before a notary public, they are duly recorded by the management in minutes, signed by the Chairman of the meeting, and forwarded to all members.

The management may be performed by one or more persons. The managers are appointed and dismissed by the general meeting of the members. The members may appoint one of the managers as chairman of the board of management.

The board of management conducts the business of the company in accordance with the law, these statutes and the resolutions of the general meeting of the members.

If there is more than one manager, the company shall be represented by two managers acting jointly, or by one of them acting jointly with an employee holding a power of attorney.

2.2 Shareholders

The initial capital of the company was DM 5 million; it was increased in 1973 and 1974 by contributions from the members, whose shareholdings are now as follows:

Rheinisch-Westfälisches Elektrizitätswerk AG	DM 3 500 000
	DM 14 000 000
	DM 21 000 000
N.V. Samenwerkende Elektriciteits-Produktiebedrijven	DM 750 000
	DM 3 000 000
	DM 4 500 000
SYNATOM S.A.	DM 750 000
	DM 3 000 000
	DM 4 500 000
Central Electricity Generating Board (the CEGB became a member of SBK in 1973)	DM 2 000 000
	DM 57 000 000

The capital will be gradually increased to DM 122 million as the work progresses.

2.3 Compatibility of the statutes with the Euratom Treaty

The statutes of the Schnell-Brüter-Kernkraftwerksgesellschaft mbH, in particular Article 13 thereof, provide that if the company obtains Joint Undertaking status within the meaning of the Treaty establishing the European Atomic Energy Community, it is subject, for the whole of the period of its activity as such, to the provisions of the Treaty which relate to Joint Undertakings and also to the Decisions of the Council of Ministers of the European Atomic Energy Community establishing it as a Joint Undertaking and conferring on it any of the advantages listed in Annex III to the Treaty. In particular:

(a) amendments to Joint Undertaking statutes shall not enter into force until they have been approved by the Council of Ministers, pursuant to Article 50 of the Treaty establishing the European Atomic Energy Community;

(b) in accordance with Article 171(3) of the Treaty establishing the European Atomic Energy Community, the company's profit and loss accounts and balance sheets relating to the preceding financial year shall, within one month after their approval by the general meeting, be sent by the

management to the Commission, which shall place them before the Council of Ministers and the European Parliament. The estimates of revenue and expenditure shall be submitted in accordance with the same procedure one month at the latest before the beginning of each financial year.

Subject to the foregoing provisions, the company continues to be governed by German law, and in particular by the law relating to companies with limited liability.

3. APPLICATIONS SUBMITTED

3.1 Application for conferment of Joint Undertaking status

In its letter of 26 April 1972, shown in Annex I to this report, the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) submitted to the Commission of the European Communities an application for conferment of Joint Undertaking status within the meaning of Chapter V of the Treaty establishing the European Atomic Energy Community.

3.2 Application for conferment of the advantages associated with Joint Undertaking status

In a letter of 26 April 1972, the SBK also requested pursuant to Article 48 of the Treaty of the European Atomic Energy Community, the advantages listed in Annex III of the Treaty be conferred on the company.

These advantages are requested on the following grounds:

3.2.1 The advantages provided for in item 3 are requested, i.e., exemption of members' past and future contributions from capital transaction tax.

The international shareholding on the operations side necessitates the formation of an autonomous company. Nevertheless, formation of such a company, while essential in this case, must not be imposed.

3.2.2 Under Item 5, exemption is requested:

(a) from the Vermögensteuer (tax on capital).

because of the enormous investments required to carry out the SNR-300 project, wealth tax would be a heavy additional burden, impossible to cover from the profits owing to the total lack of profitability. In addition, there is the fact that, of all the Member States of the European Communities, only Luxembourg still levies this tax on limited companies.

(b) from the proportion of the trade earnings tax (Gewerbeertragssteuer) which is levied on long-term debts (section 8(1) of the relevant law (Gewerbesteuergesetz):

the application refers only to the proportion of the trade earnings tax which is payable once the interest from long-term debts has been set off against the trade earnings, in accordance with Federal legislation. To tax this interest would be equivalent to taxing non-existant profits, which in the case of the SNR-300 would be unjustified and unacceptable in view of the undertaking's lack of profitability and its need to have recourse to borrowings. On the other hand, there is no request for exemption from direct taxation on actual profits.

(c) from the time-limit for carrying forward losses, particularly industrial and commercial losses (sections 10d of the Ertragssteuergesetz and 10a of the Gewerbesteuergesetz):

this would also be a case of notional profits if the company could not carry forward the losses of preceding years against the long-term annual profits. The fixing of a legal time-limit in respect of tax on trade earnings for the carrying-forward of losses is not acceptable to the SBK, since this is a project for a nuclear plant which is expected to run at a loss.

(d) from the proportion of trade earnings tax relating to long-term debts (section 12, subsection 2(1) of the Gewerbesteuerordnung).

(e) from the proportion of trade earnings tax relating to that fraction of the cost of the power plant which is financed by the contributions from the Member States:

long-term debts and large subsidies from the Member States which had not previously been granted would place a heavy burden on the SBK if it were subject to the trade earnings tax. The company considers that it would be advisable not to enlarge the basis of the tax in question by charging long-term debts against the capital and to deduct therefrom the subsidies granted by the Member States.

3.2.3 The advantages provided for in item 6 are requested, namely, exemption from all customs duties and charges having equivalent effect on all imports and exports made for the purpose of building and operating the power plant.

3.2.4 The advantages provided for in item 7 are requested, namely, exchange arrangements.

In view the fact that there are international shareholdingson the construction side and that other countries, France and the United Kingdom in particular, have far greater experience as regards certain parts of the plant, the choice of subcontractors should not be prejudiced by the application of taxes, prohibitions or restrictions on imports and exports. This also holds good for exchange restrictions.

3.2.5 The advantages provided for in items 1(a) and (b), 2 and 8 of Annex III to the Treaty are requested.

3.3 SBK's amendments to its application for conferment of advantages

In a letter of 14 March 1974, the SBK withdraw its application for the conferment of the advantages provided for in items 1(a) and (b), 2, 6(b) and 8 of Annex III to the Treaty establishing the European Atomic Energy Community.

3.4 Financial effect of the advantages requested

The effects of conferring on the SBK the advantages associated with Joint Undertaking status are set out in item 6 of this report, in line with the estimate supplied by the SBK.

4. BUILDING OF THE PLANT

4.1 Supply contracts

On 10 November 1972, three supply contracts were signed by the SBK:

- the first with the Arbeitsgemeinschaft Kernkraftwerk Kalkar, formed by the Hochtief, Hollandse Beton Maatschappij NV/Astrobel General Contractors SA Anc. Auxeltra Génie Civil and SA Compagnie d'Entreprises CFE
- the second and the third with the Internationale Natrium Brutreaktor (INB), formed by Interatom GmbH, Belgonucléaire SA and NV Neratoom

Under these contracts, the two companies are to:

- design, build, startup and power-test the SNR-300 power plant;
- manufacture and deliver fuel elements, both for plant startup and for an eight-year operating period.

The contract enters into force on 1 February 1973 and expires when the SBK takes over the power plant, estimated at 66 + 12 months later (66 months to the first charge).

INB will mainly be responsible for building the nuclear section of the plant and for delivery of the fuel elements, while the Arbeitsgemeinschaft Kernkraftwerk Kalkar will be responsible for normal construction work.

4.2 Cost of the plant

The funds needed to carry out the nuclear power plant project are estimated at a total of DM 1 540 million (without plutonium). They break down as follows:

Supply contracts	DM 942 million
Fuel element fabrication	DM 52 million
Work performed by prime contractor	DM 81 million
Probable additional costs (conditions laid down by the licensing authorities, prototype development risks, price increases)	DM 465 million

The plutonium required, which as indicated is not included in the total cost shown above, is supplied by West Germany, Belgium and the Netherlands.

The total cost of DM 1 540 will be financed as follows:

SBK's own resources	DM 120 million[1]
contributions from:	
(a) Germany	DM 990.5 million
(b) Belgium	DM 212.25 million
(c) Netherlands	DM 212.25 million

The balance of DM 5 million is accounted for by the fact that one member, the RWE, will bear the cost of linking the plant to the RWE high-voltage network to transport the energy produced; thus SBK will not have to finance this operation itself.

At the present stage of the project, the SBK will in due course probably have to borrow State guaranteed capital in order to finance the fuel cycle.

The breakdown of expenditure (at 30 November 1972) is shown in item 6 of this report and in Annex IV to this report.

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[1] The DM 2 million contributed by the Central Electricity Generating Board (CEGB) to SBK's capital will not be used to finance the SNR-300 but for studies on the high-power fast reactor.

5. TECHNICAL DESCRIPTION OF THE SNR-300 POWER PLANT

The SNR 300 project (SNR = "Schneller Natrium Reaktor" in German) is the subject of scientific cooperation between four Community countries (Belgium, Germany, the Netherlands and Luxembourg) and is the second plant with a fast-neutron prototype reactor with a significant power output to be built in the Community. With a thermal output of 750 MW, giving approximately 300 MWe, this plant differs from the first prototype station (Phénix) in primary-circuit design.

The construction of the SNR plant is intended as a means of accumulating as much experience as possible, not only in the industrial sphere - in manufacture and erection - but also in the operation of large fast-neutron plants with a view to the construction of larger units (1000 MW and over).

The site at Weisweiler, near Aachen, originally chosen as the location of the SNR plant did not satisfy the safety criteria laid down by the competent authorities in the Federal Republic of Germany, and had to be discarded. A new site was selected, at Kalkar, on the lower Rhine near the Dutch border, which met the requirements set by the German Commission for the Safety of Nuclear Installations, in particular, with regard to criteria relating to population density and the cooling capacity available from the river waters.

The SNR plant is the first major construction project under the Benelux-German fast-reactor development programme aimed at the commercial application of this reactor family. This project - its leading particulars will be found in Annex 1 - derives support both from an extensive programme of basic research and development carried out over the last ten years or so, and from what is termed the industrial programme, which relates more specifically to this project, carried out chiefly by Interatom, Neratoom and Belgonucléaire.

During the years 1963-67, the basic R&D programme was conducted within a Community association, as were the French and Italian programmes.

The development of the reactor is supported by a large number of large experimental facilities, including:

- SNEAK, a fast-neutron critical assembly, at Karlsruhe;
- STEK, a coupled fast/thermal assembly at the RCN, Petten;
- KNK, an experimental sodium-cooled thermal reactor which went critical in August 1971;
- SEFOR, in collaboration with the USAEC, General Electric and Southwest Atomic Energy Associates;
- a 5 MWe experimental loop for steam generator development and the investigation of thermal-hydraulic problems with components;
- the AKB loop for investigating thermal-hydraulic problems with core components;
- the APB loop for the testing and development of the large pumps and valves, flowmeters, etc.;
- TNO's 50 MWe loop at Hengelo for the development of the intermediate heat exchangers and the steam generators;
- the Na-3 loop at Mol for thermal-hydraulic tests on the fuel elements;
- the ASB installation for the study of problems relating to water/sodium reaction phenomena.

Many smaller facilities were also used.

As regards fuel development, an extensive irradiation programme has been carried out in the DFR, Rapsodie, BR-2 and FR-2 reactors.

Following on from this programme, the purpose of the SNR prototype plant will be chiefly:

- to demonstrate, on an industrial scale, the reliability of such a project, and that it can be built at a cost determined according to the normal practice for such construction projects;

- to demonstrate that such a reactor can be operated as part of an electricity grid with satisfactory safety and availability;

- to establish the point in time when larger plants may be competitive and can be built according to the practices usual for a commercial undertaking.

With a nominal rating of 300 MWe, the SNR plant belongs to the same generation of fast reactor as the 233 MWe Phénix plant built as part of the French programme and commissioned in 1973, and the British Prototype Fast Reactor (PFR), which entered service in 1974.

The table below gives the leading particulars of these three plants for purposes of comparison.

		PFR	Phénix	SNR
Thermal output	MW	600(670)	563	730(770)
Electrical output	MWe	250(275)	250	300
Fuel	-	PuO_2/UO_2	PuO_2/UO_2	PuO_2/UO_2
Core volume	l	1320	1227	1600
Specific fuel power	MW/kg fiss.	0.7	0.8	0.9 (approx.)
Power density	MW/l	0.4	0.42	0.4
Linear power	W/cm	450	430	400
Breeder ratio	-	1.2	1.16	1.2 (approx.)
Primary sodium temperature - inlet/outlet	°C	400/560 (425/585)	400/500 (420/580)	377/546
Steam temperature and pressure	°C/atm.abs	510&540)162	510/163	495/165

The SNR plant will lag about five years behind the Phénix and PFR prototypes, but this must be seen against the background of prospective entry into commercial service taking place about 1985 at the earliest.

Furthermore, the SNR plant will be the first large fast-neutron station of the outside-loop variant, both the PFR and Phénix being of the integrated variety, i.e., the core, intermediate heat exchangers and primary pumps are housed inside a large vessel.

Although the external-loop design may be slightly more expensive, it could have the following technical advantages as quoted by its promoters :

- greater ease of limiting the consequences of a major accident;
- better access to components, which should increase plant availability;
- the reactor vessel can be shop-assembled;
- less activation of the secondary circuit sodium;
- easier "stretching" to large sizes.

The fuel for the SNR reactor is a mixture of uranium oxide and plutonium oxide (UO_2, PuO_2) consisting of two (plutonium) enrichment regions of 22 and 30% approximately. The maximum planned burnup is 87,700 MWd/t and the average for the first core 36,600 MWd/t mixed oxide.

Thermal output is 750 MWth, giving a nominal gross power of 312 MWe. All the thermal and electrical systems, however, are designed for a thermal output of 770 MWth, which is intended to make possible the subsequent installation of a core consisting of fuel elements with a higher specific power. Furthermore, it

is planned to make greater use of the facility for conducting tests inherent in the system layout of the secondary circuits (because they are closed and independent) to install at least two different types of steam generator, a key point in the development of components for this reactor family. The reference design is of modular construction with straight tubes.

With regard to engineered safeguards, the SNR will feature:

- two entirely independent scram systems;
- an emergency cooling system independent of the primary circuits;
- an outer containment consisting of a concrete building structure with leaktight steel lining on each side and a system for the inward venting of the airgap;
- a molten-core take-up system in the reactor vault, with an independent cooling system.

ANNEX 1

SNR REACTOR - LEADING PARTICULARS

General

Type:	fast breeder	-
Primary circuit design:	outside loops	-
Number of loops (in parallel):	three	-
Coolant:		
- Primary and secondary circuits:	sodium	-
- Tertiary circuit:	water/steam	-
Fuel:	mixed U and Pu oxide	-
Blanket:	depleted uranium	-
First core power:	730	MW
Gross power:	312	MW
Gross efficiency:	42.7	%
Reference power for the thermal circuits:	770	MW
Breeder ratio:	1.16 - 1.25	-

Reactor

Sodium inlet temperature:	377	°C
Sodium outlet temperature:	546	°C
Sodium flow rate:	3405	kg/sec

Core

Diameter:	2600 (approx)	mm
Height;	1750 (approx)	mm
Number of fuel assemblies:	151	-
Arrangement:	hexagonal	-
Pins per assembly:	163/169	-
Max. nominal linear power (first cycle):	461	W/cm
Diameter:	6.0	mm
Wall thickness:	0.34 min.	mm
Length:	2475	mm
Cladding material:	steel 1.4988	-
Fuel:	$(U + Pu)O_2$	-
Type:	pellets	
First-cycle enrichment:	$(Pu^{239} + Pu^{241})$:	
inner core	22.68 21.90 21.13	at %
outer core	31.96 30.57 29.17	"
Critical mass, first cycle $(Pu^{239} + Pu^{241})$	836.2	kg
Max. burnup:	80,700	MWd/t (U + Pu)
Average max. burnup:	54,800	"
Average burnup:	36,600	"
Number of control rods:	12	
Number of safety rods:		
No. 1 system	3	
No. 2 system	3	

Blanket

Number of assemblies:	330	-
Arrangement:	hexagonal	-
Number of pins/assembly	91	-
Diameter:	9.5	mm
Wall thickness:	0.5	mm
Length:	2480/2483.5	mm
Fuel:	depleted uranium oxide	-
Type:	pellets	-
Clad material	1.4988 steel	-

Reactivity coefficient:	with control rods half in	withdrawn	
Doppler (at 1600°K (with sodium)	$-4.3 \cdot 10^{-6}$	$4.8 \cdot 10^{-6}$	$^{\circ}C^{-1}$
Density			
Fuel:	0.46	0.44	"
Structural materials	-0.018	-0.015	
Sodium	$-0.2 \cdot 10^{-2}$	$+0.13 \cdot 10^{-2}$	"
Power	$-2.07 \cdot 10^{-3}$	$-2.66 \cdot 10^{-3}$	"

Reactivity

Coolant loss (max.)	3.8	$
Control rods:	17.0	"
Safety rods:		
No. 1 system	5.2	"
No. 2 system	12	"

Reactor tank

Diameter:	6500	mm
Height:	14000	mm
Thickness:	10	mm
Material:	1.4948 steel	-

Outer tank

Diameter:	7200	mm
Height:	10,000	mm
Thickness:	10	mm
Material:	1.4948 steel	-

Intermediate heat exchangers

Number:	three	
Type:	straight-tube, counter-current	-
Number of tubes:	1800	-
Heat-transfer area	approx. 880	m^2
Primary sodium flow rate	1180	kg/sec
Secondary sodium flow rate	1090	kg/sec
Secondary sodium temperature:		
at inlet	335	°C
at outlet	520	°C

Steam generators

Type	straight-tube	-

Number of evaporators (per circuit):	3	-
Length:	approx. 23	m
Outside diameter:	approx. 0.9/0.7	m
Thermal output:	54.8	MW
Sodium temperature:	454/335	°C
H_2O temperature:	253/359	"
H_2O pressure:	191/188	atm.abs
Heat-transfer area:	239.1	m^2
Tubes, number:	211	-
Length of tubes:	20.97	m
Dimensions:	17.2 • 2	mm
Superheaters, number:	three	-
Type:	straight-tube	-
Length:	approx. 18	m
Outside diameter:	approx. 0.9/0.7	m
Thermal output:	30.7	MW
Sodium temperature:	520/454	°C
H_2O temperatures:	358/500	"
H_2O pressure:	185/170	atm.abs
Heat-transfer area:	179.64	m^2
Number of tubes:	211	-
Dimensions:	17.2 • 3.2	mm
Length of tubes:	18	m

Pumps

Number of primary pumps:	3	-
Output:	5300	m^3/h
Delivery head:	140	m
Power:	2200	kW
Number of secondary pumps:	3	-
Output:	4600	m^3/h
Delivery head:	100	m
Power:	1800	kW

Turbine

Steam pressure at inlet:	165	atm.abs
Steam temperature at inlet:	495	^oC
Flow rate:	347	kg/sec

Reactor building

Type:	concrete	-
Dimensions: Area	92 x 56	m
Height	max. 54	m

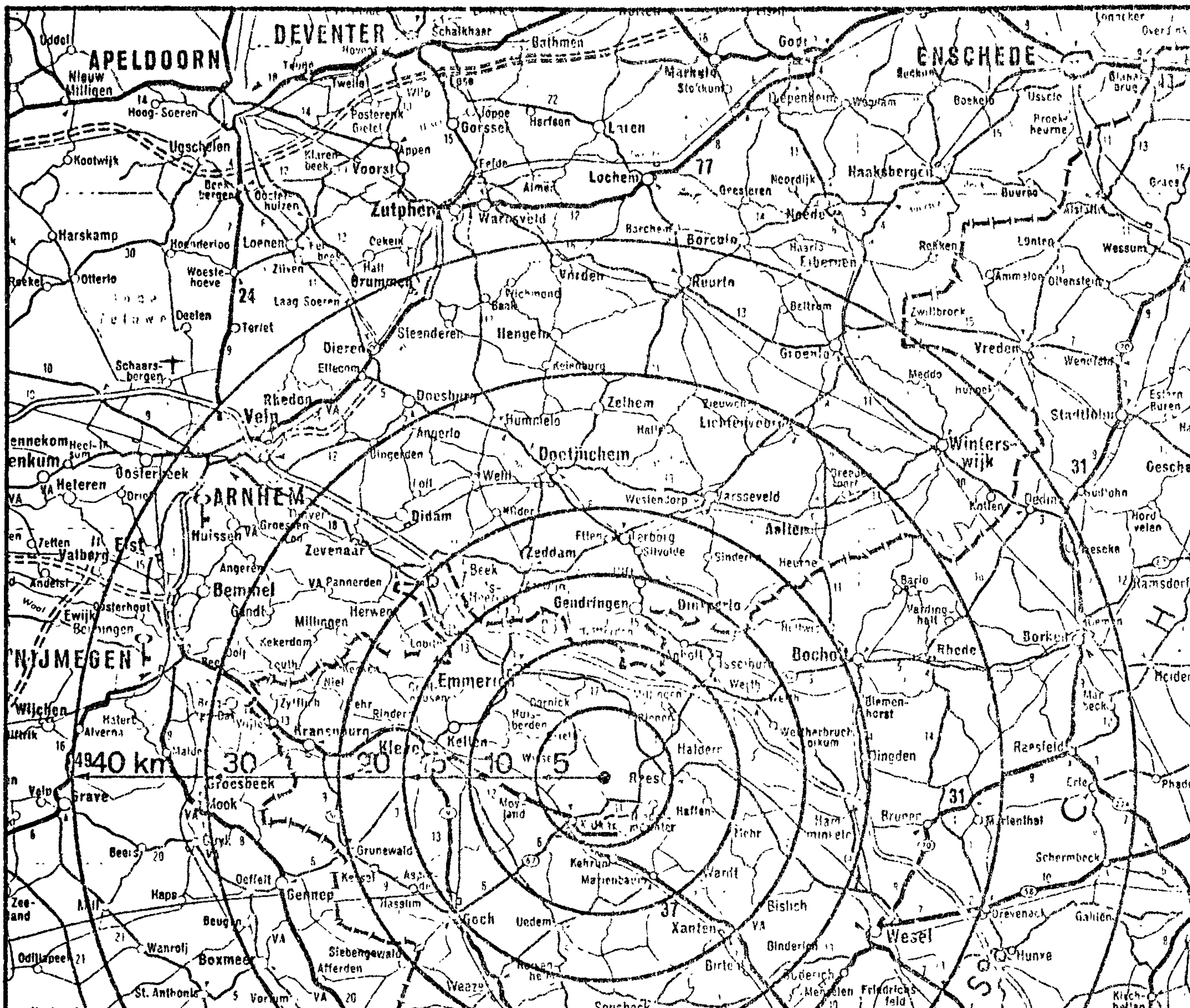
Outer containment

Type:	concrete with external leaktight steel cladding	-
Volume:	approx. 80,000	m^3

Max. pressure:	1.1	atm.abs
Permissible leakage:	1.0	vol%/day

Inner containment

Type:	concrete with leaktight steel liner	-
Volume:	approx. 13,000	m^3
Max. pressure:	1.3	atm.abs
Permissible leakage:	10	vol%/day



300MWe PROTOTYPKERNKRAFTWERK SNR

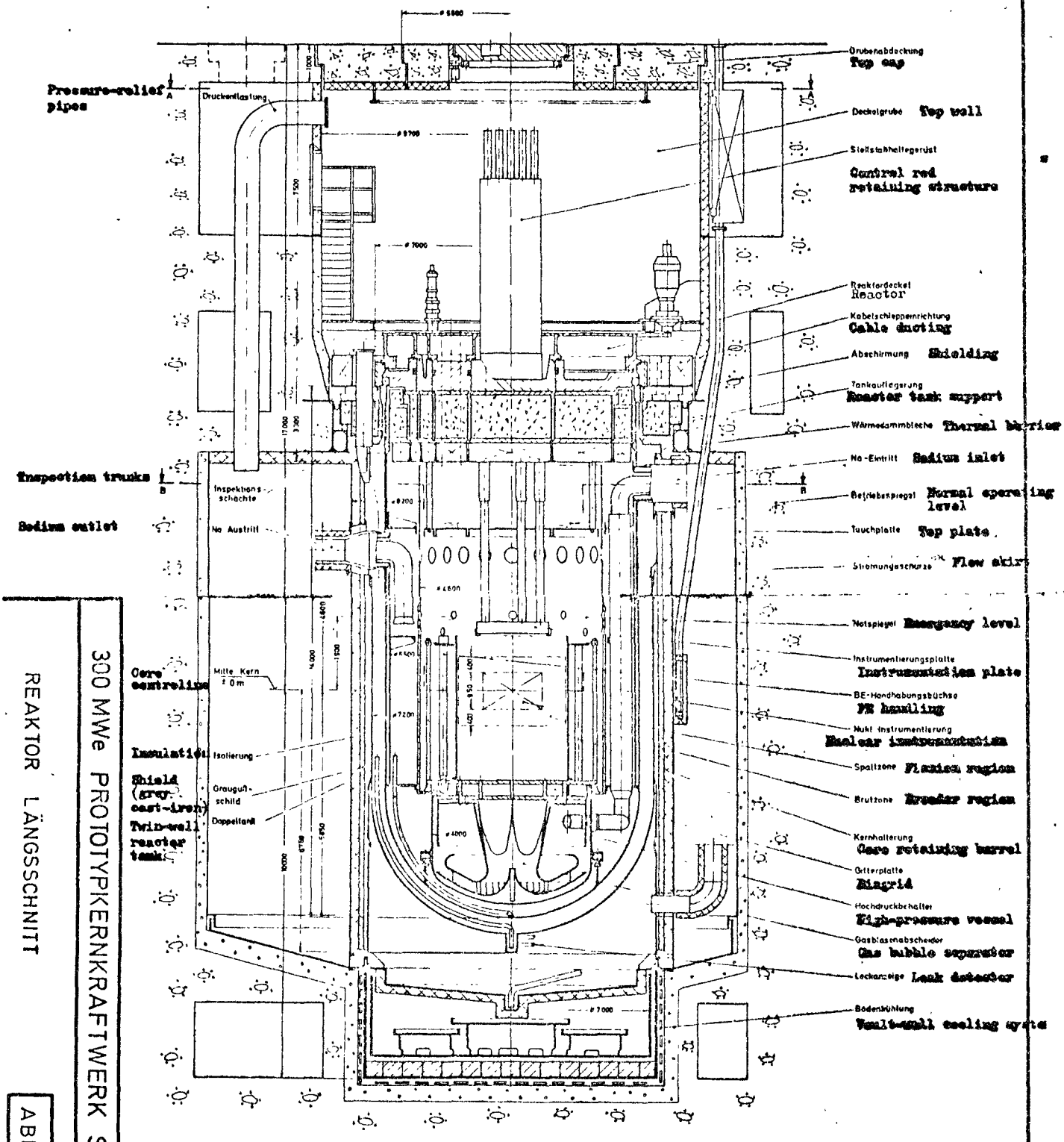
SNR 300 MWe Prototype Power Plant

Plant site and surrounding area scale: 1: 500,000

KRAFTWERKSSTANDORT, M. 1:500000

ABB. 3a

support



300 MWe PROTOTYPKERNKRAFTWERK SNR

REAKTOR LÄNGSSCHNITT

ABB. 20a

6. ECONOMIC DATA

6.1 Cost of project

The total cost of the project (without plutonium) amounts to DM 1 535 million and breaks down as follows (for details see Annex IV to this report and Table I annexed):

1. Supply contract	DM	999.7 million
2. Costs borne by the prime contractor	DM	103.0 million
3. Conditions of licensing and other additional performances	DM	74.0 million
4. Provision towards meeting contract-price variations due to the unforeseen extent of services rendered	DM	158.3 million
5. Provision for price increases	DM	200.0 million
	DM	1 535.0 million

Belgium and the Netherlands are to lend 375 kg and 75 kg respectively of equivalent plutonium-239; Germany has appropriated DM 30 million for its share in the purchase of plutonium.

6.2 Financing of the project (for details, see Annex IV to this report)

6.2.1 Members' own capital

RWE	DM	84 million
SEP	DM	18 million
SYNATOM	DM	18 million
	DM	120 million

6.2.2 Contribution to capital costs

Belgium	DM	212.25 million
Netherlands	DM	212.25 million
Germany: - investment premium	DM	150 million
- subsidy	DM	840.5 million
	DM	1 415 million

6.2.3 Financing of the entire project DM 1 535 million

TABLE B

(in millions of DM)

Essen, 12 January 1973

	total	up to and including 1972	1973	1974	1975	1976	1977	1978	1979
A. Source of appropriations									
1. SBK's own capital	120.0	2.3	21	27.8	26.9	21.6	11.7	7.8	0.9
2. Capital cost aids									
(a) Belgium	212.25	3.1	36.8	48	46.4	37.3	20.3	13.5	6.85
(b) Netherlands	212.25	3.8	36.1	48	46.4	37.3	20.3	13.5	6.85
(c) Germany									
(c1) subsidy	840.5	17.9	168.2	199.2	181.4	139.1	69.4	48.1	17.2
(c2) investment aid	150	-	-	25	35	35	25	15	15
	1 535	27.1	262.1	348	336.1	270.3	146.7	97.9	46.8
B. Use of appropriations									
1. Costs of supply contracts (including fuel-element fabrication and part-contracts)	999.7	15.4	197.2	243	236.1	170.3	76.7	39.9	21.1
2. Prime contractor's costs (including licensing procedure and spares)	103	6.6	10	10	10	20	20	20	6.4
3. Increases for charges relating to licensing and other subsequent performances	74	-	20	20	15	10	5	3	1
4. Share in meeting supply contract price variations	158.3	-	25	40	30	30	15	10	8.3
5. Price increases	200	-	15	35	45	40	30	25	10
	1 535	22	267.2	348	336.1	270.3	146.7	97.9	46.8

TABLE I

	total	up to and including 1972	1973	1974	1975	1976	1977	1978	1979
C. Aid for the purchase of plutonium and/or supply of fuel for the first core									
1. Belgium (25%); supply of equivalent Pu^{239}	375 kg	-	-	-	150 kg	225 kg	-	-	-
2. Netherlands (1%); supply of equivalent Pu^{239}	75 kg	-	-	-	30 kg	45 kg	-	-	-
3. West Germany (70%); aid	DM 30 million	-	10	10	10	-	-	-	-

6.3 Profitability

The details of the profitability calculations are given in the document "Financial effects of the advantages requested as appropriate to Joint Undertaking status" (see Annex V to this report).

The anticipated development of the annual results provided by the SNR-300 reactor was calculated on the basis of 90% utilization of the power plant during the various operating phases, taking due account of the shutdown periods and the trend of the costs provided for in the plan.

The initial cost of the SNR-300 project is financed solely by subsidies from the Member States and by the Company's own capital. Thus there is no recourse to borrowings.

The selling price for energy was fixed at 2.6 Pf/kWh plus any drift, up to and including an annual load factor of 72.5% (base load). The price for supplying energy in excess of this percentage (supplementary quantity) will depend on the fuel cycle costs (variable costs) which the SBK will have to pay.

The cost structure of a comparable light-water power plant which could be put into service at the same time was used to determine the price drift.

Staff requirements are based on an initial complement of 150, reduced to 100 towards 1990.

Taking account of the provisions governing offsetting of losses and the use of surpluses in accordance with the draft risk-sharing agreement, the cumulative amount of revenue and expenditure over a period of 25 years is as follows:

		in millions of DM
Revenue		1 884.47
Expenditure		1 732.22
Balance	+	151.25
Reserve		15.98
		135.27

which sum may be used to pay interest on own capital (taxes included).

The risk-sharing contract provides that:

(a) in the event of an annual deficit, the losses are borne by the participating States;

(b) in the event of annual surplus, this surplus (Article 8) is used:
- to offset the carrying-over of losses,
- as to 30% of the remainder, to reimburse payments made pursuant to the risk-sharing contract or to build up a reserve fund;
- as to 70% of the remainder, to redistribute among the SBK's members dividends of up to 6% of the capital.

(c) a procedure for repayment of capital costs (Article 8).

According to the table on page 11 of Annex V (Annex 3 Annex A) to this report, the States' share in the risks is repaid after 20 years, the reserve is built up over five years and the sums which can be used for the payment of interest are available after the tenth year of reactor operation. There will be no repayment of capital costs.

The profitability calculation drawn up by the SBK therefore shows that the large sums provided by the governments (90% of power plant capital costs) will not be repaid: the SBK will at no time make any profit.

Schnell-Brüter-
Kernkraftwerksgesellschaft mbH

Essen, 12 January 1973
Dr.Th/Si
Az. 3.1.1

Payment plan
(in m. DM)

	Total	up to incl. 1972	1973	1974	1975	1976	1977	1978	1979
A. Source of means									
1. SBK capital	120.0	2.3	21.0	27.8	26.9	21.6	11.7	7.8	0.9
2. Grants for construction costs									
a) Belgium	212.25	3.1	36.8	48.0	46.4	37.3	20.3	13.5	6.85
b) Netherlands	212.25	3.8	36.1	48.0	46.4	37.3	20.3	13.5	6.85
c) Germany									
c1) Grant	840.5	17.9	168.2	199.2	181.4	139.1	69.4	48.1	17.2
c2) Investment allowance	150.0	-	-	25.0	35.0	35.0	25.0	15.0	15.0
	1 535.0	27.1	262.1	348.0	336.1	270.3	146.7	97.9	46.8
B. Utilization of means									
1. Cost of supply agreements (incl. manufacture of fuel and part orders)	999.7	15.4	197.2	243.0	236.1	170.3	76.7	39.9	21.1
2. Owner's costs (incl. licensing procedures and spare parts)	103.0	6.6	10.0	10.0	10.0	20.0	20.0	20.0	6,4
3. Additional costs arising from licensing conditions and other suppl. services	74.0	-	20.0	20.0	15.0	10.0	5.0	3.0	1.0
4. Participation in excess cost of supply contracts	158.3	-	25.0	40.0	30.0	30.0	15.0	10.0	8.3
5. Price increases	200.0	-	15.0	35.0	45.0	40.0	30.0	25.0	10,0
	1 535.0	22.0	267.2	348.0	336.1	270,3	146.7	97.9	46.8
D. Subsidy for procuring or contributing plutonium for the first core									
1. Belgium (25%) contribution Pu-239 equ.	375 kg	-	-	-	150 kg	225 kg	-	-	-
2. Netherlands (5%) contribution Pu-239 equ.	75 kg	-	-	-	30 kg	45 kg	-	-	-
3. Germany (70%) grant	30 m. DM	-	10	10	10	-	-	-	-

6.4 Advantages resulting from conferment of Joint Undertaking status

In its letter of 26 April 1972 (Annex I to this report), the SBK applied for conferment of a number of advantages associated with Joint Undertaking status; the corresponding sum for an operating period of 21 years is of the order of DM 30 million.

In its letter of 5 March 1974, the West German Government agreed to the conferment of only some of the advantages requested and these for a limited period only, i.e., to the end of the third year of operation.

In a letter dated 14 March 1974, the SBK withdrew its request for the conferment of certain advantages first envisaged in 1972.

An estimate of the sums commensurate with the advantages conferred by West Germany is given below:

(a) tax savings made during the formation phase (see also point B.6, Annex V to this report)

as to wealth tax	DM 4.28 million
as to corporation tax	DM 1.45 million
	DM 5.73 million

(b) savings resulting from non-payment of customs duties on reactor equipment:

approx. DM 2.5 million

(c) tax savings achieved during the first three years of operation

in millions of DM

	Year of commissioning	Complete years (estimated) 1	2	3	Total
(a) Tax burden with exemption					
- trade earnings tax	0.59	1.46	1.17	0.72	3.94
- corporation tax with supplementary levy	1.49	2.66	1.67	-	5.82
	2.08	4.12	2.84	0.72	9.76
(b) Fiscal charge without exemption					
- trade earnings tax	1.41	2.55	2.27	1.14	7.37
- wealth tax	0.13	0.52	0.52	0.52	1.69
- corporation tax with supplementary levy	1.06	2.09	1.09	-	4.24
	2.60	5.16	3.88	1.66	13.30
(c) Tax relief					
- trade earnings tax	0.82	1.09	1.10	0.42	3.43
- wealth tax	0.13	0.52	0.52	0.52	1.69
- corporation tax with supplementary levy	- 0.43	- 0.57	- 0.58	-	- 1.58
	0.52	1.04	1.04	0.94	3.54

hence, total advantages:

1. during construction DM 5.73 million
   app. DM 2.5 million
2. during first three years of operation DM 3.54 million

app. DM 11.77 million

III/634/74-E

III-1

OFFICE OF THE PERMANENT REPRESENTATIVE
OF THE NETHERLANDS TO THE EUROPEAN
COMMUNITIES

No 4490

Belliardstraat 62,
Brussels

21 August 1973

Subject: Granting of Joint Undertaking
Status to S.B.K.

With reference to your letter No 5049 of 4 July 1973, with enclosures, regarding the above subject, I would inform you that the dossier presented by the Commission calls for no further questions or remarks.

In reply to your request for advice on this matter, I would therefore refer you to my letter No 6103 of 10 November 1972.

H.A.L. Vijverberg
For the Permanent Representative

The Commission of the
European Communities
Wetstraat 200
Brussels 1040.

PERMANENT REPRESENTATION
OF IRELAND
TO THE EUROPEAN COMMUNITIES
RUE ORBAN 9
1040 BRUXELLES

30 August 1973

Dear Sir

I refer to your letter (reference No. 5114 of 6 July 1973) about the granting of joint undertaking status in accordance with Chapter V of the Euratom Treaty to Schnell-Brüter-Kernkraftwerke-gesellschaft m.b.H. Ireland has no objection to the granting of joint undertaking status in this case.

Yours faithfully

S. O'Sullivan

The Director-General
Directorate General III/F/2
Rue de la Loi 200
1040 BRUXELLES

III-3 III/634/74-E

Brussels, 5 March 197.

PERMANENT REPRESENTATION OF THE FEDERAL REPUBLIC OF GERMANY
TO THE EUROPEAN COMMUNITIES

Ambassador Ulrich Lebsanft

Commissioner Altiero Spinelli
Commission of the European Communities
200 rue de la Loi
Brussels.

Sir,

With reference to the letter from Federal Minister Dr von Dohnanyi of 15 August 1972, I have the honour to inform you of the Federal Government's approval to establish the SNR-300 power station of the Schnell-Brüter-Kernkraftwerksgesellschaft m.b.H. (SBK) as a joint undertaking within the meaning of Article 45 et seq. of the Euratom Treaty.

In this connection, the application for the concessions set out in Annex III of the Treaty should be granted on condition that the SBK shall, from the time of its establishment until three years after the final acceptance of the power station by the SBK be exempted from the following:

- exemption from tax on capital;
- derogation from the deadline set for the deduction of losses pursuant to Article 10d of the Einkommensteuergesetz (income tax law);
- exemption from that part of the industrial or commercial profits tax which is levied in pursuance of Article 8 point 1 of the Gewerbesteuergesetz (trade tax law) on the interest due on long-term financial commitments;
- derogation from the deadline set for the deduction of operating losses in pursuance of Article 10a of the Gewerbesteuergesetz;

- exemption from that part of the tax on operating capital which is levied in pursuance of paragraph 2, point 1 of Article 12 of the Gewerbesteuergesetz on long-term financial commitments;
- exemption from that part of the tax on operating capital which is levied on the pro rata value of the plant financed through public subsidies
- from customs duties and charges of equal effect for these materials and substances detailed in Annex III, paragraph 6 of the Euratom Treaty and in accordance with the conditions laid down therein.

The application that members' subscriptions up to a total of DM 120 000 000 shall be exempted from Company Tax, pursuant to Annex III, paragraph 3 of the Euratom Treaty, is granted.

Please accept, Sir, the expression of my highest consideration.

III-5 III/634/74-E

Brussels, 18 March 1974

PERMANENT REPRESENTATION OF THE
GRAND-DUCHY OF LUXEMBOURG
TO THE EUROPEAN COMMUNITIES

ref. no. 17.4.31

Sir,

I have the honour to refer to your letter no. 1013 of 12 February 1974 and to inform you that the Luxembourg Government is in favour of conferring joint undertaking status on the Schnell-Brüter-Kernkraftwerks-gesellschaft m.b.H.

Please accept, Sir, the assurance of my highest consideration.

Jean Dondelinger
Ambassador and Permanent Representative

Mr. Ronald Grierson,
Director-General for Industrial and Technological Affairs
Commission of the European Communities
200 rue de la Loi
1040 Brussels.

III-6 III/634/74-E

PER [illegible] ITALIAN REPRESENTATION
TO THE EUROPEAN COMMUNITIES

Brussels, 19 March 1974

For the attention of Mr. Loeff
Director-General

Telex No. 133

In reply to your letter No. 1237 of 19 February 1974, the Italian Government is in favour of conferring joint undertaking status on the Schnell-Brüter-kernkraftwerksgesellschaft m.b.H.

Bombassei

III-7 III/634/74-E

rue de la Loi 34
1040 Brussels
29 April 1974

PERMANENT DANISH REPRESENTATION
TO THE EUROPEAN COMMUNITIES

400.V.3-1

Sir,

With reference to your letter of 19 February concerning the conferment of a joint undertaking status to the Schnell-Brüter-Kernkraftwerksgesellschaft m.b.H. (SBK) pursuant to Chapter V of the Euratom Treaty, I have the honour to inform you that the Danish Government agrees to this conferment.

Yours very truly,

Bent Haakonsen
Counsellor to the Ambassador

Mr. J. Loeff
Director-General for Industrial and
Technological Affairs
Commission of the European Communities
200 rue de la Loi
1040 Brussels.

III-8

III/634/74-E

Brussels, 30 April 1974

PERMANENT FRENCH REPRESENTATION
TO THE EUROPEAN COMMUNITIES

ref no. PL/mj-No 76 EUR

Joint Undertaking Status
SBK

Sir,

In reply to your letter no. 1010 of 12 February 1974, I have the honour to inform you that the French Government has no objection to the application for joint undertaking status made by Schnell-Brüter-Kernkraftwerksgesellschaft m.b.H. (SBK) for the purpose of designing and building a prototype sodium-cooled fast reactor (SNR-300).

Please accept, Sir, the assurance of my highest consideration.

E. Cazimajou
Assistant Permanent Representative

Director-General for Industrial
and Technological Affairs
Commission of the European Communities
200 rue de la Loi
1040 Brussels.

III-9 III/634/74-E

1040 Brussels, 20 May 1974
rue Belliard 62, Tel 813.45.70

PERMANENT BELGIAN REPRESENTATION
TO THE EUROPEAN COMMUNITIES

Ref. no. G/P10/91/1230/51.130

Sir,

Subject: Request for joint undertaking status to be conferrred on the SNR-300 nuclear power station.

I have the honour to refer to your letter of 12 February 1974 in which you requested the opinion of the Belgian Government on the application made by the Schnell-Brüter-Kernkraftwerksgesellschaft mbH. (SBK) that joint undertaking status be conferred on a nuclear power station equipped with a prototype sodium-cooled fast reactor (SNR-300).

The Belgian Government supports the application made by the SBK Company. Indeed, the nature of the SNR-300 project together with the significant financial participation by the Member States and the prospects that development of this family of fast reactors offers for a solution of current energy problems, can only justify such a status.

Please accept, Sir, the assurance of my highest consideration.

J. Van der Meulen
Permanent Representative.

President of the Commission of the
European Communities
For the attention of Mr. J. Loeff, Assistant Director-General for
Industrial and Technological Affairs
rue de la Loi 200
1040 Brussels.

COUNCIL DECISION OF
ON THE ESTABLISHMENT OF THE "SCHNELL-BRÜTER-KERNKRAFTWERKSGESELLSCHAFT mbH" (SBK) AS A JOINT UNDERTAKING

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 49 thereof;

Having regard to the Opinion of the Commission;

Having regard to the Report of the Commission;

Having regard to the proposal from the Commission;

Whereas the objects of "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) are to construct, equip and operate a nuclear power station of the order of 300 MWe at Kalkar, Kreis Kleve, Land North-Rhine-Westphalia, Federal Republic of Germany;

Whereas the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) has for this purpose applied for establishment as a Joint Undertaking;

Whereas the statutes of the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) are compatible with the provisions of the Treaty which relate to Joint Undertakings, and whereas Article 13 in particular of those statutes provides that if SBK is established as a Joint Undertaking it will be governed by the said provisions, by the acts adopted in implementation thereof and in particular by this Decision;

Whereas it is the task of the Community to contribute to the raising of the standard of living in the Member States and to the development of relations with other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries;

Whereas, notwithstanding the economic risks at present inherent in such an undertaking, it is important that there should be established from now onwards a first nuclear power station equipped with a fast-neutron reactor, incorporating all the progress achieved hitherto;

Whereas the project put forward by the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) is therefore, at the present stage of the application of nuclear techniques to the production of energy, of fundamental importance to the development of the nuclear industry in the Community;

HAS ADOPTED THIS DECISION:

Article 1

The "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) is hereby established as a Joint Undertaking within the meaning of the Treaty for a period of twenty-five years from 1 January, 1975.

The objects of SBK shall be to construct, equip and operate a nuclear power station of the order of 300 MWe in Kreis Kleve, Land North-Rhine Westphalia, Federal Republic of Germany.

Article 2

The statutes (articles of association) of the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) annexed to this Decision are hereby approved. The dissolution provided for in Article 8 of these statutes shall, however, be effected only after approval by the Council, acting on a proposal from the Commission, in accordance with Article 50 of the Treaty.

The "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) shall add to the designation "Gemeinsames Europäisches Unternehmen" after its name.

Article 3

This Decision is addressed to the Member States and to the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK).

Done at Brussel,

For the Council

The President

Statutes

of the

Schnell-Brüter-Kernkraftwerksgesellschaft mit beschränkter Haftung

Article 1

Name of the Company

The name of the company is :

"Schnell-Brüter-Kernkraftwerksgesellschaft mit beschränkter Haftung"

Article 2

Seat of the company

The seat of the company is at Essen.

Article 3

Objects of the company

The objects of the company are to develop fast breeder reactors to a stage at which they are ready for marketing, by contruction and operation of a prototype nuclear power station with a sodium-cooled fast breeder reactor and by participating in power station companies set up for the purpose of building and operating sodium-cooled fast breeder reactors.

Article 4

Capital

The capital of the company is DM 57,000,000 (fifty-seven million German marks).

Article 5

Subscribed capital

1. The members shall subscribe the following amounts to the capital :

(a) Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft, Essen	DM	3,500,000
	DM	14,000,000
	DM	21,000,000
(b) N.V. Samenwerkende Elektriciteits-Produktiebedrijven, Arnhem	DM	750,000
	DM	3,000,000
	DM	4,500,000
(c) SYNATOM, Société Anonyme, Brussels	DM	750,000
	DM	3,000,000
	DM	4,500,000
(d) Central Electricity Generating Board, London	DM	2,000,000

2. One quarter of the subscriptions to the capital shall be paid in cash before application is made for the entry of the company in the Commercial Register. The management may call up further amounts if necessary. Such amounts shall be paid within four weeks of receipt of the call.

Article 6

Disposal of shares

No shares or fractions thereof shall be assigned or pledged without the assent of all the members.

Article 7

Administrative organs of the company

The company shall have two administrative organs :

(a) the general meeting

(b) the management

Article 8

General meeting; resolutions

A general meeting of the members shall be convened by the management not less than once a year by registered letter at least two weeks in advance, which shall specify the place, date, time and agenda of the meeting. General meetings may be convened anywhere in Germany. Provided the proceedings do not require to be proved by notarial act, they may also be convened abroad.

Upon requisition in writing by one of the members, the management shall forthwith convene a general meeting.

Each DM 10,000 shall carry the right to one vote in the general meeting.

The chair at the general meeting shall be taken by the representative of the Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft.

Unless otherwise required by the law or the Statutes, the general meeting shall pass resolutions by a simple majority of the votes cast.

Resolutions concerning the construction of the prototype nuclear power station with a fast breeder reactor, amendment of the Statutes, participation in other power station companies and winding-up of the company shall be passed by a majority of 90 % of those entitled to vote.

Unless the resolutions passed by the general meeting are certified by a notary public, the management shall prepare minutes of the resolutions passed by general meetings, which shall be sent by the management to all members after signature by the chairman of the general meeting.

Article 9

Management

The management may consist of one or more persons. The managers shall be appointed or dismissed by the general meeting, which may appoint one of the managers to the chairmanship of the management.

The management shall conduct the business of the company in accordance with the law, these Statutes and the resolutions of the general meeting.

Article 10

Representation of the company

If there is more than one manager, the company shall be represented by two managers acting jointly or by one of them acting jointly with an employee holding power of attorney.

Article 11

Financial year

The financial year shall run from 1 July in one year to 30 June in the next.

Article 12

Closing of accounts

Within five months after the end of each financial year, the management shall draw up the balance sheet, the profit and loss account and the report for the preceding financial year.

Article 13

Joint enterprise

If the company is granted the status of a Joint Undertaking within the meaning of the Treaty establishing the European Atomic Energy Community, it is subject, for the whole of its activity as such, to the provisions of the Euratom Treaty which relates to Joint Undertakings, and also to the Decisions of the Council of Ministers of the European Atomic Energy Community establishing it as a Joint Undertaking and conferring on it any of the advantages listed in Annex III to the Euratom Treaty.

In particular :

(a) amendments to these Statutes shall not enter into force until they have been approved by the Council of Ministers, pursuant to Article 50 of the Euratom Treaty;

(b) in accordance with Article 171 (3) of the Euratom Treaty, the company's profit and loss accounts and the balance sheet relating to the preceding financial year shall, within one month after their approval by the general meeting, be sent by the management to the Commission, which shall place them before the Council of Ministers and the European Parliament. The estimates of revenue and expenditure shall be submitted in accordance with the same procedure one month at the latest before the beginning of each financial year.

Subject to the foregoing provisions the company shall continue to be governed by German law and in particular the law relating to companies with limited liability.

Article 14

Notices

All notices of the company shall be published exclusively in the Bundesanzeiger.

Article 15

Formation costs

The costs of formation of the company, including the costs of certifying the Statutes and registering the company, shall be borne by the company.

COUNCIL DECISION OF ON THE CONFERRING OF ADVANTAGES ON THE "SCHNELL-BRÜTER-KERNKRAFTWERKSGESELLSCHAFT mbH (SBK) JOINT UNDERTAKING

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Articles 48 and 124 thereof;

Having regard to the Opinion of the Commission;

Having regard to the Report of the Commission;

Having regard to the proposal from the Commission;

Whereas the objects of the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) Joint Undertaking, established for a period of twenty-five years pursuant to the Council Decision of....., are to construct, equip and operate a nuclear power station with a capacity of 300 MWe in the Kreis Kleve, Land North-Rhine Westphalia, Federal Republic of Germany;

Whereas the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) has for this purpose applied for certain advantages listed in Annex III to the Treaty;

Whereas the Kalkar nuclear power station will be constructed by a consortium of undertakings from several Community countries, and nearly exclusively with components from the Community, and whereas the construction of this power station will enable the technical processes for the production of electricity on an industrial scale to be considerably improved;

Whereas the conferment on the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK), in respect of the period of contruction and operation of the nuclear power station, of advantages listed in Annex III to the Treaty may, by lightening the financial burden, limit the economic risks inherent in such an undertaking;

Whereas it is desirable to confer on "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) the said advantages only if the latter makes available to the Community the non-patentable information it collects in the course of implementing the nuclear power station project;

HAS ADOPTED THIS DECISION:

Article 1

The Member States shall confer on the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) Joint Undertaking in the first place for a period of three years dating after final acceptance of the power station by the undertaking, the following advantages listed in Annex III to the Treaty:

1. Under paragraph 3 of the said Annex, exemption from the Kapitalverkehrsteuer (Gesellschaftsteuer) (capital transaction tax - company tax) on assets contributed to SBK by members (Stammeinlagen), up to a total of DM 120 million.

2. Under paragraph 5 of the said Annex:

exemption from tax on capital;

derogation from the deadline set for the deduction of losses pursuant to Article 10d of the Einkommensteuergesetz (income tax law);

exemption from that part of the industrial or commercial profits tax which is levied in pursuance of Article 8 point 1 of the Gewerbesteuergesetz (trade tax law) on the interest due on long-term financial commitments;

derogation from the deadline set for the deduction of operating losses in pursuance of Article 10a of the Gewerbesteuergesetz;

exemption from that part of the tax on operating capital which is levied in pursuance of paragraph 2, point 1 of Article 12 of the Gewerbesteuergesetz on long-term financial commitments;

exemption from that part of the tax on operating capital which is levied on the pro rata value of the plant financed through public subsidies

3. The advantages provided for in paragraph 6(a) of the said Annex.

4. The advantages provided for in paragraph 7 of the said Annex.

Article 2

The advantages conferred on the "Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) by this decision shall apply to the rights and obligations at the time of its incorporation as a Joint Undertaking.

Article 3

The conferment of the advantages listed in Article 1 on the Schnell-Brüter-Kernkraftwerksgesellschaft mbH" (SBK) is subject to the condition that the Commission shall have access to all the industrial, technical and economic information, including that relating to safety, acquired by SBK throughout the period of design, construction and operation of the nuclear power station. This duty extends to all the information which SBK is entitled to receive from its major supplier and pass on in accordance with the contracts concluded with him. The Commission shall determine which information must be communicated to it, as well as the manner in which such communication shall be made. The Commission shall ensure its dissemination among the Member States, persons or undertakings in accordance with the provisions of Chapter II of the Treaty establishing the European Atomic Energy Community.

Article 4

This Decision is addressed to the Member States and to the Joint Undertaking "Schnell-Brüter-Kernkraftwerksgesellschaft mbH".

Done at Brussels,.....

For the Council

The President

VOLUME II

Rating as Joint Undertaking of

"Schnell-Brüter-Kernkraftwerksgesellschaft m.b.H." (SBK)

- Annexes to the Report on the Project for Establishing the "Schnell-Brüter-Kernkraftwerksgesellschaft m.b.H." (SBK).

ANNEX I Doc. No. III/1807/72 E
Application for grant of Joint Undertaking status, pursuant to Chapter V of the Treaty establishing Euratom, including the Articles of the Company SBK

ANNEX II Doc. No. III/254/73 E
Draft risk-sharing agreement for the fast breeder reactor SNR-300

ANNEX III Doc. No. III/643/73 E
- Letter of 15 August 1972 from Mr von Dohnanyi to Mr Spinelli
- Letter of 6 October 1972 from Mr Spinelli to Mr von Dohnanyi
- Letter of 10 November 1972 from the Permanent Representative of the Netherlands to the Commission
- Letter of 9 January 1973 from Mr Spinelli to Mr Lubbers

ANNEX IV Doc. No. III/644/73 E
Project costs and project financing for the SNR-300 (in million DM) including :

- Appendix 1 Contract Prices
- Appendix 2 Reserve for participation of SBK in excess above the prices ..
- Appendix 3 Reserve for price increases

ANNEX V Doc. No. III/74/73 E
Financial implications of the advantages applied for by virtue of Joint Undertaking status

Annex 1 Determination of tax coefficients
Annex 2a Taxation, taking into account Joint Undertaking status advantages requested
Annex 2b Taxation, not taking into account Joint Undertaking status advantages
Annex 2c Determination of average specific costs with or without Joint Undertaking status advantages
Annex 3 Forecast of results :

Annex A Table of corecasts
Annex B Table of fuel cost calculations
Annex C Explanations concerning fuel cost calculation
Annex D Liquidity trend and interest calculation

~~ANNEX VI~~

III/1807/72-E

Annex I

Schnell-Brüter-Kernkraftwerksgesellschaft mbH

26 April 1972

The Commission of the European Communities

Dear Sirs,

Re: Application for grant of Joint Undertaking status pursuant to Chapter V of the Treaty establishing EURATOM

We intend to build and operate at Kalkar (Kreis Kleve) a 300 MW nuclear power station with a fast sodium-cooled reactor (SNR) and hereby request that our company be granted the status of "Joint Undertaking" within the meaning of the EURATOM Treaty and some of the advantages envisaged in Annex III to the EURATOM Treaty.

The details below are given by way of explanation and justification of our applications:

(A) Our company was established on 25 January 1972 by the Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft, (RWE) Essen, N.V. Samenwerkende Elektriciteits-Produktiebedrijven, Arnheim, SYNATOM, S.A., Brussels.

The capital of the company, initially DM 5,000,000, was subscribed by the members as follows:

.../...

Rheinisch-Westfälisches Elektrizitätswerk AG	DM 3,500,000
N.V. Samenwerkende Elektriciteits-Produktiebedrijven	DM 750,000
SYNATOM S.A.	DM 750,000

It is planned to increase the capital to DM 120,000,000 as construction progresses. A copy of the Company's Statutes is enclosed. These Statutes will be adapted to the requirements of a "Joint Undertaking" if the requested status is granted.

(B) Brief description of the site and plant

(a) Site

The site at Kalkar, Kreis Kleve, is on the left bank of the Lower Rhine between 842.1 and 842.5 km from the source, to the north of Hönnepel. The site meets the prerequisites specified by the German Reactor Safety Commission as regards river-water cooling, good facilities for power distribution and the population density criteria.

(b) Plant

The nuclear power station incorporates a sodium-cooled reactor.

The heat released from the nuclear reactions to the coolant is passed via three external circulating loops to an intermediate circuit likewise filled with sodium and from there to a conventional feed water/steam circuit. The reactor is designed for a thermal output of 730 MW, from which about 300 MW electrical energy is generated in the steam power plant.

.../...

Selection of sodium as the coolant creates the prerequisite for ensuring that the breeding effect (conversion of the non-fissile uranium-238 into fissile plutonium-239) known from the early days of nuclear reactor technology has a beneficial effect in the power station fuel balance. Consequently, current can be generated on a large scale after a certain starting-up period without constant additional purchases of fissile material, because the breeding process ensures that more fissile plutonium is produced than is consumed in the same period.

(6) Financing of the project

The total costs of the nuclear power station project are estimated at DM 1,540 million (not including plutonium). This amount can be broken down as follows:

Costs of supply contracts	DM 942 million
Fuel element manufacture	DM 52 million
Owners' costs	DM 81 million
Estimated additional costs (charges of approving authorities, prototype risks, price increases)	DM 465 million

The necessary plutonium will be supplied by the Federal Republic of Germany and the Kingdoms of Belgium and the Netherlands and is not included in the above-mentioned total costs.

It is intended that the total costs of DM 1,540 million will be financed as follows:

Power station company's own capital	DM 120 million
Subsidies	
(a) Federal Republic of Germany	DM 990.5 million
(b) Belgium	DM 212.25 million
(c) Netherlands	DM 212.25 million

.../...

The difference of DM 5 million compared with the total costs results from the fact that the RWE will connect the power station to the RWE high-voltage grid for transmission of the generated power at its own expense, thus obviating the need for financing by the power station company.

According to the present state of planning, the power station company will in due course probably have to raise government-guaranteed outside capital to finance the fuel cycle.

(D) Profitability of the project

The total costs of the "turnkey" plant without the initial fuel supply are probably four to five times as high as those of a commercial light-water nuclear power station of the same size. As the fuel costs are also a multiple of those of light-water reactors, particularly as a result of the much higher fuel-element fabrication costs, the power generation costs of this plant - even in the event of high availability - will be considerably higher than those of other power stations. Hence if commercial criteria were applied the project would not be feasible.

(E) Reasons in support of the application

If the project materializes despite its unprofitability as outlined above, it is intended to pursue the following aims:

(a) Verification of the theoretically calculated breeding gain in a large-scale experiment;

(b) demonstration that commercially exploitable electrical energy can be generated with a reactor of this type;

(c) if the data under (a) and (b) are established, it is intended to use the plant for large-scale testing of further-developed components under operating conditions.

.../...

We consider that grant of Joint Undertaking status for this project would be justified for the following reasons:

The project is the first of this type in the Community in which firms from more than two countries are participating in both operation and construction (Belgium, Germany and the Netherlands together with Luxembourg as an associated participant). This international cooperation dates back to the early sixties, when the government research centres were fully responsible for carrying out the preparatory work. At this time development of this reactor type in the course of the Second EURATOM Programme was also accorded financial assistance from EURATOM. Transfer of the work to the industry was completed in 1966/67, whereby Siemens/Interatom, Belgonucleaire, Neratoom and Luxatom continued the development work until the project was ready for the construction stage.

Compared with the nuclear reactors previously used in the Community for power generation, the SNR operates with fast, i.e., unmoderated, neutrons. In this sense it is comparable with the reactor at the Phénix nuclear power station, which is a national construction project in France. However, the SNR differs substantially from the Phénix reactor in that the primary sodium is circulated in external lines and heat-exchangers, i.e., outside the reactor tank (loop construction), in the SNR. In the view of the suppliers, an arrangement of this type permits great flexibility of component design, easier access and better adaptation to subsequent developments. The national economies of the countries concerned will also benefit from the experience obtained during construction and operation of the plant.

.../...

In addition, the plant is available to the participating countries and, if Joint Undertaking status is granted, to the Commission and members of the European Communities for the secondment of technicians.

The exchange of information through the Commission will also be effected by the despatch at regular intervals of technical reports on operating processes. Such exchanges should be regarded as particularly important, since, after a certain period of operation, the plant is to be used for further large-scale development of fuel elements and plant components for future generations of fast breeder reactors. In this respect, however, a qualification is necessary insofar as the plant operator does not have completely free access to the knowhow and experience of the industrial firms participating in the experiments. It should also be taken into consideration that operation of the SNR provides opportunities for experiments, which could be carried out at the request of the Commission's research centres after agreement with the power station company.

(F) Advantages requested and justification

1. We hereby apply in accordance with Annex III, para. 5 to the EURATOM Treaty for exemption from:

   (a) property tax;
   (b) that portion of the Trade Earnings Tax attributable to interest on long-term debts (Section 8 (1), Trade Tax Law);
   (c) the time-limit for deduction of the loss or trading loss (Sections 10d Income Tax Law and 10a Trade Tax Law);
   (d) that portion of the trading capital tax attributable to long-term debts (Section 12,(2) (1), Trade Tax Law);

(e) trading capital tax on that part of the value of the power station represented by government subsidies.

Re: (a)

In view of the enormous capital requirement of the SNR project, the property tax would constitute a substantial additional burden, which cannot be covered by earnings as the plant is not profitable. Furthermore, Luxembourg is the only other member country of the European Communities in which limited-liability companies are subject to property tax.

Re: (b)

The application is restricted to that part of the trade earnings tax resulting from the incorporation of the interest on long-term debts to trading profits as prescribed in West Germany. Taxation of such interest on long-term debts is taxation of fictitious income, which is neither justified nor acceptable in the case of the SNR on account of its non-profitability and the need to use borrowed capital. On the other hand, exemption of the actual income from direct taxes is not requested.

Re: (c)

It would also be a case of fictitious income if losses incurred in previous years could not be deducted from income in subsequent years. The statutory time-limit for the carrying-forward of losses in the case of taxes on earnings does not appear to be acceptable in the case of a nuclear power station project for which losses are already anticipated.

.../...

Re: (d) and (e)

The long-term debts and the high government subsidies not granted in previous cases would impose a considerable burden on the power station company as a result of the trading capital tax. Hence we consider it appropriate not to increase the assessment basis for the trading capital tax by including the long-term debts or to reduce it by deducting the government subsidies.

2. We request that, in accordance with Annex III (3) to the EURATOM Treaty, present and future contributions of assets by members be exempted from capital transaction tax.

The international nature of participation on the operational side inevitably calls for the establishment of an independent company. However, it is desirable to avoid a tax burden on the setting-up of a company which in this case is essential.

3. Under the conditions set out in para. 6 of Annex III to the EURATOM Treaty, we request exemption from customs duties and charges of a similar nature on imports and exports required for erection and operation of the nuclear power station. Our application also extends to the exchange arrangements pursuant to Annex III, para. 7.

In view of the international nature of participation on the construction side and the fact that considerable experience is available in other countries (France and the United Kingdom in particular) as regards individual parts of the plant, the choice of suppliers should not be adversely affected by import and export duties, prohibitions or restrictions. This also applies to foreign exchange restrictions.

.../...

4. We also apply for the advantages listed in paras. 1(a) and (b), 2 and 8 of Annex III to the EURATOM Treaty.

Yours faithfully,

Enclosure

ANNEX

Statutes
of the
Schnell-Brüter-Kernkraftwerksgesellschaft
mit beschränkter Haftung

Article 1

Name of the company

The name of the company is:

"Schnell-Brüter-Kernkraftwerksgesellschaft mit beschränkter Haftung".

Article 2

Seat of the company

The seat of the company is at Essen.

Article 3

Objects of the company

The objects of the company are to develop fast breeder reactors to a stage at which they are ready for marketing, by construction and operation of a prototype nuclear power station with a sodium-cooled fast breeder reactor and by participating in power station companies set up for the purpose of building and operating sodium-cooled fast breeder reactors.

Article 4

Capital

The capital of the company is DM 5,000,000 (five million German marks).

.../...

ANNEX

Article 5

Subscribed capital

1. The members shall subscribe the following amounts to the capital:

(a) Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft, Essen	DM 3,500,000
(b) N.V. Samenwerkende Elektriciteits-Produktiebedrijven, Arnhem	DM 750,000
(c) SYNATOM, Société Anonyme, Brussels	DM 750,000

2. One quarter of the subscriptions to the capital shall be paid in cash before application is made for entry of the company in the Commercial Register. The management may call up further amounts if necessary. Such amounts shall be paid within three weeks of receipt of the call.

Article 6

Disposal of shares

No shares or fractions thereof shall be assigned or pledged without the assent of all the members.

Article 7

Administrative organs of the company

The company shall have two administrative organs:

(a) the general meeting

(b) the management

Article 8

General meeting; resolutions

A general meeting of the members shall be convened by the management not less than once a year by registered letter at least two weeks in advance, which shall specify the place, date, time and agenda of the meeting.

Upon requisition in writing by one of the members, the management shall forthwith convene a general meeting.

.../...

Each DM 10,000 shall carry the right to one vote in the general meeting.

The chair at the general meeting shall be taken by the representative of the Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft.

Unless otherwise required the law or the Statutes, the general meeting shall pass resolutions by a simple majority of the votes cast.

Resolutions concerning the construction of the prototype nuclear power station with a fast breeder reactor, amendment of the Statutes, participation in other power station companies and winding-up of the company shall be unanimous. Unless the resolutions passed by the general meeting are certified by a notary public, the management shall prepare minutes of the resolutions passed by general meetings, which shall be sent by the management to all members after signature by the chairman of the general meeting.

Article 9

Management

The management may consist of one or more persons. The managers shall be appointed or dismissed by the general meeting, which may appoint one of the managers to the chairmanship of the management.

The management shall conduct the business of the company in accordance with the law, these Statutes and the resolutions of the general meeting.

Article 10

Representation of the company

If there is more than one manager, the company shall be represented by two managers acting jointly or by one of them acting jointly with an employee holding power of attorney.

ANNEX

Article 11

Financial year

The financial year shall run from 1 July in one year to 30 June in the next. The first financial year shall end on 30 June 1972.

Article 12

Closing of accounts

Within five months after the end of each financial year, the management shall draw up the balance sheet, the profit and loss account and the report for the preceding financial year.

Article 13

Joint enterprise

If the company is granted the status of a Joint Undertaking within the meaning of the Treaty establishing the European Atomic Energy Community, it is subject, for the whole of its activity as such, to the provisions of the Euratom Treaty which relates to Joint Undertakings, and also to the Decisions of the Council of Ministers of the European Atomic Energy Community establishing it as a Joint Undertaking and conferring on it any of the advantages listed in Annex III to the Euratom Treaty.

In particular:

(a) amendments to these Statutes shall not enter into force until they have been approved by the Council of Ministers, pursuant to Article 50 of the Euratom Treaty;

(b) in accordance with Article 171 (3) of the Euratom Treaty, the company's profit and loss accounts and the balance sheet relating to the preceding financial year shall, within one month after their approval by the general meeting, be sent by the management to the Commission, which shall place them before the Council of Ministers and the European Parliament. The estimates of revenue and expenditure shall be submitted in accordance with the same procedure one month at the latest before the beginning of each financial year.

.../...

Subject to the foregoing provisions the company shall continue to be governed by German law and in particular the law relating to companies with limited liability.

Article 14

Notices

All notices of the company shall be published exclusively in the Bundesanzeiger.

Article 15

Formation costs

The costs of formation of the company, including the costs of certifying the Statutes and registering the company, shall be borne by the company.

III/254/73-E
Definite Version

Translation
(Orig. German)

Annex II

Risk-Sharing Contract for the 280 MWe Prototype Nuclear Power Station Using a Sodium-Cooled Fast Breeder Reactor (SNR-300)

- The Federal Republic of Germany, represented by the Federal Minister for Education and Science,
- the Kingdom of Belgium,
- the Kingdom of the Netherlands

hereinafter called the Participating Countries,

and

- the Fast Breeder Nuclear Power Station Company Ltd., represented by their managing directors, hereinafter called SBK,

desiring to promote nuclear development in the Participating Countries and to accelerate the commercial utilisation of nuclear energy by constructing and operating the SNR-300,

hereby conclude the following contract :

Table of Contents

I. Rules

Art. 1

Obligations on the part of SBK

(1) SBK shall, in accordance with its Articles of Association of 25 January 1972, operate as owner company the SNR 300 nuclear power station as economically as possible and, as possible on the basis of careful financial management, and shall use the power station for the generation of electricity to the greatest possible extent according to the principles of sound technical management. At the same time, the aim shall be to achieve an average annual load factor* of at least 72.5 %.

(2) In accordance with Article 8 SBK shall reimburse or compensate out of its profits payments made by the Participating Countries and claims made on them in accordance with this Contract.

*The load factor in per cent is calculated according to the following formula:

$$\frac{\text{electricity supplied (} \quad \text{kWh)}}{\text{continuously attainable net capacity (} \quad \text{kW) x 8760 (h)}} \; 100$$

with the measurements being based on the readings on the high-voltage side of the machine transformer. Temporary deviations of the actual capacity from that which is continuously attainable shall not be taken into consideration. The Contracting Parties will agree upon the value (cf. Art. 2, para. 5) for the continuously attainable net capacity - for the first time when SBK takes over the nuclear power plant and afterwards at any time when any significant changes occur in the net capacity (e.g. more than 5 MWe).

Art. 2

Obligations of the Participating Countries

(1) During the demonstration period (para. 4), the Participating Countries shall take over losses incurred by SBK and occurring in connection with the operation of the SNR-300, in their entirety and afterwards to the extent of 80%, and shall bear part of any expenses of a

definite closedown (Art. 10). The take-over of losses and sharing of costs shall be definite to the extent that the payments on the part of the Participating Countries and the claims made on them (Art. 1, para. 2) are not reimbursed or compensated up to the expiry of this Contract in accordance with Art. 14, unless SBK is committed to repayment in accordance with Art. 15, para. 3.

(2) For the take-over of losses and the sharing of costs in accordance with para.11, the Participating Countries shall make available funds totalling up to 150 (one hundred and fifty) million DM. The funds thus provided shall, when reimbursed by SBK (Art. 1, para. 2), be made available anew. The funds to be provided by the Federal Republic of Germany shall be limited to 105 million DM, those of the Kingdoms of Belgium and the Netherlands to 22.5 million DM respectively (70 : 15 : 15).

(3) The take-over of losses and sharing of costs shall commence with the take-over of the SNR-300 by SBK in accordance with the contract dated 10.11.72 for planning, delivery, turnkey construction, commissioning and trial operation of the SNR-300, Chapter 9. It shall end on the expiry of this Risk-Sharing Contract.

(4) The demonstration period shall begin with the take-over of the SNR-300 by SBK. It shall not end earlier than on the expiry of the third full financial year after the take-over, provided that the nuclear power station has achieved a total average availability of at least 70% during the last two financial years.

(5) Availability within the meaning of paragraph 4 shall be calculated according to the following formula:

$$K_A = \frac{A_B + A_R}{A_N} \times 100\%$$

wherein the abbreviations used above have the following meaning:

K_A = Availability of energy generation

A_B = Net energy actually generated

A_R = Net energy not generated for reasons to be sought outside the plant (e.g. grid, restrictions due to the load dispatcher), which could otherwise have been generated

A_N = Net energy which can be generated given unrestricted availability, i.e. the product out of the continuously attainable net capacity and the number of hours in the period under review.

Net capacity and net energy refer to the capacity reached on the high-voltage side of the machine transformer which can be used for the grid.

II. Prerequisites for the take-over of losses

Art. 3

Power Supply

SBK shall supply the electricity generated in the SNR-300 to the Rheinisch-Westfälisches Elektrizitätswerk AG, Essen (RWE). SBK shall submit to the Participating Countries for prior approval the power supply contract, which must comply with the price regulations mentioned below (Articles 4, 5) and must be concluded for a period corresponding at least to that of this Contract, and it shall also submit to them without delay the arrangement between its shareholders as well as any modifications envisaged.

Art. 4

Purchase prices

In the power supply contract concluded with RWE, SBK will agree on a price of 2.6 Dpfg/kWh for the electricity supplied by it subsequent to the take-over up to an annual load factor of 72.5% (basic amount). For the amount supplied in excess (additional amount) SBK may reduce the price to 1.20 Dpfg/kWh, not however, to a price below the variable cost (including the fuel cycle costs) of the SNR-300.

Art. 5

Modification of purchase prices

(1) In the case of a modification of the costs of the SNR-300, the Participating Countries shall be informed without delay.

(2) At the time of the take-over, and then every two years, the Contracting Parties shall negotiate on changes in the electricity price. SBK will endeavour to negotiate fair purchasing prices with RWE and, if necessary, the other utilities. In the event of an electricity price cut, the costs involved in the SNR-300 and the

probability of relying on the Participating Countries for their support under this contract or the probability of a reimbursement of payments made and the compensation of possible claims shall be taken into account. Art. 13, para. 2 shall remain unaffected by this provision.

(3) Each change in the purchasing prices agreed with RWE and, if necessary, other utilities, shall require the prior agreement of the Participating Countries.

III. Accomplishment of the take-over of losses

Art. 6

Calculation of the annual surplus or annual deficit

(1) The basis of the take-over of losses within the meaning of Articles 7 and 8 is constituted by the annual surpluses or deficits of SBK, which can be ascertained by the comparison of expenses and yield of SBK. Unless otherwise agreed in this Contract, the trade balance and profit and loss accounts pertaining thereto shall provide the basis for the calculation of the annual take-over of losses by the Participating Countries; the principles governing the drawing-up of a balance sheet for tax purposes shall apply to this calculation. The firm of auditors charged with the auditing of the annual balance sheet shall examine the accounts and balance as to their correctness in each case.

(2) With regard to the depreciation of the nuclear power station as a whole, an operational life of 17 years is to be assumed. Assets with a shorter operational life may, however, be written off in accordance with the depreciation rates customary in the German power supply industry. Expenditures which, under the scope of the law, are to be carried as launching costs, shall be written off in 5 years' time. The linear procedure shall be applied to all write-offs. To the extent that, in justifiable cases, special or additional depreciations become necessary, the Participating Countries shall be consulted in order to obtain their prior approval.

(3) SBK shall be bound to enforce all claims against third parties, in particular claims for guarantee or warranty.

(4) The following extraordinary expenditures and proceeds incurred by SBK shall not be taken into account when calculating the annual deficits or deficit shares which have to be taken over by the Participating Countries or the reimbursements which have to be made by SBK in accordance with Article 8 :

(a) Receipts of SBK on the basis of claims made on the Participating Countries in accordance with this Contract;

(b) Expenditures on the part of SBK on the basis of claims made by the Participating Countries in accordance with this Contract;

(c) Expenditures on the part of SBK on account of the infringement, either intentional or as the result of gross negligence, of contracts of guarantee with the Participating Countries.

Art. 7

Balancing of an annual deficit

(1) An annual deficit calculated in accordance with Art. 6 shall be balanced as follows :

(a) During the demonstration period at the rate of 100% by way of the release of reserves accumulated in accordance with Art. 8, para. 1 ba and, to the extent that such reserves are not, or are only to an insufficient amount, available, by grants provided by the Participating Countries under the terms of their take-over of losses in accordance with Art. 2, para. 2,

(b) following the expiry of the demonstration period, at the rate of 80% by way of the release of reserves accumulated in accordance with Art. 8, para. 1 ba and, to the extent that such reserves are not, or are only to an insufficient amount, available, by grants provided by the Participating Countries under the terms of their take-over of losses, in accordance with Art. 2, para. 2, as well as at the rate of 20% by giving account of a corresponding loss on the part of SBK, which is to be carried forward into the next financial year.

(2) In the financial year during which the take-over of losses by the Participating Countries commences, the Participating Countries will only take over that portion of the annual deficit which was incurred subsequent to the commencement of the take-over of losses.

Art. 8

Utilization of an annual surplus

(1) The annual surplus calculated in accordance with Art. 6 shall be utilized in the following order :

(a) for the settlement of loss carryovers;

(ba) to the amount of 30% of the remaining sum for the repayment of the payments made by the Participating Countries under this Contract and afterwards for the settlement of any claims made in accordance with this Contract by SBK on the Participating Countries or - if such payments have not yet been made or have already been reimbursed by SBK and eventual claims have been settled for the accumulation of reserves, which are to be utilized in accordance with Art. 7, para. 1;

(bb) to the amount of 70% of the remaining sum for the payment of a profit to the shareholders of SBK up to 6% of the equity capital (following taxation) for the past financial year and, where appropriate, for previous financial years during which only a small or no dividend was paid since the take-over of the SNR-300.

(2) If the reserves to be built up in accordance with para. 1 ba have reached the amount of 30 million DM, or have regained this level, the annual surplus incurred shall, in addition, likewise be made available to SBK for the payment of a profit to the shareholders up to 6% (following taxation) on the equity capital in accordance with para. 1 bb.

(3) If, in accordance with paragraphs 1 and 2, the payment of a profit to the shareholders averaging 6% on equity capital (following taxation) has been achieved, the amount in excess is first of all to be employed for the reimbursement of payments made by the Participating Countries in accordance with this Contract, then for the settlement of eventual claims made by SBK on the Participating Countries in accordance with this Contract, and after this, for replenishing the reserves. The remaining amount is to be divided in proportion according to the shares taken in the financing of the construction costs. In this connection, SBK shall receive that amount corresponding to the proportion of equity capital in the overall financing. The remainder shall be repaid by SBK to the Federal Republic of Germany, the Kingdom of Belgium and the Kingdom of the Netherlands to the ratio of 70 : 15 : 15, in order to reduce the grants towards construction.

Art. 9

Payments

(1) In accordance with Art. 7, para. 1, claims made by SBK on the Participating Countries shall become due - subject to paragraph 2 - three months after presentation of the annual balance. Claims on the part of the Participating Countries on SBK in accordance with Art. 8 shall become due after the annual balance has been drawn up. If the annual balance has still not been drawn up 6 months after the close of the financial year, SBK shall, at this time, undertake preliminary reimbursement on the basis of the preliminary balance sheet submitted.

(2) The Participating Countries shall make appropriate instalments to SBK, to the extent that the necessity of payments out of the take-over of losses can already be foreseen in advance. SBK, on its part, will demand instalments and payments from the Participating Countries in accordance with para. 1 to the extent that its strained liquidity so requires. Subject to Art. 1, para. 1, SBK shall decide on the utilization of liquid funds within its freedom of disposition according to normal business practice, extending also to special amortization, investment transactions and to the granting of shareholder loans in line with real market conditions. When evaluating SBK's liquidity it shall be assumed that the liquid funds earned by careful management and utilized by SBK within its freedom of disposition according to normal business practice have remained with SBK as liquid funds. This provision shall not apply to equity capital re-accumulated by depreciations.

Art. 10

Definite Close-down

(1) The definite close-down of the SNR-300 shall, as a matter of principle, require the consent of all Contracting Parties. The Participating Countries shall not oppose the definite close-down if SBK cannot be expected to further operate the SNR-300 owing to technical or economic reasons specific of the SNR-300.

(2) SBK is under an obligation to inform the Participating Countries without delay as soon as it can be foreseen that at a fixed date in the future

(a) the depreciations, crediting the loss carryovers in accordance with Art. 7, para. 1 b, at the most, however, a total of DM 50 million,

and

(b) that portion of the funds to be made available by the Participating Countries in accordance with Article 2 which has not yet been made use of (for payments and claims)

will correspond to the existing liabilities and those still to be expected up to the completion of the close-down (with the exception of those mentioned in para. 6 b), and if, afterwards, an improvement in the business situation of SBK is not to be expected.

(3) (a) SBK is under an obligation to further operate the SNR-300 or parts thereof, in accordance with the wishes of the Participating Countries, against reimbursement of the costs thus arising and of those costs not covered by possible proceeds from the generation of electricity, if the Participating Countries reques this within three months after they were so informed in accordance with para. 2. This obligation is also valid if SBK is not in a position to notify in good time, i.e. 3 months in advance, that its business situation is that mentioned in para. 2. In this connection, the payment of a profit to the SBK shareholders to the amount of 6% (following taxation) per year of the equity capital reduced in accordance with para. 6 b and still remaining with SBK after a reduction, if any, in accordance with Art. 16, para. 2 is to be regarded as a cost factor, calculated to the date on which the SNR-300 would otherwise have been closed down.

(b) SBK is entitled to definitely close down the SNR-300, even without agreement of the Participating Countries, if

- the situation described in para. 2 arises, and an improvement is not to be expected,

- it has informed the Participating Countries of its intention to do so at least three months in advance, and

- the Participating Countries have not stated their intention to make use of their rights in accordance with Article 3 a.

(4) In the event that SBK opposes a proposal on the part of the Participating Countries that the SNR-300 be definitely closed down on the grounds that the Participating Countries cannot be expected to endorse the further operation of the power station for technical or economic reasons, specific to the SNR-300, the Participating Countries shall have the right to denounce the present Contract with effect from the end of the next full financial year.

(5) In the event of the definite close-down of the SNR-300, SBK shall

either dismantle those parts of the plant which are not necessary for further operation with another steam generator, or shall leave them in such a state as to permanently guarantee the interests of public safety.

(6) In the event of the definite close-down, SBK's liabilities are as follows :

(a) the total liabilities which have been incurred from the operation of the nuclear power station up to the completion of the close-down,

(b) the differences from the equity capital on the one hand, and the depreciations if these are less than DM 50 million, or amount to DM 50 million, on the other hand.

(7) (a) SBK's liabilities in accordance with para. 6 will be offset with

- the liquid funds available,

- the proceeds from the entire company assets, with the exception of the real property and of those parts of the plant which are necessary for the further operation of the nuclear power station with another steam generator and which SBK wishes to retain in its possession,

- the market value of the real property and of those parts of the plant which are necessary for the further operation of the nuclear power station with another steam generator and which SBK wishes to retain in its possession, and

- those funds mentioned in para. 2 b.

(b) To the extent that the amounts of SBK's liabilities mentioned in para. 6 are smaller than the amount of the total funds, proceeds and market values mentioned in para. 7 a, the funds mentioned in para. 2 b will be used to offset these liabilities only to the proportion which the funds mentioned in para. 2 bear to the amounts of the total liquid funds, proceeds and market values mentioned in para. 7 a. The amount corresponding to the sum remaining from these liquid funds, proceeds and market values mentioned in para. 7 a following amortization and settlement of the liabilities, shall be reimbursed by SBK to the Federal Republic of Germany, the Kingdom of Belgium and the Kingdom of the Netherlands at the ratio of

70 : 15 : 15, in order to reduce the grants towards construction costs.

(c) To the extent that the amounts of the liabilities of SBK in accordance with para. 6 exceed the amount of the entire funds, proceeds and market values mentioned in para. 7 a, priority is to be given to the amortization of the liabilities incurred as the result of measures taken in accordance with para. 5 and then to the amortization of the remaining liabilities. Only then shall the liabilities mentioned in para. 6 b be amortized and settled to the extent that funds and market values are available.

(d) The Contracting Parties shall agree on a supplementary provision concerning the amortization of liabilities possibly guaranteed by the Participating Countries, if SBK makes application for corresponding guarantees.

(e) If the SNR-300 has definitely been closed down, after previously having been further operated in accordance with the wishes of the Participating Countries in accordance with para. 3 a, SBK will be treated in this case as though the definite close-down had taken place immediately.

(f) In the event of a close-down, the separate part of the company assets mentioned in Condition 8 of the Notification of Grants for the construction costs shall not be taken into consideration.

IV. Other provisions

Art. 11

Audit privileges

(1) SBK shall submit to the auditing of its annual balance (including its accounts and annual report), economic situation and financial management by an independent auditor. Prior to the appointment of the auditor the Participating Countries have to be consulted.

(2) SBK is bound to allow the Participating Countries, or persons appointed by them, to carry out an audit at any time in order to ensure the proper execution of this Contract; furthermore it has to give any information requested. A corresponding audit privilege shall be accorded to the Federal Audit Office, the Court des Comptes and the Algemene Rekenkamer.

(3) The audit fees with regard to para. 1 above shall be borne by SBK.

Art. 12

Submission of the annual balance sheet and operational reports

(1) SBK shall undertake to submit to the Participating Countries sufficient copies of its annual report, annual balance sheet and the reports (including the annexes) of the auditor immediately after the annual balance sheet has been drawn up.

(2) SBK shall submit to the Participating Countries sufficient copies of reports on the technical operation of the SNR-300 and on SBK's financial development, and, if necessary, on the patent rights involved. Moreover, it shall submit reports each year on the major technical and economic operating characteristics of the SNR-300, taking the information system envisaged for project control into account.

(3) The Participating Countries shall be entitled to provide access to information received and, if necessary, to the patent rights in accordance with the notification of grants-in-aid for the construction costs, to interested companies in the power supply industry and reactor building industry in the Participating Countries, provided that and in so far as there are no legitimate interests of SBK or the supplying enterprises opposed to such access.

(4) Each country is entitled to designate a given number of trainees - the number has still to be decided - to follow the operation of the SNR-300.

V. Final provisions

Art. 13

Interpretation and modification of the Contract

(1) In the spirit of the existing partnership, the Contracting Parties shall endeavour, by way of negotiation, to reconcile any differences of opinion concerning the interpretation of this Contract.

(2) In the event of any major change in the technical and economic principles on which this Contract is based, the Contracting Parties shall meet to discuss whether and in what way the provisions of the Contract are to be adapted to the changed conditions, while at the same time safeguarding its technical and economic objectives as far as possible.

(3) If differences of opinion are not reconciled according to para. 1, the arbitration agreement, attached to this Contract as Annex 1, shall be applied.

Art. 14

Duration of the Contract

(1) This Contract shall take effect on signature, on conclusion of the power supply contract and on the take-over of the SNR-300. It shall end on completion of the close-down in accordance with Art. 10 or notice of denunciation, respectively, in accordance with Art. 10, para. 4, or Art. 15, paras. 1 or 3, at the latest, however, at the end of the 25th full financial year following the take-over.

(2) If, on the termination of the Contract in accordance with Art. 10, para. 4 or Art. 15, paras. 1 or 3, or at the end of the 25th full financial year, reserves accumulated in accordance with Art. 8, para. 1 ba are available, these shall be repaid by SBK to the Federal Republic of Germany, the Kingdom of Belgium, and the Kingdom of the Netherlands, to the ratio of 70 : 15 : 15, in order to reduce the grants towards construction.

Art. 15

The right to give notice

(1) The Participating Countries shall have the right to denounce this Contract at the earliest with effect from the end of the 17th full financial year following the take-over. The term of notice shall be one year.

(2) If, either as the result of gross negligence or intentionally, SBK infringes important provisions of this Contract, the Participating Countries may stop the payments under this Contract in the future. The other provisions of this Contract shall remain unaffected.

(3) If SBK acts in a manner contravening this Contract, thus causing the subsequent removal of the basic principles for risk sharing, the Participating Countries may withdraw from this Contract and demand repayment within 12 months from SBK of the payments already made under their risk sharing obligations.

Art. 16

Amendment of the Articles of Association, liquidation of SBK, and reduction of the equity capital

(1) The amendment of the Articles of Association of SBK dated 25 January 1972, and the liquidation of SBK shall require the written consent of the Participating Countries.

(2) Without specially obtaining the consent of the Participating Countries which shall be considered as given by the conclusion of this Contract, SBK shall be entitled to reduce its equity capital by means of re-accumulated depreciation funds at the end of its third and ninth full financial year following the end of the demonstration period by no more than one-third in each case, if, at the same time, SBK's shareholders commit themselves to reimburse these funds when, in accordance with Art. 10, the decision to close down is taken, or otherwise at the time of the expiration of the Contract - except in the case of normal expiry following the 25th full financial year in accordance with Art. 14, para. 1 - and if they guarantee SBK's claims by means of absolute guarantees, or, instead, provide other securities of equal value.

Art. 17

Declaration of intent

(1) All declarations of intent made by the Participating Countries with regard to this Contract and its execution shall take effect only

(a) if they have been laid down either in one document in the German language with an official English translation, or in three documents in the language of the respective country with an official English translation of identical wording, and if they have been signed by the Participating Countries, either jointly or separately, and

(b) if the document, or the three documents, have been communicated

to SBK.

(2) All declarations of intent made by SBK with regard to this Contract and its execution shall take effect only

(a) if they have been laid down in the German language with an official English translation in three identical documents and if they have been signed by it and

(b) if these documents have been communicated to the Participating Countries.

(3) For the calculation of time limits and dates

(a) in the event of para. 1b, and if three documents are used, that point of time is decisive at which the last of the three documents submitted by the Participating Countries has been communicated to SBK.

(b) in the event of para. 2b, that point of time is decisive at which the last of the Participating Countries has received one of the three documents submitted by SBK.

Art. 18

Place of Performance

The place of performance shall be Bonn.

German law shall apply exclusively for the conclusion and execution of this Contract.

For the Federal Republic of Germany, the Federal Minister for Education and Science :

Bonn, the 4th December, 1972.

For the Kingdom of Belgium :
Brussels, the 16th February, 1973.

For the Kingdom of the Netherlands :
The Hague, the 10th May, 1973.

Fast Breeder Nuclear Power Station Company Ltd. :
Essen, the 18th December, 1972.

Annex 1

Arbitration Agreement annexed to the

Risk-Sharing Contract for the SNR-300

(1) All disputes arising from or in connection with the risk-sharing Contract for the SNR-300 during its term or after its expiry which cannot be settled amicably will be decided by a Court of Arbitration to be convened in Bonn.

(2) The Court of Arbitration shall consist of three arbitrators. Each Contracting Party, i.e. the Participating Countries on the one hand and the Fast Breeder Project Company on the other, shall appoint one arbitrator, who in their turn shall appoint a third arbitrator to act as the chairman. If one of the Contracting Parties does not appoint an arbitrator one month after being requested to do so by the other Party, or if both arbitrators cannot reach agreement on a third one within one month after the second arbitrator has been appointed, then the President of the European Court in Luxembourg, or failing that, the President of the Bundesgerichtshof at Karksruhe shall appoint the arbitrator or arbitrators on the request of either of the Contracting Parties. The arbitrator acting as chairman must be qualified to hold a judgeship.

(3) The decisions of the Arbitration Court shall be taken by the majority of votes. It will decide according to German law and regulate its proceedings according to the provisions of the 10th Book of the German Code of Civil Procedure.

In the arbitral proceedings as well as in the procedure for the execution of the arbitral award, the exception of State immunity may not be raised.

(4) Each Contracting Party shall bear the costs for the arbitrators appointed by or for it, as well as the costs of its representatives in the arbitral proceedings. The cost of the chairman as well as the remaining costs shall be borne in equal parts by the Contracting Parties. The Court of Arbitration may make a different regulation regarding costs.

(5) The Landgericht Bonn is agreed on as the competent court within the meaning of sections 1045, 1046 of the Code of Civil Procedure.

(6) German law shall apply to the conclusion and execution of the foregoing agreement.

For the Federal Republic of Germany, the Federal Minister for Education and Science :

Bonn, the 4th December, 1972.

For the Kingdom of Belgium :

Brussels, the 16th February, 1973.

For the Kingdom of the Netherlands :

The Hague, the 10th May,,1973.

Fast Breeder Nuclear Power Station Company Ltd. :

Essen, the 18th December, 1972.

Annex 2

Protocol of Signature to the Risk Sharing Contract for the SNR-300

In addition to the provisions of the Risk-Sharing Contract for the SNR-300, the Contracting Parties have agreed as follows :

(1) Any expenditures and proceeds on the part of SBK arising from activities others than those mentioned in Art. 1, para. 1, as well as any future capital increases that are not used for the funding of the SNR-300, shall not be considered when applying the Risk-Sharing Contract.

(2) The Contracting Parties shall negotiate on an increase of the Risk-Sharing Fund in accordance with Art. 2, para. 2 and retaining the arrangement laid down in Art. 2, para. 2, if the general development of costs so requires.

(3) During the negotiations on the financing of the construction of the SNR-300, the originally envisaged equity capital for SBK was increased by DM 20 million, i.e. from DM 100 million to DM 120 million. The difference amount of DM 20 million shall, however, be subject to a stipulation deviating from the provisions of the Risk-Sharing Contract :

(a) The depreciation basis shall be reduced by the difference amount of DM 20 million when calculating the annual surplus or annual deficit according to Art. 6.

(b) The difference amount of DM 20 million shall not be considered when employing an annual surplus in accordance with Art. 8, paras. 1,2, and 3, 1st sentence.

(c) However, before an annual surplus according to Art. 8 para. 3, 2nd sentence and subsequent sentences is employed, at first depreciation and then payment of profits up to 6% (following taxation) will be made to the shareholders on the difference amount of DM 20 million for the expired business year, and for past business years, too, in which no or only some depreciation or payment of profits to the shareholders was made on the difference amount of DM 20 million; any such depreciation or payment of profits will be made for the period of time following the take-over of the SNR-300.

(d) In all other cases, the total equity capital shall be used as the basis for calculation.

(4) When calculating the annual surplus or annual deficit in accordance with Art. 6, the depreciation basis shall - independent of the arrangement set forth in para. 3a - be reduced by the investment grant.

(5) SBK will make use of its right to reduce the equity capital in accordance with Art. 16, para. 2 only, if it can be foreseen that a full yield from the equity capital can be achieved during the following years.

For the Federal Republic of Germany, the Federal Minister for Education and Science :

Bonn, the 4th December, 1972.

For the Kingdom of Belgium :

Brussels, the 16th February, 1973.

For the Kingdom of the Netherlands :

The Hague, the 10th May, 1973.

Fast Breeder Nuclear Power Station Company Ltd. :

Essen, the 18th December, 1972.

III/643/73-E

ANNEX III

Dr Klaus von Dohnanyi
Bundesminister für Bildung und
Wissensohaft
Postfach 120 124
53 Bonn 12.

15 August 1972

Mr Altiero Spinelli
Member of the Commission of the
European Communities.

Dear Mr Spinelli,

The Schnell-Brüter-Kernkraftwerkgesellschaft mbH established by German, Belgian and Dutch power supply undertakings will soon start work on a prototype nuclear power station with a sodium-cooled fast breeder reactor (SNR-300) at Kalkar, Kreis Kleve. The company has applied for conferment of Joint Undertaking status within the meaning of Article 45 of the Treaty establishing the European Atomic Energy Community and requested a number of advantages, which are listed in Annex III to the Treaty.

I am pleased to inform you that the Government of the Federal Republic of Germany supports this application. In the view of the Federal Government, the prerequisites for conferment of a Joint Undertaking status pursuant to Article 45 of the Treaty have been satisfied, because the undertaking is indeed of decisive importance to the nuclear industry in the Community. This has already been explained in detail by the Schnell-Bruter-Kernkraftwerkgesellsohaft in its application.

In its opinion dated 4 February 1972 concerning construction of an "SNR" breeder reactor prototype power station at Kalkar, the Commission evaluated the project in the light of the aims of the EURATOM Treaty and emphasised the technical and commercial aspects, which make the project

.../...

of decisive importance where nuclear energy in the Community is concerned.

In accordance with the international character of the project, the basic research work has been carried out in association with EURATOM. Even though, for reasons with which you are fimiliar, the Euratom contracts of association relating to fast breeder development were not renewed on completion of the second Euratom five-year programme, and it has not yet been possible to arrange a different form of collaboration within the framework of the European Communities in the prototype phase, the Federal Government considers that the aims set out in the 1968 German/Belgian/ Dutch memorandum concerning collaboration on fast breeders in the Community still apply. There is still the same readiness to cooperate with other countries in the Community.

The agreements between the German, Belgian, Luxembourg and Dutch governments concerning joint action in the field of fast breeder development have been and are still regarded as a contribution to the coordination of efforts in the Community. The further development of fast-breeder cooperation in the Community has proved that the SNR-300 constitutes a step towards fulfilment of this aim. The cooperation of the electricity supply undertakings and of industries is already being extended to the entire Community in the case of the 1000 MWe demonstration plants as a result of the agreements concluded last year between RWE, EDF and ENEL, Benelux electricity supply undertakings being able to participate through RWE's involvement. Inclusion of the energy interests of the United Kingdom as one of the countries acceding to the Community is to be anticipated.

The construction of the SNR-300 as planned by the international Schnell-Brüter-Kernkraftwerkgesellschaft is of decisive importance as regards the creation of an adequate basis for technical experience, which in the long run will determine the marketing of the SNR family. It is precisely for

.../...

this reason that the Federal Government supports and endorses the Commission's efforts in this direction, which in the opinion of the Federal Government should include conferment of Joint Undertaking status on the Schnell-Brüter-Kernkraftwerksgellschaft.

Yours truly,

III/643/73 E

A. Spinelli

Dr Klaus von Dohnanyi,
Bundesminister für Bildung und Wissenschaft,
Postfach 120-124,
53 Bonn 12.

6 October 1972

Ref: HvL/bc

Dear Herr von Dohnanyi,

Many thanks for your letter of 15 August 1972 in which you informed me that the Federal Government supports the application of the Schnell-Brüter-Kernkraftwerksgesellschaft mbH for grant of Joint Undertaking status in accordance with Article 45 of the Euratom Treaty.

This application has been received here in the meantime and the competent Commission departments are currently making the usual preparations for initiation of the procedure laid down in Article 46 of the Euratom Treaty. It goes without saying that all arguments put forward by the applicant will receive detailed consideration in this procedure. I can already assure you, however, that the points of view emphasised in your letter will receive special attention in the formation of opinion within the Commission.

You rightly draw attention to the Commission's opinion dated 4 February 1972, which favourably assessed the project for construction of the SNR-300, with consideration of all relevant aspects, and emphasized the international character of this project from both the construction and power-generation points of view. The Commission hopes that still greater coordination of efforts can be achieved in the Community in the field of fast breeders as

.../...

regards the 1000 MWe demonstration plants. I was pleased to note from your letter that the Federal Government also attaches special importance to these efforts.

You will appreciate that I cannot anticipate the Commission's decision on the proposal to be submitted to it in accordance with Article 46 of the Euratom Treaty. However, I can assure you that the Commission is prepared to initiate and carry out the examination procedure without delay.

Yours truly,

PERMANENT REPRESENTATION OF THE KINGDOM OF
THE NETHERLANDS AT THE EUROPEAN COMMUNITIES

No 6103 Brussels, 10 November 1972

Subject: recognition of the German/Belgian/Dutch/Luxembourg fast breeder prototype power station as a Joint Undertaking.

The Schnell-Brüter-Kernkraftwerksgesellschaft mbH (SBK) established by Dutch, Belgian and German electricity supply undertakings intends in the near future to start construction of a prototype power station with a sodium-cooled fast breeder reactor (SNR-300) at Kalkar, near Kleve (Germany). The SBK has applied for conferment of Joint Undertaking status within the meaning of Article 45 of the Treaty establishing the European Atomic Energy Community and for grant of a number of advantages pursuant to Annex III to the Treaty.

I have the honour to inform you that the Dutch Government supports this application. In its opinion, the conditions for conferment of the Joint Undertaking status pursuant to the abovementioned article of the Euratom Treaty are satisfied; it considers this undertaking to be of fundamental importance to the development of the nuclear energy industry in the Community. This the SBK has explained in detail in its application.

In its opinion dated 4 February 1972 on the construction of a SNR-300 fast breeder prototype, the Commission recognized the significance of this project from the point of view of realizing the aims of the Euratom Treaty and elucidated the technical and economic aspects which make this project of decisive importance to the development of the nuclear energy industry in the Community.

.../...

In conformity with the international character of the project, the basic research and development work has been carried out under contract of association with Euratom.

Although, for reasons with which you are familiar, it was not possible to continue the contracts of association with Euratom after completion of the second Euratom five-year programme, or to arrange a different form of cooperation in the prototype phase, the Dutch Government believes that the aims set out in the 1968 German/Belgian/Dutch memorandum still hold good. Thus there is still the same readiness to collaborate with other countries in the Community, as expressed in the memorandum.

The arrangements between the Netherlands, Belgium, Germany and Luxembourg concerning joint action by these countries in the field of fast breeder reactors have been and are still regarded as a contribution to the concentration of effort in the Community. The further development of cooperation in this field in the Community has proved that the SNR-300 constitutes a step towards the fulfilment of this aim. As regards the demonstration plants, the cooperation of the electricity supply undertakings and of industry in accordance with the agreements concluded last year between RWE, EDF and ENEL has already been extended throughout the Community; electricity supply undertakings in the Benelux countries can share in this collaboration through RWE's participation. Furthermore, it is to be anticipated that Britain, as one of the countries soon to accede to the Community, will also be included in this development.

Construction of the SNR-300 by the international SBK company is of decisive importance as regards acquisition of the necessary technical

.../...

experience, which in the final analysis will determine the marketing of the SNR-300 family. The Dutch Government therefore supports the efforts of the Commission in this respect, which in its opinion should also include conferment of Joint Undertaking status on the SBK.

(Signed) J.H. LUBBERS

Deputy Permanent Representative.

Altiero Spinelli
Member of the Commission of
the European Community

9 January 1973

J.H. Lubbers,
Deputy Permanent Representative,
Permanent Representation of the
Kingdom of the Netherlands at the
European Communities.

Dear Minister,

I acknowledge receipt of your letter of 10 November 1972 in which you inform me that the Dutch Government supports the application by the Schnell-Brüter-Kernkraftwerksgesellschaft mbH for conferment of Joint Undertaking status pursuant to Article 45 of the Euratom Treaty.

The appropriate departments of the Commission are currently taking the usual steps to initiate the procedure laid down in Article 46 of the Euratom Treaty. All documents submitted by the applicant will be carefully examined during this procedure. I can already assure you that when reaching its decision the Commission will give particular consideration to the points of view outlined in your letter.

You rightly drew attention to the Commission's favourable opinion dated 4 February 1972 on the project for construction of the SNR-300, which takes into account all aspects of this project and in particular emphasises its international character resulting from the participation of construction firms and electricity supply undertakings from various countries.

The Commission hopes that the realization of this project in the field of fast breeder reactors, and in particular the development of 1000 MWe demonstration power stations within the Community, will lead to

.../...

collaboration on an even wider basis. I was pleased to note from your letter that the Dutch Government also attaches great importance to the work in this field.

You will appreciate that I cannot anticipate the Commission's decision on this project, which has been submitted in accordance with Article 46 of the Euratom Treaty. I can assure you, however, that the Commission intends to initiate and carry out the prescribed examination procedure with due speed.

Yours faithfully,

III/644/73-E

Essen 20.11.1972

ANNEX IV

Schnell-Brüter-
Kernkraftwerksgesellschaft mbh

Further appendix to our proposal to the European Community on the granting of the status of a Joint Undertaking

Project costs and project financing for the SNR 300 (Fast Breeder Reactor 300)
(in millions of DM)

I. Project costs

1. Supply contracts

(a) Preliminary orders for planning and detailing the project, of 23.3.1972

(a1) SNR Consortium (Interatom, Neratoom, Belgonucléaire) 14.9

(a2) Association of bidders (leading firm Hochtief, Essen) 0.9

(b) Main orders to Internationale Natrium-Brutreaktor Baugesellschaft mbH (International Sodium-Breeder Reactor Construction Company) of 10.11.1972 (see also Appendix 1)

(b1) Planning, delivery, turnkey erection, commissioning and test running of the power station plant - excluding construction 749.9

(b2) Design, manufacture, testing and supplying of the first reactor core filling of fuel elements, breeder elements and reserve elements together with absorbers and reflector elements, including provision of planning services. 60.0

(c) Main order to Arbeitsgemeinschaft Kernkraftwerk Kalkar of 10.11.1972. Planning, delivery, turnkey erection, commissioning and test running of the power station plant - limited to the construction part - 174.0 999.7

2. Promoter's costs		
(a) Licensing procedure including Technical Inspection Report	15.0	
(b) Spares	20.0	
(c) Other promoter's costs		
(c1) Initial provision of auxilliary and operational fuels	5.0	
(c2) Laboratory and workshop equipment	4.5	
(c3) Advisers and experts	4.0	
(c4) Land acquisition and investigation of foundation soil	2.5	
(c5) Roads, parking areas etc. and other services in the building sector	3.0	
(c6) Electricity consumption during building	9.0	
(c7) Personnel costs before take-over	21.5	
(c8) Provision of housing	5.0	
(c9) Building taxes (assuming status of a Joint Undertaking)	3.5	
(c10) Other promoter's costs	10.0	103.0
3. Licensing requirements and other subsequent services		
(a) constructional part for cooling tower, aircraft crash guard and lowering of ground water	20.3	
(b) plant part for cooling tower	11.4	
(c) reserve for further services	42.3	74.0
4. Reserve for covering share of excess over the contract prices as a result of unforeseeable increases in the items to be supplied (see Appendix 2)		158.3
5. Reserve for expected price increases (see Appendix 3)		200.0
Total project costs (without plutonium)		1,535.0

Plutonium for the initial charge		
Quantities to be provided by Belgium and the Netherlands on loan and funds required for German provision on loan	450 kg Pu-239 equivalent 30 million DM	
II. Project financing		
1. Capital resources of the participants		
(a) RWE	84.0	
(b) SEP	18.0	
(c) SYNATOM	18.0	120.0
2. Construction cost contributions		
(a) Belgium	212.25	
(b) Netherlands	212.25	
(c) Germany		
(c1) Capital grant in accordance with the Capital Grant Law of 18.8.1969	150.0	
(c2) Contribution	840.5	1,415.0
Total financing of project		1,535.0
Plutonium for the initial charge		
(a) Belgium (25%); provision	375 kg Pu-239 equivalent	
(b) Netherlands (5%); provision	75 kg Pu-239 equivalent	
(c) Germany (70%); contribution	30 million DM	

III/644/73-E
Appendix 1
Essen 10.11.1972

SNR

Contract Prices

	Millions DM	Millions Dutch guilders (M.DM)	Millions Belgian francs (M.DM)	Total (M.DM)
INB				
A-part (Item 4.2.1)	319.900	35.000 (35.000)	840.000 (60.000)	414.900
C-part (Item 4.2.3)	173.530	82.735 (82.735)	472.290 (33.735)	290.000
D-part (Item 4.2.4)	15.400	3.300 (3.300)	46.200 (3.300)	22.000
E-part (Item 4.2.5)	8.000	-	-	8.000
CII-Increase (Item 4.4)	10.500	2.250 (2.250)	31.500 (2.250)	15.000
First core (Fuel element contract)	37.564	-	314.104 (22.436)	60.000
Arge* (Construction part)	121.800	26.100 (26.100)	365.400 (26.100)	174.000
Total	686.694	149.385 (149.385)	2 069.494 (147.821)	983.900
Proportion	69.8	: 15.2	: 15.0	

*Arge = Arbeitsgemeinschaft Kernkraftwerk Kalkar

SBK

Reserve for participation of SBK in excess above the prices in accordance with Items 4.2.3, 4.4 and 4.2.4 of the Plant Contract and in accordance with Item 4.1.1 of the Fuel Element Contract.

The attached diagrams show the participation of the SBK in excess above the prices in accordance with Items 4.2.3, 4.4 and 4.2.4 of the Plant Contract and Item 4.1.1 of the Fuel Element Contract.

For the calculation of the reserve, different probabilities are assumed for the individual ranges of excess (Malus ranges) as regards their expected utilization, the basic principle adopted being that the probability decreases as the amount of excess rises. For the rest, the calculation of the reserve is based on the following considerations:

C-Malus including CII-Malus (Item 4.5.1 Power Station Contract)

In the course of the negotiations with the INB, a supply quantity of around 70 million DM from supply sector A (Item 4.1.1) was included in supply sector C (Item 4.1.3) and simultaneously a reduction of this amount was granted, with adjustment of the Malus arrangement (Item 4.5.1). For this reason a high degree of probability (95%) is assumed for the first 70 million DM of excess. Analogously to the sharp increase in the Malus arrangement when the excess reaches 145 million DM (INB share increases from 25 to 50%), a steep reduction in the expected utilization is also assumed beyond this limit. It is important for the overall assessment of this part of the reserve that on the one hand there is no engineering included in this sector and on the other hand that the excess basis contains the contingency price in accordance with Item 4.4 (CII-increase) amounting to 15 million DM. Both factors have a risk-reducing effect as regards the expected excesses.

D-Malus (Item 4.5.2 of the Power Station Contract)

Supply sector D (Item 4.1.4) covers, in the main, engineering. In contract to sector C, there is no limitation on the excess. For the calculation of the reserve a continuously falling probability function up to an excess of approx. 40 million DM = approx. 180% is assumed.

BE-Malus (Item 4.2.1 of the Fuel Element Contract)

For exceeding of the guideline prices for the initial core a Malus arrangement was agreed which results in a 50% participation by the INB beyond an excess of 15 million DM. This warrants the assumption of a higher probability (95%) of utilization up to this limit. Beyond this limit the probability function exhibits a falling trend. While the Malus arrangement for the initial core is not limited, there is a restriction in so far as SBK participates in price excesses only during the initial period of manufacture, namely until completion of 50% of the fuel elements (the time at which the guideline price is converted into a fixed price). This Malus arrangement includes the prototype risks in accordance with Item 1.6 of the Fuel Element Contract.

On the basis of the foregoing considerations, we arrive at the following calculation of the Malus reserve:

	Malus ranges	Max. SBK participation	Probability	Probable SBK participation
	M.DM	M.DM	%	M.DM
C-Malus including CII-Malus	0 - 35	33.25	95	31.59
	35 - 70	31.59	95	30.01
	70 - 100	25.65	90	23.09
	100 - 130	22.80	85	19.38
	130 - 145	9.97	80	7.98
	145 - 228.75	39.78	40	15.91
		163.04		127.96

= 41.2% of 305 M.DM

	Malus ranges M.DM	Max. SBK partici-pation M.DM	Probability %	Probable SBK participation M.DM
D-Malus	0 - 4.4	3.76	90	3.38
	4.4 - 8.8	3.34	80	2.67
	8.8 - 13.2	2.93	70	2.05
	13.2 - 17.6	2.51	60	1.51
	17.6 - 22.0	2.09	50	1.05
	each 4.4	2.09	40	0.84
	"	2.09	30	0.63
	"	2.09	20	0.42
	"	2.09	10	0.21
		:	0	-
				12.76
			= 58.0% of 22 M.DM	
BE-Malus	0 - 6	5.13	95	4.87
	6 - 12	4.56	95	4.33
	12 - 15	1.99	95	1.89
	15 - 30	7.22	60	4.33
	each 15	7.22	30	2.17
	"	:	0	0
	"	:	:	:
				17.59
			= 29.3% of 60 M.DM	
				158.31 M.DM

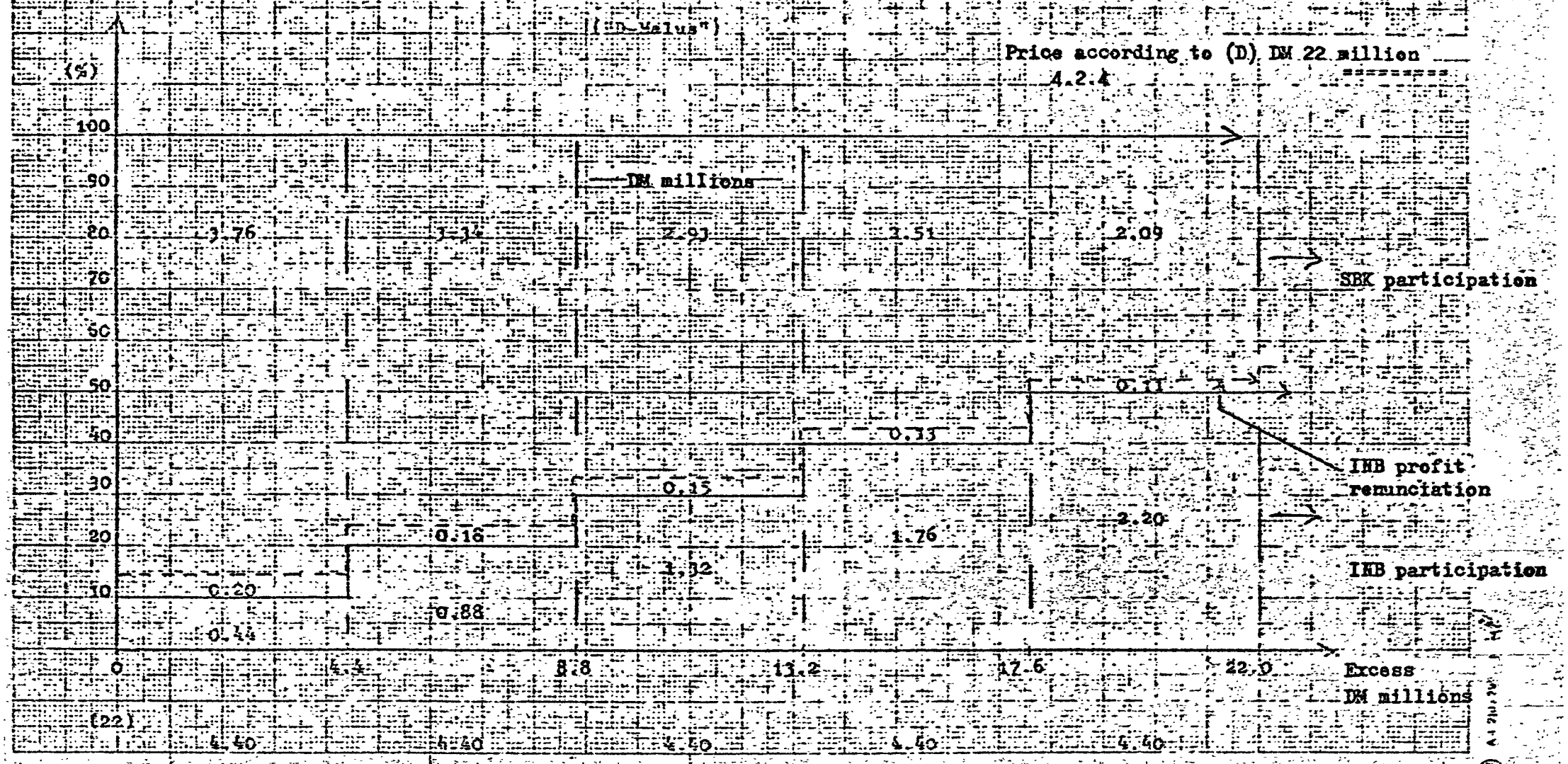
Total Malus reserve

The price increases expected upon this probable utilization are taken into account in the calculation of the reserve for price increases.

SBK

Essen, 10 November 1972

Participation according to item 4.5.2 of the power station contract in the excess over the price in accordance with item 4.2.4



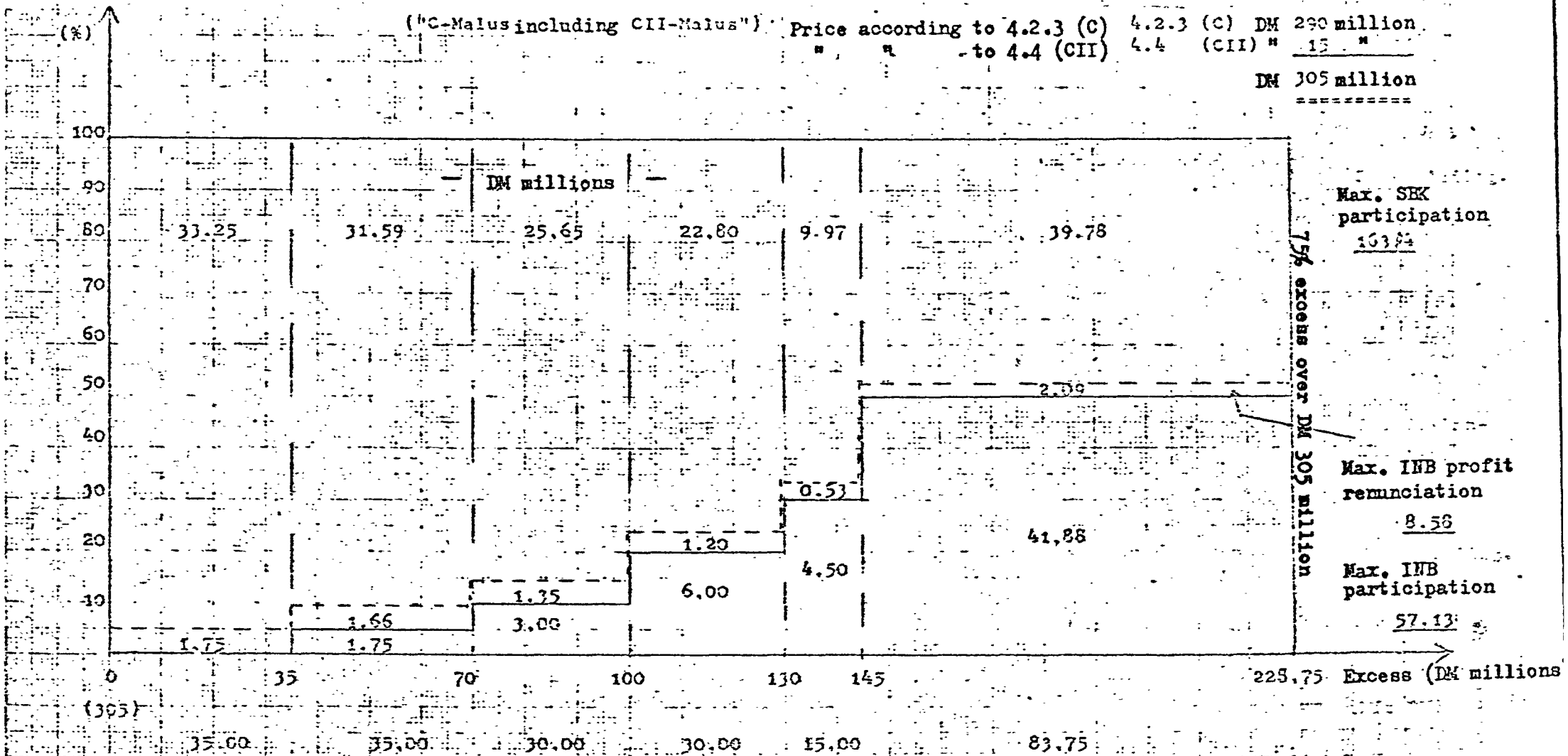
SBK

Essen, 10 November 1972

Participation according to item 4.5.1 of the power station contract in the excesses above the prices in accordance with items 4.2.3 and 4.4

("C-Malus including CII-Malus")

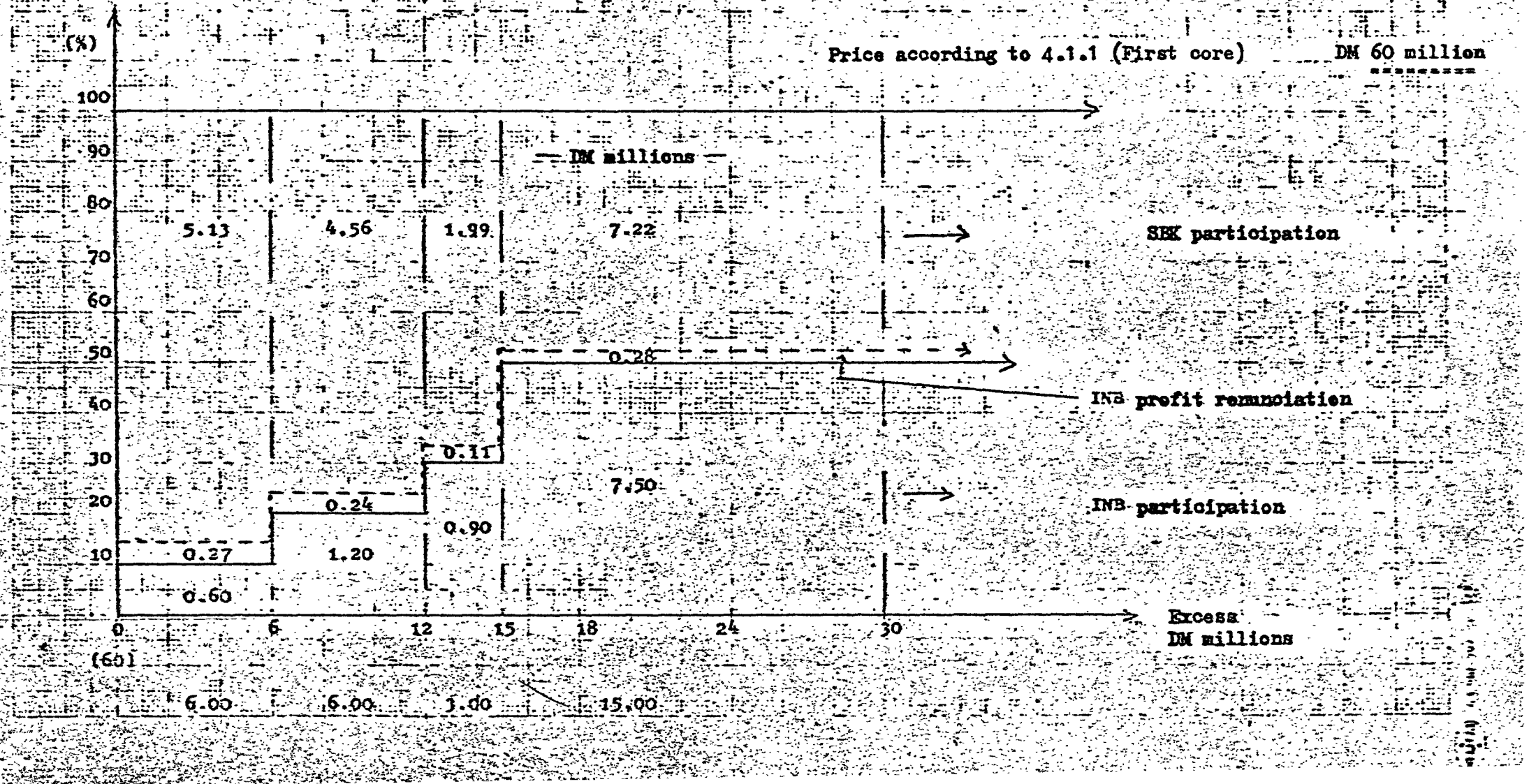
Price according to 4.2.3 (C) 4.2.3 (C) DM 290 million
" " to 4.4 (CII) 4.4 (CII) " 15 "
DM 305 million



SBK

Essen, 10 November 1972

Participation according to item 4.2.1 of the fuel element contract
in the excess above the price according to item 4.1.1 (FE Malus)



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Appendix 3

Essen, 10.11.1972

Reserve for price increases

In the appended tables the price increase has been calculated for all supply sectors on the basis of the agreed payments schedules or the estimated outflow-of-funds schedules and the agreed sliding-scale price revision formulae.

An average yearly price increase of materials of 3% and a wage increase of 7% are assumed.

The calculation yields the following result:

	Basic amount M.DM	Price increase %	Price increase M.DM
1. Contracts for supplies			
a) Part orders	15.8	-	-
b) Main orders			
INB - A-part in DM	319.9	15.544	49.73
A-part in Dutch guilders	35.0	11.775	4.12
A-part in Belgian francs	60.0	15.085	9.05
C-part	290.0	13.111	38.02
D-part	22.0	45.137	9.93
E-part	8.0	-	-
C11- increase	15.0	13.111	1.97
First core	60.0	23.605	14.16
Arge : Construction part	174.0	11.357	19.76
	999.7	14.678	146.74

		Basic amount	Price increase %	Price increase M.DM
	Brought forward	999.7		146.74
2.	Promoter's costs	103.0	18.821	19.39
3.	Approved expenditures, etc.			
	(a) Construction part.	20.3	11.357	2.31
	(b) Plant part and gas store	13.9	15.207*	2.11
	(c) Further reserve	39.8	14.678**	5.84
4.	Malus reserve			
	(a) C-CII and D-Malus	140.7	15.266***	21.48
	(b) Fuel Element Malus	17.6	23.605	4.15
		1,335.0		202.02
				rd.200.0

* Average of A, C, D and CII

** Average of all supply orders

*** Average of C, D and CII

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Price variation : A-Part (Portion supplied by Germany)

Date	Factors for b	Factors for c	Basis b	Escalation b	Basis c	Escalation c	Total Escalation	Proport. %	Price Escalation
II/72	1,015	1,035	0,51	0,518	0,29	0,300	1,018	6,05	6.159
I/73	1,030	1,070	0,41	0,422	0,39	0,417	1,039	11,05	11.481
II/73	1,045	1,107	0,32	0,334	0,48	0,531	1,065	11,55	12.301
I/74	1,061	1,145	0,27	0,286	0,53	0,607	1,093	10,06	10.996
II/74	1,076	1,185	0,27	0,291	0,53	0,628	1,119	12,75	14.267
I/75	1,093	1,225	0,18	0,197	0,62	0,760	1,157	11,34	13.120
II/75	1,109	1,268	0,18	0,200	0,62	0,786	1,186	10,09	11.967
I/76	1,126	1,311	0,13	0,146	0,67	0,878	1,224	8,66	10,600
II/76	1,143	1,357	0,08	0,091	0,72	0,977	1,268	5,88	7,456
I/77	1,159	1,402	-	-	0,80	1,122	1,322	4,55	6.015
II/77	1,176	1,451	-	-	0,80	1,161	1,361	3,34	4.546
I/78	1,194	1,501	-	-	0,80	1,201	1,401	2,75	3.853
II/78	1,212	1,553	-	-	0,80	1,242	1,442	1,93	2,783
								100,00	115.544
								→	100,000
									15,544 %

Price variation : A-Part (Portion supplied by the Netherlands)

Date	Factors for b	Factors for c	Basis b	Escalation b	Basis c	Escalation c	Total Escalat.	Proport. %	Price Escalation
II/72	1.015	1.035	0.60	0.609	0,20	0,207	1,016	7.99	8.118
I/73	1,030	1.070	0.46	0,474	0,34	0,364	1,038	19,11	19.836
II/73	1.045	1,107	0,08	0,084	0.72	0,797	1,081	22,92	24.777
I/74	1.061	1.145	0.04	0,042	0,76	0.870	1,112	18,30	20.350
II/74	1.076	1,185	0.04	0.043	0,76	0.901	1,144	10.27	11.749
I/75	1,093	1.225	0.27	0.295	0,53	0,649	1,144	4.68	5.354
II/75	1,109	1,268	0.04	0,044	0,76	0,964	1.208	3,96	4,784
I/76	1,126	1,311	0.04	0,045	0,76	0,996	1.241	3,14	3,897
II/76	1,143	1.357	-	-	0,80	1.086	1,286	3.06	3.935
I/77	1.159	1,402	-	-	0.80	1,122	1,322	2.85	3,768
II/77	1,176	1.461	-	-	0.80	1.161	1,361	1,42	1.933
I/78	1.194	1.501	-	-	0.80	1,201	1,401	1.05	1,471
II/78	1.212	1.553	-	-	0.80	1.242	1.442	1,25	1.803
								100.00	111.775

→ 100.000

11.775 %

SBK

Price variation : A-Part (Portion supplied by Belgium)

Date	Factors for b	Factors for c	Basis b	Escalation b	Basis c	Escalation c	Total Escalation	Proport. %	Price Escalation
II/72	1.015	1.035	0.20	0.203	0.60	0.621	1.024	7.77	7.956
I/73	1.030	1.070	0.21	0.216	0.59	0.631	1.047	9.24	9.674
II/73	1.045	1.107	0.24	0.251	0.56	0.620	1.071	6.43	6.887
I/74	1.061	1.145	0.24	0.255	0.56	0.641	1.096	9.93	10,883
II/74	1.076	1.185	0.24	0.258	0.56	0.664	1.122	15.30	17.167
I/75	1.093	1.225	0.40	0.437	0.40	0.490	1.127	13.49	15.203
II/75	1.109	1.268	0.40	0.444	0.40	0.507	1.151	11.68	13.444
I/76	1.126	1.311	0.08	0.090	0.72	0.944	1.234	10.31	12.723
II/76	1.143	1.357	-	-	0.80	1.086	1.286	5.80	7.459
I/77	1.159	1.402	-	-	0.80	1.122	1.322	4.58	6.055
II/77	1.176	1.451	-	-	0.80	1.161	1.361	1.78	2.423
I/78	1.194	1.501	-	-	0.80	1.201	1.401	2,69	3.769
II/78	1.212	1.553	-	-	0.80	1.242	1.442	1.00	1.442
								100.00	115.085

→ 100.000

15.085 %

SBK

Price-variation : C-Part

Date	Factors for b	Factors for c	Escalation for b=0,30 (Basis)	Escalation for c=0,50 (Basis)	Total Escalat.	Outflow of funds %	Price Escalation
II/72	1.015	1.035	0.305	0,518	1.023	5.6	5.729
I/73	1.030	1.070	0.309	0,535	1,044	9.4	9,814
II/73	1.045	1.107	0.314	0,554	1,068	10.0	10,680
I/74	1.061	1.145	0.318	0,573	1,091	15.0	16,365
II/74	1.076	1.185	0.323	0,593	1,116	15.0	16,740
I/75	1.093	1.225	0.328	0.613	1.141	13,5	15.404
II/75	1.109	1.268	0,333	0,634	1,167	7.6	8,869
I/76	1.126	1.311	0.338	0.656	1.194	9.6	11,462
II/76	1.143	1.357	0.343	0,679	1.222	4.7	5.743
I/77	1.159	1.402	0.348	0.701	1.249	3.4	4.247
II/77	1.176	1.451	0.353	0.726	1,279	3.0	3.837
I/78	1.194	1.501	0.358	0.751	1.309	2.2	2,880
II/78	1.212	1.553	0.364	0.777	1,341	1.0	1,341
						100.0	113,111
						→	100,000
							13,111 %

Price variation D-Part

Date	Factor for C	Escalation for C=0.80 (basis)	Total escalation	Outflow of funds %	Price escalation
II/77	1,451	1,161	1,361	18,4	25.042
I/78	1,501	1,201	1,401	18,4	25,778
II/78	1,553	1,242	1,442	14,2	20,476
I/79	1,606	1,285	1,485	25,1	37,274
II/79	1,662	1,330	1,530	23,9	36,567
				100,0	145,137

→ 100.000

45,137 %

Price variation First core

Date	Factorsffor C	Escalation for C=80 (basis)	Total escalation	Outflow of funds %	Price escalation
II/72	1.035	0.828	1.028	10	10.280
I/75	1.225	0.980	1.180	25	29.500
I/76	1.311	1.049	1.249	40	49.960
I/77	1.402	1.122	1.322	20	26.440
I/79	1.606	1.285	1.485	5	7.425
				100	123.605
				→	100.000
					23.605%

SBK

Price variation : Construction part

Date	Factors for b	Factors for c	Escalation for b=0,40 (Basis)	Escalation for c=0,50 (Basis)	Total escalat.	Outflow of funds %	Price Escalation
II/72	1,015	1,035	0,406	0,518	1,024	8	8,192
I/73	1,030	1,070	0,412	0,535	1,047	11	11,517
II/73	1,045	1,107	0,431	0,554	1,085	16	17,360
I/74	1,061	1,145	0,424	0,573	1,097	16	17,552
II/74	1,076	1,185	0,430	0,593	1,123	16	17,968
I/75	1,093	1,225	0,437	0,613	1,150	15	17,250
II/75	1,109	1,268	0,444	0,634	1,178	10	11,780
I/76	1,126	1,311	0,450	0,656	1,206	5	6,030
II/76	1,143	1,357	0,457	0,679	1,236	3	3,708
						100	111,357
						→	100,000
							11,357 %

Price variation : Promoters' Costs

Date	Factors for b	Factors for c	Basis b	Escalat. b	Basis c	Escalat. c	Total Escalat.	Outflow of funds %	Price Escalation
II/72	1,015	1,035	-	-	-	-	1,000	9.0	9,000
I/73	1,030	1,070	-	-	0.8	0,856	1,056	4,8	5,069
II/73	1,045	1,107	-	-	0,8	0,886	1,086	4,9	5,321
I/74	1,061	1,145	-	-	0.8	0,916	1,116	4,3	4,799
II/74	1,076	1,185	-	-	0,8	0,948	1,148	4,4	5,051
I/75	1,093	1,225	-	-	0,7	0,858	1,158	4,7	5,443
II/75	1,109	1,268	-	-	0,7	0,888	1,188	4,8	5,702
I/76	1,126	1,311	0,4	0,450	0,4	0,524	1,174	9,9	11,623
II/76	1,143	1,357	0,4	0,457	0,4	0,543	1,200	10,0	12,000
I/77	1,159	1,402	0,4	0,464	0,4	0,561	1,225	10,4	12,740
II/77	1,176	1,451	0,4	0,470	0,4	0,580	1,250	10,5	13,125
I/78	1,194	1,501	0,4	0,478	0,4	0,600	1,278	9,5	12,141
II/78	1,212	1,553	0,4	0,485	0,4	0,621	1,306	9,6	12,538
I/79	1,230	1,606	0,4	0,492	0,4	0,642	1,334	3,2	4,269
								100,0	118,821
								→	100,000
									18,821 %

ANNEX V

Schnell-Brüter-
Kernkraftwerksgesellschaft mbH

Essen, 27 November 1972

Re: Application to the European Community for conferment of Joint Undertaking status

Financial Implications of the Advantages applied for by virtue of Joint Undertaking status

Schnell-Brüter-
Kernkraftwerksgesellschaft mbH

Essen, 27 November 1972
Dr. Th/Ei
Az. 2.5.1

Re: Application to the European Community for the conferment of Joint Undertaking status

Financial implications of the advantages applied for by virtue of Joint Undertaking status

- Contents -

Annexes

Annex 1 Determination of tax coefficients

Annex 2a Taxation, taking into account Joint Undertaking status advantages requested

Annex 2b Taxation, not taking into account Joint Undertaking status advantages

Annex 2c Determination of average specific costs with or without Joint Undertaking status advantages

Annex 3 Forecast of Results

including :

Annex A Forecast of Results (table)

Annex B Fuel expenditure for SNR-300 (table)

Annex C Explanations concerning the fuel cost calculations

Annex D Liquidity trend and interest calculation

A. Preliminary remarks

The advantages requested in our letter of 26 April 1972 to the European Communities by virtue of Joint Undertaking status are examined below with regard to their effects on the construction costs and operating costs.

The basis used for determining the effects on the operating costs is our Forecast of Results (Annex 3). This forecast sets out the anticipated trend of the yearly figures for the SNR-300 based on an achievable power output of 90% during the operating phase and on the planned shutdown times and planned expenditure trends. This initial situation, which already takes into account the advantages requested in respect of Joint Undertaking status, serves as a basis for determining the manner in which the countries participating in the project will share the SNR-300 operating risks (risk-sharing contracts).

The tax advantages calculated on this basis will be modified if the actual trend results in a change in the basis of taxation (profit, capital, etc.). Furthermore, the calculations are based on the present tax legislation.

B. Tax exemption

1. Tax coefficients for operating phase

a) Coefficients not covered by advantages

In accordance with the attached calculation of the tax coefficients (Annex 1), the following annual taxation figures are obtained for the operating phase in respect of the various types of tax applicable, on the assumption that no Joint Undertaking status advantages are granted:

$0.3254\ i_E \cdot E + 0.0047\ E$	(Corporation tax, incl.surcharge)
$+ 0.1988\ i_E \cdot E + 0.15\ i_F \cdot F + 0.0012\ E$	(Trade earnings tax)
$+ 0.0043\ E$	(Property tax)
$+ 0.0049\ E + 0.006\ F$	(Trading capital tax)
$+ 0.0011\ E$	(Land tax)

$$= 0.5242\ i_E \cdot E + 0.0162\ E + 0.15\ i_F \cdot F + 0.006\ F$$

where:

E = own capital

F = borrowed capital

i_E = interest on own capital ($i_E = P_E/100$)

i_F = interest on borrowed capital ($i_F = P_F/100$)

b) Coefficients covered by advantages

The advantages obtained through recognition as a Joint Undertaking result in the following reductions in annual taxation:

b1) Exemption from property tax (point F 1. of our proposal of 26 April 1972); cf Annex 1. Sec. 6.

$- 0.0068\ E$

b2) Exemption from the part of the trade earnings tax payable on interest from long-term loans (point F1. b of our proposal); cf Annex 1, Sec. 7

$- 0.1011\ i_F \cdot F$

b3) Exemption from the part of the trading capital tax payable on long-term loans (point F 1. d of our proposal); cf Annex 1, Sec.7

$- 0.0040\ F$

The annual tax is thus altogether reduced by

$$0.0068\ E + 0.1011\ i_F \cdot F + 0.0040\ F$$

to

$$0.5242\ i_E \cdot E + 0.0094\ E + 0.0489\ i_F \cdot F + 0.0020\ F$$

2. Tax coefficients for construction phase

a) Coefficients not covered by advantages

The overall construction costs of the SNR-300 project are financed exclusively by subsidies from the countries concerned and by the company's own capital. No borrowed capital (long-term loans) is therefore introduced. Interest on the company's own capital during the construction phase is excluded, in accordance with the terms of the grants accorded by the countries concerned. The overall expenditure (including taxes) less earnings (mainly from interest) is charged as construction costs, so that during the construction phase there is neither profit nor loss.

On the foregoing assumptions, the annual tax coefficients in accordance with the calculation in Annex 1 (Secs. 8-10) are as follows:

0.0047 . E	(Corporation tax, including surcharge)
+ 0.0012 . E	(Trade earnings tax)
+ 0.0043 . E	(Property tax)
+ 0.0049 . E	(Trading capital tax)
+ 0.0011 . E	(Land tax)
= 0.0162 . E	

b) Coefficients covered by advantages

Through exemption from property tax, the non-payability of the earnings taxes depending on the capital tax, the advantages during the construction period lead to a reduction in tax of:

0.0102 . E (see Annex 1, Sec. 11)

to 0.0060 . E

3. Removal of time limit for bringing forward losses

A further possible advantage is in the exemption from the time limit for the deduction of a financial or trading loss (under point F 1.c of our application). This advantage, which cannot be calculated by an overall formula owing to the fluctuations in the annual figures, is taken into account, on the basis of the annual losses and profits as set out in our Forecast of Results, in the calculation of the absolute advantages.

4. Standard evaluation of commercial operation and government subsidies

The application for exemption from trading capital tax of the proportional value of the power station financed by the countries concerned (in accordance with point F 1.e) is based on the following considerations:

For the determination of the trading capital, the standard value, nominal value or part value must be specified according to the type of accounting breakdown. It is common to these estimates that - partly expressly, partly implicitly - the purchasing or production costs are the starting point for the evaluation. The method used for financing the industrial plant, e.g. by public subsidies, etc., is irrelevant to this evaluation. The unrestricted application of these principles to the SNR-300 Project, more than 90% of which is financed with public subsidies, might lead to an unreasonably high assessment of the trading capital and consequently to an unduly high trade tax. It is not possible to judge how high the financial authorities will assess the trading capital in this concrete case, since comparable examples do not exist.

In order to prevent the trading capital from being assessed at too high a value and thus avoid any disputes as a result and to have clear bases of calculation, our application includes exemption from trade tax of the trading capital provided by public subsidies. For the present differential calculations, this "exemption" serves only to clarify the matter and does not imply any difference between the taxation of a Joint Undertaking and "non-Joint Undertaking".

5. Company tax

Exemption of existing and future assets subscribed by the Members from capital transaction tax (company tax) in accordance with point F. 2 of our application gives a tax saving amounting to:

2% on the payment-up of capital up to 31 December 1973
and 1% on the payment-up of capital from 1 January 1974.

6. Tax saving during construction phase

Payment-up of the company's own capital in the amount of DM 120 million is approximately linear during the seven-year construction period. This results, for this period, in an average own-capital figure of DM 60 million.

The tax saving as a result of the calculated coefficients (see under 2b) is:

0.0102 . E,
since E = DM 60 million,
0.0102 . 60 million DM/year . 7 years = approx DM 4.28 million

As a result of the exemption from company tax the following saving is made:

payment-up of capital up to 31 December 1973: DM 25 million
payment-up of capital from 1 January 1974: DM 95 million

Saving: 0.02 . DM 25 million + 0.01 . DM 95 million = DM 1.45 million

The overall reduction in construction costs as a result of tax savings during the construction phase is: approx. DM 5.73 million

7. Tax saving during operating phase

The determination of the tax advantage during the operating phase (the scheduled date for handing over the power plant is 1 April 1979) is based on the SNR-300 Forecast of Results, shown in Annex 3. The latter sets out the planned development of expenditure and income over a 25-year operating period. The tax concessions requested for a Joint Undertaking have been taken into account.

Annex 2a indicates the remaining amount of tax payable, based on the Forecast. This shows the cumulative tax over 25 years to be DM 75.47 million.

This figure can be compared with that in Annex 2b, which gives the tax payable without the Joint Undertaking advantages, namely DM 103.90 million, resulting in a tax saving of DM 28.43 million, as can be seen from the following table (in millions of DM):

	Tax payable with Joint Undertaking status	Tax payable without Joint Undertaking status	Tax saving
Trading capital tax and Land tax	18.18	21.23	3.05
Trade earnings tax	16.63	22.62	5.99
Property tax	-	13.13	13.13
Corporation tax	40.66	46.92	6.26
	75.47	103.90	28.43

On the basis of the average costs of electricity production, which amount, according to Annex 2c for the reference case and the assumptions in our Forecast, to:

3.627 Pf/kWh without advantages

and 3.564 Pf/kWh with advantages from Joint Undertaking status,

the cost saving is:

0.063 Pf/kWh = 1.75%.

A simplified assessment not based on the reference case, of the saving in costs, results in the following figures, using the reduction in the tax coefficient as calculated in 1b):

Tax saving: $0.0068\ E + 0.1011\ i_F \cdot F + 0.0040\ F$

E own capital: 120 Mio DM

F borrowed capital: start-up period, an average of DM 35 million
normal operation period, DM 0 million

i_F interest on borrowed capital: 0.08

Tax saving per year:

a) Start-up period: $0.0068 \cdot 120 + 0.1011 \cdot 0.08 \cdot 35 + 0.0040 \cdot 35$ = 1.24 Mio DM

b) Normal operation period: $0.0068 \cdot 120$ = 0.82 Mio DM

On the basis of an average annual electricity production of about 2000 GWh, this results in:

0.062 Pf/kWh in the start-up period

0.041 Pf/kWh in the normal operation period.

C. Financial implications of the other advantages requested

The other advantages requested, in particular exemption from customs duties and charges having equivalent effect, have similar financial repercussions on project costs.

It is not possible at the present time to calculate the amount represented by this advantage, since the type and extent of the imports from non-member countries are not yet definitely known. The imports at present under discussion concern Austria and Sweden (reactor pressure vessel, electrically heated steam boiler, cooling-water and feed-water pumps, and piping), amounting to about DM 50 million.

(signed)

Annex 1

Subject: Financial implications of granting of Joint Undertaking status advantages

Determination of tax coefficients

Designations:

E	Own capital
F	Borrowed capital
i_E	Interest on own capital: $i_E = P_E/100$
i_F	Interest on borrowed capital: $i_F = P_F/100$
A	Distribution of profits
G	Profit subject to corporation tax
K'	Corporation tax
K	Corporation tax, including surcharges
GE	Trade earnings tax
GK	Trading capital tax
V	Property Tax
Gr	Land tax

Tax coefficients for the operating phase

1. Corporation tax and surcharge

Rates of corporation tax:

for distributed profits	15%
for non-distributed profits	51%

Rate of surcharge 3%

Distribution of profits in full is assumed. The corporation tax itself is treated as non-distributed profits. The property tax is also subject to corporation tax as a non-deductible tax.

It follows from the foregoing that:

$$G = A + 1.03\ K' + V$$

$$G = A + 1.03\ [\,0.15\ A + 0.51\ (G-A)\,] + V$$

$$G = 0.6292\ A + 0.5253\ G + V$$

$$G = \frac{0.6292\ A + V}{0.4747}$$

$$G = 1.3254\ A + 2.1066\ V$$

Since $K = G-A-V$, then

$$K = 0.3254\ A + 1.1066\ V$$

for $A = i_E\ E$ and for $V = 0.0043\ E$ (see Sec. 3),

$$\boxed{K = 0.3254\ i_E.E + 0.0047\ E}$$

and $$G = 1.3254\ i_E.E + 0.0091\ E$$

2. Trade earnings tax

Index: 5%
Rate of assessment: 300% (estimate)

This results in a trade earnings tax of 15%

Basis of the tax:

profit subject to corporation tax, including property tax (G in Sec. 1)
+ interest on long-term loans (i_F . F)
- 3% of unit value of property. This unit value is assumed to represent 4%* of the company's own capital (0.03 . 0.4 . E)
= Trading profit

The trade earnings tax is calculated as follows:

$$GE = 0.15\ (1.3254\ i_E\ .\ E + 0.0091\ E + i_F\ .\ F - 0.03\ .\ 0.04.E)$$

$$GE = 0.1988\ i_E\ .\ E + 0.15\ .\ i_F\ .\ F + 0.0012\ E$$

3. Property tax

The basis for determining property tax is the total net worth, which, for the purposes of the present calculations, has been assumed to represent 85% of the company's own capital. According to paragraph 117 of BeWG (Valuation Law) 1965, the net worth is assessed at only 50%.

The rate of property tax is 1%
This results in a property tax (V) of:
V = 0.01 . 0.5 . 0.85 E

$$V = 0.0043\ E.$$

*In this case, the basis of the unit evaluation has been assumed to be that ruling on 1 January 19[illegible]. Any changes in taxation which may result from the planned application of the new unit evaluation (1 January 1964) have been disregarded for the purposes of the present calculations.

4 Trading capital tax

Index 2 o/oo

Rate of assessment 300%

This results in a trading capital tax of

0.6%

Basis of the tax:

standard value of commercial operation (0.85 . E ; see also remarks under No. 3)

+ long-term loans (F)

- standard value of the property (0.04 . E ; see Sec. 2)

= trading capital

The trading capital tax (GK) is calculated as follows:

$GK = 0.006 (0.85 E + F - 0.04 E)$

$GK = 0.0040 E + 0.006 F$

In this calculation it is assumed that basically only the property purchased with the company's own capital and not with public subsidies is taken into account for determining the standard value and part value of the property for the purposes of property tax and trading capital tax. As well as a debatable procedure, and the basis of the calculations for estimating costs of operating the SNR must be as clear as possible, the granting of the status of Joint Undertaking involves, amongst other things, exemption of the property tax account of the value of the power station financed by government subsidies from trading capital tax. In the present calculation of the tax advantages, this problem is not considered on account of lack of comparative values.

5. Land tax

The land tax is estimated at 0.1% of the company's own capital plux 10% for residential estate.

From this we obtain:

$Gr = 0,0011 . E$

6. Changes in tax coefficients as a result of exemption from property tax

a) Non-applicability of property tax (see Sec. 3): - 0.0043 E

b) Change in corporation tax and surcharge:

As a result of the non-applicability of the tax on capital, the amount of the profit liable to tax remains unaltered. There is simply a higher amount available for distribution. Because of the change in the ratio of retained profits to distributed profits, there is the following reduction in corporation tax and surcharge:

b1) Non-applicability of corporation tax on property (see Sec. 1, last term in the formula)

$$- 0.0047\ E$$

b2) The amount saved in respect of property tax (V) and the corporation tax saved on the latter (0.0047 E = 1.1066V), i.e., altogether 2.1066 V, are available for distribution (A_V) - deduction being made for the corporation tax calculated below (K_V):

$$2.1066\ V = A_V + K_V;$$
$$K_V = (0.15\ A_V + 0.51\ (2.1066\ V - A_V))\ 1.03$$
$$K_V = -0.3708\ A_V + 1.1066\ V;\ \text{as}\ A_V = 2.1066\ V - K_V:$$
$$K_V = 0.5171\ V;\ \text{as}\ V = 0.0043\ E:$$
$$K_V = 0.0022\ E$$

In view, therefore, of the non-applicability of property tax, there is a variation in corporation tax and surcharge of

$$- 0.0047 + 0.0022\ E = - 0.0025\ E$$

c) Alteration in trade earnings tax:

As far as trade earnings tax is concerned, there is no change as a result of exemption from property tax, since the trading profit remains constant.

The overall annual tax savings as a result of exemption from property tax is, therefore,

$$0.0043\ E + 0.0025 =$$

$$= 0.0068\ E$$

7. Alteration in the corporation tax and surcharge as a result of the reduction in trade tax.

Exemption from that part of the trade earnings tax (GE) which is payable on interest from long-term loans results in a saving in GE of $0.15\ k_F \cdot F$ (see Sec. 2) per year.

Exemption from that part of the trading capital tax (GK) which is payable on long-term loans amounts to 0.0006 F per year (see Sec. 4).

This saving in trade tax results in an increase in the profit subject to corporation tax, and thus to additional corporation tax and surcharge of

$0.3254 \cdot 0.15\ i_F \cdot F$ and
$0.3254 \cdot 0.006\ F$

The trade tax is thus altogether reduced by:

a) Trade earnings tax:
$0.15\ i_F \cdot F - 0.3254 \cdot 0.15\ i_F \cdot F = 0.1011\ i_F \cdot F$

b) Trading capital tax:
$0.006\ F - 0.3254 \cdot 0.006\ F = 0.0040 \cdot F$

Tax coefficients for the construction phase

During the construction phase no borrowed capital (long-term loans) will be used. Payment of interest on the company's own capital during this period is excluded under the terms of the grants made by the countries concerned. The overall expenditure (including taxes chargeable as costs) and income (mainly yield from interest) during the construction phase are debited or credited as construction costs, so that there is no resulting gain or loss.

On these assumptions, the calculation of taxes - without the advantages granted to a Joint Undertaking - is simplified as follows:

8. Corporation tax and surcharge

Corporation tax and surcharge is calculated only on the non-deductible taxes, i.e., the property tax (V) and corporation tax itself (K):

$$K = 1.03 \cdot 0.51 (V + K)$$

$$K = 1.1066\ V$$

since $V = 0.0043\ E$,

$$K = 0.0047\ E$$

9. Trade earnings tax

The trade earnings are obtained from the sum of the property tax and corporation tax minus 3% of the standard value of the property (0.04 . E). The trade earnings tax (GE) amounts to:

$$GE = 0.15 (V + K - 0.03 \cdot 0.04\ E)$$

since $K = 1.1066\ V$,

$$GE = 0.3160\ V - 0.00018 \cdot E$$

and since $V = 0.0043 \cdot E$,

$$GE = 0.0012 \cdot E$$

10. Property tax, trading capital tax and land tax

The same coefficients are applicable during the construction phase as during the operating phase to the taxes dependent on net worth. There are, however, no long-term loans to add to the trading capital, since during the construction phase there is no borrowed capital. Thus:

$$V = 0.0043 \cdot E$$

$$GK = 0.0049 \cdot E$$

$$Gr = 0.0011 \cdot E$$

11. Change in tax coefficients as a result of tax exemptions

During the construction phase, exemption applies only to property tax and the taxes which depend on it, i.e., corporation tax and trade earnings tax. Consequently, for this particular case, there is a savings of:

$$V + K + GE = 0.0043 \cdot E + 0.0047 - E + 0.0012 \cdot E$$

$$= 0.0102 \cdot E$$

Explanations concerning the breakdown of the table in Annex 2 a

Column 1: The scheduled date for handing over the Power Station is 1 April 1979. The examination covers the following 25 financial years. This is the period during which the risk-sharing contract will be applicable.

Column 2: The annual income (without taxes) has been taken from the tabulations in the Forecast of Results, lines 10 and 12.

Column 3: See line 17 of the Forecast of Results.

Column 4: In accordance with the risk-sharing contract, the amount to be written off is calculated only to the extent of SBK's own capital (DM 120 million). Of this sum, DM 100 million is dealt with in priority. The DM 20 million may be charged only subsequently, i.e., only if there is a sufficient surplus. These DM 20 million are not included in the annual figures to which column 2 relates.

Column 5: col. 2 + col. 3 - col. 4.

Column 6: The calculation is made in accordance with the formulas for trading capital tax and land tax in Annex 1, secs. 4 and 5.

Column 7: The trade earnings tax is calculated as follows, in a similar way to the formula in Annex 1, sec. 2:

GE = 0.15 (col. 5 - col. 6 - 0.03 . 0.04 . E - GE)

GE = 0.1304 (col. 5 - col. 6 - 0.144)

Column 8: col. 5 - col. 6 - col. 7 - 0.144.

Column 9: col. 5 - col. 6 - col. 7; the amounts marked with *) are used to replenish a reserve; the first three items represent the reserve including the corporation tax payable thereon.

Column 10: col. 10 preceding year - col. 8.

Column 11: col. 11 preceding year - col. 9.

Column 12: The first three items are calculated as follows:
1.03 . 0.51 . col. 9.

By varying the formulas in Annex 1, sec. 1, we have for the remaining items:

$K = 1.03 \quad 0.15 A + 0.51 (G - A)$ where $A = G - R - R - K$ (R = Reserve)

$K = 0.2455 G + 0.5893R$

Here the loss carried forward is taken into account.

Column 13: col. 6 + col. 7 + col. 12.

Annex 2a

Subject: Financial implications of granting of Joint Undertaking status advantages

Taxation, taking into account Joint Undertaking status advantages requested (based on our forecast of results dated 10 Oct. 1972) in DM 10^6

Financial year	Annual profit without trading capital tax	Payment from Risk-Sharing Contract (=Reimbursement)	Depreciation on DM20 million	Annual profit before tax	Trade tax from capital & land tax	Trade tax from profit	Taxable trading profit or loss	Profit or loss	Loss brought forward for profits tax	Loss brought forward for corp. tax	Corporation tax incl. surcharge	Total tax
1	2	3	4	5	6	7	8	9	10	11	12	13
1.4.-												
30.6.79	3,73	-	0,30	3,43	0.18	0.41	2.70	2.84*)	-	-	1.49	2,08
79/80	7,71	-	1.18	6,53	0.72	0.74	4.93	5.07*)	-	-	2.66	4.12
80/81	5,52	-	1.18	4,34	0,72	0.45	3.03	3.17*)	-	-	1,67	2,84
81/82	- 14,98	0,36	1,18	- 15,80	0,72	-	- 16,66	- 16,52	16,66	16,52	-	0.72
82/83	- 12.67	13,39	1.18	- 0,46	0,72	-	- 1,32	- 1,18	17,98	17.70	-	0.72
83/84	- 8.60	9.32	1,18	- 0.46	0,72	-	- 1.32	- 1,18	19,30	18.88	-	0.72
84/85	- 4,77	4,39	1.18	- 1,56	0,72	-	- 2.42	- 2.28	21,72	21,16	-	0.72
85/86	- 13.86	11,66	1,18	- 3,38	0.72	-	- 4.24	- 4.10	25.96	25.26	-	0.72
86/87	- 2,89	2,89	1,18	- 1,18	0.72	-	- 2.04	- 1,90	28,00	27,16	-	0.72
87/88	1,31	-	1.18	0,13	0.72	-	- 0.73	- 0.59	28,73	27.75	-	0.72
88/89	12.39	- 2,26	1,18	8.95	0,72	-	8,09	8,23	20,64	19,52	-	0.72
89/90	6,22	- 1,65	1,18	3,39	0,72	-	2.53	2,67	18,11	16,85	-	0.72
90/91	15.45	- 4,42	1,18	9,85	0,72	-	8.99	9,13	9,12	7,72	-	0.72
91/92	15.37	- 4,40	1,18	9,79	0,72	-	8.93	9,07	0,19	-	0,33	1.05
92/93	11,83	- 3,33	1,18	7,32	0.72	0.82	5.64	5.78	-	-	1,42	2.96
93/94	5,15	- 1,33	1,18	2,64	0,72	0.23	1,55	1.69	-	-	0,41	1.36
94/95	13,63	- 3,87	1,18	8,58	0.72	1,01	6.71	6,85	-	-	1.68	3.41
95/96	16,43	- 4,71	0,82	10,90	0,72	1.31	8,73	8.87	-	-	2.18	4.21
96/97	20,68	- 5,99	-	14,69	0,72	1,80	12,03	12,17	-	-	2,99	5.51
97/98	20,37	- 5,90	-	14,47	0,72	1,77	11.84	11,98	-	-	2.94	5.43
98/99	7,00	- 1,88	-	5,12	0.72	0.55	3.71	3.85	-	-	0.95	2.22
99/00	17,24	- 2.27	-	14.97	0.72	1,84	12,27	2,69*) 9.72	-	-	4,63	7.19
00/01	18,39	-	-	18.39	0.72	2.29	15.24	5,30*) 10,08	-	-	6,90	9.91
01/02	13,22	-	-	13,22	0,72	1.61	10.75	3,75*) 7,14	-	-	4.88	7.21
02/03	3,08	-	-	3,08	0.72	0,29	1.93	0,71*) 1.36	-	-	0.93	1.94
03/04	12,48	-	-	12,48	0.72	1.51	10.11	3,53*) 6,72	-	-	4,60	6.83
Total	169,43	-	20,00	149,43	18,18	16.63	110,98	114,62	-	-	40.66	75.47

Explanation concerning the individual columns are given in the following pages

Explanations concerning the breakdown of the Table in Annex 2 b

Column 2: In order to finance the initial operating phase (connecting-up of the fuel circuit) it is necessary to obtain a loan of probably DM 70 million, which can be paid off at an annual rate of DM 10 million, this repayment starting after five years during which no repayment would be required.

Column 3: See col. 5 of the table in Annex 2a.

Column 4: Calculations are made in accordance with the formula for trading capital tax and land tax shown in Annex 1, secs. 4 and 5.

Column 5: The trade earnings tax was calculated as in col. 7 in Table 2a, but taking into account the interest on long-term loans (8% of col. 2), namely:

$$GE = 0.1304 \ (\text{col. } 3 - \text{col. } 4 + 0.08 \cdot \text{col. } 2 - 0.144)$$

Column 6: col. 3 - col. 4 - col. 5 + 0.08 . col. 2 - 0.144

Column 7: col. 3 - col. 4 - col. 5; The amounts marked with an *) serve to replenish a reserve; the first three items represent the reserve including the corporation tax payable thereon.

Column 8: col. 8 preceding year - col. 6; here the time limit for deducting the trading loss is taken as five years. As a result of this time limit, there will be no deduction of DM 4.32 million trading loss allowable for deduction.

Column 9: col. 9 previous year - col. 7; here the time limit for deducting the trading loss is taken as five years. As a result of this time limit, there will be no DM 20.53 million trading loss allowable for deduction.

Column 10: The calculation is based on the formula for property tax given in Annex 1, sec. 3.

Column 11: The first three items were calculated as follows: 1.03 . 0.51 . col. 7; by varying the formula in Annex 1, sec. 1 we have for the remaining items: $K = 1.03 \ (0.15 \ A + 0.51 \ (G-A))$ in which $A=G-R-K-V$ (R = reserve)

$K = 0.2455 \ G + 0.5893 \ V + 0.5893 \ R$

This takes into account the bringing forward of the loss within the specified time.

Column 12: col. 4 + col. 5 + col. 10 + col. 11.

III/74/73-E

Annex 2b

Subject: Financial implications of granting of Joint Undertaking status advantages

Tax coefficients, not taking into account the Joint Undertaking status advantages in DM1

Financial year	Borrowed capital	Annual profit before tax	Trading tax from capital & land tax	Trading tax from profit	Taxable trading profit or loss	Taxable profit or loss	Loss brought forward for trade tax	Loss brought forward for corp. tax	Property tax	Corporation tax incl. surcharge	Total tax
1	2	3	4	5	6	7	8	9	10	11	12
1.4.- 30.6.79	70	3,43	0.29	1,12	7.48	2.02 *)	-	-	0.13	1.06	2,60
79/80	70	6,53	1.14	1,41	9,44	3.98 *)	-	-	0.52	2.09	5,16
80/81	70	4,34	1.14	1,13	7,53	2.07 *)	-	-	0.52	1.09	3,88
81/82	70	- 15,80	1.14	-	- 11.48	- 16,94	11,48	16.94	0,52	-	1,66
82/83	70	- 0,46	1.14	-	3.86	- 1.60	7,62	18,54	0.52	-	1,66
83/84	60	- 0,46	1.08	-	3,12	- 1.54	4,50	20,08	0.52	-	1,60
84/85	50	- 1.56	1,02	-	1.28	- 2.58	3.22	22,66	0.52	-	1.54
85/86	40	- 3.38	0,96	-	- 1,28	- 4,34	4,50	27,00	0.52	-	1,48
86/87	30	- 1.18	0,90	-	0,18	- 2,08	4,32	29,08	0,52	-	1,42
87/88	20	0,13	0,84	0,10	0,65	- 0,81	(- 11,48) -	(-16,94) 12,95	0,52	-	1,46
88/89	10	8,95	0,78	1,15	7,68	7,02	-	(- 1,60) 4,33	0,52	-	2,45
89/90	-	3,39	0,72	0,33	2,20	2,34	-	(- 1,54) 0,45	0.52	-	1,57
90/91	-	9.85	0,72	1,17	7.82	7,96	-	(- 2,58) -	0.52	2.26	4,67
91/92	-	9.79	0,72	1,16	7.77	7.91	-	-	0,52	2,25	4,65
92/93	-	7.32	0.72	0.84	5.62	5,76	-	-	0.52	1,72	3,80
93/94	-	2,64	0,72	0.23	1.55	1.69	-	-	0.52	0.72	2,19
94/95	-	8,58	0,72	1.01	6.71	6,85	-	-	0.52	1,99	4,24
95/96	-	10,90	0,72	1,31	8.73	8,87	-	-	0,52	2,48	5,03
96/97	-	14.69	0,72	1,80	12,03	12.17	-	-	0,52	3,29	6,33
97/98	-	14.47	0,72	1.77	11,84	11.98	-	-	0.52	3,25	6,26
98/99	-	5,12	0,72	0.55	3.71	3.85	-	-	0,52	1,25	3,04
99/00	-	14,97	0,72	1.84	12.27	2.69 *) 9.72	-	-	0,52	4,94	8,02
00/01	-	18,39	0,72	2,29	15.24	5,30 *) 10.08	-	-	0,52	7,21	10,74
01/02	-	13.22	0,72	1.61	10,75	3.75 *) 7,14	-	-	0,52	5,19	8,04
02/03	-	3,08	0,72	0,29	1.93	0,71 *) 1.36	-	-	0,52	1,23	2,76
03/04	-	12.48	0.72	1,51	10.11	3.53 *) 6,72	-	-	0,52	4,90	7,65
Total	-	149.43	21,23	22.62	146.74	105.58	4,32	20,53	13,13	46,92	103.90

Explanations concerning the individual columns are given in the following pages

Explanations concerning the breakdown of the Table in Annex 2 C

Column 2: see line 1 of Forecast of Results

Column 3: see line 15 less line 12 of Forecast of Results

Column 4: see col. 13 of Table 2a

Column 5: see col. 12 of Table 2b

Column 6: col. 3 + col. 4

Column 7: col. 3 + col. 5

Column 8: Factor for calculating present value at 7%/a

Column 9: col. 2 X col. 8

Column 10: col. 6 X col. 8

Column 11: col. 7 X col. 8

Annex 2 C

Subject: Financial implications of granting of Joint Undertaking status advantages

Determination of average specific costs, with or without the granting of Joint Undertaking status advantages in DM 10^6

Financial year	Electricity production GWh	Exp. (w/o taxes)	Taxes		Total expenditure		Cash values			
							Factor (7%)	Electr. prod.	Total expenditure	
			*	**	*	**			*	**
1	2	3	4	5	6	7	8	9	10	11
1.4.- 30.6.79	322	5.99	2.08	2.60	8,07	8.59	1.0000	322	8.07	8.59
79/80	1,197	30.02	4.12	5.16	34,14	35.18	0.9346	1,119	31.90	32.88
80/81	1,221	32.99	2.84	3.88	35,83	36.87	0.8734	1,066	31.29	32,20
81/82	1,632	66.32	0.72	1.66	67,04	67,98	0,8163	1,332	54.72	55.49
82/83	2,016	75.54	0.72	1.66	76,26	77,20	0,7629	1,538	58.18	58.90
83/84	1,875	70.70	0.72	1.60	71.42	72,30	0,7130	1,317	50.92	51.55
84/85	1,802	64.76	0.72	1,54	65,48	66,30	0,6663	1,201	43,63	44,18
85/86	2,061	81.89	0.72	1,48	82,61	83,37	0,6227	1,283	51.44	51,91
86/87	1,738	63.18	0.72	1,42	63,90	64,60	0,5820	1,012	37.19	37.60
87/88	2,125	68.85	0,72	1,46	69,57	70,31	0.5439	1,156	37.84	38,24
88/89	2,013	56.49	0,72	2.45	57,21	58,94	0,5083	1,023	29.08	29,96
89/90	1,850	61.41	0.72	1,57	62,13	62,98	0.4751	879	29.52	29.92
90/91	2,125	58.04	0.72	4,67	58,76	62,71	0,4440	944	26.09	27.84
91/92	1,932	57.70	1.05	4,65	58,75	62,35	0.4150	802	24.38	25.88
92/93	2,125	65.53	2.96	3,80	68,49	69,33	0,3878	824	26.56	26,89
93/94	2,125	74.91	1.36	2,19	76,27	77,10	0,3624	770	27.64	27.94
94/95	1,932	68.66	3,41	4,24	72,07	72,90	0.3387	654	24,41	24.69
95/96	2,125	68.63	4.21	5,03	72,84	73,66	0.3166	673	23.06	23,32
96/97	2,125	66.48	5.51	6,33	71,99	72,81	0.2959	629	21.30	21,54
97/98	1,932	65.60	5.43	6.26	71,03	71,86	0,2765	534	19.64	19,87
98/99	1,932	80.88	2.22	3,04	83,10	83,92	0,2584	499	21.47	21,68
99/00	1,932	73,62	7.19	8.02	80,81	81,64	0,2415	467	19.52	19,72
00/01	2,125	77.76	9.91	10.74	87,67	88,50	0,2257	480	19.79	19,97
01/02	2,125	85.92	7.21	8,04	93,13	93,96	0.2109	448	19,64	19,82
02/03	1,932	95,09	1,94	2,76	97,03	97,85	0.1971	381	19.12	19.29
03/04	2,125	98.08	6,83	7.65	104.91	105,73	0.1842	391	19,32	19.48
Total	48,444	1,715.04	75,47	103,90	1,790.51	1,818,94	-	21,764	775.72	789,35

Average specific costs (expenditure): with Joint Undertaking advantages :

$\frac{\text{DM } 775.72 \text{ mill.}}{21.764 \text{ GWh}} = 3.564 \text{ Pf/kWh}$

without Joint Undertaking advantages :

$\frac{\text{DM } 789.35 \text{ mill.}}{21.764 \text{ GWh}} = 3.627 \text{ Pf/KWh}$

* = with Joint Undertaking status

** = without Joint Undertaking status

Explanation concerning the individual columns are given overleaf.

Annex 3

Subject: Financial implications of granting of Joint Undertaking status advantages

Schnell-Brüter-Kernkraftwerksgesellschaft mbH

Forecast of Results

SNR-300

Situation at 10 October 1972

amplified to show situation at 10 November 1972

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and

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Annexes

Annex 3

A. Preliminary remarks

This forecast represents an attempt to describe the anticipated development of the annual results for the SNR-300 on the basis of an achievable power station utilization factor of 90% during the operating phase, together with planned shutdown periods, and the planned development of expenditure. This initial situation, in which possible unplanned effects are not taken into account, serves as a basis for the decisions to be taken in the discussions on the sharing of the SNR-300 operating risks by the countries participating in the project.

In this connection, a matter of special importance is the fuel expenditure. The attached Annex C contains a study based on tender prices quoted by the SNR Consortium and on a fuel-rod concept offering the following alternatives:
a) a change in the rod diameter from 6 mm to 7.5 mm after the sixth operating period, and b) the use of a rod diameter of 7.5 mm from the outset.

In the course of the discussions on these problems, it was finally decided to adopt the following concept as the reference basis, which also forms the basis of the fuel contract:

> From the commencement of the first operating phase, the core will be enlarged with a row of blanket material, and have a fuel rod diameter of 6 mm. From the second core onwards the design of the fuel element used for power station reloads will be based on the use of fuel rods with a diameter of approximately 7.5 mm.

This is the basis for the present Forecast of Results, in which, for 15 reloads, the prices applied are those agreed with INB in the fuel contract of 10 November 1972. Annex B lists the resulting fuel expenditure for the operating phase. In addition, we have, in assessing the long-term income and expenditure situation, taken due account of, on the one hand, the anticipated price increases and, on the other hand, price reductions as a result of technical progress.

The overall calculations are based on the following essential assumptions:

a) the countries concerned enable the SNR Consortium to adopt the price model proposed in the tender dated 11 August, 1972 by sharing the unpredictable cost increases;
b) the countries concerned finance the research and development programme required for the use of the 7.5 mm rod diameters;
c) reprocessing facilities at a maximum price of 500 DM/kg U + Pu for fuel elements and 250 DM/kg U + Pu for breeder elements (on a current price basis) are provided;
d) the countries concerned undertake the solution of the fuel-circuit problems described in Annex C, which are not specific to SNR.
e) the Federal Government enables SBK to contract the necessary loans by providing federal guarantees.

The take-over date for the Power Station has been assumed to be 1 April 1979. The Forecast of Results in tabular form (see Annex A) covers a period of 25 years.

Below we give details of the assumptions on which the calculations are based:

B Explanations concerning the assumptions and mode of calculation

1. Fuel costs and load factor

In order to determine the fuel costs, details were first gathered concerning the cycle-specific charges. These are set out in Annex B The calculated expenditure for each operating period - without the expenditure for plutonium - has been entered to the individual financial years as fuel costs, in accordance with the distribution of the electricity production for the corresponding cycle.

With regard to plutonium, the only costs calculated are those of the interest required in order to preserve the existing Pu-circuit situation (without Pu for the first core). This interest has been taken into account in the calculation of interest resulting from financing overall operation.

The determining parameters for the calculated annual load factor, i.e. the net output, operational availability and the down times also emerge from Annexes B and C.

2. Electricity sale proceeds

Electricity sale proceeds have been determined as 2.6 Pf/kWh plus price drift, up to an annual load factor of 72.5% (basic quantity). For an electricity production in excess of this figure (additional quantity) the price is based on the fuel circuit costs (variable costs) of the SNR.

In order to calculate the price drift, the cost structure of a reference power station (a commercial light water reactor which could be put into operation at the same time is used as a basis:

Price situation as at 1 April 1979 (take-over date of SNR)
1.8 Pf/kWh plant-dependent costs
0.8 Pf/kWh fuel-dependent costs
0.4 Pf/kWh remaining costs (insurance, repairs, maintenance)

The plant-dependent costs are not subject to any further price drift. As far as the fuel-dependent costs are concerned, the following drift is assumed, together with a reduction as a result of technical advance (similar to the assumptions for the SNR fuel cost calculations):

2/3 of the costs: 50% fixed; 50% wage-dependent
1/3 of the costs: 30% fixed; 70% wage-dependent as well as a cost reduction of 4% per year.

An annual wage-increase of 7.5% is assumed. As far as the remaining costs are concerned, an increase of 4% per year is anticipated.

3. Depreciation

Pursuant to the agreement with the countries concerned only DM 100 million is calculated as being written off under the risk-sharing contract. The depreciation curve is linear over 17 years.

4. Personnel costs

The personnel costs are based on a manpower requirement of 150 and a cost of DM 30,000 per man-year (price situation as applicable to 1972).

It has been assumed that after 1985/86, as a result of the construction of a further power station in the same area, manpower requirements for the SNR-300 will fall to 100 at the rate of 10 per year.

A figure of 7.5% has been used as the annual rate of increase in personnel costs. On this basis, the costs per man-year as at 1 April 1979 will be about DM 50,000.

5. Repair and maintenance costs

The repair and maintenance costs are based on a figure of DM 20 per kW of gross output (price situation for 1972). The annual price increase is assumed to be 4%, so that the costs as at 1 April 1979 amount to about DM 7.9 million per year.

6. Trading capital tax and land tax

The taxes have been calculated on the basis of advantages granted through the conferment of joint undertaking status. Consequently, the only taxes chargeable as expenses are trading capital tax and land tax. On a basis of DM 97 million (85% of the capital - standard value of the property), basic amount (for trade tax purposes) of 2 o/oo and a basic-rate multiplier of 300%, the annual trading capital tax amounts to DM 580,000. The land taxes were calculated as DM 140,000.

7. Insurance costs

On the assumption of a normal insurance coverage of DM 80 million, the annual premium for the liability insurance amounts to DM 700,000.

With regard to fire and machinery-breakage risks, no acceptable proposals have been received from the insurance firms and consideration is being given to the building-up of a special insurance reserve. The annual allocations to this reserve are treated, also in the context of the risk-sharing contract, as operating expenditure. The costs of rectifying defects are charged to the reserve. If this is insufficient, the excess costs are deducted from the profit for the current year.

For the purposes of the Forecast of Results, the following model was used in particular:

Maximum reserve figure:

DM 5 million, 1979 prices, plus 5% for price drift

Allocations to the reserve:

1.5 million DM/year until the maximum figure is reached; thereafter, commansurately with drawings, plus price drift on the maximum amount.

Drawings on the reserve, as a result of loss-entailing events:

Throughout the first two full financial years, no drawings, since the Supplier's guarantee provides coverage. In subsequent years, drawings averaging 0.5 million DM/year, 1979 prices, plus 5% for price drift.

On this basis, the reserve shows the following trend: (in DM 10^6)

Fin. year	Price increment factor	Allocations to reserve	Drawings (expenditure affecting liquidity)	Reserve level	
				target	actual
1.4. 30.6.79	1.000	0.38	-	5.00	0.38
79/80	1.037	1.50	-	5.19	1.88
80/81	1.089	1.50	-	5.45	3.38
81/82	1.143	1.50	0.57	5.72	4.31
82/83	1.200	1.50	0.60	6.00	5.21
83/84	1.260	1.50	0.63	6.30	6.08
84/85	1.323	1.20	0.66	6.62	6.62
85/86	1.389	1.03	0.70	6.95	6.95
86/87	1.458	1.07	0.73	7.29	7.29

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8. Interest paid and received

In order to determine the interest paid and received, a detailed calculation of the trend of liquid funds was made (see Annex D). According to this, a loan is required in order to finance the overall expenditure of the plant (including expenditure on plutonium), as is shown in the following table:

(in DM 10^6)

Fin. Year	Loan contracted	Redemption of loan on basis of scheduled pattern of operation
before taking-over	5	-
1979/80	65	-
1980/81 - 1982/83		-
1983/84 - 1989/90		10 each year

This does not take into account repayment of the subscribed capital to the Members.

The rate of interest on borrowed capital is taken to be 8%. The yield on liquid assets is assumed to be 7%.

C. Result of Calculations

The cumulative income and expenditure over 25 years is given below; it assumes observance of the conditions concerning the adjustment of losses and the use of surpluses in accordance with the draft risk-sharing contract (RBV); the figures are in millions of DM:

Income:

Electricity sale proceeds		1,808.31
Interest received		76.16
	Total proceeds	1,884.47

Expenditure	
Fuel costs	789.71
Depreciation	100,00
Personnel costs	388,62
Repairs and maintenance	340,75
Trading capital tax and land tax	18,18
Insurance charges	58,07
Interest payable	37,90
Total expenditure	1,733.22
Cumulative annual profit	+ 151.25
Participation of countries concerned	-.-
(maximum calls on countries concerned)	(42.01)
Reserve under Article 8 of risk-sharing contract	15,98
Losses brought forward	-.-
Depreciation on DM 20 million	-.-
Amount available for payment of interest on own capital (including taxes)	135.27

Essen, 10 November 1972

Dr. Th/Ei (signed)

Schnell-Brüter-Kernkraftwerkgesellschaft — Forecast of Results — Essen, 10.10.1972

		Total over 25 yrs	1.4.-30.6.72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04
1.	Electricity production (GWh)	48 444	288	1 197	1 881	1 638	2 016	1 875	1 806	2 061	1 730	2 125	2 013	1 890	2 125	1 938	2 125	2 125	1 938	2 125	2 125	1 938	1 938	1 938	2 125	2 125	1 938	1 938	1 938	2 125	2 125	1 938	2 125	2 125	1 938
2.	Load factor (%)		50	66	67	63	78	73	70	80	68	83	78	73	83	75	83	83	75	83	83	75	75	75	83	83	75	75	75	83	83	75	83	83	75
3.	Specific electricity sale proceeds, for the basic quantity (Pf/kWh)		3 00	3 03	3 07	3 11	3 16	3 21	3 26	3 32	3 37	3 44	3 50	3 57	3 64	3 72	3 80	3 89	3 99	4 09	4 19	4 30	4 40	4 53	4 66	4 80	4 94	5 09	5 24	5 40	5 56	5 73	5 90	6 08	6 26	6 45
4.	Specific fuel costs (Pf/kWh)		-	0,54	0 59	0 63	0 63	0 61	1 76	1 68	1 79	1 75	1 85	1 66	1 88	1 85	1 63	1 80	1 56	1,40	1,43	1,41	1 48	1,59	1 58	1 58	1,59	1 58	1 58	1,59	1 58	1 58	1,59	1 58	1,59	1,58
	Income																																		
5.	Electricity sale proceeds	800,72	9 66	36 27	37 48	38 76	48 17	60 29	58 74	66 64	58 57	68 74	67 18	66 05	75 11	70 26	75 44	77 27	78 10	79 97	81 99	81 38	83 87	85 98	91 30	95 58	94 46	101 33							
6.	Interest received	75,18	0,06	1 46	1 03	0 58	0 70	1 01	1 35	1 39	1 72	1 43	1 79	1 58	2 18	2 01	2,72	2 79	3 15	3 09	3 27	3 77	4 01	4 16	4 83	4 36	3,71	4 33							
7.	Total income	875,92	9,72	37 73	38 51	39,34	48 87	61 30	60 09	68 03	60 29	70,16	68 88	67 63	77,29	72 07	77 16	80 06	81 25	83 06	85 26	85 15	87 88	90 14	96 13	99,94	98 17	105 66							
	Expenditure																																		
8.	Fuel costs (without plutonium interest charges)	789 71	-	1 88	2 34	26 69	48 86	37 72	31 71	44 39	31 03	37 10	33 22	30 67	37 92	24,19	30 45	38 19	30,22	29 79	30 13	27 18	40,25	30 64	33 30	37 79	44 15	44 23							
9.	Depreciation on DM 100 million	1200 00	2 67	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5 88	5,88	4,45	-	-	-	-	-	-	-	-							
10.	Personnel costs	388 62	1 88	7 50	8 31	9 15	9 84	10 58	11 37	11 40	11 39	11,30	11 13	10 88	11 70	12 37	13 32	14 53	15 62	16 79	18 05	19 40	20 86	22 43	24 10	25 91	27 85	29 95							
11.	Repair and maintenance costs	340 75	1 98	8 44	8 46	8 80	9 16	9 52	9 90	10 29	10 71	11 13	11 56	12 04	12 52	13 03	13 54	14,09	14 65	15 23	15 84	16 48	17 14	17,82	18 53	19 28	20 04	20 85							
12.	Trading capital tax and land tax	18 18	0 18	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0,72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0 72	0,72	0 72							
13.	Insurance costs	98 07	0 56	2 20	2 20	2,20	2 20	2 20	1 98	1 73	1 77	1 84	1 88	1 96	2 02	2 07	2 14	2,22	2,29	2 37	2 46	2 54	2 63	2,74	2 83	2 94	3 05	3 15							
14.	Interest payable	17,00	0 10	4,20	3 68	3 60	3 60	3 60	4 09	3 70	3 50	3 69	2 80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
15.	Total expenditure	733 22	5 17	30 74	31 71	67 04	75,26	71 52	65 48	80,61	63 90	69 27	72 21	62 13	58 76	58 43	64 35	75 63	74 18	69 35	67 20	66 31	81 60	79 36	78 48	86 44	95 81	98 80							
16.	Annual profit	142 70	4 55	-6 99	-6 80	-13,70	-12 39	-9 78	-5 39	-14 58	-3 61	-8 59	-11 67	-5 50	-15 73	-15 63	-11 11	-14 43	-12 93	-13 71	-13 96	-19 65	-6 28	-16 22	-17 67	-13 70	-2 15	-11 78							
17.	Participation of countries concerned in risk-sharing contract	-	-	-	-	0 36	13 39	9,30	4 39	11 66	2 89	-	- 2 26	-1 65	-4 42	-4,46	-3 33	-1 33	-3 87	-4 71	-5 99	-5 98	-1 88	-8 17	-	-	-	-							
	ditto, cumulative		-	-	-	0 36	13 75	23 07	27 46	39 12	42 01	42 01	39 75	38 10	33 68	29 28	25 95	24 62	20 75	16 04	10 05	4 15	2 27	-	-	-	-	-							
18.	Reserve in accordance with Article 8	15 48	3 55	6 99	4 86	-15 36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2 69	5 30	3 75	0 71	7 53	
	ditto, cumulative	-	3 55	10 54	15 34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2 69	7 99	11 74	12 54	15 98	
19.	Losses carried forward	-	-	-	-	-	-	-	1 98	2 98	0 72	-0 59	-4 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	ditto, cumulative		-	-	-	-	-	-	1,98	4 68	5 76	5 15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20.	Amount available for payment of interest on own capital (including taxes)	125,27	-	-	-	-	-	-	-	-	-	-	5 26	3 85	10 31	10 25	7 78	3 98	9 44	11 08	13 98	13 73	6 46	11 36	12 37	8 73	1 65	8 33							
	ditto, cumulative		-	-	-	-	-	-	-	-	-	-	5 26	9 11	19 42	29 67	37 45	41 43	50 87	61,95	75 68	89 41	95 87	107 23	119 60	128 33	130 98	139 31							

Fuel expenditure for SNR-300

Starting with an enlarged core with a 6 mm rod diameter. From the second period, a 7.5 mm core. Burnup increased to 80,000 MWd/t from the 16th operating period.

	Fabrication							Transport after use				Reprocessing			
Period	No. of fuel elements	Specific basic price ($DM10^3$/Element)	No. of breeder elements	Specific basic price ($DM10^3$/Element)	Absorber basic price ($DM10^6$)	Overall basic price ($DM10^6$)	Escalation in overall price. Expenditure ($DM10^6$)	No. of units	Specific basic price ($DM10^3$)	($DM10^3$)	Expenditure ($DM10^6$)	Quantity t heavy metal	Specific basic price for FE DM/kg heavy metal	Specific price escalation for FE + E DM/kg heavy metal	Expenditure ($DM\ 10^6$)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2	-	-	-	-	1.09	1.09	1,62	-	4,8	7,4	-	-	400	753	-
3	-	-	-	-	1·07	1.07	1,67	-	4·8	7,7	-	-	400	784	-
4	215	108	-	-	1·47	24.75	40.01	-	4·8	8.1	-	-	400	829	-
5	71	112	-	-	0,91	8.84	15.23	-	4·8	8,4	-	-	400	847	-
6	-	-	54	51	0 88	3.62	6·48	54	4.8	8,7	0.47	4·1	400	438	1.89
7	67	106	-	-	1·23	8.32	15,49	130	4.8	9.1	1.18	7·4	400	912	6.73
8	69	99	-	-	0,72	7.58	14,66	69	4.8	9.4	0.65	3·9	400	931	3.65
9	69	93	-	-	0·70	7 ·12	14.29	69	4.8	9.7	0·67	3.9	399	959	3.76
10	67	87	96	46	0.69	10.89	22·82	109	4·8	10,1	1,10	7.2	386	769	5.51
11	69	81	-	-	1.11	6.68	14·53	123	4·8	10.5	1.29	8·2	376	754	6·21
12	69	75	-	-	0.66	5.86	13.24	69	4.8	10.9	0·75	3.9	365	966	3.79
13	67	72	-	-	0,64	5.44	12.78	67	4,8	11·3	0.76	3.8	355	969	3,69
14	69	68	-	44	0.62	5·31	13.03	69	4.7	11,5	0·79	3.9	343	973	3,81
15	69	66	-	43	1.01	5,59	14.26	69	4,5	11·6	0.80	3.9	334	977	3.83
16	67	64	54	42	0·72	7,28	19,65	121	4,3	11 7	1·41	8·1	320	762	6 ·19
17	69	62	-	41	0.69	4,96	14.24	69	4,1	11.8	0,81	3·9	306	989	3. 88
18	69	60	-	40	0 68	4,80	14.58	69	4,0	11,9	0.82	3, 9	294	995	3,90
19	67	58	-	38	1.02	4.88	15,72	67	3,8	12, 1	0,81	3.8	282	1.002	3,81
20	69	56	42	37	0·64	6·04	20,71	111	3.6	12·2	1·36	7·3	270	816	5,94
21	69	54	54	36	0·62	6,29	22.84	123	3.5	12,4	1·52	8,2	259	797	6 ,57
22	67	56	-	35	0,60	4·08	15.73	67	3.3	12·5	0·84	3·8	249	1.027	3. 91
23	69	50	-	34	0·91	4·36	17, 90	69	3,2	12,7	0.88	3·9	238	1.037	4 ,06
24	69	48	-	33	0.57	3.91	17.01	69	3.0	12 ·9	0.89	3·9	228	1.046	4, 10
25	67	47	-	32	0.55	3.69	17.03	67	2,9	13, 1	0,88	3·8	219	1.057	4.02
26	69	45	54	31	0.54	5 ,34	26 ,31	123	2.8	13 ,3	1.63	8·2	210	836	6.89
27	69	44	-	30	0.81	3,82	19,96	69	2.6	13 ,5	0·93	3,9	201	1.079	4.21
28	67	42	-	30	0,51	3,33	18.48	67	2.5	13 ,7	0.92	3·8	193	1.091	4 ·15
29	69	41	-	29	0 49	3.29	19.52	69	2,4	13.9	0.96	3·9	185	1 .104	4.33
30	69	39	42	28	0·48	4·36	27·45	111	2.3	14·1	1,56	7·3	177	902	6,57
31	67	38	54	27	0.73	4·73	31·64	121	2,2	14·3	1.73	8·1	170	877	7.13
32	69	37	-	27	0.45	3·03	21.62	69	2,1	14.6	1·01	3·9	163	1 .145	4.49
33	0	37	-	27	-	-	-	301	2,0	15·9	4,78	19,3	157	1 .165	22.52

Annex 3

(Annex B)

Fuel expenditure: SNR-300

Starting with an enlarged core with 6 mm rod diameter. From the second period, a 7.5mm core. Burnup increased to 80,000 MWd/t (U + Pu) from the 16th operating period.

	Plutonium				Conversion				Physics services		Overall expenditure		
Period	Quantity kg of Pu_{fis}	Specific basic price DM/g Pu_{fis}	Specific price escalation DM/g Pu_{fis}	Expenditure DM10^6	Quantity kg of Pu_{tot}	Specific basic price DM/g Pu_{tot}	Specific price escalation DM/g Pu_{tot}	Expenditure	Basic price DM10^6	Price escalation DM10^6	(w/o Pu) DM10^6	Power-station Utilization factor %	Electricity production GWh
	17	18	19	20	21	22	23	24	25	26	27	28	29
2	-	22.37	22.37	-	-	3,00	4.45	-	0.20	0.34	1,96	37	630
3	-	21,53	21,53	-	-	3,00	4.67	-	0.19	0.35	2.02	47	1,037
4	1,271	21,01	21,01	26,71	1-619	3,00	4.83	7.91	0.21	0.39	48,31	52	1,072
5	318	20.03	20.75	6.59	410	2.50	4.28	1,76	0.20	0.40	17.39	64	1,221
6	- 34	20.00	20,87	- 0.70	-	2,50	4.46	-	0,20	0,41	9.26	75	1,221
7	372	20.00	21.77	8.09	479	2,50	4,63	2,22	0,19	0,42	26.04	72	1,221
8	351	20,00	22,33	7.87	455	2,50	4,81	2,19	0,19	0.43	21,57	75	1,221
9	- 676	20,00	23,01	-15,56	454	2,50	4,99	2,27	0,19	0.45	21.43	68	1,221
10	247	20,00	23,54	5.81	440	2,50	5.21	2,29	0,19	0,46	32.18	78	1,221
11	353	20.00	24,15	8,52	455	2,50	5.41	2.46	0,18	0.47	24,96	78	1,221
12	- 624	20,00	24,95	-15,57	454	2,50	5,62	2,55	0,18	0,48	20,81	78	1,221
13	22	20.01	25,48	0,56	458	2,47	5,77	2,64	0,18	0,49	20,16	68	1,221
14	- 54	20,47	27,05	- 1,47	473	2,38	5,82	2,75	0,17	0,49	20,88	78	1,221
15	- 56	20.81	28.27	- 1,59	471	2,31	5.87	2.77	0,17	0,50	22,16	78	1,221
16	30	21.23	29,82	0.90	456	2,22	5,95	2,71	0,16	0,52	30,49	74	1,835
17	52	21,78	32,02	1,68	473	2.11	6,04	2.85	0,16	0.54	22,32	81	1,835
18	- 281	22.28	34,00	- 9,59	471	2,02	6.12	2,88	0,15	0,56	22.74	81	1,835
19	- 72	22,81	36,44	- 2,61	456	1,94	6.21	2,83	0,15	0,58	23,75	74	1,835
20	36	23.44	39.37	1,43	473	1.85	6,31	2.98	0,15	0,60	31,59	81	1,835
21	36	24,00	42,16	1,54	471	1.77	6.40	3.02	0,14	0,62	34,56	81	1,835
22	34	24,57	45,18	1,54	456	1,70	6,50	2,96	0,14	0,64	24,08	74	1,835
23	- 113	25,19	48,63	- 5,50	473	1,62	6.61	3.12	0,14	0,66	26,62	81	1,835
24	- 108	25,79	52,20	- 5,61	471	1,55	6,71	3.16	0,13	0,69	25,85	81	1,835
25	34	26,44	56.27	1,91	456	1,48	6,82	3,11	0,13	0,71	25,74	74	1,835
26	37	27,13	60,91	2,28	473	1,42	6,94	3,28	0,13	0,73	38,34	81	1,835
27	36	27,78	65,54	2,39	471	1,36	7,05	3,32	0,12	0,76	29,20	81	1,835
28	34	28,45	70,56	2,40	456	1,30	7,17	3,27	0,12	0,79	27,61	74	1,835
29	- 109	29,16	76,29	- 8,34	473	1,24	7,30	3,45	0,12	0,82	29,07	81	1,835
30	36	29,89	82,54	3,01	471	1,19	7,43	3,50	0,11	0,84	39,92	81	1,835
31	34	30,00	87,27	2,97	456	1,14	7,56	3,45	0,11	0,87	44,82	74	1,835
32	37	30,00	92,45	3,46	473	1,08	7,70	3,64	0,11	0,90	31,66	81	1.835
33	- 549	30,00	97,26	-53,38	-	1,04	7,84	-	-	-	27,30	90	1,835
	- 466	30.00	102,64	-47,87									
	- 329	30.00	108,93	-35,84									
	-1.612	30,00	118.74	-191,46									

Explanations concerning the fuel cost calculations

1. Statement of the problem

(a) For the forecast of operating costs, all of the expenditure and income relating to the fuel circuit had to be estimated over an assumed operating time of 25 years (1979-2004).

(b) A "solution to the fuel cost problem" had to be found. The calculations made on the basis of the contractual conditions, designs and operating schedules contained in the original tenders from the supplier firms give grounds for fearing that the SBK will be involved in losses of several hundred million. As a result, the implementation of the project was called into question.

2. Mode of calculation

The problem outlined above could not be solved by our usual methods of calculation, since these were developed purely for making a cost comparison on the basis of comparable tenders or for determining the average electricity generating costs for nuclear power stations, the subsequent trend of the costs being disregarded as being more or less similar. The present problem, on the other hand, called for a cash-flow representation, in which the probable further trend had definitely to be taken into account because of the strongly differing patterns in which the income and expenditure evolved. In order to comply with this requirement in the optimum manner, an attempt was made, for each stage in the development of the fuel cycle, to assess separately the cost-reducing effect of technical progress (rationalization, increased turnover, improvements) and the cost increases due to rises in wages and/or salaries and higher prices of materials. The results are set out in Tables 1-15.

3. Trends in wages, salaries and prices of materials (Tables 1 & 2)

Tables 1 and 2 show the development on a logarithmic basis of wages and salaries, as regards the main sectors of importance to the fuel cycle, in Belgium and West Germany over the period 1960-72. With the exception of a discontinuity in the years 1970/71, which was due to the economic situation, it will be seen that the trend is constantly linear. This enables us to assume a constant annual rate of increase of 8% for wages in Belgium, and 7.15% for West Germany, the figure for salaries being 5.8%. Taking into account the proportion of supplies expected to be provided by Belgium and West Germany for fabrication of the fuel elements, an average annual wage increase of 7.5% was obtained; this figure was used as the basic figure for calculating the wage increases for all supplies and services relating to the fuel cycle.

The 7.5% increase in wages means that wages will double in 9.3 years; the 5.8% increase means that salaries will double in West Germany in 12.1 years. If this trend is maintained for a long time, the average level of wages would exceed the average level of salaries within the period of time under consideration. As such a trend appears scarcely credible, the calculations have been based on an appropriate annual salary increase rate of 7%, through which there would simply be a reasonable alignment between wages and salaries.

Attempts to use the method described above in order to determine a specific pattern for price trends among materials (steel) have proved unsuccessful. The proportions accounted for by materials prices in the price escalation formulas have therefore been added to the fixed or wage-dependent proportions in accordance with a suitable formula.

4. Dependence of fuel cycle supplies and services on wages, salaries and prices of materials (Tab. 1a)

It is necessary to eliminate from the tables in 1a those factors by which the price quotations can be converted as from one reference point

in time to another, in order to be able to determine the escalation resulting from changes in wages, salaries and costs of materials in the intervening period (months). For the calendar dates listed on the left of Table 1a, the starting point chosen was 1 July 1971, since the original tender prices quoted by the manufacturing firms were based on that date. Later quotations based on other reference times have been converted to prices as applicable on 1 July 1971. It is only in the case of plutonium that the escalation has been assumed not to commence until 1 January 1980, since this market is initially characterized by a surplus and the trend of plutonium values during this phase is mainly determined by other factors.

The escalation formulas used are indicated at the top of Table 1a. These formulas are derived, with the exception of the plutonium formula, from binding tenders submitted by the manufacturing or service-rendering firms. The following ratios were obtained:

Supplies or services	Fixed proportion	wage- or salary-dependent proportion
$PuNH/PuO_2$ conversion	20%	80%
Fabrication of first core	20%	80%
Fabrication of reloads	30%	70%
Reactor physics management	10%	90%
Transport of irradiated elements for reprocessing	40%	60%
Reprocessing	30%	35%+35% chemical-dependent
Plutonium	50%	50%

As far as plutonium escalation is concerned - and no data or pointers at all are available on the subject - the price was assumed to remain constant up to 1980 (the reasons being set out in the explanations concerning the reference times); from 1980 onwards, it is assumed to be proportional to the rough estimate of the price trend for enriched uranium. As this still very uncertain assumption has a decisive effect

on the long-term operating results, and in particular on the pattern of sales revenue after discontinuance of plant operation (DM 152 million net Pu revenue), it is necessary to be extremely cautious when drawing inferences and making financial arrangements in connection with the final winding-up of the operating company and the decision as to the purchase or leasing of plutonium.

With regard to escalation in the reprocessing prices, the chemical-dependent proportion was found to be subject to a 4% annual increase, on the basis of information provided by United Reprocessors GmbH. The escalation formula for the transport of irradiated fuel elements is, according to the tender from the Transnuklear firm, composed of a fixed proportion amounting to 10%, a wage-related proportion of 45% and a freight-related proportion of 45%. As the necessary data concerning the recent development of the price index for freight-dependent costs could not be prepared quickly enough, the freight-related proportion in the formula was replaced by a 30% increase in the fixed proportion and a 15% increase in the wage-related proportion. The escalation formula for reload fabrication is also in line with current tendering practice in respect of light-water reactor fuel elements. The escalation formula for conversion from plutonium nitrate into plutonium oxide should be considered too pessimistic with a wage-related proportion of 80%. Here a reduction can possibly be negotiated. (The figure aimed at should be between 60 and 70%.)

5. Dependence of fuel cycle supplies and services on technical progress

Tables 3 to 9 and Table 12 show what is considered to be the possible price trend of the various fuel cycle supplies and services, as a result of the effects of rationalization and of more efficient firms operating with a better utilization factor, over the period up to the planned cessation of operation, on the assumption that wages, salaries and materials prices remain constant at the 1971 level. The prices applicable for the individual years, which are designated as basic

prices, are obtained by multiplying the actual price used for the calculation of the fuel costs by the appropriate escalation factor from Table 1a. The basic prices at the beginning of the period in question have in general been taken from the existing binding tenders. The relevant assumptions and the special dependences have been included in the tables. The basic prices at the end of the period in question were determined by evaluating the information provided by the Karlsruhe nuclear research centre to obtain an estimate of the figures ultimately achievable. The initial and final values have been connected by a straight line, which, using the logarithmic price-scale, corresponds to a constant percentage of variation over the years.

6. Basic prices for plutonium (Table 3)

The initial fissile plutonium value of 25 DM/g corresponds to the recycling value which, according to the existing binding tenders, can be achieved in thermal reactors. Because of the anticipated glut of plutonium, the uneconomic start-up phase in the plutonium element fabrication and the specific difficulties of plutonium recycling in thermal reactors, a momentary drop in the price of plutonium will occur, which, in the event of selling being necessary, could lead to prices as low as 10 DM/g. As, however, we must purchase large quantities of plutonium during this phase, it would be prudent to assume that the purchase price will not be less than 20 DM/g. Particularly because of the construction of installations with fairly large breeder capacities, which is likely to start around 1985, a resurgence in the price of plutonium may be expected, finding its upper limit in the actual substitution value for enriched uranium in fast reactors, which may range up to 40 DM/g for fissile plutonium. As, however, we shall be mainly acting as sellers of plutonium, the possible basic price finally obtained has been estimated at only 30 DM/g.

7. Basic prices for PuNH/PuO_2 conversion (Table 4)

Alkem offered the Consortium this service at a basic price of DM 2.10 per gramme of total plutonium. The Consortium wants to charge us DM 2.20 per gramme (0.10 DM/g administrative levy). This is based on the following assumptions:

(a) A long-term contract will be concluded (for the overall requirements up to 1986).

(b) The annual quantity ordered must be at least 800 kg. The ordering of smaller annual quantities will result in the following price increases:

Shortfall in quantity ordered	Price increase
0-25%	0%
37.5%	10%
50%	30%
62.5%	55%
75%	90%

(c) Americium separation is included in the price, but not any necessary storage or elimination thereof.

(d) Only the extra cost of Pu nitrate transport as compared with transport in the form of Pu oxide in West Germany is included. (Arrangements have been made for the transport of Pu oxide in the quantities necessary for fuel element fabrication.)

(e) Any necessary homogenization must be paid for at an additional charge of 0.32 DM/g Pu_{tot}.

(f) If the plutonium is provided by us in the form of plutonium nitrate and americium separation is not required, there is a 10% reduction in price.

(g) If the plutonium is delivered by us as plutonium oxide for the purposes of subsequent americium separation, the basic price is 6.80 DM/g Pu_{tot}.

As it is not known where, in what form, or with what isotopic composition and americium structure the plutonium required for the fuel cycle inventory will be procured, there is a considerable margin of uncertainty regarding the power output range, and consequently also the price for conversion, which might be only 10% under, or more than 200% over. However, if these factors are taken into account in the purchasing of the plutonium, by careful selection of the sources of supply or commensurately revised plutonium price quotations, a certain degree of compensation will be possible. Consequently, we have calculated the average remaining additional expenditure as only 0.5 DM/g Pu_{tot}. After the commencement of recycling, the plutonium used will largely all be our own, so that this additional expenditure can be dispensed with from 1981 onwards (discontinuity in the curve).

If the americium can be sold, as has hitherto been the case, revenue will accrue to SBK. If, however, the americium can no longer be sold, additional storage and removal costs arise; at the present time there is no indication of what these would be. We have attempted to allow for this situation by means of a basic price supplement of 0.30 DM/g Pu_{tot} for conversion. The governments concerned will, however, have to find a solution for this americium problem.

On expiry of the contract, increasingly favourable prices will be obtainable as a result of new, more efficient conversion capacities and of competition (note the kink in the curve), and we consider that it will be possible to halve the initial value by the year 2000 and to solve the problem of the americium by optimum coordination of the various fuel cycle stages.

8. Basic prices for reloads (Tables 5, 5a, 5b)

The basic price trend for reload elements, which underlies the present cost calculations, can be seen in Table 5a. The initial values were obtained from the new tender submitted by the Consortium. As the new

price quotation too referred to the individual reloads under the original refuelling scheme, in which the times for ordering and numbers of fuel elements produce a markedly changing variable on account of the refuelling policies now under consideration, it is necessary to modify the concept so as to align it with an agreement to cover requirements up to 1985 - an arrangement on which there is a fundamental consensus with the Consortium. The relevant price conversion (initial values in Table 5a) was determined jointly with the Consortium and rechecked by the latter. The new reference date for escalation has been taken into account. The prices are valid for order batches of 52 fuel elements in each case. If batches of different quantities are involved, this gives rise to reductions or increases in the prices, the dependence of which can be seen from Table 5b.

An assumption which is of decisive importance as regards the validity of the abovementioned basic prices is that the governments put the fabrications in a position, by appropriate safeguards, to pass on to the SBK their fabrication costs calculated on the basis of the state of the art at that time, without any risk or safety surcharges, as the upper limits for the prices. In the event of the actual fabrication costs proving to be higher, provision is made for the additional costs to be borne proportionally by the governments and the fabricators on the lines of a "Malus" (extra premium for heavy claims) model. Furthermore, the governments must make it possible for the Consortium to waive the reservations regarding additional research and development costs which are still contained in the draft contract negotiated with us.

Table 5 sets out the Consortium's original price quotations, which in practice would retain their validity if the new price model cannot be achieved. (Perhaps a reduction of another 5% is possible.) The comparison shows that the former fuel element prices are about 1.4 times the basic prices which are now used for calculating the fuel costs. It should also be noted that the new price quotation covers supplies plus design work.

The segment of the basic price curves which relate to the end of the operating period is determined by identical assumptions to those in Tables 5 and 5a for the specific fabrication costs, namely 1600 DM/kg U + Pu in the year 2000. In the determination of this figure, due account was taken of the fact that the fabrication costs which can at present be achieved in the case of large new fast breeder power stations will be impossible to achieve for the SBK fuel elements, since orders will remain relatively small, and the design may be out of keeping with the customary design for fuel elements at that time.

It will be seen from Table 5 that, at the end of the contractual delivery time to be met by the Consortium, there is a sudden drop of 10% in the price, which corresponds to the probable effect of competition from which we will profit at the time. Table 5a does not show this kink, since the new price terms are scarcely undercut by competitors. Consistency of the curve segments in Tables 5 and 5a applicable after expiry of the supply contract would require a price jump of about 20% for the 1985 initial value shown in Table 5a. We have, however, assumed that the initial assistance given by the governments in view of the new price model will enable the fabrication industry to have an efficient set-up, which, even after the discontinuance of the promotion measures, will continue to have a beneficial effect on the fabrication costs and the delivery conditions which can be granted by SBK. We should endeavour to safeguard this possibility by means of options in the supply contract.

The use of a larger fuel rod diameter, namely 7.5 mm, is in line with specific fabrication prices reduced by 20% compared with the 6 mm variant. This corresponds, on account of the different heavy-metal content, to a reduction of about 12% in the unit price of fuel elements. For our fuel cost calculation it was assumed that the changeover from a 6 mm to a 7.5 mm rod diameter will occur after the sixth cycle, i.e., about the beginning of 1982. This period of time would be sufficient to demonstrate, by radiation tests on the usual scale, that the 7.5 mm diameter variant is operationally suitable. As, however, in the present

case the neutron flux and thermal load can be largely adapted at the expense of the blanket by an increased number of fuel elements in the core, and identical metallurgical conditions apply as in the case of the 6 mm design, it should also be possible to consider immediate use of the 7.5 mm design (i.e., from the very first core charge) without there being any need for radiation experiments on the usual scale. Assuming that the discharge burn-ups remain identical, this would result in a saving of about DM 15 million in fabrication costs.

Conversion to a 7.5 mm diameter involves re-equipment costs which, on the basis of present wages, are estimated at DM 3 million. These have been taken into account in our calculation. In addition, a supplementary development programme is required, which should be financed by the governments. The abovementioned costs cannot be avoided even if the 7.5 mm diameter is used right from the outset. Nevertheless, in view of the shorter escalation time, a further saving of DM 1.5 million is rendered possible.

The essential disadvantage of later conversion to another fuel rod diameter lies in the additional reactor outage which this entails. Using the assumptions in our cost calculation (i.e., transition after the sixth cycle), this results in a loss of electricity sale proceeds amounting to some DM 17 million, which naturally would not arise if the 7.5 mm fuel rods are used right from the start.

The foregoing figures must be regarded only as incomplete data. In view of the complex interdependence between the fuel utilization policy to be employed and the other nuclear factors, a usable basis for decision can be obtained only by a thorough calculation of the various cases.

9. Basic prices for reload breeder elements (Tables 6, 6a)

The trend of basic prices which is used in the present cost calculation for reload breeder elements can be seen in Table 6a. The initial values were obtained from the Consortium's new tender. With regard to the

recalculation, reference may be made to what is said in Chapter 8, Section 1. The prices apply for orders in batches of 48 elements. Where quantities are involved, increased or reduced prices are applicable, the dependence of which can be seen in Table 5b.

Table 6 sets out the Consortium's original price quotations. A comparison shows that the previously offered breeder elements with a rod diameter of 9.5 mm were about 1.55 times as expensive as the 11.6 mm elements now offered. The new prices are due to the following changes:

(a) reduction in the number of rods per breeder element from 91 to 61;

(b) increase in the batches of breeder elements ordered from 16 to 48;

(c) widening of the scope of the supplies by the inclusion of design work;

(d) genuine price reduction.

It can be seen from Table 6 that the effect of (a) alone is a 20% reduction, so that 16% is due to the remaining effects. It cannot, however, be concluded that because of the 20% reduction in fabrication costs resulting from the increase in diameter there will be a corresponding saving in fuel costs, since unfortunately the discharge burn-up too is substantially lower for the new variant.

The segment of the basic price curve which relates to the end of the operating period as shown in Table 6a is based on the supposition that the specific fabrication prices up to the year 2000 can be, reduced to 350 DM/kg U, (i.e., the price for current light-water reactors recalculated, on the basis of the same diameter, with a 40% supplement for relatively small rates of output and complicated special design). For the 11.6 mm variant in Table 6, a specific fabrication price of 400 DM/kg U was used, which takes account of the substantially smaller order batches. A figure of 500 DM/kg U was then obtained for the 9.5 mm design.

In Table 6, the end of the contractual delivery time to be observed by the Consortium is likewise characterized by a sudden 10% drop in prices owing to the effect of competition. This discontinuity did not apply to Table 6a, since the subsequent prices, taking into account the different order batches, are consistent with the prices in Table 6.

10. Basic prices for absorbers (Tables 7, 7a and 7b)

The basic prices for trend absorbers on which the present cost calculation was made can be seen in Table 7a. The initial values were obtained from the new tender submitted by the Consortium and relate to the cycle - reload requirements of a normal one-out-of-three refuelling scheme with 57,000 MWd/t fuel element discharge burn-up. The values for nine shim absorbers and three shutdown absorbers are shown separately, since the requirements for these recur at different intervals for the various cycles. The use of a one-out-of-two cycle and/or the feasibility of a higher discharge burn-up call for higher B-10 contents in the absorbers. In the case of the one-out-of-two cycle, this means a price increase of 1% and, in the case of 80,000 MWd/t fuel element discharge burn-up, an increase of 21%. For the period after the expiry of the contractual delivery time, a steady increase in basic prices is anticipated, with a gradient conforming to that for the corresponding segment of the curve displayed by the breeder element prices (about 60% of the 1985 final value under the contract for the year 2000).

Table 7 shows the Consortium's original price quotations with their anticipated trend. Comparisons with the new prices cannot be made automatically, since the scope of the supplies and the absorber system have been fundamentally changed. The most important differences between the old and the new system are as follows:

(a) as a result of better positioning and a higher B-10 content, there is a saving of six core positions;

(b) the previously separate initial shutdown with three special shutdown absorbers is now integrated in the operation of the shim absorbers;

(c) the number of shim absorbers has been reduced from the original twelve to nine.

The prices shown in Table 7 relate to shim absorber designs for a service time of 119 full-load days. For longer lives, designs involving a higher B-10 content are necessary. The price increases involved can be seen in Table 7b.

A comparison between the original tender and the new one shows, in the case of the shim absorbers, a compensation through the effects of the reduction in the number of elements and the increase in B-10. In the case of the shutdown absorbers, on the other hand, there is a significant saving as a result of the reduction by half of the number required. In addition, the prices now drop by 28% over the contract period, whereas previously they remained virtually constant. The consistently high prices in the original tender prompted us to allow in Table 7 for the effect of competition in the form of a 7% jump after expiry of the contract, and to make a more conservative estimate of the subsequent price decrease (falling-off to about 70% by the year 2000) than in Table 7a (60%).

It should also be pointed out that the absorber design envisaged at that time is only suitable for service times of up to perhaps 200 full-load days, on account of the He pressure build-up. The feasibility of increasing the cycle duration to 260 full-load days, from the 14th cycle, which has been included in our cost calculation (in connection with the increase in burn-up to 80,000 MWd/t) is dependent on the timely development of new absorbers, for which ventilation and/or other absorber materials are to be taken into account. We have assumed in our calculation that the costs involved in this development will also be borne by the governments and consequently the possible cost effect is disregarded. Furthermore, no indication is available from the Consortium concerning the probable prices of the new absorbers.

11. Basic rates for the transport of spent breeder and fuel elements (Table 8)

Transnuklear's tender of July 1972 quoted transport rates of 93 DM/kg initial heavy metal for fuel elements and 59 DM/kg initial U for breeder elements. This would correspond to the following basic transport unit rates, for the newly envisaged heavy-metal contents:

DM 4450 per fuel element with a 6 mm rod diameter
DM 4940 per fuel element with a 7.5 mm rod diameter
DM 4420 per breeder element.

The recalculation takes into account the later start of the escalation process (1 January 1973). As all types of elements are to be transported with the same containers, there should, in our experience, be a standard charge per component. Consequently, Table 8 shows a unit rate per element of DM 4800 for the period during which this container is expected to be used. For the subsequent period a steady drop in costs has been assumed, mainly because of improved and better-balanced containers, so that the rate in the year 2000 represents only 50% of the initial amount. An indication of this is also given by the known transport costs for light-water reactor fuel elements, the specific value of which is today at least 20% below the abovementioned estimated charge for fast-breeder elements as applicable to the year 2000.

The rates quoted by Transnuklear are valid for transport to GWK, Karlsruhe, and include the cost of developing and constructing the containers. As the Federal Government has indicated its readiness to bear the container development costs, there is the possibility of a rate reduction of perhaps up to 10%. On the other hand, there are certain ancillary services which are not included in the scope of the supplies, such as police and convoy escort, decontamination of the containers and any supplementary expenditure owing to changes in official requirements, as a result of which the abovementioned possible saving might again be partly eroded.

The essential prerequisite in the Transnuklear offer is for payment, on placing the order, of a deposit of DM 1.1 million, which will later be adjusted proportionally to the journeys completed over the first eight years after the start of the transport operations. This requirement is for the following reasons:

(a) The small firm of Transnuklear does not feel in a position to undertake anticipatory financing from its own resources of the purchase of such an expensive container.

(b) Transnuklear's price calculation is based on an eight-year period of normal use of the containers for the SNR-300. Transnuklear wishes to avoid losses resulting from non-materialization of the volume of transport assumed in the calculations.

According to our calculations, the anticipated volume of transport orders during the first eight years of transport operations (1982-90) would amount to some DM 5.4 million, without escalation. It can be concluded from the deposit requirement that containerage accounts for an estimated 20% or so of the overall transport costs. With interest, the 20% anticipatory financing figure rises over an average of six years, if the rate of interest is 8%, to about 32%. In other words, the foregoing price quotation corresponds to a price 1.12 times as high, for a normal payment plan conforming with the settlement procedure. The net effect of the assumption of the development costs by the Federal Government, the fact that the volume of the supplies will not quite be complete and the required anticipatory financing has been to prompt us to estimate a 3% rise in the weighted average (DM 4670) of the tender prices mentioned at the outset, and we have thus arrived at the unit price of DM 4800 in Table 8. We hope on this basis to be able to conclude a normal transport contract with Transnuklear, since any shifting of the transport industry's financing and risk-coverage problems to the SNR-300 appears to be neither acceptable nor justified.

If, contrary to the present plans, reprocessing cannot be carried out at GWK in Karlsruhe, a quite different situation arises with regard to

transport. For the next most likely event, i.e., transport to Windscale, the transport rates must be set twice as high (mainly due to increased transport and insurance costs). The time required for a round trip for the containers is about one week if the reprocessing is done in Karlsruhe, and about two weeks if done in Windscale. It is envisaged that a container will accommodate six elements.

In conclusion, it may also be mentioned that Transnuklear, in accordance with present practice regarding our light-water reactors, offers SBK advice on all questions relating to the fuel element handling equipment, in order to obviate difficulties with the containers which it is planned to use. The fee for this, namely, DM 15,000 should be paid by the governments concerned.

12. Basic prices for reprocessing (Table 9)

As a result of the information currently available to us it is intended to convert GWK, Karlsruhe, to reprocessing of fast breeder elements. This can be done in two ways:

(a) by using highly diluted solutions, and restricting the daily throughput to about 28 kg heavy metal. For this, all that is required is the attachment of a special "head-end";

(b) by using a concentrated flow diagram, affording a throughput of about 125 kg per day. This would also require extensive modifications to the existing processing units.

The costs of conversion should be borne by the Federal Government and on the present wage-cost basis are estimated at:

DM 30 million for alternative (a)
and DM 70 million for alternative (b).

Having regard to the foregoing, the different throughput capacity for the assumed full utilization of the plant and 300 operating days/a gives

fuel element reprocessing costs, on the basis of data supplied by GWK, of 1430 DM/kg heavy metal for alternative (a) and 230 DM/kg heavy metal for alternative (b).

In view of probable malfunctions during the initial phase, 1982-87, capacity under alternative (a) would not be sufficient to serve the SNR-300 promptly. If, then, the requirements of the SNR-300 were later to diminish gradually through improvements in the fuel cycle, the reprocessing capacity which would thereby become available would hardly be sufficient to offer a reliable reprocessing service to other nuclear power stations. It follows that the actual reprocessing prices for alternative (a) should be estimated at 2000 DM/kg SM. This gives a reprocessing price per fuel element of more than DM 100,000, i.e., the reprocessing costs would exceed the new fabrication prices and alone account for 0.7 Pf/kWh, plus escalation, in the electricity generating costs. These considerations indicate clearly that alternative (a) proposed by GWK offers no usable solution and cannot, therefore, be taken into consideration.

If, on the other hand, alternative (b) permits for an additional expenditure of DM 40 million, as stated by GWK, savings of 1200 DM/kg heavy metal or 61,000-68,000 DM/fuel element in the reprocessing cost, excluding escalation, then this solution would become profitable for the SNR-300 as early as 1986. We have therefore assumed that alternative (b) will be adopted. However, instead of the reprocessing costs of 230 DM/kg indicated by GWK we have adopted for the breeder elements in Table 9 reprocessing prices of 500 DM/kg heavy metal for the period up to 1985. With the extra 270 DM/kg heavy metal the following additional costs are incurred:

A. the difference between the operating costs involved in reprocessing and reprocessing price;

B. malfunctions and part utilization of the reprocessing plant;

C. possible financing of the DM 40 million additional costs at GWK by contracting a loan. (For a financing charge of 200 DM/kg heavy metal, the DM 40 million could be paid off in about five years of operation.)

Not until the period after 1985 is there, in our anticipation, likely to be a gradual drop in the reprocessing price to 250 DM/kg heavy metal by the year 2000, since at least the main additional-cost factor C. is finally eliminated.

On the American side, reprocessing costs of 400-480 DM/kg heavy metal have been quoted; taking into account possible differences in transport costs, these figures also justify our assumption of 500 DM/kg heavy metal at the outset.

For the reprocessing of fast breeder elements in a 1500 t/a LWR reprocessing plant, GWK quotes a cost of 8 DM/g. This would mean that, even in the future, with the concentration reduction process the reprocessing costs for the SNR-300 would not fall below 800 DM/kg heavy metal (at the wage level then applicable). One should not, however, assume as a hard and fast rule that only special reprocessing plants constitute a solution where fast breeder reactors are concerned. In the case of large fast breeder reactors much more favourable conditions may be expected, coming much closer to those applying in the case of light-water reactors in that the necessary Pu enrichment is far less and an increasingly large number of breeder elements are available for combined reprocessing. There is therefore a certain danger from the reprocessing point of view that the SNR-300 will remain a special case which is economically unfavourable, even in the longer term. This applies all the more if alternative (b) is implemented at the GWK plant.

For the reprocessing of the breeder elements we have quoted a figure of 9250 DM/kg heavy metal in Table 9 for the period up to 1985; this finally decreases to half by the year 2000. GWK has quoted reprocessing costs of 230 DM/kg heavy metal for the breeder elements, no special requirements apparently having to be met. Our supplement of 20 DM/kg heavy metal should therefore cover only the difference between the operating cost involved in processing and any reprocessing prices. The assumed subsequent 125 DM/kg drop in the reprocessing price in Table 9

leads by the year 2000 to a basic value which can already be attained at present in respect of LWR-fuel elements. As the fissile material contents are virtually identical, this assumption should also be tenable.

13. Trend of power plant utilization (Tables 10 and 13)

In order to be able to examine the influence of the various core element utilization policies on availability, and therefore also on the operating costs, the scheduled outages for refuelling, maintenance, servicing and repairs have been shown separately from the unscheduled plant shutdown times. Here it was assumed that the scheduled maintenance, servicing and repair work could be merged in with the operations required on the reactor owing to the need for core shuffling. The plant outages due to the core reshuffling can be seen in Table 13. From this it emerges that the minimum stoppage owing to necessary refuelling is 15 days. The down time which has to be planned on top of this is determined mainly by the extent of the refuelling required, since in the case of breeder elements it is not necessary to wait for a decay in the radiation intensity. The possibility of carrying out certain operations simultaneously is illustrated in the Table 13 diagram. The times indicated for the various individual operations were given by the Consortium. In the down time involved in each core reshuffle, the minimum durations to be planned for maintenance, servicing and repairs on the power station have been duly taken into account. The boundary conditions used were as follows:

(a) In each year, a scheduled shutdown of not less than 30 days non-stop will be required.

(b) Every three years, a scheduled shutdown of not less than 60 days non-stop will be required.

(c) The down time relating to the first two scheduled core reshuffles amounts to 60 days in each case.

Table 10 sets out the additional unscheduled shutdowns which are considered likely. Here we based our calculations on the assumption that utilization of the SNR-300 prototype for a construction cost of more than DM 1,500 million (3000 DM/kW) must first andforemost be geared to the acquisition of experience. It follows from this that the installation, if it is ever to be usable, should be operated at the highest output possible. In view of the size of the participating electricity companies, there can be no question of their being technically able to handle an output of 300 MW at all times. We have therefore assumed in Table 10 that utilization of the plant is restricted solely by availability. For the participating electricity companies this means that the SBK, which will be unaffected by them, will be able, regardless of their particular interests, to feed their grid with the electricity produced. The economic value of such an obligatory supply of electricity (not provided "on call"), and which is not guaranteed either, is relatively low. Payment at the usual prices must be incorporated as a genuine additional contribution by the electricity companies to the project.

On the basis of the foregoing explanations, the curve pattern shown in Table 10 was obtained by eliminating from the 100%-utilization line the assumed times of unscheduled non-availability of the plant for the various years of operation. The curve can only be interpreted, of course, as an expression of the anticipated long-term trend; the detailed pattern will probably be quite different. This trend is characterized by the fact that from an initial 50% availability rises over five years to an average of 90% for the long term. The 90% will probably come about because after a number of years of virtually 100% scheduled availability, an unscheduled shutdown lasting several months will occur as a result of fairly considerable damage. The trend in question corresponds to the pattern of availability which a conservative estimate prompts us to anticipate for LWR power stations. No attempt has been made to incorporate the availability deduction undoubtedly inherent in the prototype character of the SNR-300, since the loss factor involved should be specially compensated for in the risk-sharing contract with the governments.

14. Evolution of the Pu cycle (Table 11)

Table 11 shows, in respect of the supplies and services inherent in the core reshuffle, the time relationships on which the present cost calculation was based. The assumptions are based on our past experience with light-water reactors. Proceeding from this, the minimum Pu cycle duration (time between removal from to reinsertion in the reactor) is estimated at 30 months plus the time lag up to scheduled reactor requirement. A more precise coordination of the sequence of evolution without an appropriate slack is virtually impossible, since the various contractors must all constantly work on the "First in, first out" principle and any disruption of their operating schedule has repercussions on all the customers. As conditions in this respect in the case of the SNR-300, which is of a special design, are particularly unfavourable (there is probably only one reprocessing plant and only one suitable transport container) our assumptions are probably too optimistic.

In view of the fact that the service-rendering firms' capacities for the predictable future are relatively small, the cycle duration is also highly dependent on the size of the charge, and consequently on the core-element utilization policy. We have taken this into account by adding a period of six months in each case to allow for serious discontinuities in the first cycles (replacement of the entire core charge). For the equilibrium conditions which are reached later, a check carried out on Table 11 showed that the values indicated could be sufficient if operations were performed to schedule.

The vital importance of the cycle duration is that it largely conditions the plutonium inventory in the fuel cycle outside the reactor. In the present instance account must be taken of a peak requirement of some 2800 kg Pu_{fis} outside the reactor (in the reactor an additional 1120 kg Pu_{fis}) for the period from 1982 to 1985. Finally a decrease to about 1700 kg Pu_{fis} may be expected.

15. Basic prices for reactor physics services (Tables 12 and 12a)

The basic price trend for reactor physics services which underlies the present cost calculations can be seen in Table 12a. As the work and computer time of this service are perhaps 90% due to the core reshuffle, the price quotation relates to an operating period and is almost independent of its duration. By operating period is meant the time between reactor shutdown for one scheduled core reshuffle and reactor shutdown for the next scheduled core reshuffle. The first operating period starts with plant takeover.

The basic prices quoted in Table 12a for 6 mm rod diameters over the probable contract term, i.e., up to 1985, were taken from the new tender of July 1972 (only calculated back to the start of the escalation process, namely, 1 January 1971). The adjoining curve segment was obtained from the assumption of a steady further decrease to DM 100,000 per operating period in the year 2000. The DM 100,000 per operating period corresponds to the basic price to be quoted for LWR servicing, which has become a routine.

The basic prices indicated in Table 12a for 7.5 mm rod diameters were obtained by a parallel shift of the 6 mm curve. The underlying assumption was that the changeover to another core design made it necessary to start again with the higher initial servicing prices for the 6 mm variant. In addition, a 7.5% supplement was included for the operating period, which is 1.45 times as long as that entailed by the 7.5 mm version. The Consortium did not overlook in its tender the price change due to changeover to the 7.5 mm diameter for reactor physics servicing. We should, however, in our abovementioned assumptions keep on the safe side. If the 7.5 mm fuel element design were used from the outset, there would be no need to revert to the higher initial price (effect of 7.5% saving in the servicing cost for the entire period of operation: DM 1.5 million).

Table 12 contains the basic prices for reactor physics services on the basis of the original tender. A comparison shows that the prices in the former tender are about three times those in the new one. Part of this difference can be explained by the difference in the scope of the supplies. In the original tender prices, the Consortium's core element design work was included among the reactor physics services; in the new tender these costs are included in the core element prices.

In view of the very high tender prices, we have allowed in Table 12 for a further sudden 10% drop in prices on expiry of the contract as a result of the competition which will begin to make itself felt at that time. In the case of the larger range of supplies, however, it is assumed that a target value of only DM 200,000 can be achieved by the year 2000. A more favourable assumption would also have led to an unbelievably high rate of increase in the prices.

The charge on electricity production represented in the Consortium's original tender by 117 full-load days, with the unusually high servicing prices shown in Table 12, was one of the main reasons for the unfavourable results in our earlier Forecast of Results (more than 1,000,000 DM/a supplementary costs).

16. Core design and core element utilization policy (Tables 14 and 15, with continuations)

The core design and core element utilization policy originally proposed by the Consortium was certainly, on the basis of the overall targets, geared to testing in the SNR-300 on the widest possible scale those designs and processes which were considered likely to be used for a later 1000 MW breeder reactor.

This involved in particular the following requirements:

(a) a small Pu inventory
(b) a high power density
(c) demonstrable breeding gain
(d) simple, rapid achievement of the equilibrium cycle.

When, however, our Forecast of Results based on the original tender from the Consortium indicated prohibitively high losses, we were compelled to go through the core design and core-element utilization policy with a fine toothcomb for possible ways of making savings within the margin still available (important components having been indicated by the Consortium as being already "non negotiable"). In order to depict more clearly the highly complex relationships between the refuelling scheme, the cycle duration, the burnup, the power density and the core element balance for the core and breeder blanket, we developed the diagrammatic representation used in Tables 14 and 15. With the aid of this representation and from cost analyses, incentives could then be given to the Consortium to produce a series of economically favourable policy proposals. The investigations have not yet been completed, since the precise calculation of each individual case involves the Consortium in considerable expenditure. The utilization policy shown in Tables 14 and 15, which was used as a basis for our present fuel cost calculations, is the latest version which, according to the Consortium scheme, appears feasible without excessive risks. There are certainly possibilities of arriving at even more favourable solutions from a cost standpoint. It should, however, be pointed out that every saving has its price, which in the present case consists in a disregard of experience and/or increased risks. Careful consideration of the advantages and disadvantages is imperative, in the solution currently proposed as in others, since it already implies a considerable departure from the targets specified at the outset. For this purpose, we should outline the economic consequences which emerge from the abovementioned requirements (a) to (d);

The remarks below relate exclusively to the special case of the SNR-300 and do not permit of any generally applicable conclusions.

Requirement (a)

The Pu inventory in the reactor does not, for all practical purposes, enter into our Forecast of Results since the governments supply the material required for the first core. The Pu inventory in the cycle outside the reactor would be reduced significantly only through a drastic curtailment of the servicing and storage times. This would lead to costly solutions (e.g., a greater number of containers with special cooling and shielding). In the case of the marked Pu value increase assumed in our cost calculations,

a high Pu inventory actually experiences an increase in value exceeding the interest charges for plutonium, which in the initial phase of market surplus can probably be bought relatively cheaply. The requirement involving a small Pu inventory can therefore be waived here.

Requirement (b)

The envisaged transition from a 6 to a 7.5 mm rod diameter means a reduction in the power density in proportion to the number of fuel rods by a factor of 0.75. This is made possible by an enlargement of the core around the innermost row of breeder elements. The increase in the Pu inventory which this requires does not have any influence (see explanation under (a)). There is no change in the fixed-costs burden, since the total fabrication (core and blanket) price remains, as it happens, virtually constant. The discharge burnup of the fuel elements can also be maintained since the power distribution is slightly more favourable. As regards fuel element costs, therefore, the 20% saving in fabrication costs due to the larger rod diameter comes fully into effect. The breeder element costs decrease through the rise in the discharge burnup (see Table 15) from the previous 2000-4000 MWd/tU to about 5000 MWd/tU. The overall element costs too will be lower because the fuel element costs, which are economically more favourable than the breeder element costs, carry relatively more weight. The cycle durations increase (see Table 14) from 119 to 173 full-load days. The scheduled shutdowns occur at correspondingly longer intervals, so that the resulting electricity production loss is reduced in almost the same proportion. In addition, the physics service charges fall correspondingly to 69%. The requirement regarding a higher power density would consequently lead in this case to a definite departure from the economic optimum. The operating loss involved in the use of a 6 mm fuel rod diameter is accordingly only justified if it has become sufficiently clear that the abovementioned conditions for a later 1000 MW breeder reactor are reversed in respect of power density and if the operating demonstration with the 6 mm variant has to be considered as a necessary precondition for its utilization in the large-scale project.

Requirement (c)

The breeding gain depends above all on the size of and the power density in the breeder blanket. The increase in the size of the core, due to the changeover to the 7.5 mm fuel rod diameter, does not cause any alteration in the axial breeder blanket. The radial breeder blanket is, on the other hand, reduced from three to two rows. It can be seen from the representation in Table 15 that the power density in the various breeder elements decreases sharply away from the centre, and that after the inner row (1) has become spent almost the same power densities prevail in the remaining rows (2 and 3) as originally in rows 1 and 2 (taking into account the power density drop stemming from the core). It may therefore be concluded that the loss in breeding effect resulting from the reduction of the breeder blanket will be insignificant. In these circumstances, the question arises whether the demonstration of a somewhat larger breeding ratio outweighs the otherwise obvious cost advantages.

The foregoing remarks probably also hold good basically for a further stage, i.e., for the additional replacement of the breeder elements from row 2 by fuel elements. For this stage too the savings effects mentioned under b) would likewise continue to obtain. As, however, a further increase in the diameter can hardly be taken into consideration, only the saving in fabrication costs which this would bring about is forfeited and the fuel elements could then no longer operate in the design load zone (reduction of risk). As, however, the Consortium still has misgivings about starting with the 7.5 mm design, owing to the lack of radiation experience, there would perhaps be a possibility of easing this step by the risk reduction associated with only one row of breeder elements. Then, of course, we should forego a guaranteed breeding ratio. The restricted experience due to the reduced fuel element charge could be made up by the addition at a later date of a second row of breeder elements if operating experience with the 7.5 mm fuel rods justified it.

Whilst in the case of the fuel elements as described in the new tender there are already encouraging aspects, including economic aspects, from a long-term standpoint, the breeder elements are in no way adequate as regards their present design and utilization principle to satisfy the requirements which profitable electricity production will impose. This is due principally to the fact that the achievable burnups are very low, bearing in mind possible core melt-down, case material embrittlement and swelling and/or element deflection (exposed to strong flux gradients). Consequently the discharge burnups of the fuel elements are about 14 times as high (see Tables 14 and 15) as those of the breeder elements, whereas the specific total cost for fabrication, removal after radiation and reprocessing is only about four times as high. This gives a ratio of 3.5: 1 in the proportionate element costs. Compared with the LWR fuel elements the ratio is 10: 1 to the disadvantage of breeder elements. By the inclusion of the fission material balances in the overall comparison of element costs, these disparities cannot be approximately balanced out. In earlier proposals from the Consortium, discharge burnups for the breeder elements were then shown to be twice as high as they are in the new proposal (see Table 15). The values at the time related to a breeder element design with a 9.5 rod diameter (now 11.6 mm) and management based on rearrangement of the breeder elements (now the position remains unchanged throughout the utilization time). As these changes have led to a saving of no more than 20% in fabrication costs, the net effect of the new proposal is likely to be that breeder element costs will be about 1.8 times as high. If there are no other decisive effects here, it must be recommended that the original diameter of 9.5 mm be reverted to, and also provision made for rotation of the elements, if appropriate.

Requirement (d)

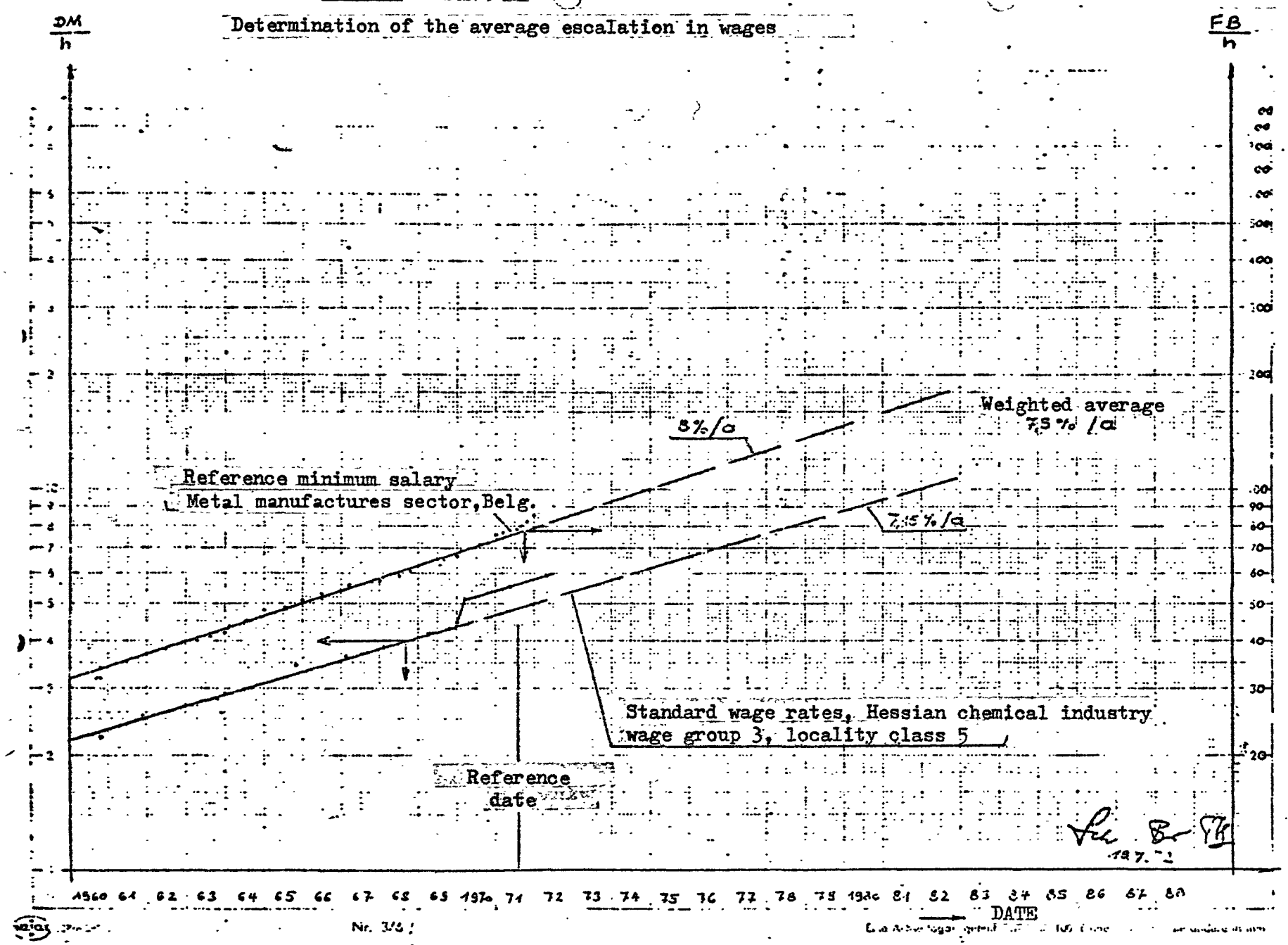
The Direct approach to the equilibrium cycle is generally accompanied by a burnup loss of about 50% in the case of the initial core. This also applied in the Consortium's original policy proposal, which envisaged a simple start with a normal one-out-of-three cycle. In line with our practice regarding

boiling-water reactors, we then recommended that consideration be given to the possibility of the later reinsertion of partly burnt-up fuel elements. It finally turned out that, with the present reactivity pattern, direct sequential insertion throughout the core is possible up to the design burn-up. Combination of both processes led to the fuel element policy shown in Table 14, with which the insertion burn-up losses in the case of the fuel elements can be almost completely avoided. The beginning of this policy represents virtually a single batch cycle, the interruption of which on two occasions is only restricted by the inadequate service-life characteristics of present absorber designs.

In contrast to this, the breeder element policy proposed in accordance with Table 15 involves considerable insertion burnup losses, since in this case the conditions are substantially more complex on account of the widely differing limitations imposed by the service lives in the various rows. Judging from the tendency which is illustrated in Table 15, the use of the 7.5 mm diameter core design right from the start would produce a considerable improvement. In addition, it should be possible to achieve general burnup increases by detailed analyses.

Table 1

Determination of the average escalation in wages



Annex 3
(Annex C)

For the escalation factors, please see

german original

Table 2

Determination of average escalation in salaries

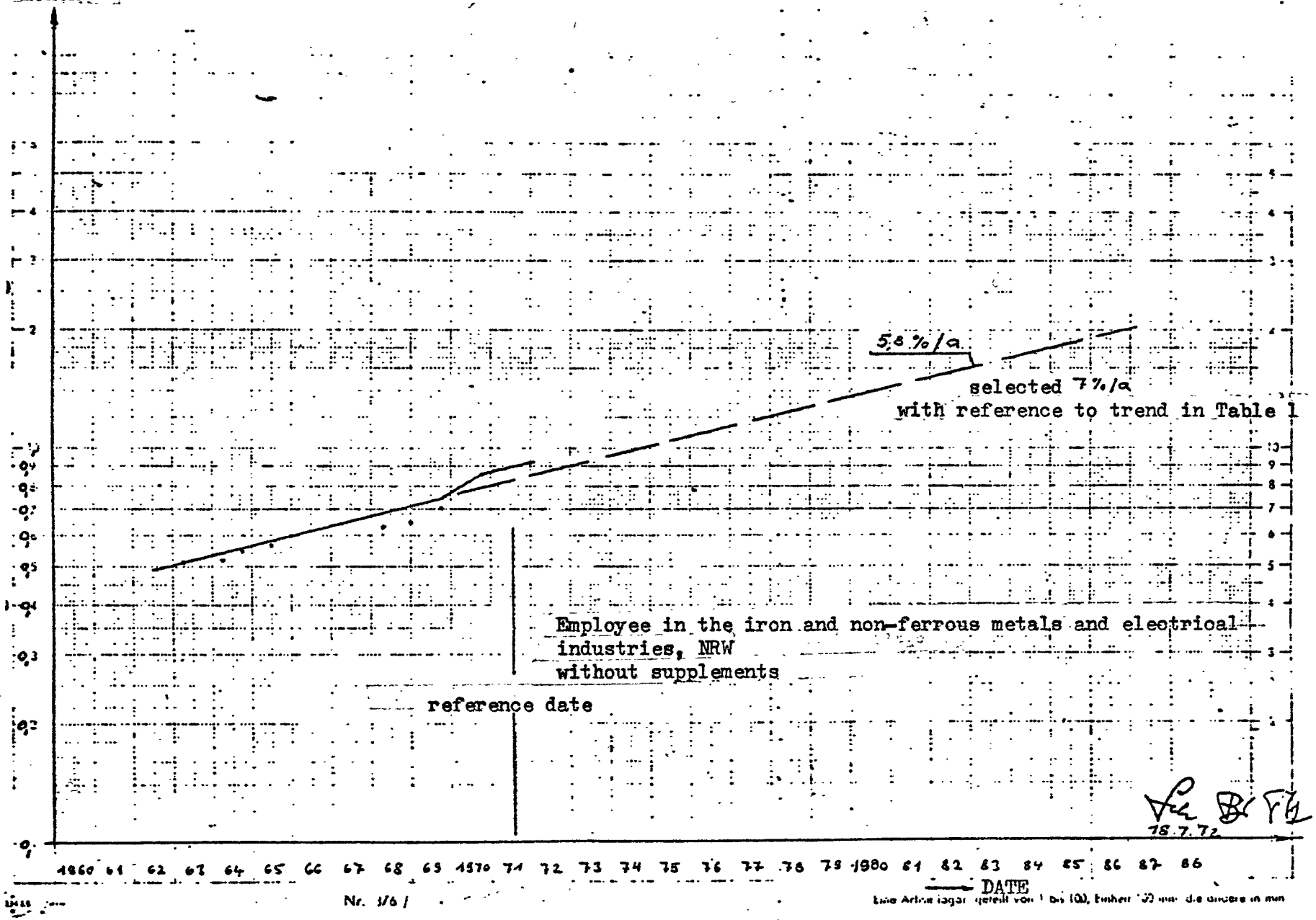


Table 3

Assumed trend in basic prices for plutonium nitrate (start of escalation: 1 January 1980)

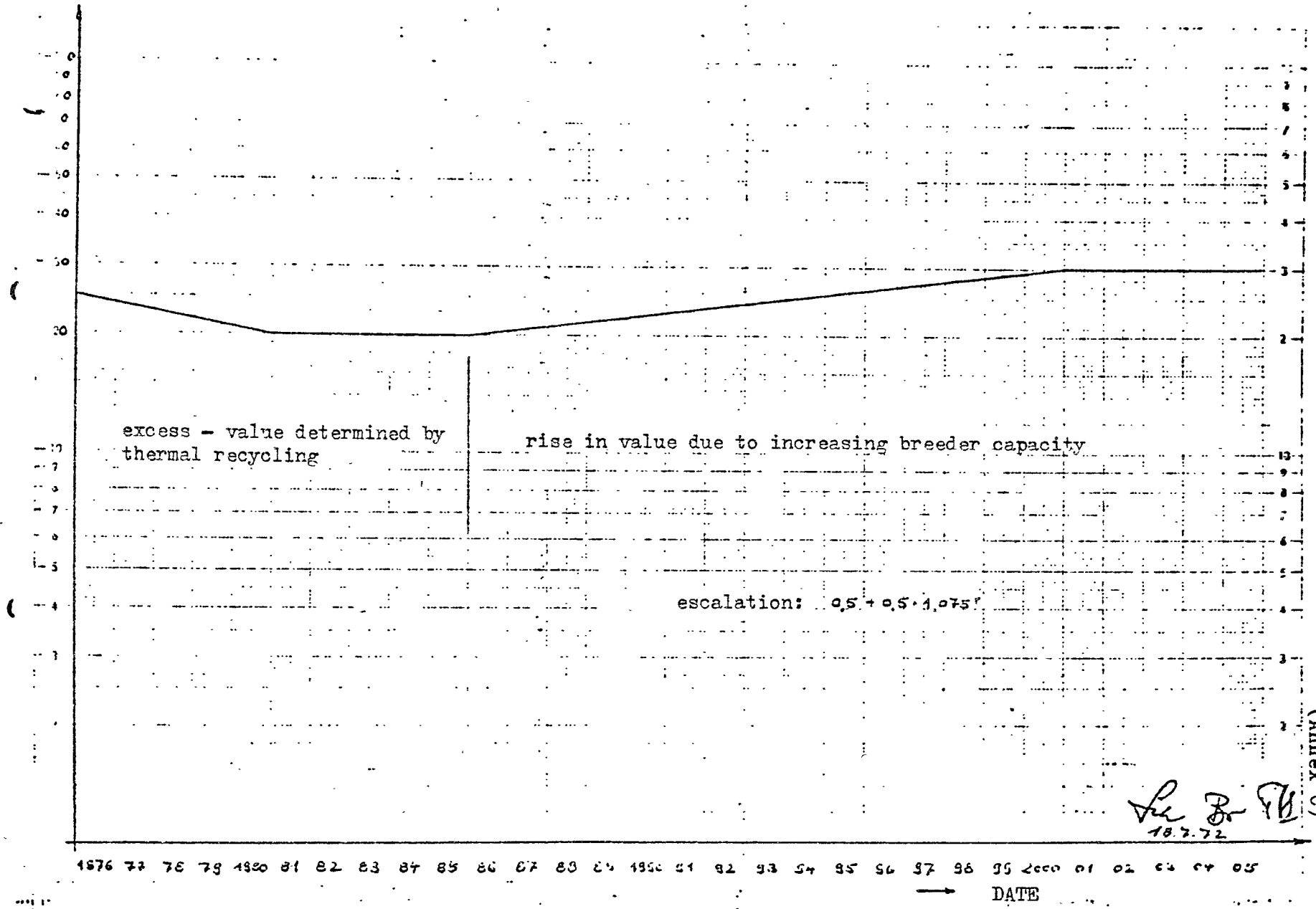


Table 4

Assumed trend of basic price for Pu NH → Pu_{O2} conversion, including transport
(start of escalation 1 July 1971)

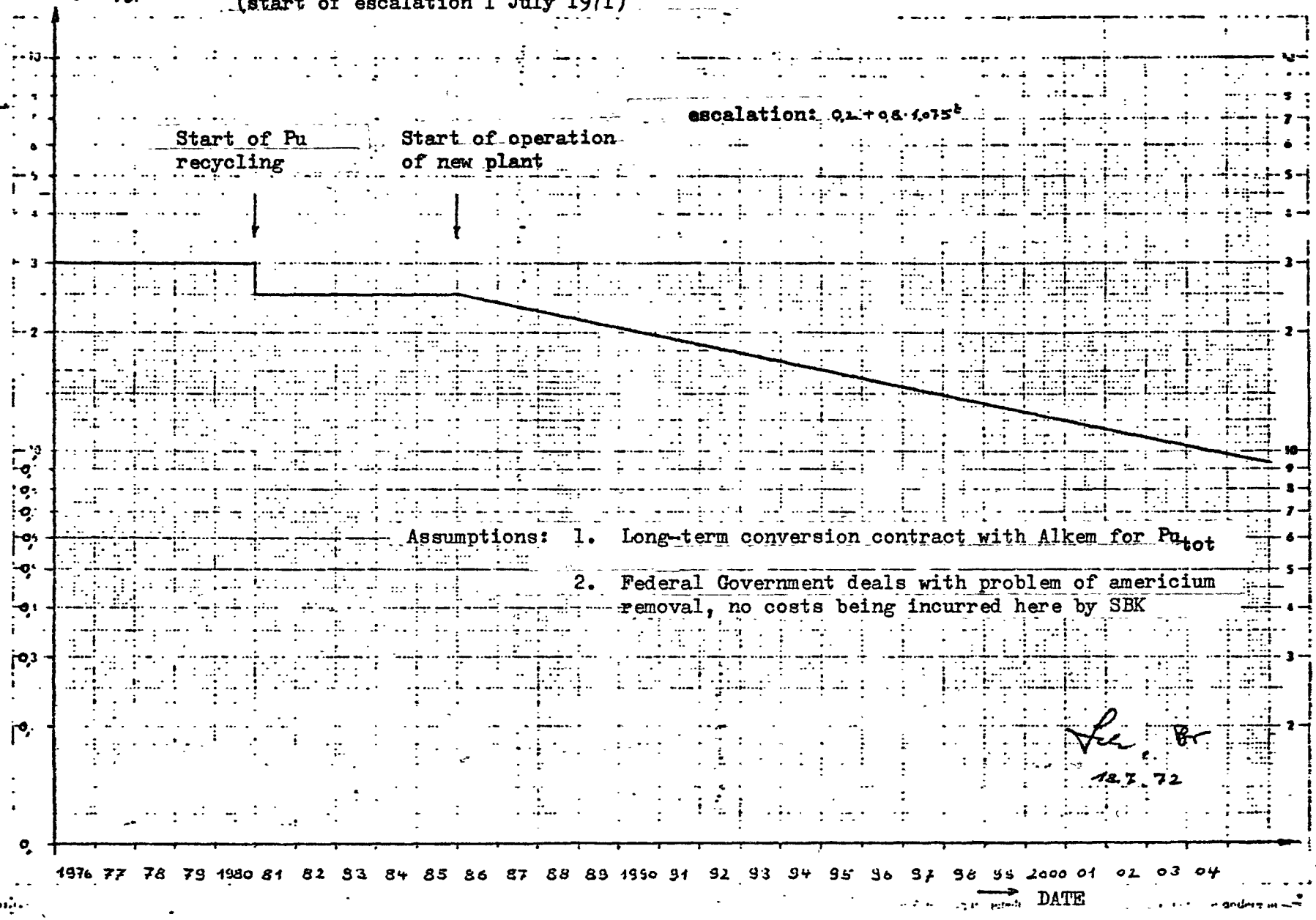


Table 5

Assumed trend of basic prices for reload fuel elements (tender of November 1971)
Position at May 1972 (Start of escalation: 1 July 1971)
order batch for 1/3 core charge, corresponding to 50 or 51 elements
scope of supplies: FE design not included

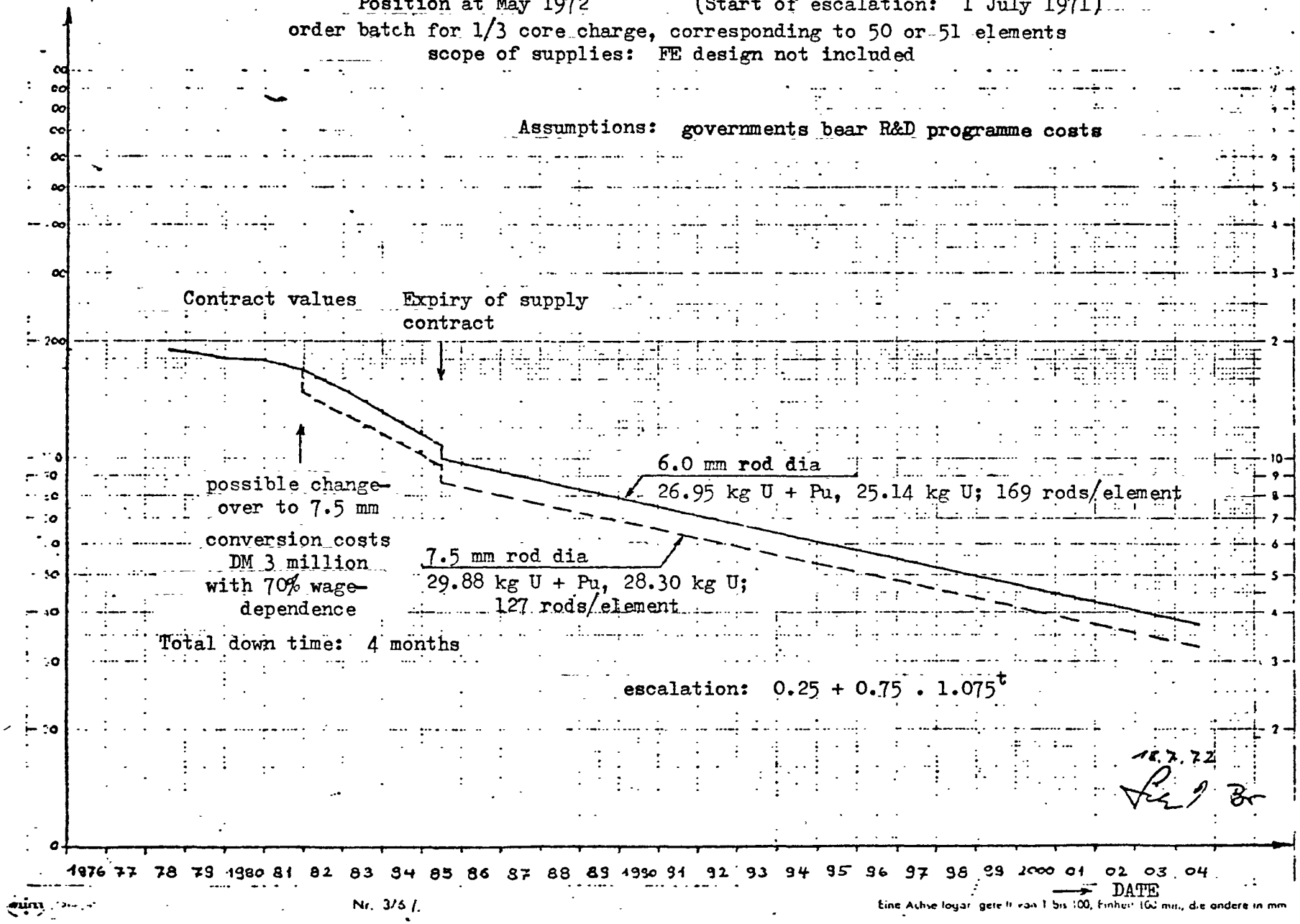
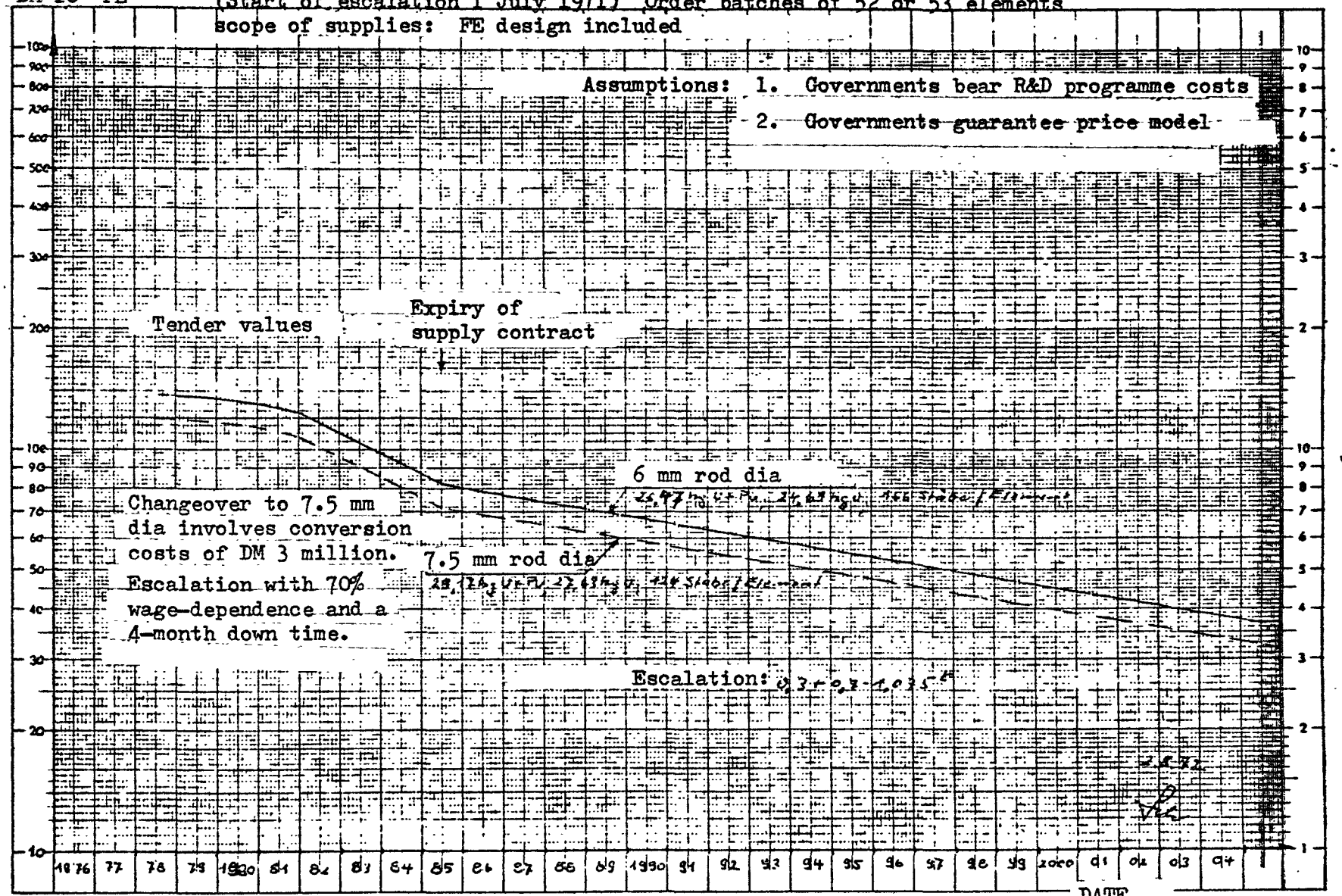


Table 5a

Assumed trend of the basic price for reload fuel elements (tender of July 1972)
(Start of escalation 1 July 1971) Order batches of 52 or 53 elements
scope of supplies: FE design included



Eine Achse logar. geteilt von 1 bis 100, Einheit 100 mm, die andere in mm

Annex 3
(Annex C)

Table 5b

Dependence of element prices on number of items in order batches

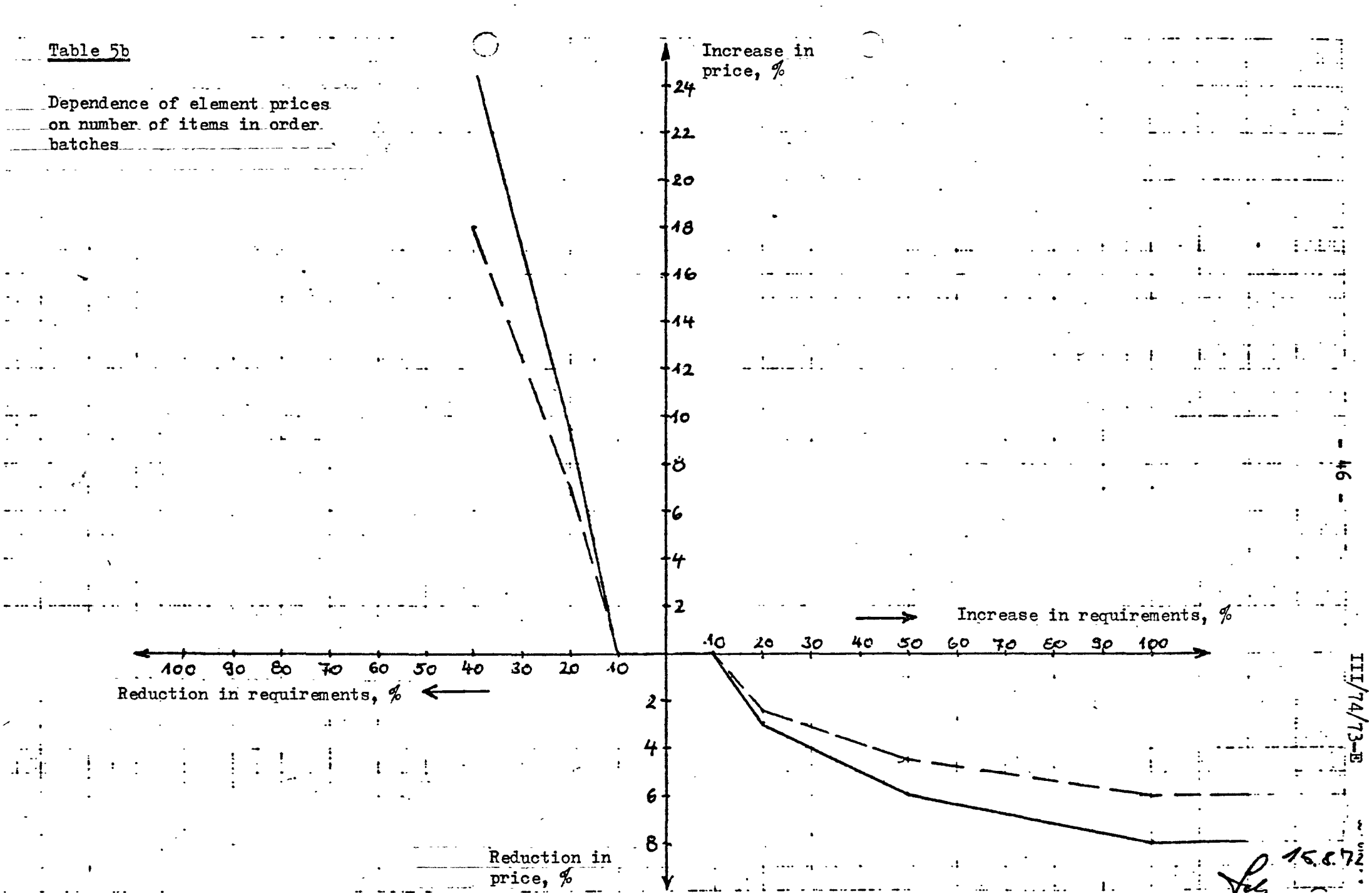


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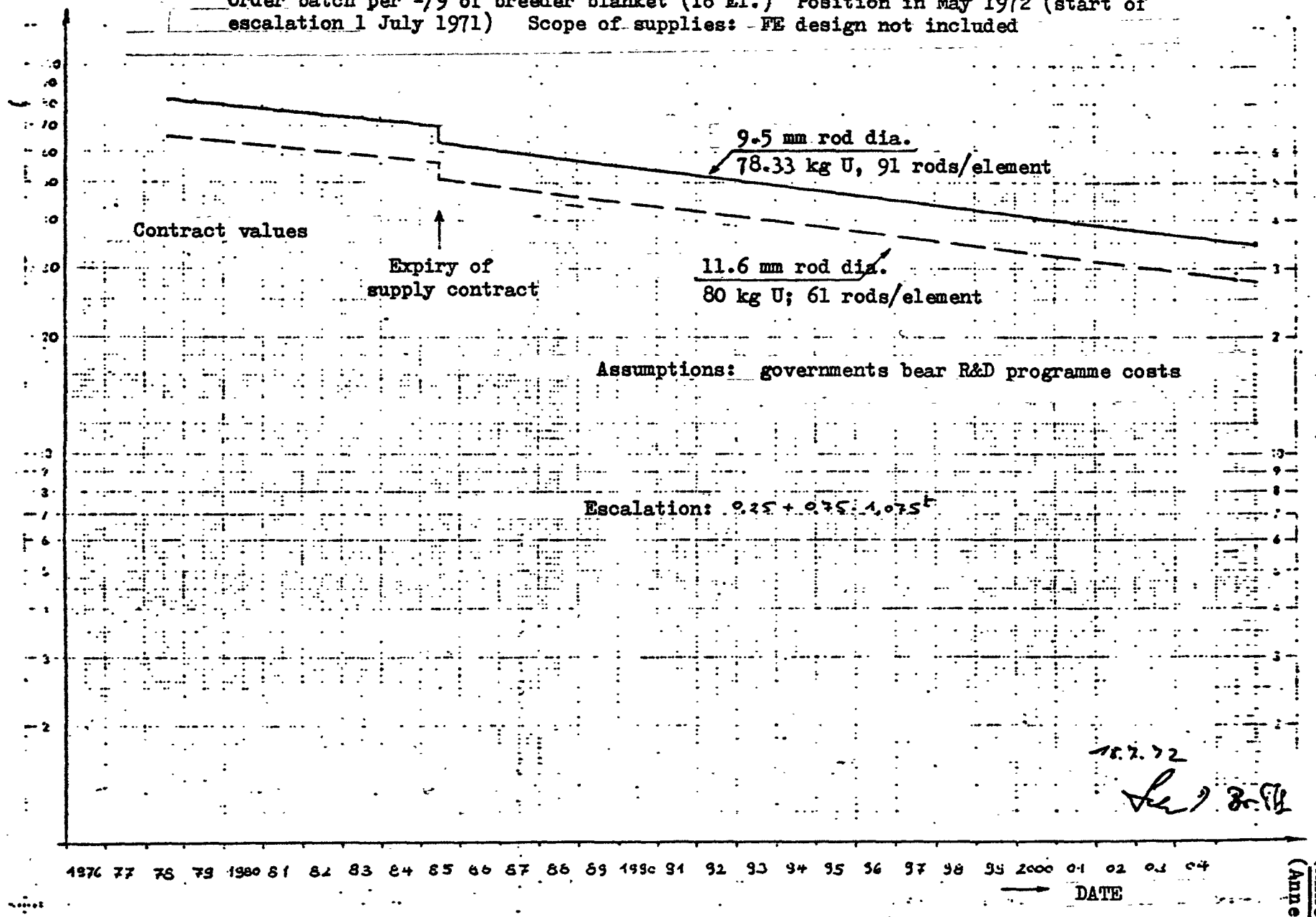
Table 6

Assumed trend in basic prices for reload breeder elements (tender of November 1971)
Order batch per 1/9 of breeder blanket (16 El.) Position in May 1972 (start of escalation 1 July 1971) Scope of supplies: - FE design not included



(Annex 3 (Annex C))

Table 6a

Assumed trend in basic prices for reload breeder elements (tender of July 1972)
(start of escalation 1 July 1971) Order batches: 48 elements for every third cycle

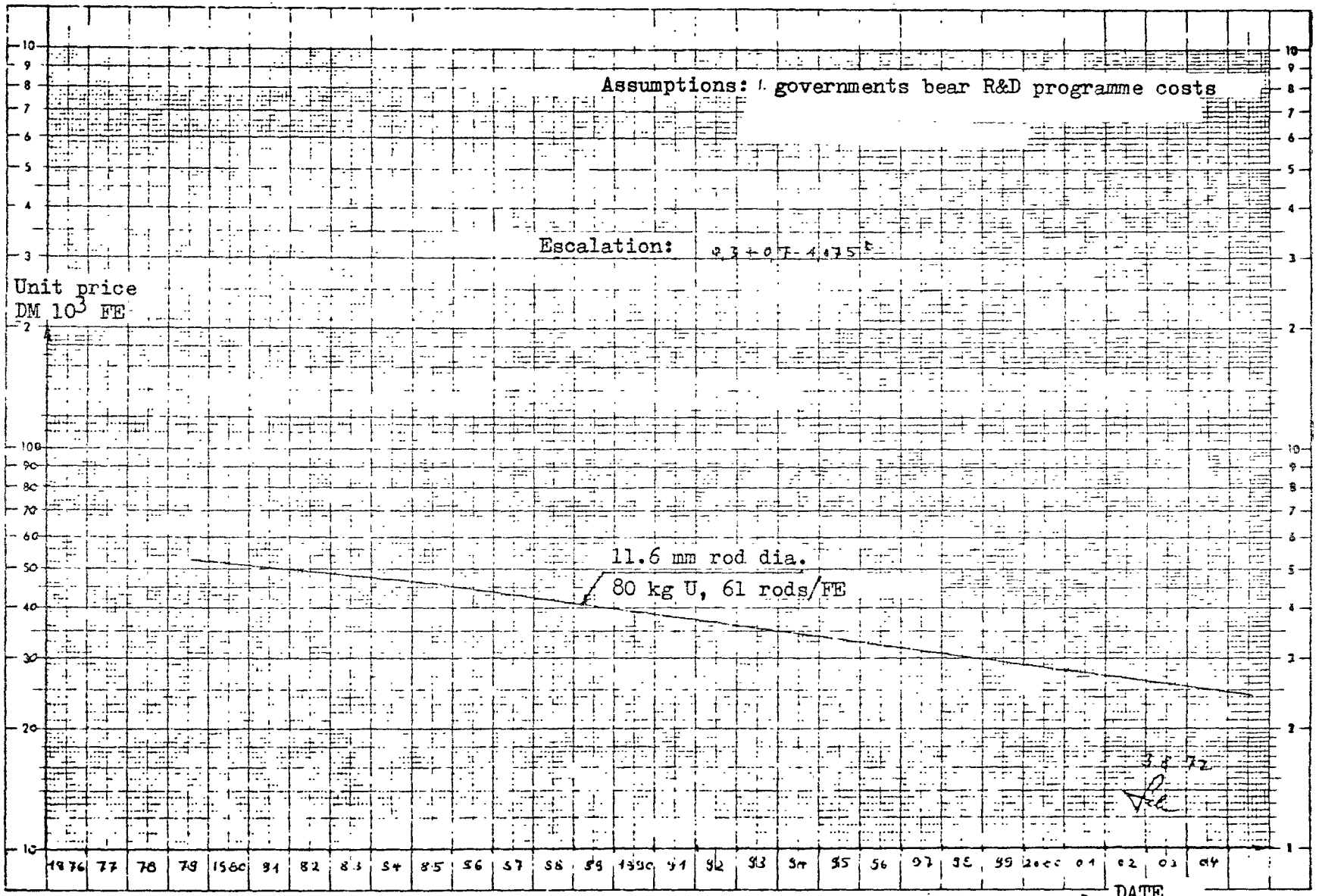


Table 7

Assumed trend in basic prices for absorbers (tender of November 1971) (start of escalation: 1 July 1971) Order batch of 12 shim absorbers per cycle, 6 shutdown absorbers for every fourth cycle

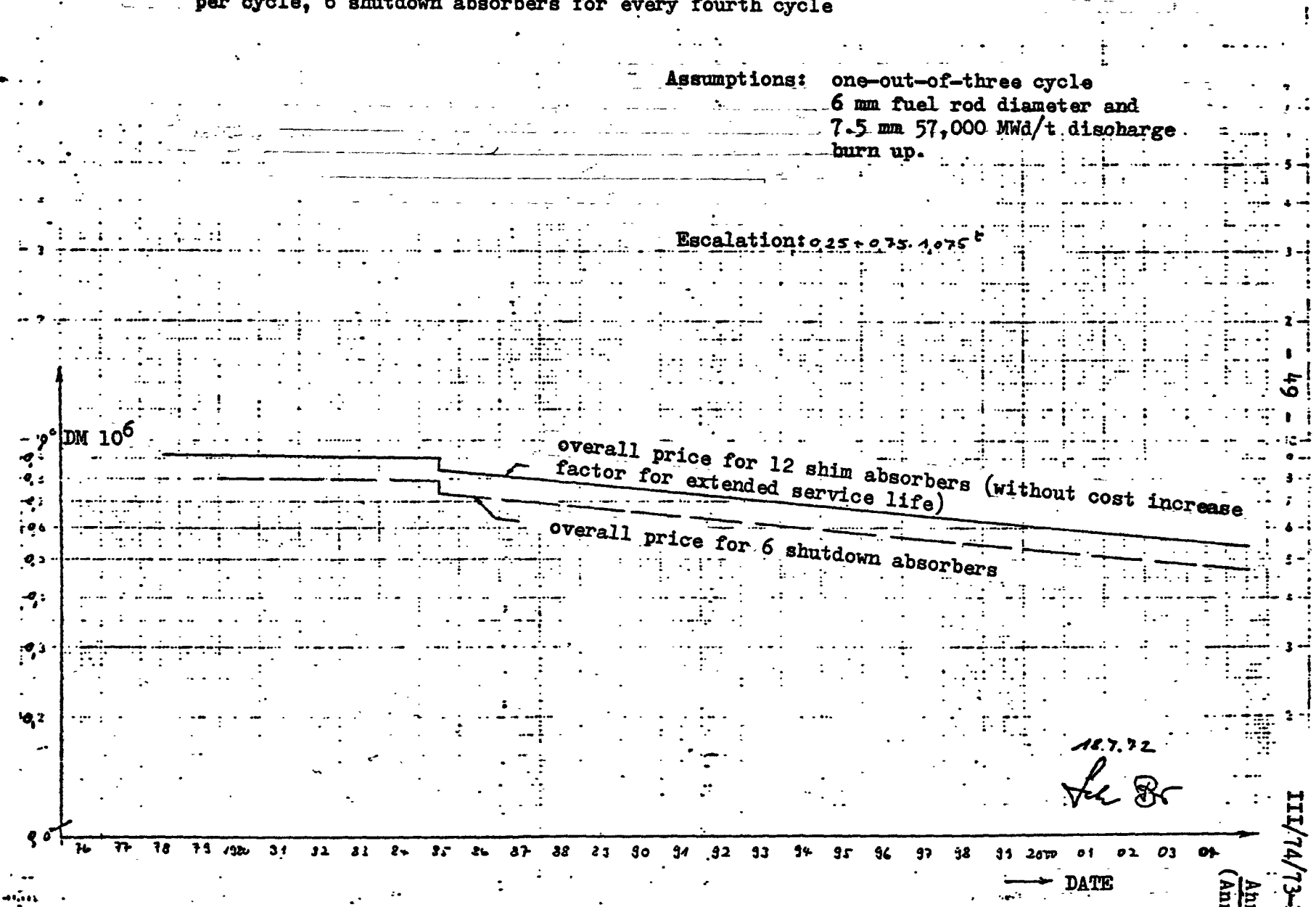
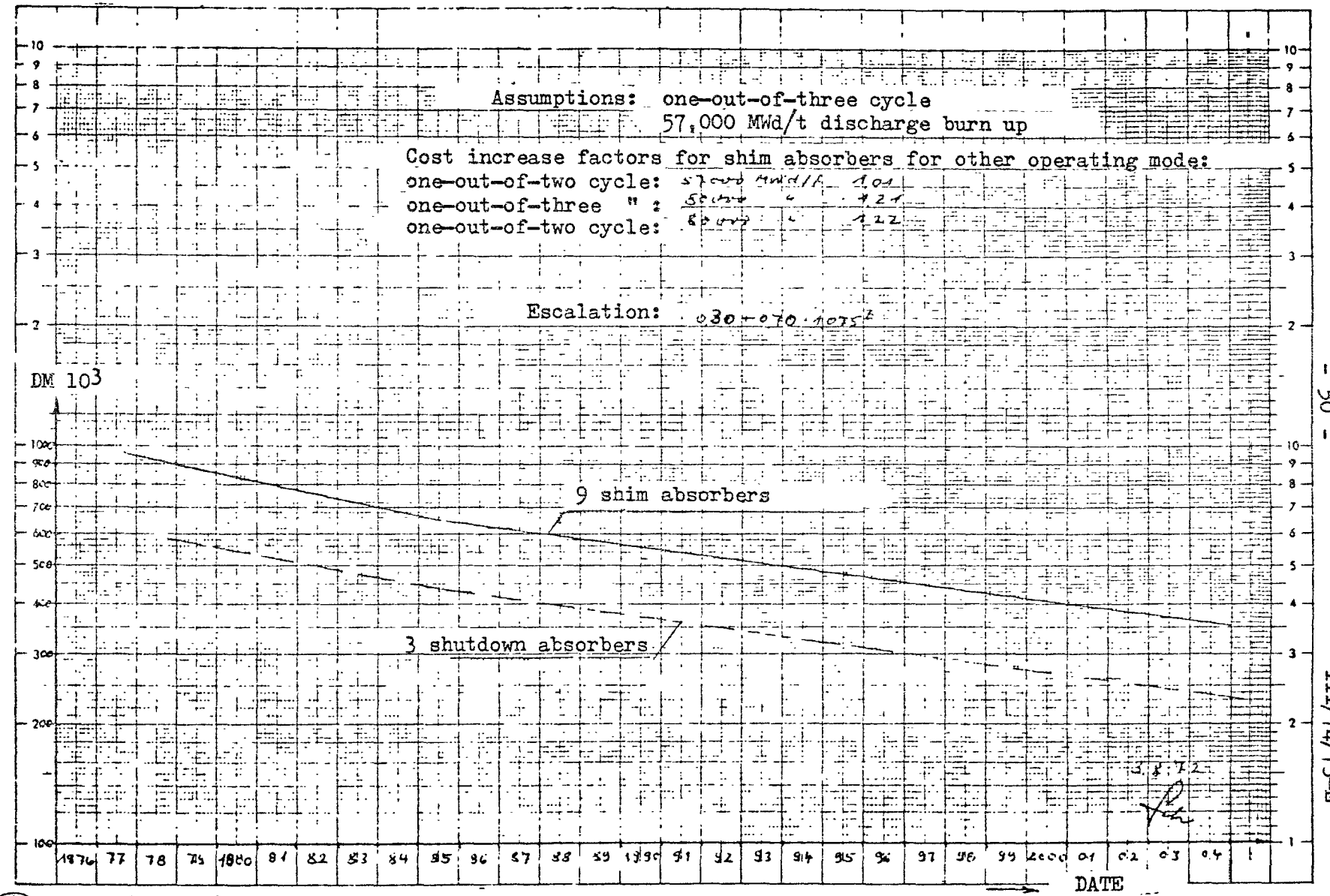


Table 7a

Assumed trend in basic prices for absorbers (tender of July 1972)
(start of escalation: 1 July 1971)



Annex 3 (Annex C)

Annex 3
(Annex C)

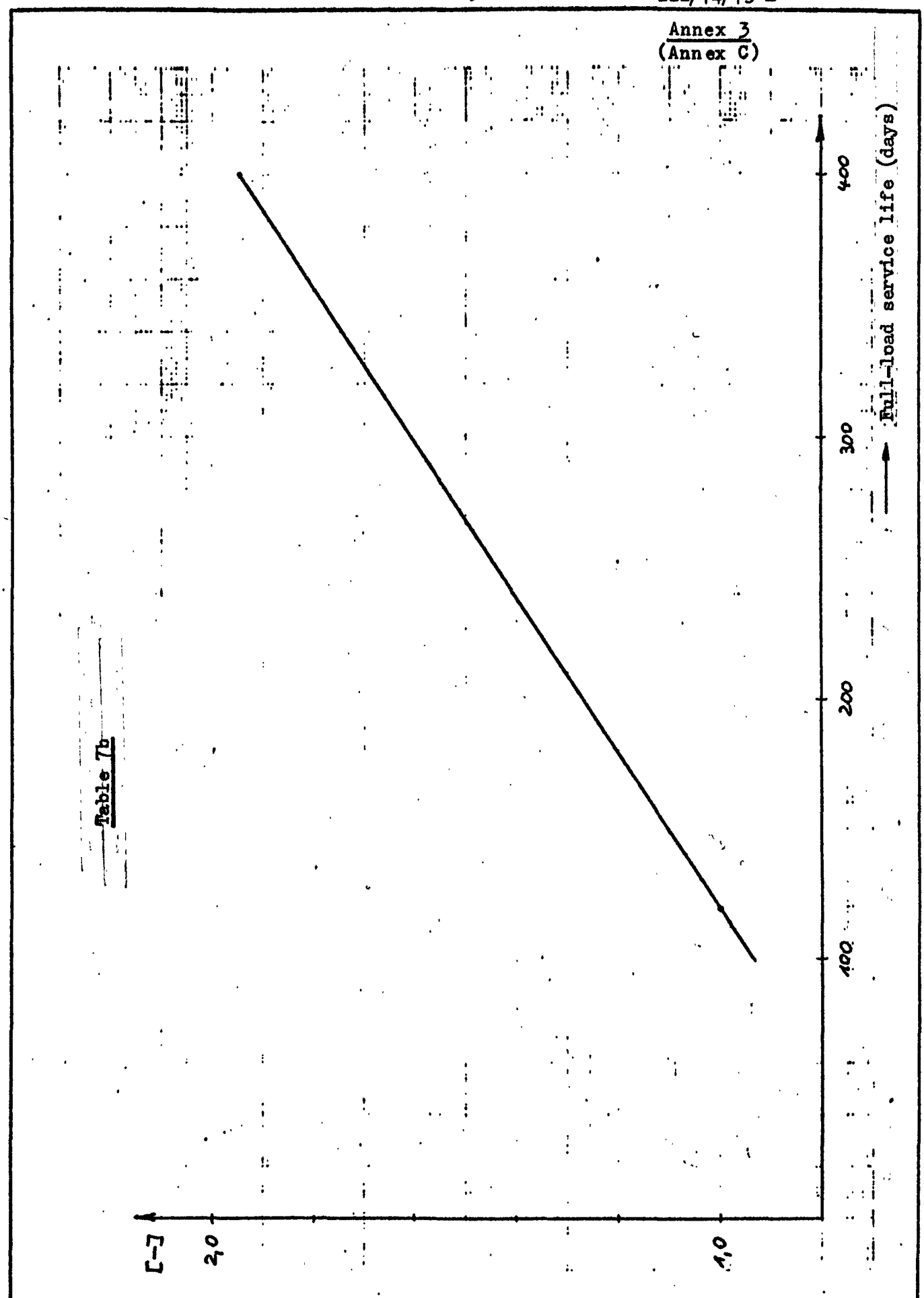
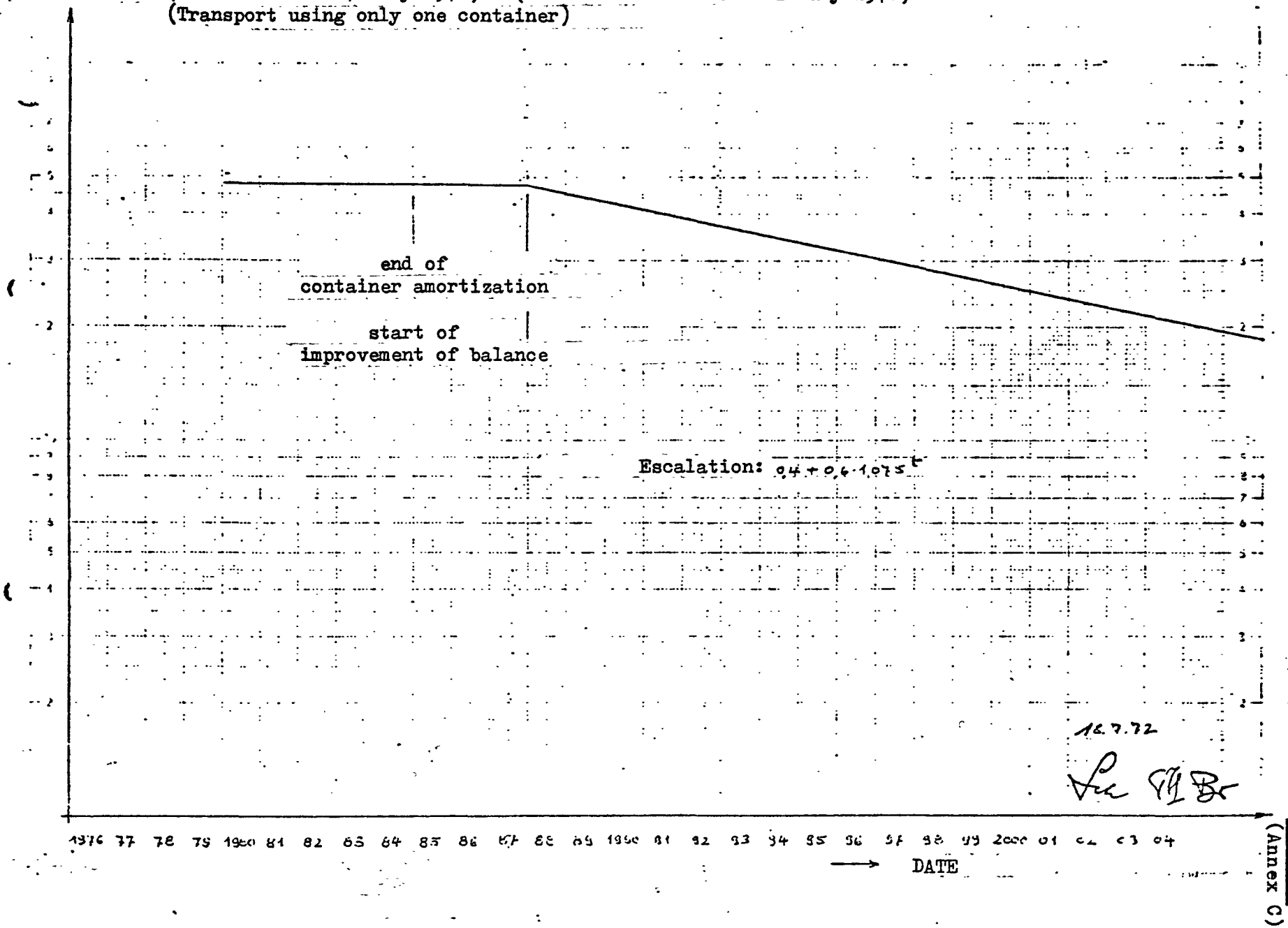


Table 7b

Cost increase factor for shim absorbers for extended service life (not valid for new policy, August 1972)

Table 8

Assumed trend in basic transport costs for spent fuel and breeder elements
(TN's telex of 17 July 1972) (Start of escalation: 1 July 1971)
(Transport using only one container)



Annex 3
(Annex C)

Table 9

Assumed trend in basic prices for reprocessing (letter from GWK of 29 May 1972 and US data) (start of escalation 1 January 1971)

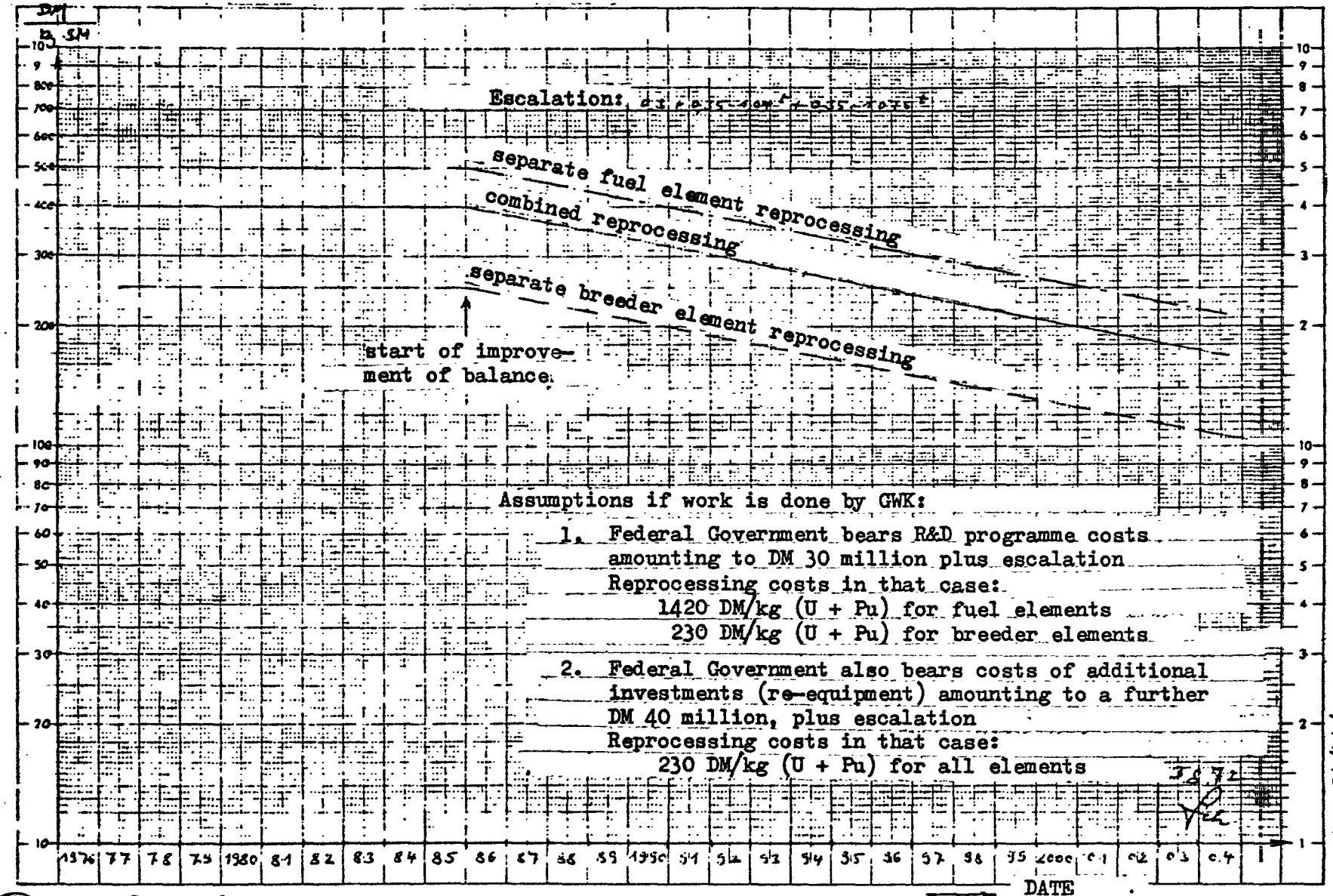


Table 10

Assumed trend in power station utilization during period of scheduled operation (excluding the time for scheduled refuelling, maintenance and servicing)

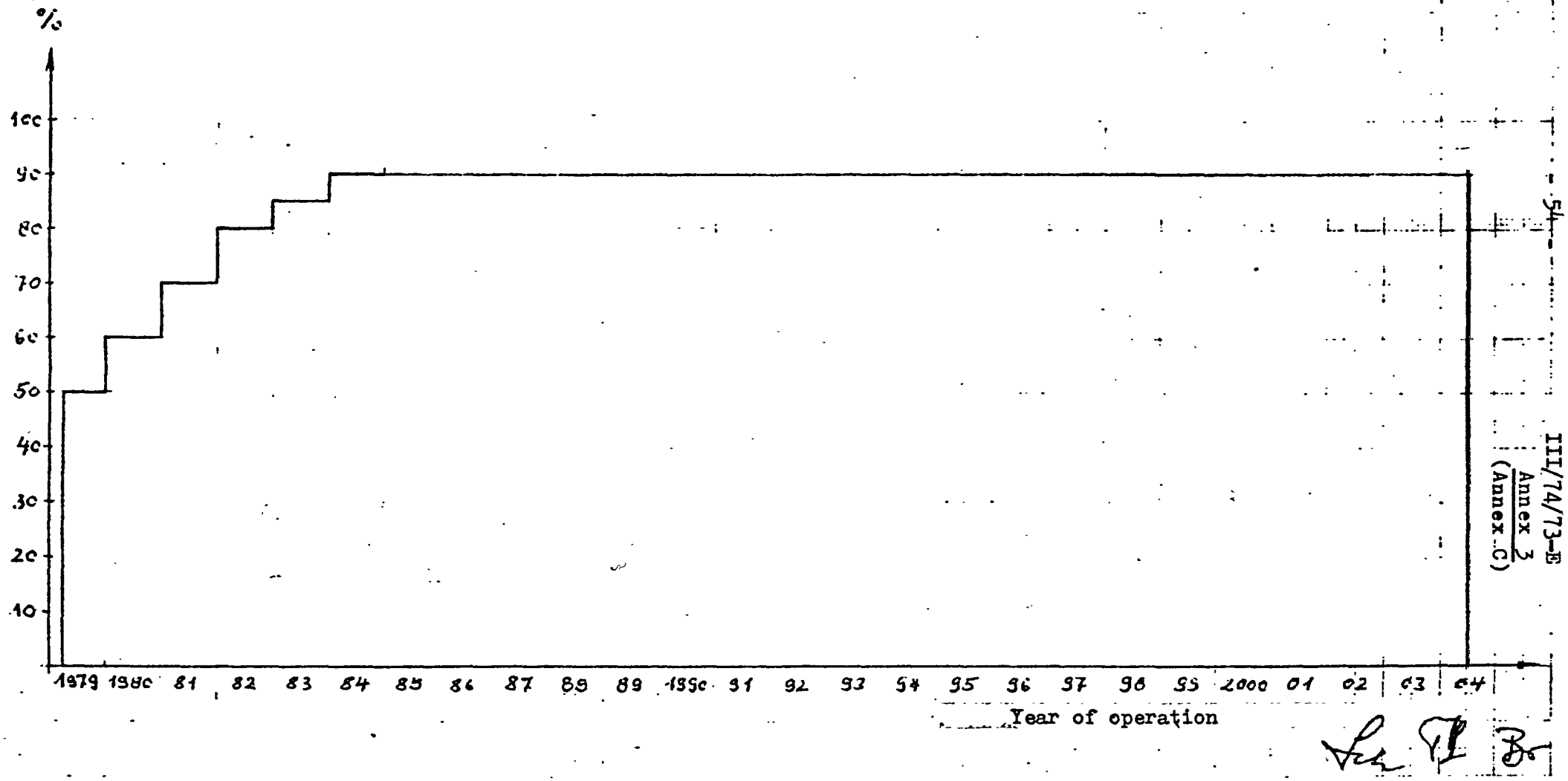


Table 11
Various phases of the plutonium cycle

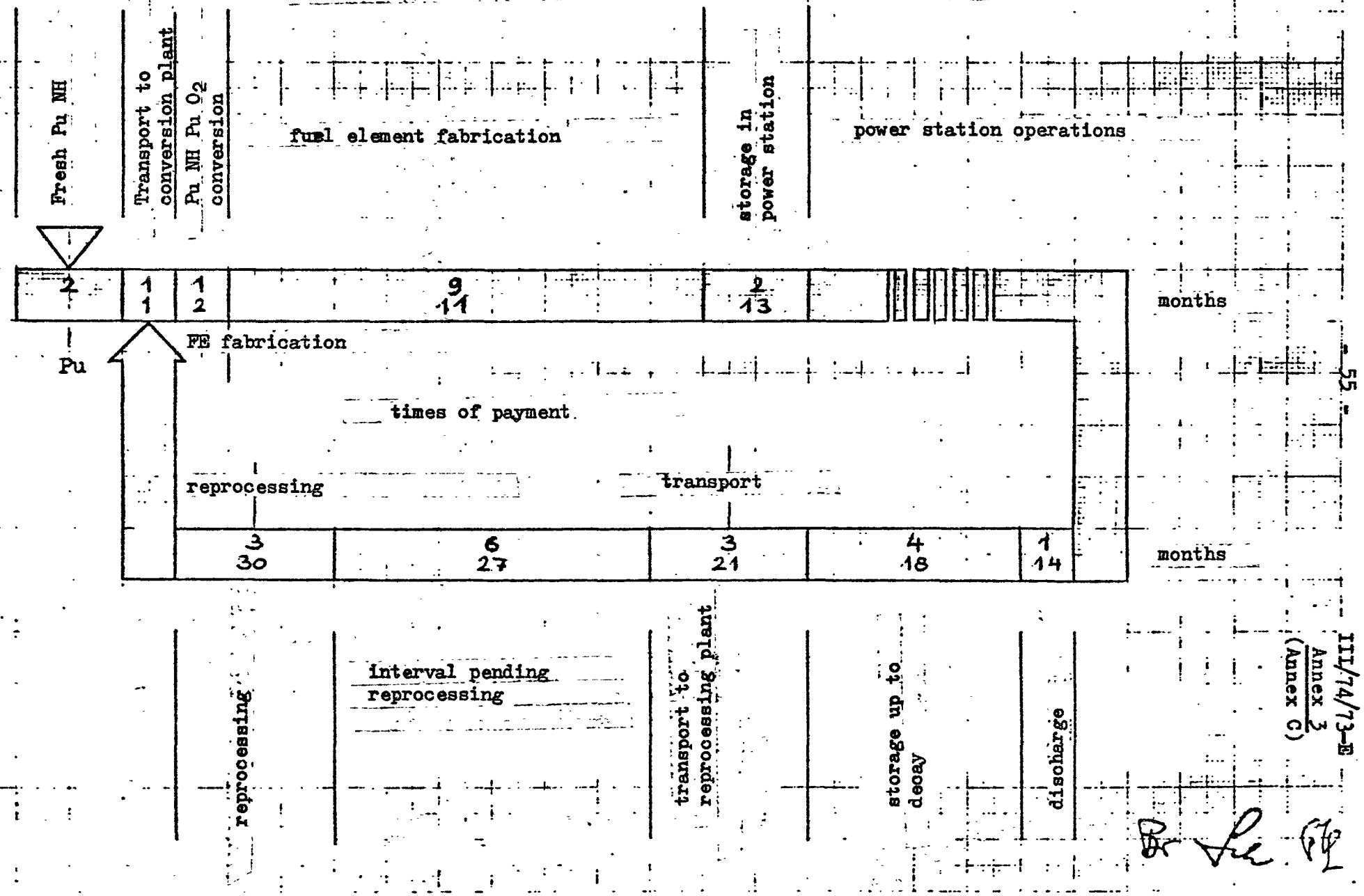


Table 12

Assumed trend in basic price for reactor physics services
(tender of November 1971) (start of escalation 1 July 1971)
Core element design included

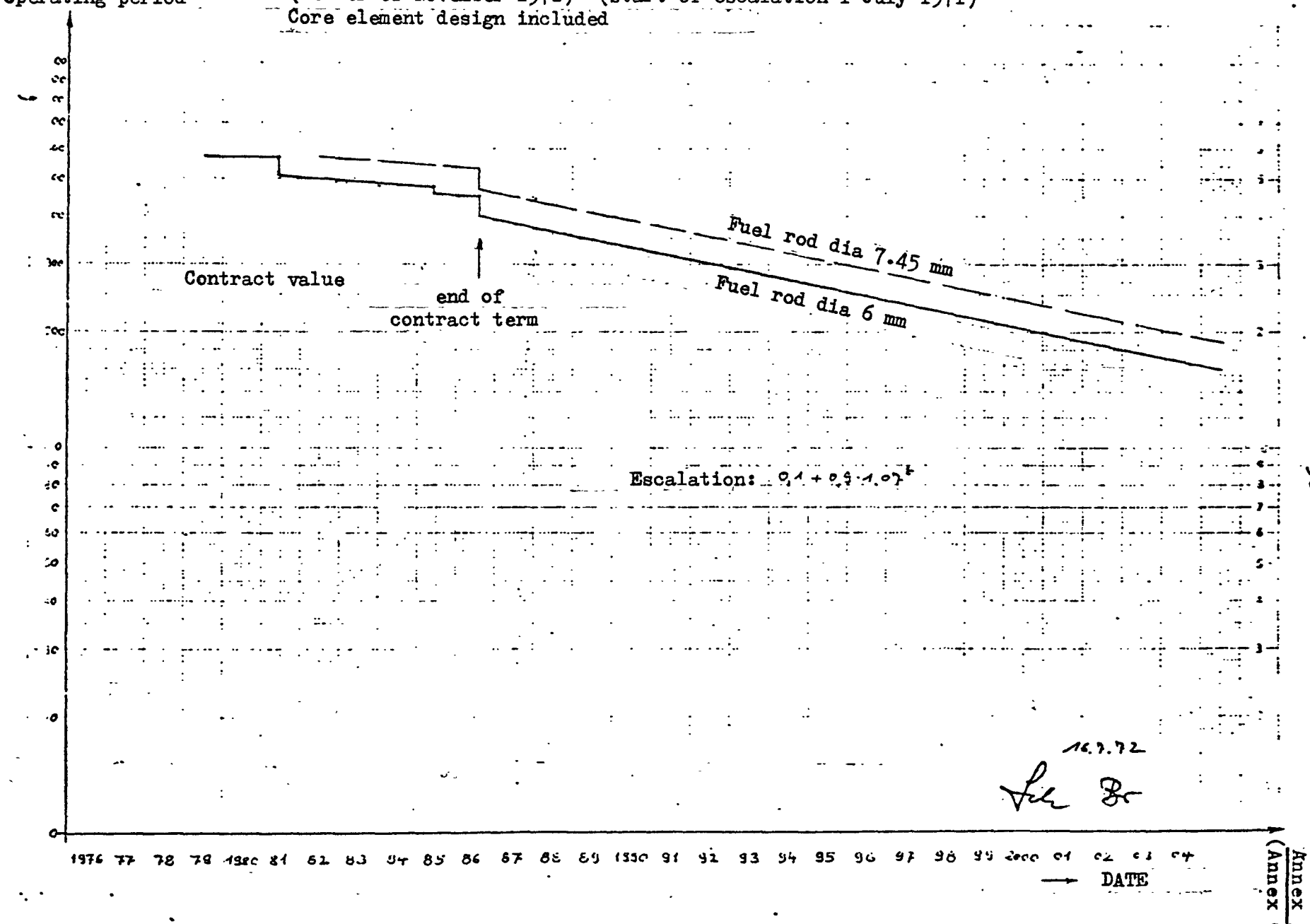


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Table 12a

Assumed trend in basic price for reactor physics assistance (tender July)

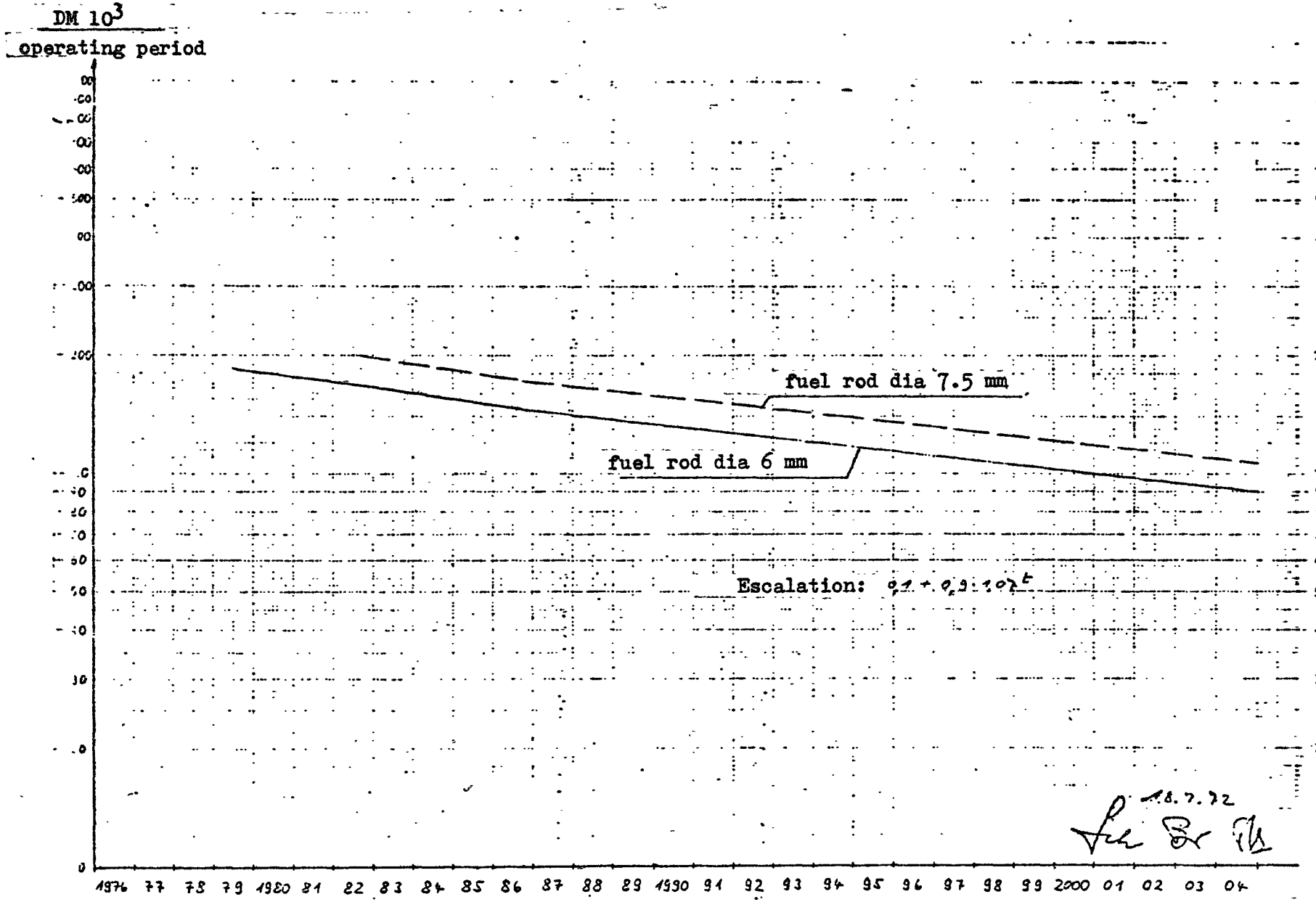

Table 13

Reactor down-time during core refuelling for two-shift operation (2 x 8 h/d) (without irregularly occurring operations, the time occupied by which is 6 d/a)

Additional assumptions concerning the overall installation:
For maintenance and repair work:
continuous shutdown requires 30 days each year and 60 days every third year

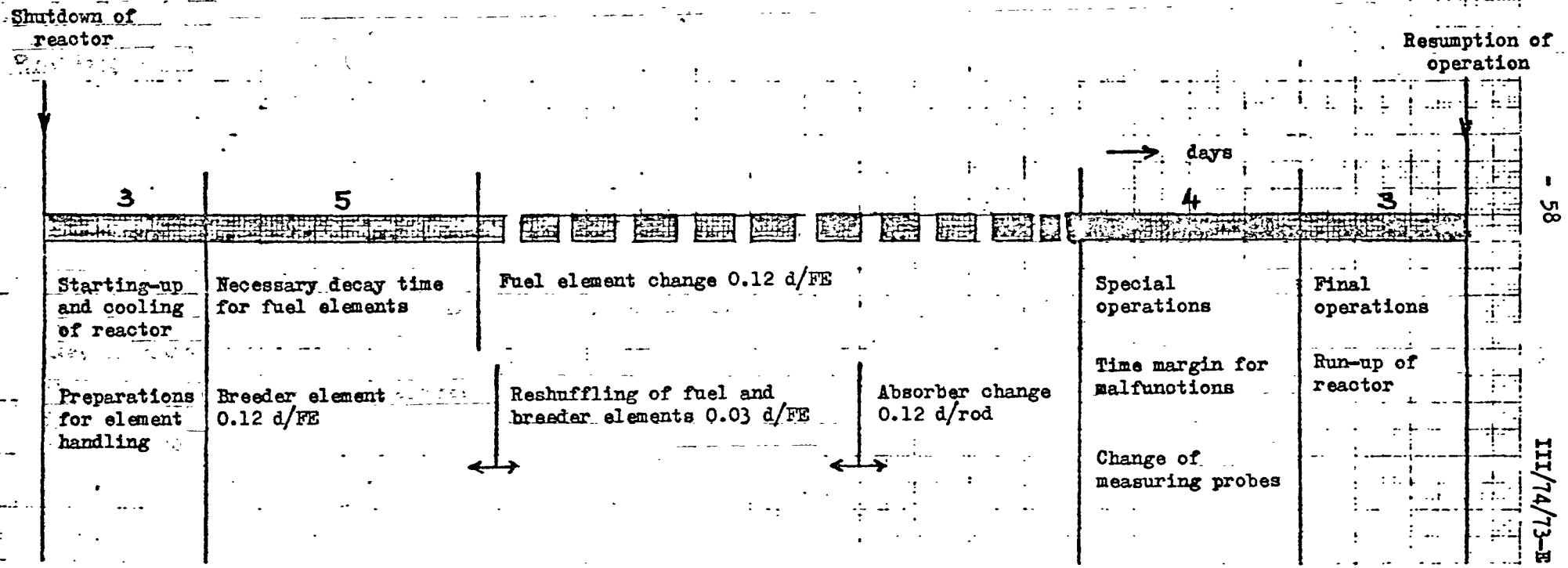

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Table 14

Fuel element utilization policy and burn up pattern
Interatom/Belgonucléaire Memo. of 27 August 1972

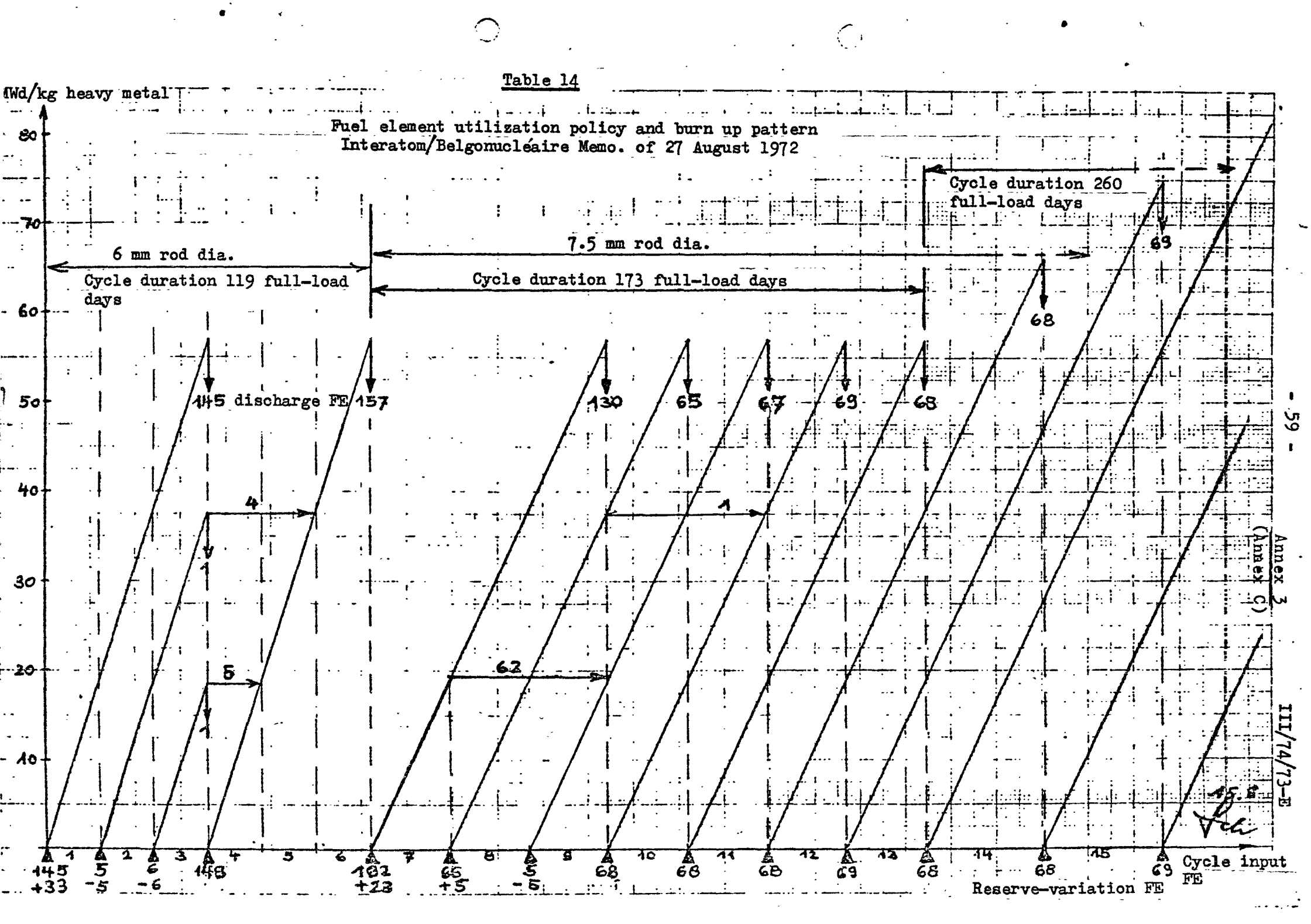


Table 14 (cont)

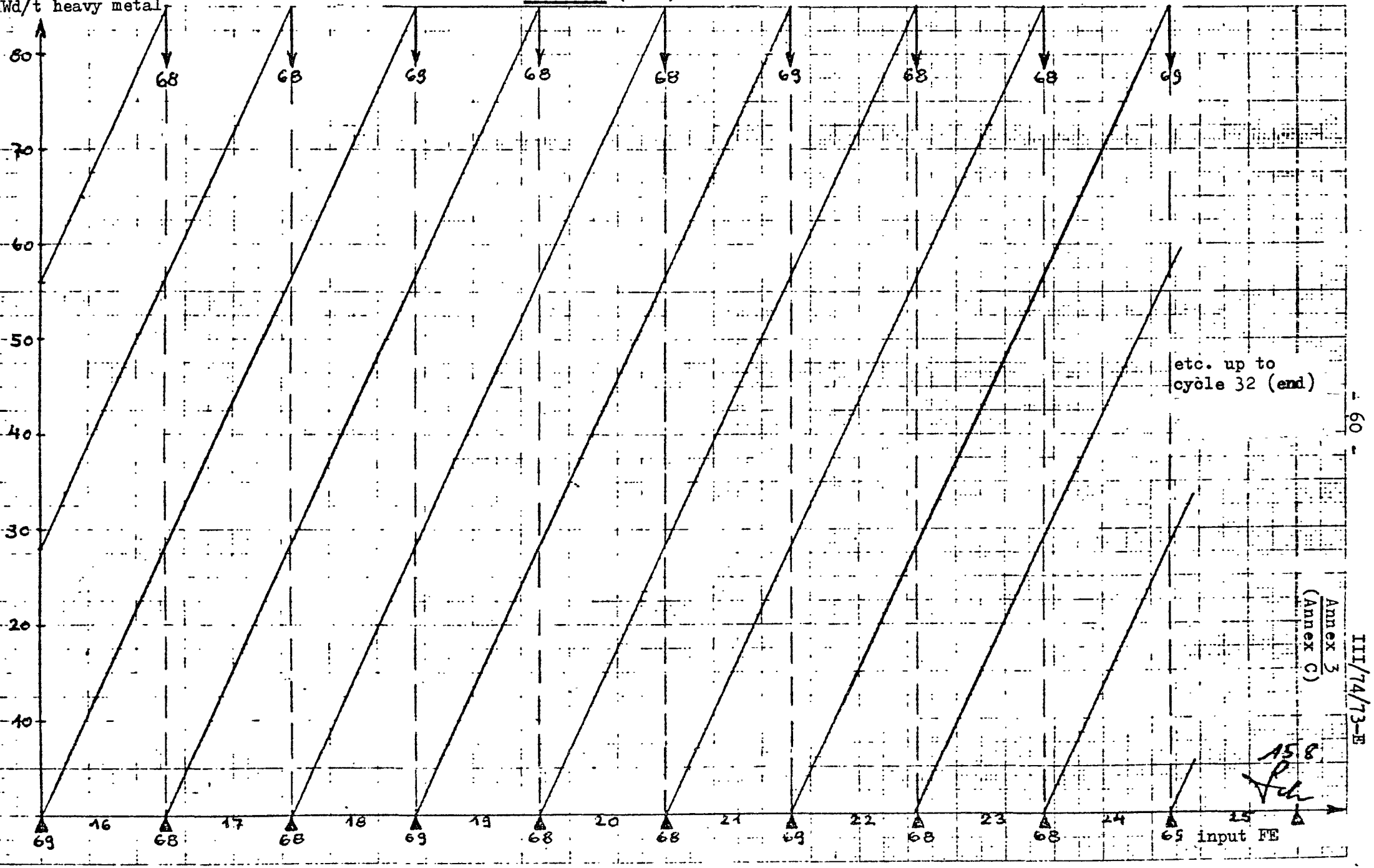


Table 15

Breeder element utilization policy and burn up pattern
(Interatom/Belgonucleaire Memo. of 27 August 1972)

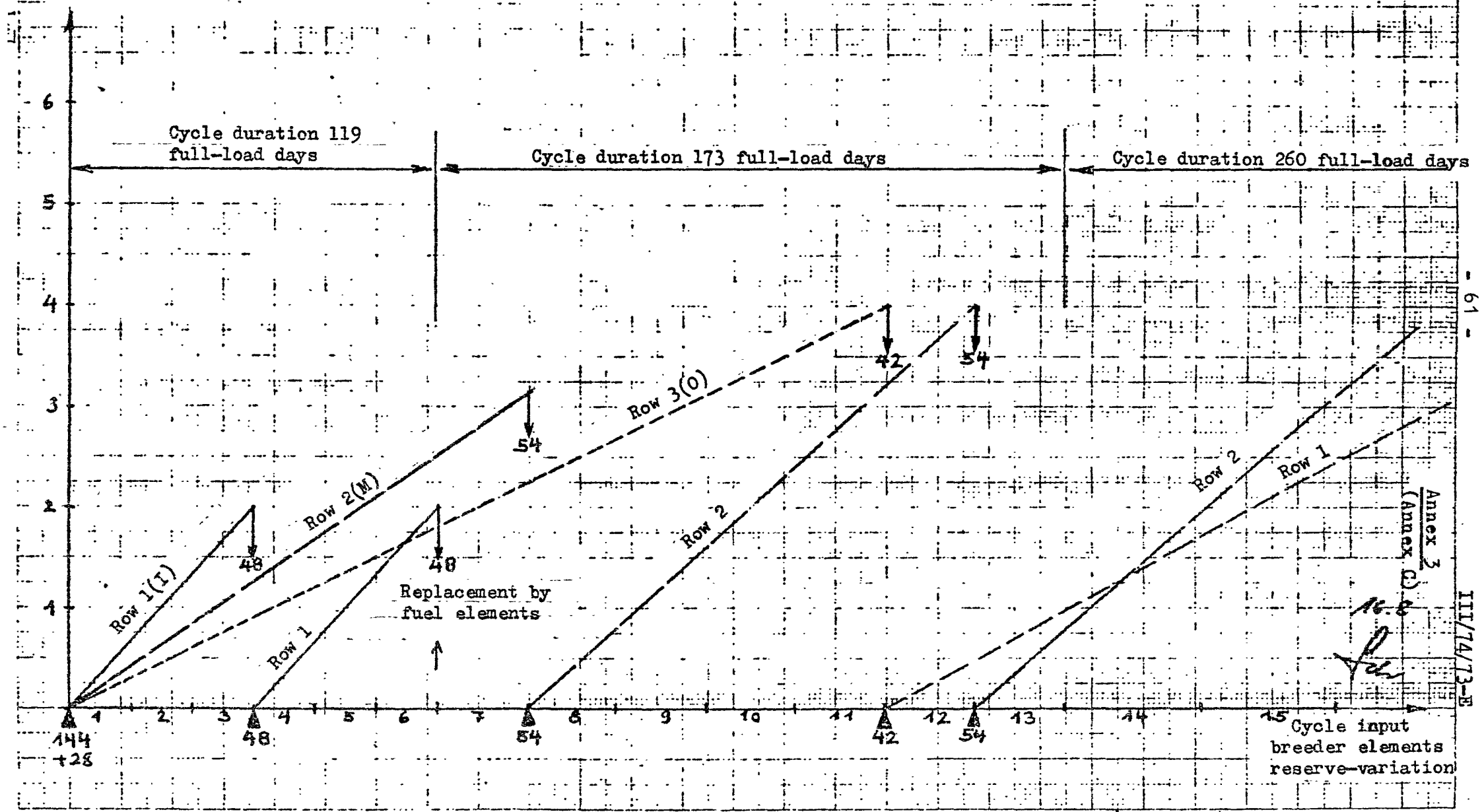
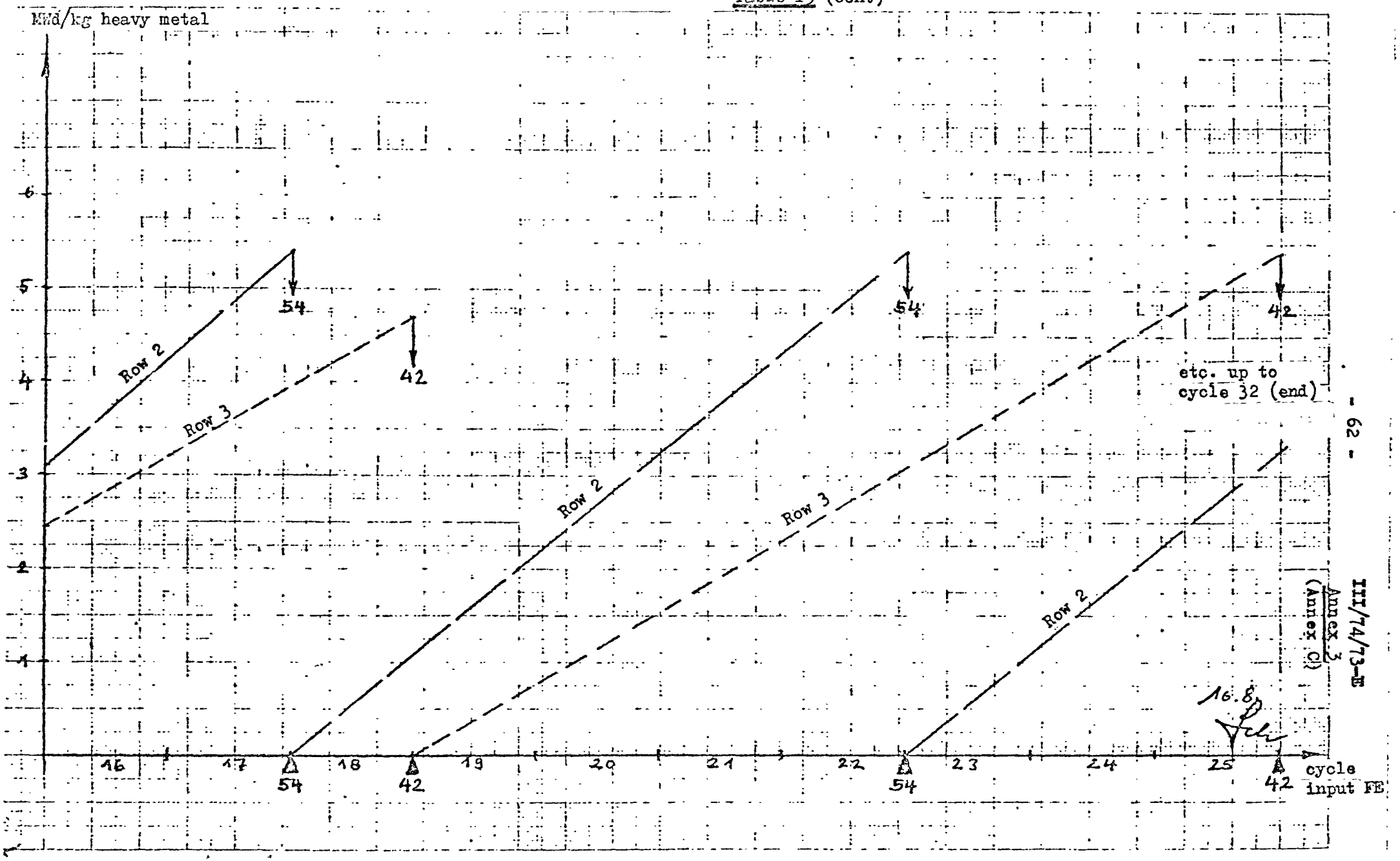


Table 15 (cont)



Liquidity trend and interest calculation in DM 10^6

Annex 3
(Annex D)

Date	Fuel expenditure	Other expend. affecting liquidity	Elect. sales revenue	Balance to this point	Cumulative outside borrowings		Interest on loans	Dividends	Payments under risk sharing contract	Interest received	Liquidity holding
1	2	3	4	5	6	7	8	9	10	11	12
IV/78	1.62			-1.62	5.00	5.00					
I/79	-			-	-						3.38
II/79	-	4.21	9.66	5.45	-		0,10	-	-	0,06	8.79
III/79	1,67	4.37	9.06	3.02	-	5,00			-		11.81
IV/79	26,71	4,37	9.07	-22,01	65,00	70,00	1,40				53,40
I/80	48,87	4,37	9,07	-43,87	-		-		-		9.53
II/80	0.34	4.37	9,07	4,36	-		2.80	-	-	1.46	12.55
III/80	-	4,60	9,37	4.77	-		-		-		17,32
IV/80	6,59	4,60	9,37	-1,82	-		2.80		-		12,70
I/81	1,41	4.60	9,37	3,36	-		-		-		16,06
II/81	17,47	4.59	9,37	-12,69	-		2,80	-	-	1,03	1.60
III/81	-	4.99	12,69	7.70	-		-				9,30
IV/81	6.87	4,99	12,69	0,83	-		2.80				7.33
I/82	-	4.98	12.69	7.71	-		-				15.04
II/82	8,09	4.98	12,69	-0.38	-		2,80	-	0,36	0,58	12,80
III/82	18,10	5.26	15,55	-7.81	-		-		3.50		8,49
IV/82	7,87	5,26	15,54	2,41	-		2.80		3.50		11 60
I/83	18,26	5.25	15,54	-7.97	-		-		3.50		7,13
II/83	0.47	5,25	15.54	9,82	-	70,00	2,80	-	2.89	0,70	17.74
III/83	-15,56	5.54	15.03	25.05	-10,00	60,00	-		3,00		35.79
IV/83	16.99	5.54	15,02	-7.51	-		2.40		3.00		28,88
I/84	8.11	5.54	15,02	0,60	-		-		3.00		32.48
II/84	2.72	5,53	15.02	6,77	-	60,00	2,40	-	0.32	2,01	39,18
III/84	23,46	5,84	14.68	-14,62	-10,00	50,00	-		1,20		15.76
IV/84	8,52	5,84	14.68	0,32	-		2,00		1.20		15.28
I/85	24.22	5.84	14,69	-15,37	-		-		1.20		1,11
II/85	4.32	5.83	14.69	4,54	-	50,00	2.00	-	0.79	1.15	5.69
III/85	-13.02	5,96	16,66	23.72	-10.00	40.00	-		3.00		22.41
IV/85	13,54	5,95	16,66	-2.83	-		1,60		3.00		20.98
I/86	4.32	5,95	16.66	6,39	-		-		3.00		30,37
II/86	15,89	5,95	16.66	-5.18	-	40,00	1,60	-	2,66	1,39	27,64
III/86	6,80	6.07	14.65	1,78	-10,00	30,00	-		1.00		20 42
IV/86	1.28	6,06	14.64	7,32	-		1,20		1.00		27.54
I/87	14,26	6,06	14,66	-5.66	-		-		1.00		22.88
II/87	4 63	6,06	14,66	3.97	-	30,00	1,20	-	-0,11	1.72	27,26
III/87	17,52	6,16	17.18	-6 50	-10,00	20,00	-		-		10.76
IV/87	4,54	6,16	17.18	6,48	-		0,80		-		16 44
I/88	0 90	6.15	17.19	10 14	-		-		-		26,58
II/88	3.21	6.15	17.19	7.83	-	20.00	0,80	-	-	1,42	35.03
III/88	24,13	6,24	16,80	-13,57	-10,00	10 00	-		-		11,46
IV/88	-	6,23	16.80	10,57	-		0,40		-		27,63
I/89	2,97	6.23	16,79	7.59	-		-		-		29,22
II/89	20,93	6.23	16,79	-10,37	-	10,00	0.40	5.26	-2.26	1.70	12,63

Liquidity trend and interest calculation in DM 10^6 Annex 3 (Annex D)

Date	Fuel expenditure	Other expend. affecting liquidity	Elect. sales revenue	Balance to this point	Cumulative outside borrowings		Interest on loans	Dividends	Payments under risk sharing contract	Interest received	Liquidity holding
1	2	3	4	5	6	7	8	9	10	11	12
III/89	-	6,30	16,52	10,22	-10,00	-					12,85
IV/89	-4,35	6,30	16,51	14,56	-	-					27,41
I/90	0,52	6.29	16,51	9,70	-	-					37.11
II/90	17,46	6,29	16,51	-7,24	-	-	-	3,85	-1,65	1,58	21,95
III/91	6,15	6,64	17,78	4,95							30,90
IV/91	-1,26	6,63	17,78	12,41							43,31
I/92	18,53	6,63	17,78	-7,38							35,93
II/92	-	6.63	17,77	11,14			-	10,31	-4,42	2,38	34,72
III/92	3,87	6,99	17,57	6,71							41,43
IV/92	2,62	6,99	17,57	7.76							49,19
I/93	14,25	6 99	17,56	-13,68							35,51
II/93	-	6,98	17.56	10.58			-	10,25	-4,40	2,81	34,25
III/93	6,82	7.37	18,66	4,47							38,72
IV/93	3.01	7,37	18.66	8,28							47,00
I/94	22.84	7.36	18,66	-11,54							35.46
II/94	3.81	7,36	18 66	7,49			-	7,78	-3,33	2.72	34,56
III/94	3,49	7.77	17,31	8,05							42,61
IV/94	18,68	7.77	19,32	-7,13							35,48
I/95	-	7.77	19,32	11,55							47.03
II/95	6.56	7,76	19,31	5,00			-	3,10	-1,33	2,79	50,39
III/95	-3,98	8,20	19,52	15,30							65,69
IV/95	21,01	8,19	19,51	-9,68							56,01
I/96	-	8,19	19,53	11,34							67.35
II/96	2,43	8,19	19,53	8.91			-	9,04	-3,17	4,19	67,54
III/96	3,16	8,65	19,99	8,18							75,72
IV/96	17,01	8,64	19.99	-5.66							70,06
I/97	3,91	8,64	19,99	7.44							77,50
II/97	3,46	8,64	20,00	7.90			-	11,00	-4,71	5.09	74,78
III/97	20,13	9,13	20,47	-8,79							65,99
IV/97	-	9,13	20.47	11.34							77,33
I/98	5,63	9,12	20 47	5,72							83.05
II/98	2,28	9,12	20,48	9.08			-	13,97	-5,95	5,27	77.44
III/98	29,59	9,64	20 30	-18,93							58,51
IV/98	4,10	9,64	20 30	6,56							65,07
I/99	3.97	9,64	20,30	6,69							71,76
II/99	23,28	9,63	20,30	-12,61			-	13,75	-5,90	4,77	44,27
III/99	-	10,19	20,91	10,77							55,04
IV/99	4,02	10,18	20,97	6,77							61,81
I/00	4,76	10,18	20,97	6.03							67,84
II/00	21,75	10,18	20,97	-10,96			-	4,40	-1,88	4,01	57,67
III/00	-	10,76	21,49	10,73							61,34
IV/00	0,24	10,76	21,49	10,49							71,83
I/01	3,45	10,76	21,50	7 29							83,72
II/01	19,52	10,76	21,50	-8,78			-	11,56	-2,27	4,88	62,70

Liquidity trend and interest calculation in DM 10^6 Annex 3 (Annex D)

Date	Fuel expenditure	Other expend. affecting liquidity	Elect. sales revenue	Balance to this point	Cumulative outside borrowings	Interest on loans	Dividends	Payments under risk sharing contract	Interest received	Liquidity holding
1	2	3	4	5	6	7	8	9	10	11	12
III/01	4.23	11.38	22.82	7.21							72.60
IV/01	4.70	11.37	22.82	6.71							79.35
I/02	30.95	11.37	22.82	-19.50							59.85
II/02	-	11.37	22.83	11.46			-	12.27	-	4.85	63.79
III/02	7.93	12.04	23.64	3.67							67.46
IV/02	4.41	12.03	23.64	7.20							74.66
I/03	31.64	12.03	23.65	-20.02							54.64
II/03	10.18	12.03	23.65	1.44			-	8.75	-	4.56	51.89
III/03	3.64	12.73	23.61	7.24							59.13
IV/03	21.62	12.73	23.61	-10.74							48.39
I/04	6.57	12.72	28.62	4.33							52.72
II/04	-70.18	12.72	23.62	61.68			-	1.65	-	3.71	116.46
III 04	-	15.05	25.33	10.28							126.74
IV 04	-	15.05	25.33	10.28							137.02
I 05	-	15.05	25.33	10.28							147.30
II 05	-38.81	15.05	25.34	49.14			-	8.23	-	9.23	197.44
	-195.82										392.96