



Comissão Nacional de Energia Nuclear-Brasil
Organismo Internacional de Energia Atômica



***CURSO REGIONAL DE CAPACITACION
SOBRE LOS SISTEMAS NACIONALES DE
CONTABILIDAD Y CONTROL DE
MATERIALES NUCLEARES***

11 a 22 de Abril de 1988
Rio de Janeiro

NUCLEAR MATERIAL CONTROL IN BRAZIL

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National Nuclear Energy Commission - CNEN

1. INTRODUCTION

The objective of this paper is to give a general view about the safeguards activities in Brazil. The national system of accounting for and control of nuclear materials is described. The safeguards agreements signed by Brazil are presented, the facilities and nuclear material under these agreements are listed, and the difficulties on the practical implementation are discussed.

The development and maintenance of the safeguards system is a responsibility of the National Nuclear Energy Commission (CNEN), the state authority responsible for the proposition of the necessary measures to the implementation of the nuclear energy general policy. Fig.1 shows the CNEN's position within the federal organic structure.

The aim of the national system of accounting for and control of nuclear materials is to prevent and to detect the non-authorized use of the nuclear materials and facilities. For that CNEN has the following competence:

- a) to apply the safeguards system to nuclear materials and to the fuel elements.
- b) to account and to store the materials under safeguards.
- c) to verify the fulfilment of the international safeguards agreements.
- d) to accompany the IAEA inspectors.
- e) to propose the definition of areas subject to safeguards.
- f) to prepare and to send the accountancy of nuclear materials under international safeguards.

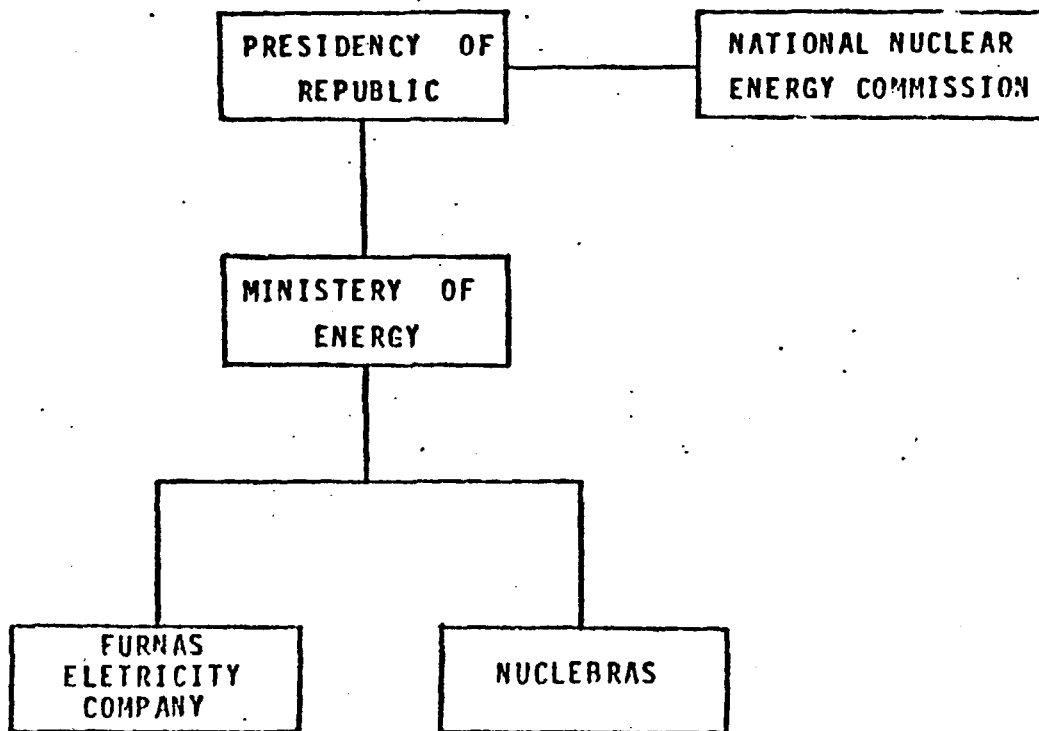


Fig. 1 : ORGANIC STRUCTURE

Brazil is committed to the, IAEA-Safeguards through trilaterals agreements, between the parts and the IAEA, based on the document INFCIRC/66-Rev.2.

The agreement Brazil-USA-IAEA for safeguards application (INFCIRC/110) was signed on 67/03/10, within the cooperation agreement between Brazil and USA signed on 65/07/08, which involves the following subjects:

- project, construction and operation of research reactor.
- Radioisotopes applications to medicine, biology, agriculture and physics research. The INFCIRC/110 was applied until 1972, when it was amended by the INFCIRC/110/Mod.1, which includes further:

- project, construction and operation of power reactors and
- nuclear material utilization on industry, medicine, biology, agriculture and physics research.

This agreement has the same duration of the cooperation accordance, i.e., thirty years.

The agreement Brazil-FRG-IAEA for safeguards application (INFCIRC/237) was signed on 76/02/26 in the ambit of the cooperation agreement between Brazil and FRG signed on 75/07/27. This agreement is in force while an item listed in its inventory will be existed. After its end, it must be reestablished, if a nuclear facility or specified equipment will be projected, constructed or operated based on relevant technological information under this agreement.

Each one of these agreements has different characteristics, which reflect the existent safeguards concept in its conclusion time. This is a basic difference between the NTP signatory countries, which have a single agreement with the IAEA, and the NTP non signatory countries, which are linked to many agreements.

The table 1 presents a summary of the nuclear facilities and materials under safeguards agreements.

2. SAFEGUARDS AGREEMENTS

The agreement INFCIRC/110 (Brazil-USA-IAEA) has characteristics of the old agreements, which had been elaborating by the IAEA to apply safeguards to:

- transferred materials, equipments and facilities.
- produced fissile materials.
- nuclear material processed or used in transferred materials, equipments or facilities.
- equipments or facilities, while they contain transferred nuclear material.

The agreement describes also requirements referent to the notifications, dispositions related to IAEA-inspectors, applicable safeguards procedures, for instance the prevision of subsidiary arrangements, and a declaration of both parts, that they will not use the transferred materials, equipments and facilities for military purposes.

Each part can denounce the agreement with six months previous communication.

The subsidiary arrangement of this agreement is composed of two parts: general part and the attachments. The general part describes operator's obligations to notifications, records, reports and dispositions to termination and to exemption of nuclear material safeguards.

The facility attachment for a "Principal Nuclear Facility"-PNF, (reactor, enrichment, conversion, fuel fabrication and reprocessing facilities) describes their record and reports systems, also the report frequency, and it contains maps and data of the facility project.

The facility attachment for a "Research and Development Facility" (RDF) or for an "Other Location" (OL) describes only their record and report system, as well as the frequency of these.

Upon transfer of the Pressurized Water Reactor Angra-I (627 MWe) an addendum letter has been included, after IAEA solicitation, containing dispositions referent to the application

Tab.1 - Nuclear facilities and material under Safeguards Agreements

Safeguards Agreement	Facility	AREA	MATERIAL
Brazil-USA A1 (INFCIRC/110) 10.03.67	ITA-SP	ITA Sub-critical	Natural-uranium Plutonium
	IEN-RJ	Argonauta Research Reactor	Uranium 20%
	CDTN-MG	Research Reactor Sub-critical	Uranium - 93% Uranium - 20% Natural - uranium Heavy water
	IPEN-SP	Research reactor Nuclear Metalurgy	Uranium - 93% Uranium - 20% Plutonium Uranium - 3% Natural Uranium
	Angra 1	All facility	Uranium 2,1%-3.3%

Safeguards Agreement	Facility	AREA	MATERIAL
BRAZIL-RFA-AIEA (INFCIRC/237) 26.02.75	Fuel Fabrication Plant	All facility	Uranium 3.3% Uranium 0,2% and specified equipment
	Angra 1 *		Uranium 3.3%
	IPEN - SP *	Research reactor	Uranium 20%
	CDTN - MG	Department of Materials Technology	Specified Equipment
	NUCLEI	under construction	
Angra II	under construction		

* facility listed in the Subsidiary Part of Inventory because the material is under 237.

of containment and surveillance, which are not foreseen neither on the INFCIRC/110 nor on the INFCIRC/66 Rev. 2.

The safeguards agreement INFCIRC/237 (Brazil, FRG., IAEA) means a new kind of agreement applied to countries non-signatories of the NPT. Besides the safeguards application according to the INFCIRC/110, this agreement introduces other points, like the concept of safeguards application to specified material, to specified equipment and to relevant technological information.

Specified material means any material which is specially prepared for the processing, use or production of nuclear material.

Specified equipment means any equipment which is specially designed or prepared for the processing, use or production of nuclear material or specified material.

Relevant technological information means information designated as such by either contracting government transferring such information on the design, construction or operation of a nuclear facility or specified equipment or on the preparation, use of processing of nuclear material or specified material in all forms in which such information can be transferred, but excepting technological information available to the public. By this concept, the Agreement extend the safeguards application to materials, equipments and facilities, which are constructed or operated on the basis of transferred relevant technological information. The time expiration of this agreement is not defined and there is neither any prevision for an interruption, since that the agreement is in force while any item, under safeguards, exists. If, after the end of the agreement, any equipment or facility would be projected, constructed or operated based on relevant technological information the agreement must be re-established. In addition to these points, the agreement determines that the IAEA should be informed about the physical protection measures and it foresees the application of containment and surveillance by the IAEA.

The subsidiary arrangements implement the procedures to the safeguards application. This document details the requirements and the rights of the operator as:

- notification to the IAEA: a) before the import of nuclear material, or facility, or specified equipment: b) before the first receipt of nuclear material or specified materials or specified equipments in a facility constructed on the basis of relevant technological information, or in a facility not listed in the inventory of the agreement. These notifications should accompany the design information.

- Advanced information in the case of failure of containment and surveillance, and urgent information in case of an emergency.
- Inventory Change Report, Operation Report, special report in case of not foreseen incidents, and Construction Report.
- Procedures for safeguards exemption and suspension for nuclear material and safeguards termination for nuclear material, specified material and specified equipment.
- Inspections to nuclear material, to specified material, and to specified equipments.

The attachment for the Fuel Fabrication Plant presents as principal characteristic the classification of the facility as constructed with base on relevant technological information. The document defines the Zircaloy as specified material. Therefore it details the requirements for records and reports for the nuclear material control, and for the control of the tubes of zircaloy.

The zircaloy inventory is grouped in the following strata: - tubes in the storage - tubes in the processing area - scraps

The accounting records consist of:

- (i) The book inventory for all specified material at the facility, per strata of specified material, but independent of the applicable safeguards agreements; these number shall reflect the total quantities of zircaloy present at the facility.
- (ii) The book inventory for all specified material subject to each particular safeguards agreements.

The summary records consist of:

- records in the form journal, which the inventory changes.
- The list of inventory items at the facility, which reflects the situation as of the date of physical inventory taking.

The entries in the journals for specified material are similar as for nuclear material. The principal difference are:

- the designation "MUF" is not used;
- the termination of safeguards on tubes upon acceptance of fuel rods; when the tube of zircaloy becomes a fuel rod, it is not more safeguarded as specified material, but it is safeguarded as contained nuclear material.

Accounting reports for specified material shall be submitted semi-annually as of 30 of June and 31 of December each year, in the form of Material Balance Report. Each accounting report refers to the applicable safeguards agreement or agreements.

For specified equipment the records may be kept at the facility or at CNEA and consist of a list updated all notifications sent by Brazil to the IAEA, name manufactures, serial number and other indentifiers. No routine reports of specified equipments need be sent by Brazil.

The second facility attachment is for "Locations Outside Nuclear Facilities". There is no provisions for specified material. For specified equipment, the record system shall be compound by an inventory list, notifications sent by Brazil to the IAEA as well the confirmations from Brazil of notifications of FRG related to specified equipment. The inventory list includes the name and location for each item specified equipment.

Nuclear material subject to a safeguards agreement would be "contaminated" when it is used at a facility subject to an other safeguards agreement. For instance, we describe how a nuclear power station performs the accounting of nuclear materials subject to different safeguards agreement.

The Angra-1 Nuclear Power Plant is a facility listed in the principal part of the agreement INFCIRC/110. The first fuel load is also subject to this agreement. (125 fuel elements). For

the first reload, 40 fuel elements have been fabricated in Brazil with nuclear material subject to the agreement INFCIRC/237. This means that when these 40 elements went to the plant, the nuclear material contained in the 40 fuel elements has been recorded in the principal part of the inventory under both agreements (U110/237).

When these 40 elements have been loaded, the 81 fuel elements, which remain in the core began to be recorded under both agreements 110 and 237.

The 40 unloaded fuel elements remain under the safeguards agreement INFCIRC/110 and consequently the plutonium contained remains also also under INFCIRC/110 (U110). (The plutonium is recorded only when the fuel element is unloaded from the core.) In the next reload, the plutonium contained in the unloaded fuel elements will be subject to both agreements (U110/237).

3. THE NATIONAL SAFEGUARDS SYSTEM OF ACCOUNTABILITY AND CONTROL

The SSAC in Brazil is based on the Regulation CNEN-NE-2.02 issued in April 1982. It consists of requirements referring to measurement system, physical inventory taking, records, reports and transfers of nuclear material, specified material and specified equipment, containment and surveillance and CNEN inspections.

According to that regulation, CNEN issues an Authorisation to use nuclear material after the approval of a Control Plan submitted by the operator describing the characteristics of the facility, its organization structure, definition of responsibilities by the nuclear material, information about the process, description of the facility showing accounting areas, flow and storage areas, procedures of accountability and for physical inventory taking, the records and the measurement system.

For specified material and equipment, if their use is related to the fabrication of such items, the operator must be registered as such by CNEN. In the case they are used to produce or process nuclear material, the operator must have an Authorisation to use nuclear material issued by CNEN. In both cases the operator must perform the procedures to account and control the specified material or equipment.

Any transfer of nuclear material, specified material

and equipment must be authorised by CNEN. The documents, namely ATM for nuclear material and ATEM for specified material and equipment, describes the type and function of the equipment, the type and quantity of material, the safeguards agreement, the origin and destination of the transfer in terms of country, facility and accounting area and expected date of transfer.

Upon each shipment the operator must complete the form NTM for nuclear material or NTEM for specified material or equipment describing shipper and receivers data for the material or the equipment, the date, the origin and the destination of the transfer.

Facilities under construction must send to CNEN annual reports describing the present status of the construction and a forecast for the next year.

Special reports are foreseen, to inform CNEN about any special event involving nuclear material or containment and surveillance devices.

Nuclear Material Balance Report (RBM) and Operating Report are submitted to CNEN, semi-annually by the research reactors and monthly by the power reactors. For research reactors the Operating Report describes the nuclear loss in terms of total uranium and U-235, the nuclear production, the time in operation and the energy released. For power reactors, the gross thermal and electrical production, the gross and the average electric power, the number of hours critical, the number and duration of shut-downs and the average burn-up are described.

For research reactors the nuclear loss and burn-up are recorded as calculated for each individual fuel element and the updated masses are reported in a computer print-out and submitted together with the RBM. For power reactors, print-out are also submitted together with the RBM but nuclear loss and burn-up are reported upon final discharge of the fuel elements from the core.

The RBM describes imports, domestic receipt, nuclear production, exports, domestic shipments, nuclear loss, other increases and decreases and the distribution of the material in the facility. The report form is the same for power and research reactors.

Research facilities submit RBM for bulk facilities semi-annually and large bulk facilities do it monthly. For each physical and chemical form and enrichment a separate RBM form is filled,

describing, imports, domestic receipts, exports, domestic shipments, processing losses, other increases and decreases, material unaccounted for and the distribution of the nuclear material in the facility.

There is no report concerning the physical inventory although it is foreseen in the regulation: Since we have few and small bulk facilities and reactors, the CNEN inspectors are always present during the physical inventory taking and a copy of the list of items for the PIT used by the operator on the facility is provided to the inspector.

Specified Material Balance Report (RBME) are submitted semi-annually and for specified equipment no report is required.

Since there is no experience the accounting and control of specified material, it is our feeling that new report forms will be developed in proportion to classification of other materials as specified. Up to now we just have zircaloy classified as such.

They are stratified as tubes in feed store, tubes in process and scrap. The accounting principles are almost the same as for nuclear material. The zircaloy is recorded in terms of number of tubes and in terms of mass when the tube is not entire any more, notwithstanding its dimension. Using the linear density it is possible to make the final balance in terms of mass. Termination of safeguards on tubes is automatically achieved upon completion of fuel rods acceptance test. The physical inventory is taken once a year by counting the number of entire tubes, weighing cutted tubes and scrap.

The RBME describes imports, domestic receipts, exports, domestic shipments, automatic termination, other increases and decreases and book inventory minus physical inventory as well as the distribution of material in the facility in terms of rods, tubes and scrap.

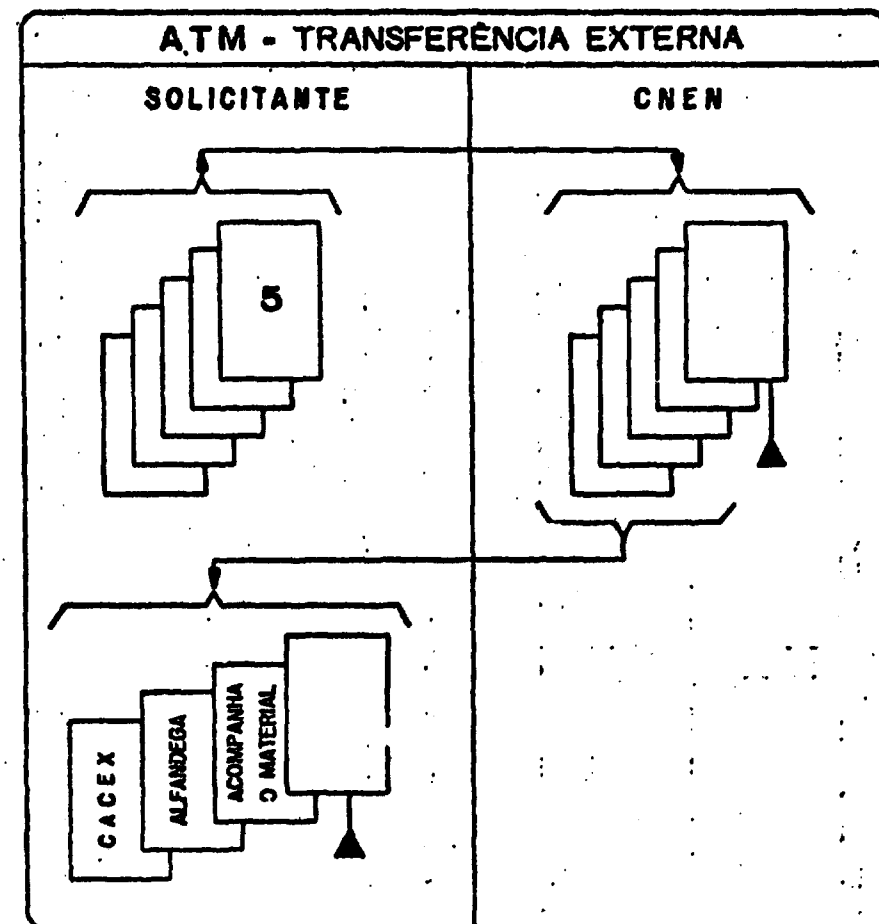
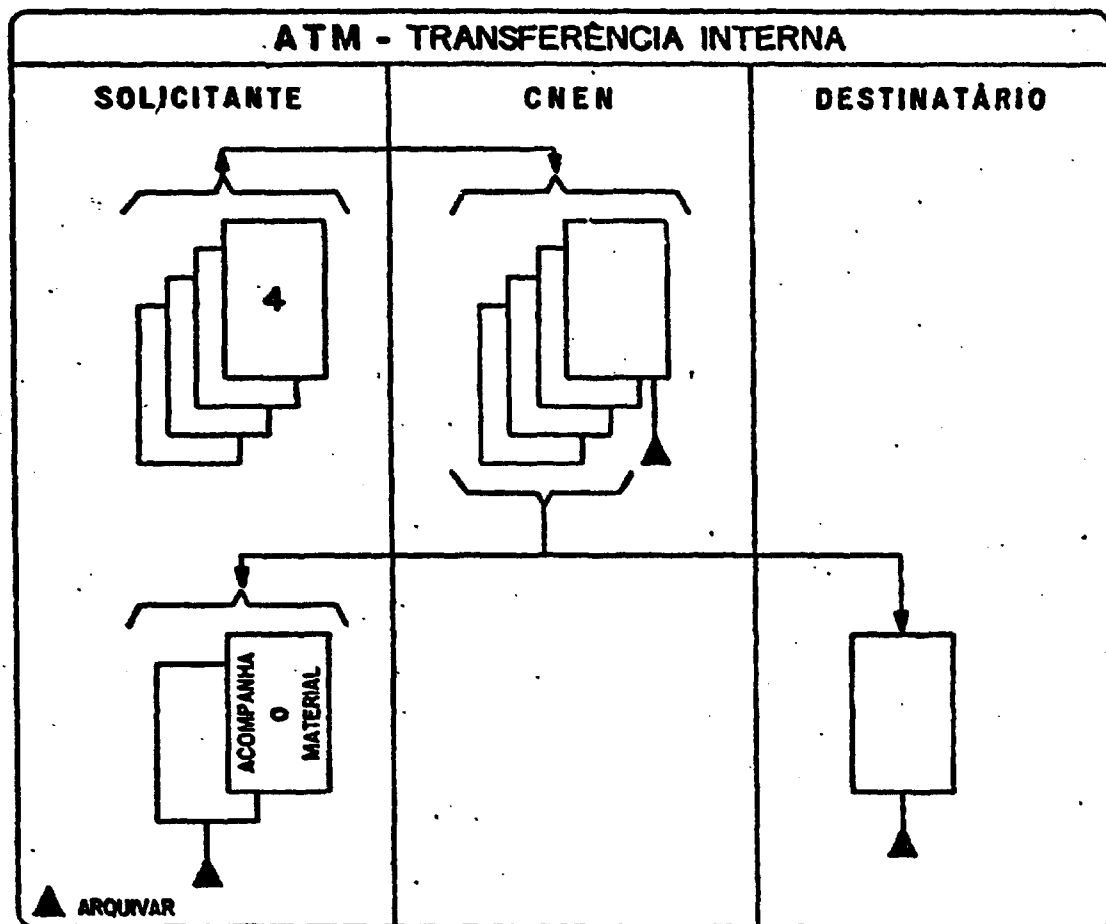
The word MUF is not used here, since this is a well defined concept having sound principles not applicable to this rough and new accountability. In this case we use simply the wording book inventory minus physical inventory.

The only records to be maintained for specified

equipment are the name, manufacturer, serial number and location of the equipment in the facility and the operating data relevant to time of operation and integral throughput.

According to regulation CNEN-NE-2.02 four kinds of inspections are foreseen: routine, pre-operational, unannounced and special inspections. CNEN inspectors have the right to examine records, verify the quantity of material by means of measurements and sampling, verify the functioning and calibration of instruments and equipment for nuclear material measurement and apply and verify containment and surveillance devices.

Sample taking is documented in the Nuclear Material Transfer Form (TAM) which is signed by the inspector and by the operator and describes the sample bottle and the sample item identification number, material description and batch identification, gross weight, net weight, element and isotope factors, weight of element and isotope, measurement analysis to be performed and the date of sampling.



É NECESSÁRIO QUE TODAS AS VIAS SEJAM ASSINADAS SEM USO DE CARBONO

- — Indicar forma física, fórmula química e tipo de embalagem
Ex: Latas UO₂, pó, caixas UO₂, pastilhas, cilindros UF₆, ...
- — Indicar a quantidade de latas, quantidade de caixas, quantidade de cilindros...
- — Material sob salvaguarda da AIEA, dar o n.º do Acordo
Material de origem estrangeira, sem salvaguarda da AIEA, dar o nome do país de origem
Material nacional, sem salvaguarda da AIEA, escrever N



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COMISSÃO NACIONAL DE ENERGIA NUCLEAR
DEPARTAMENTO DE INSTALAÇÕES E MATERIAIS NUCLEARES
RUA GENERAL SEVERIANO, 80 BOTAFOGO - RJ - TEL. 298-1748
CEP. 22294 - TELEX (021) 2180 CNEN - BR
NOTIFICAÇÃO DE TRANSFERÊNCIA DE MATERIAL NUCLEAR (NTM)

DE

PARA

DATA DA TRANSFERÊNCIA

AUTORIZAÇÃO N.º

PAIS
INSTALAÇÃO
ÁREA DE CONTABILIDADE

PAIS
INSTALAÇÃO
ÁREA DE CONTABILIDADE

QNTD	DESCRIÇÃO DO MATERIAL	IDENTIFICAÇÃO DO ITEM	UNID. PESO	DADOS DO REMETENTE				ACORDO	DADOS DO DESTINATÁRIO													
				PESO LÍQUIDO	EMBARQUE (LÍQUIDO)	U TOTAL	PU		U 935	PESO LÍQUIDO	ENTRADA (LÍQUIDO)	U TOTAL	PU	U 935								

ESTE DOCUMENTO DESTINA-SE A CÁLCULOS DE BALANÇO DE MATERIAL. É IMPORTANTE A DESCRIÇÃO DA QUANTIDADE PRECISA, ASSIM COMO A RATIFICAÇÃO DA DATA DA TRANSFERÊNCIA.

CONFIRMAÇÃO DO EMBARQUE

CONFIRMAÇÃO DO RECEBIMENTO

ASSINATURA E NOME DO RESPONSÁVEL PELO MATERIAL

DATA

ASSINATURA E NOME DO RESPONSÁVEL PELO MATERIAL

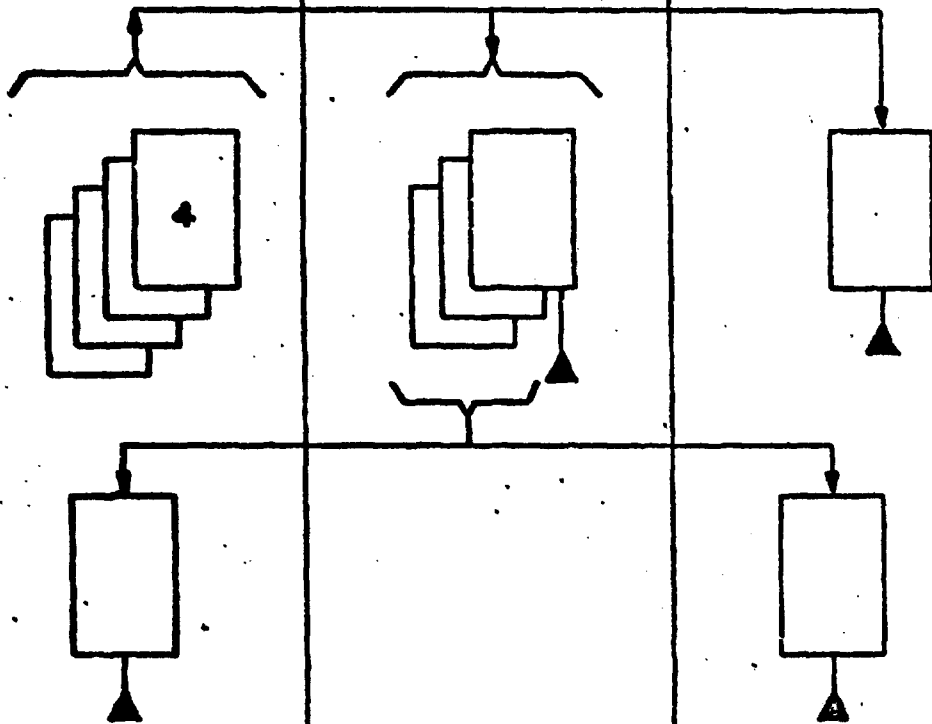
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NTM - TRANSFERÊNCIA INTERNA

REMETENTE

DESTINATÁRIO

CNEN

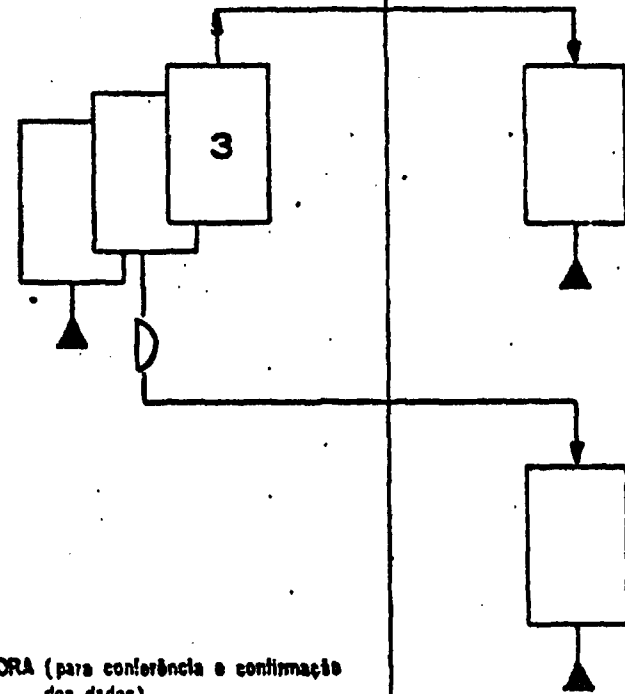


▲ ARQUIVAR

NTM - TRANSFERÊNCIA EXTERNA

REMETENTE / DESTINATÁRIO
(EXPORTAÇÃO) (IMPORTAÇÃO)

CNEN



D DEMORA (para conferência e confirmação dos dados)

É NECESSÁRIO QUE TODAS AS VIAS SEJAM ASSINADAS SEM USO DE CARBONO

- — Indicar forma física, fórmula química e tipo de embalagem
Ex: Latas UO_2 , pá, caixas UO_2 , pastilhas, cilindros UF_6 , ...
- — Dar o número de identificação da lata, caixa ou cilindro...
- — Em caso de importação o destinatário deve preencher os Dados do Remetente com base no certificado do fornecedor
- — Material sob salvaguarda da AIEA, dar o n.º do Acordo
Material de origem estrangeira, sem salvaguarda da AIEA, dar o nome do país de origem
Material nacional, sem salvaguarda da AIEA, escrever N



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COMISSÃO NACIONAL DE ENERGIA NUCLEAR
 DEPARTAMENTO DE INSTALAÇÕES NUCLEARES
 R. GEN. SEVERIANO, 90 BOTAFOGO RJ - TEL. 2951745 CEP 22294 TELEX 021-2180CNEN-BR
**AUTORIZAÇÃO DE TRANSFERÊNCIA DE EQUIPAMENTO
 ESPECIFICADO E MATERIAL ESPECIFICADO (ATEM)**

ATEM Nº

USO DA CNEN - DIN

DE	PARA	DATA PREVISTA
PAÍS	PAÍS	
INSTALAÇÃO	INSTALAÇÃO	
ÁREA DE CONTABILIDADE	ÁREA DE CONTABILIDADE	

MATERIAL ESPECIFICADO					
LINHA	DESCRIÇÃO DO MATERIAL	QUANT. ÍTENS	UNID. PESO	PESO LÍQUIDO	Nº ACORDO

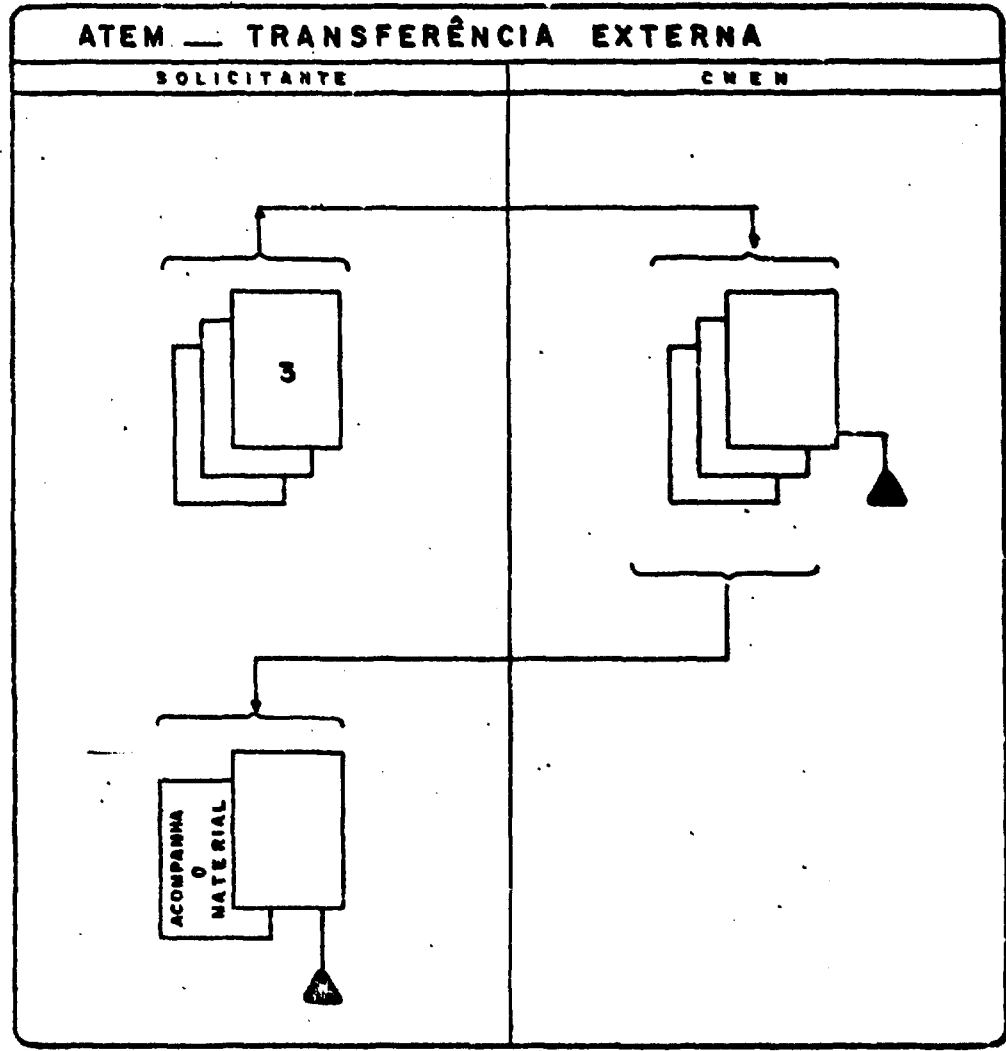
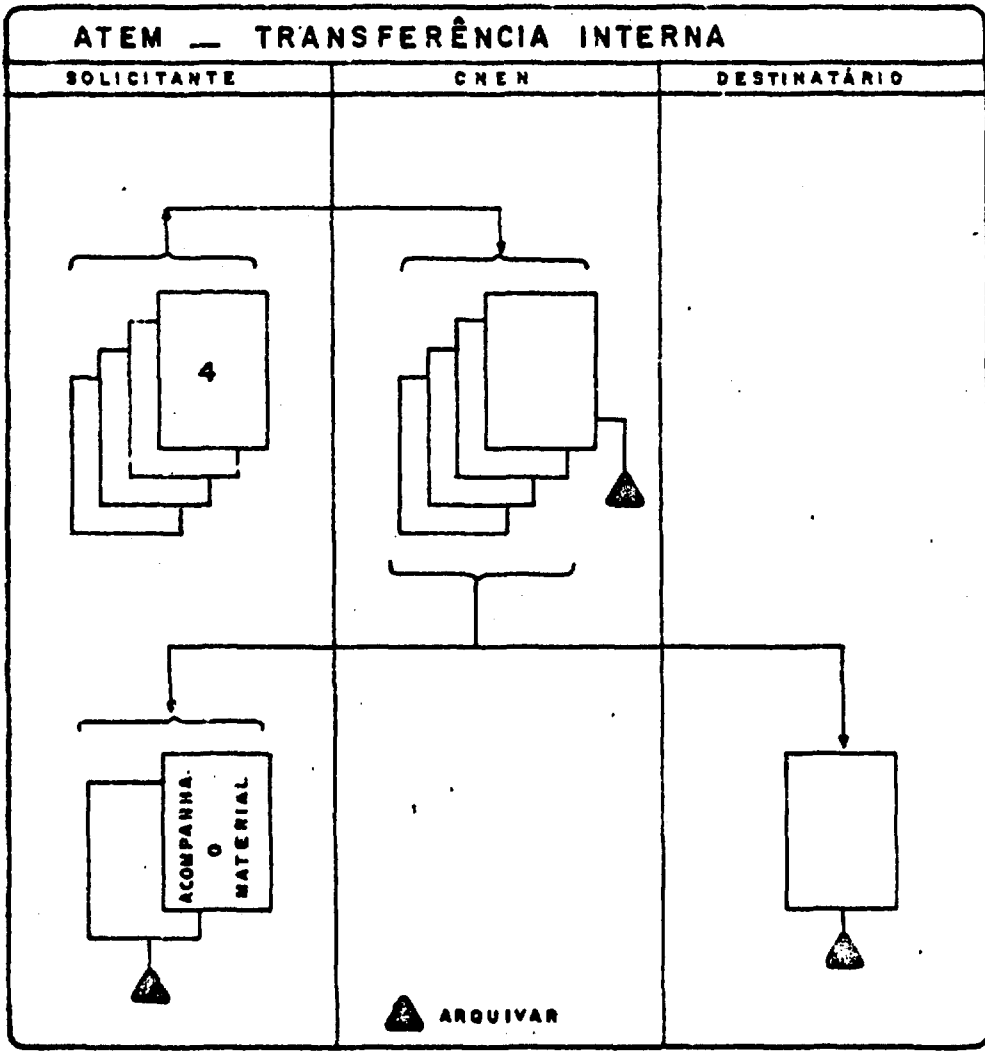
EQUIPAMENTO ESPECIFICADO				
LINHA	NOME OU TIPO	FINALIDADE	QUANT. ÍTENS	Nº ACORDO

USO DA CNEN - DIN

ESTE DOCUMENTO, QUE AUTORIZA APENAS A TRANSFERÊNCIA ACIMA DESCRITA, É VÁLIDO ATÉ ____/____/____
 APÓS ESTA DATA DEVE SER SOLICITADA NOVA AUTORIZAÇÃO

SOLICITANTE
_____ NOME DO DIRETOR DA INSTALAÇÃO
_____ ASSINATURA
_____ DATA

CNER
_____ NOME DO DIRETOR DO DIN
_____ ASSINATURA
_____ DATA



É NECESSÁRIO QUE TODAS AS VIAS SEJAM ASSINADAS SEM USO DO CARBONO

* MATERIAL OU EQUIPAMENTO SOB SALVAGUARDA DA AIEA, DAR O Nº DO ACORDO
 MATERIAL OU EQUIPAMENTO, SEM SALVAGUARDA DA AIEA, ESCREVER N



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COMISSÃO NACIONAL DE ENERGIA NUCLEAR
DEPARTAMENTO DE INSTALAÇÃO NUCLEARES

RUA GENERAL SEVERIANO, 90 BOTAFOGO RJ - TEL: 293-1745 CEP 22294 TELEX 021-280 CNEN-BR

NOTIFICAÇÃO DE TRANSFERÊNCIA DE EQUIPAMENTO ESPECIFICADO E MATERIAL ESPECIFICADO (NTEM)

DE	PARA	DATA DA TRANSFERÊNCIA	AUTORIZAÇÃO Nº
PAÍS INSTALAÇÃO ÁREA DE CONTABILIDADE	PAÍS INSTALAÇÃO ÁREA DE CONTABILIDADE		

MATERIAL ESPECIFICADO		DADOS DO REMETENTE			DADOS DO DESTINATÁRIO			
LINHA	DESCRIÇÃO DO MATERIAL	Nº ACORDO	QUANT. ITENS	UNID. PESO	PESO LÍQUIDO	QUANT. ITENS	UNID. PESO	PESO LÍQUIDO

EQUIPAMENTO ESPECIFICADO			DADOS DO REMETENTE		DADOS DO DESTINATÁRIO	
LINHA	NOME OU TIPO	FINALIDADE	Nº ACORDO	QUANT. ITENS	QUANT. ITENS	

CONFIRMAÇÃO DO EMBARQUE

NOME DO RESPONSÁVEL PELO MATERIAL OU EQUIPAMENTO

ASSINATURA

DATA

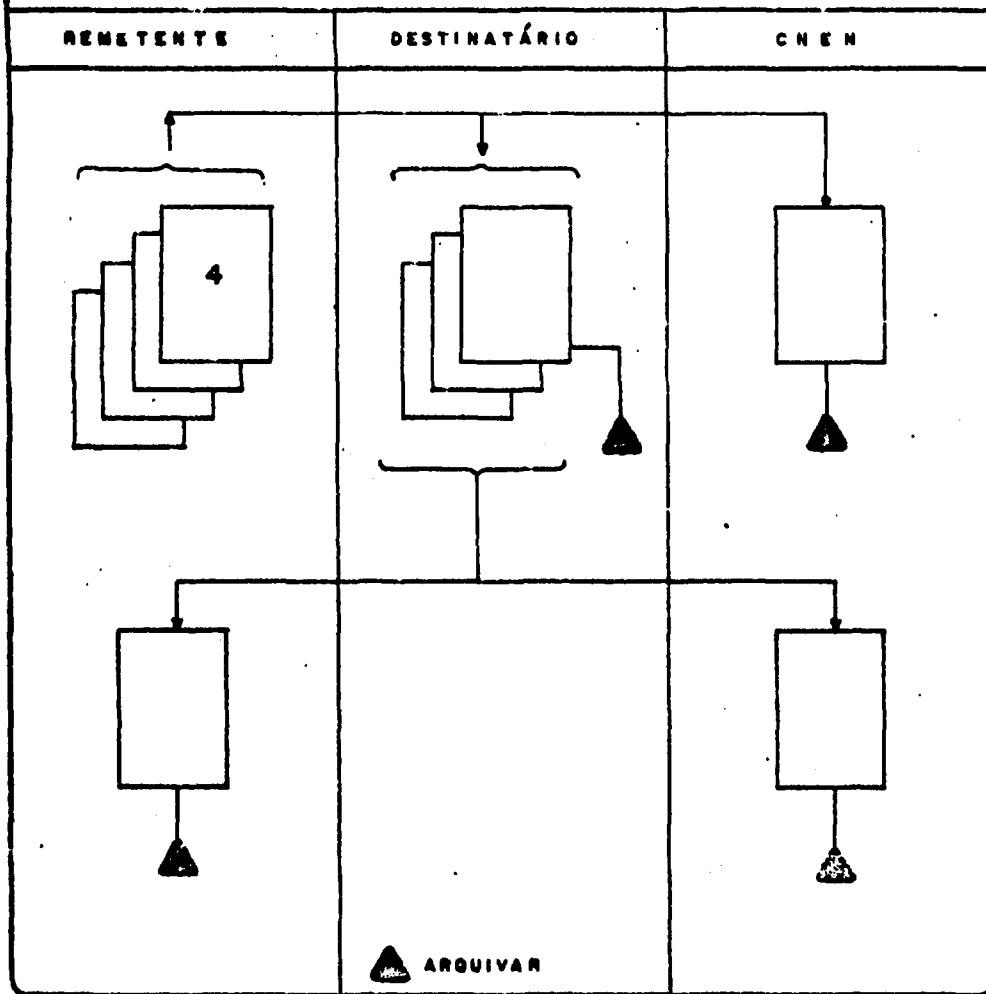
CONFIRMAÇÃO DO RECEBIMENTO

NOME DO RESPONSÁVEL PELO MATERIAL OU EQUIPAMENTO

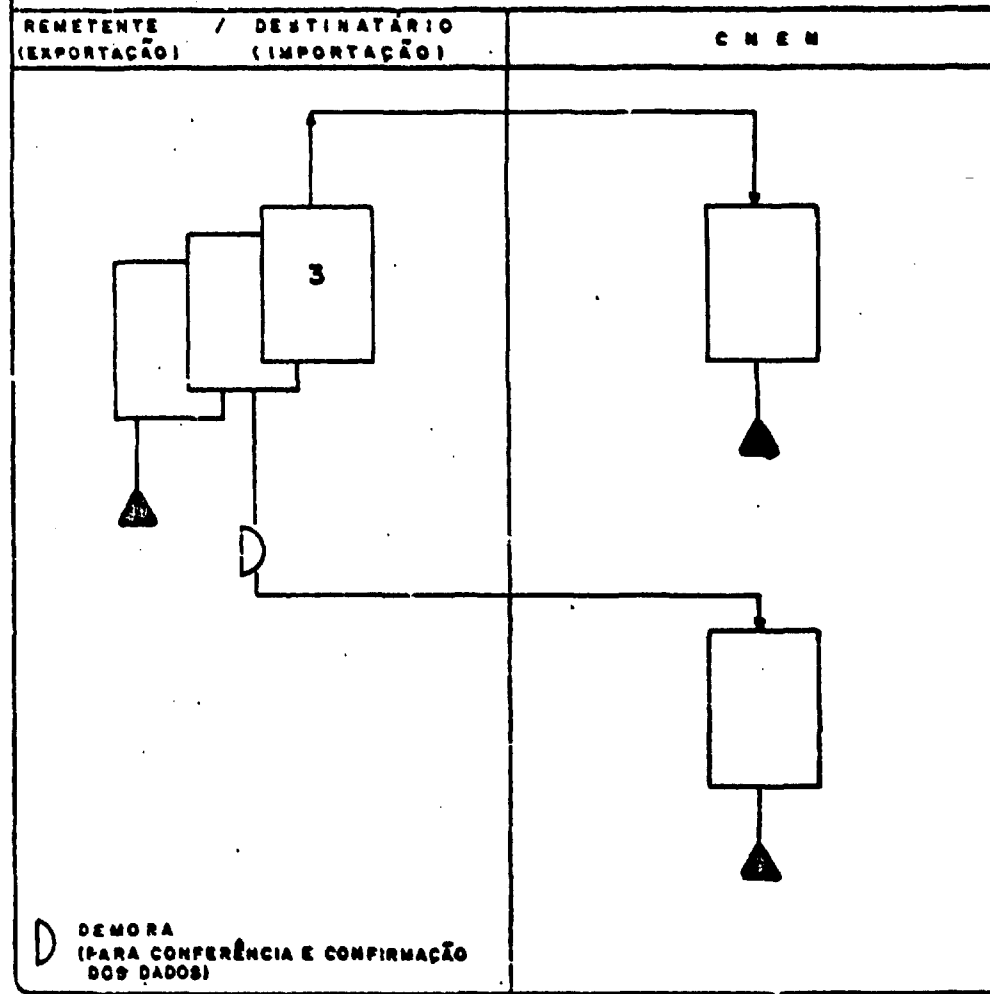
ASSINATURA

DATA

NTEM - TRANSFERÊNCIA INTERNA



NTEM - TRANSFERÊNCIA EXTERNA



É NECESSÁRIO QUE TODAS AS VIAS SEJAM ASSINADAS SEM USO DO CARBONO

* MATERIAL OU EQUIPAMENTO SOB SALVAGUARDA DA AIEA, DAR O Nº DO ACORDO
 MATERIAL OU EQUIPAMENTO SEM SALVAGUARDA DA AIEA, ESCREVER N

** EM CASO DE IMPORTAÇÃO O DESTINATÁRIO DEVERÁ PREENCHER OS DADOS DO REMETENTE COM BASE NO CERTIFICADO DO FORNECEDOR

RÉLATÓRIO DE BALANÇO DE MATERIAL NUCLEAR - RBM
COMISSÃO NACIONAL DE ENERGIA NUCLEAR

INSTALAÇÃO
(EXCETO REATOR)

INSTALAÇÃO _____ ÁREA DE CONTABILIDADE _____ PERÍODO RELATADO _____ RELATÓRIO Nº _____

FORMA FÍSICA / FÓRMULA QUÍM. / ENRIQ. _____

UNIDADE DE PESO _____

ACORDO _____

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		BALANÇO DE MATERIAL NUCLEAR	Nº DE ITENS	COMPOSTO	ELEMENTO	ISÓTOPO
		INVENTÁRIO INICIAL				
ACRÉSCIMOS		IMPORTAÇÃO				
		RECEBIMENTO DOMÉSTICO				
		TRANSFORMAÇÃO				
		OUTROS				
		SUBTOTAL				
DECRÉSCIMOS		EXPORTAÇÃO				
		REMESSA DOMÉSTICA				
		TRANSFORMAÇÃO				
		PERDA DE PROCESSAMENTO				
		OUTROS				
	SUBTOTAL					
		MATERIAL NÃO CONTABILIZADO				
		INVENTÁRIO FINAL				

		DISTRIBUIÇÃO DO MAT. NUCLEAR	Nº DE ITENS	COMPOSTO	ELEMENTO	ISÓTOPO
		ESTOCAGEM DE PRODUTO INICIAL				
		ÁREA DE PROCESSO				
		ESTOCAGEM DE PRODUTO FINAL				

OBSERVAÇÕES

RESPONSÁVEL PELA CONTABILIDADE E CONTROLE NA

ÁREA DE CONTABILIDADE.

INSTALAÇÃO

 NOME

 NOME

 ASSINATURA

 DATA

 ASSINATURA

 DATA

RELATÓRIO DE BALANÇO DE MATERIAL NUCLEAR - RBM
COMISSÃO NACIONAL DE ENERGIA NUCLEAR

REATOR

INSTALAÇÃO _____ ÁREA DE CONTABILIDADE _____ PERÍODO RELATADO _____ RELATÓRIO Nº _____

FORMA FÍSICA / FÓRMULA QUÍM. / ENRIQ. _____ UNIDADE DE PESO _____ ACORDO _____

g

Kg

BALANÇO DE MATERIAL NUCLEAR		Nº DE ITENS	COMPOSTO	ELEMENTO	ISÓTOPO
INVENTÁRIO INICIAL					
ACRÉSCIMOS	IMPORTAÇÃO				
	RECEBIMENTO DOMÉSTICO				
	PRODUÇÃO NUCLEAR				
	OUTROS				
	SUBTOTAL				
DECRÉSCIMOS	EXPORTAÇÃO				
	REMESSA DOMÉSTICA				
	PERDA NUCLEAR				
	OUTROS				
	SUBTOTAL				
INVENTÁRIO FINAL					

DISTRIBUIÇÃO DO MAT. NUCLEAR	Nº DE ITENS	COMPOSTO	ELEMENTO	ISÓTOPO
ESTOCAGEM DE COMBUSTÍVEL NOVO				
NÚCLEO DO REATOR				
ESTOCAGEM DE COMBUSTÍVEL IRRADIADO				

OBSERVAÇÕES

RESPONSÁVEL PELA CONTABILIDADE E CONTROLE NA

ÁREA DE CONTABILIDADE.

INSTALAÇÃO

NOME

NOME

ASSINATURA

DATA

ASSINATURA

DATA

MATERIAL BALANCE REPORT - MBR
COMISSÃO NACIONAL DE ENERGIA NÚCLEAR - BRAZIL



FACILITY _____	ACCOUNTING AREA _____	REPORTING PERIOD _____	REPORT Nº _____
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MATERIAL _____	Unit () G () Kg	AGREEMENT _____
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MATERIAL BALANCE		NUMBER OF ITEMS	U TOTAL	U 235	Pu TOTAL
BEGINNING INVENTORY					
INCREASES	RECEIPT	INTERNATIONAL			
		DOMESTIC			
	INITIATION OF SAFEGUARDS				
	OTHER				
	TOTAL INCREASES				
DECREASES	SHIPMENT	INTERNATIONAL			
		DOMESTIC			
	PROCESSING LOSS				
	OTHER				
	TOTAL DECREASES				
MATERIAL UNACCOUNTED FOR					
ROUNDING ADJUSTMENT					
ENDING INVENTORY					

MATERIAL DISTRIBUTION	NUMBER OF ITEMS	U TOTAL	U 235	Pu TOTAL
RECEIVING AREA				
PROCESS AREA				
FINAL PRODUCT AREA				

REMARKS

SIGNATURE _____	Date _____
Safeguards Division Officer	

RELATÓRIO DE OPERAÇÃO-RO
COMISSÃO NACIONAL DE ENERGIA NUCLEAR

**REATOR DE
 POTÊNCIA**

INSTALAÇÃO	ÁREA DE CONTABILIDADE	PERÍODO RELATADO	ACORDO	RELATÓRIO Nº
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DADOS DE PRODUÇÃO E NUCLEARES		Unidade	TOTAL
ENERGIA	ENERGIA TÉRMICA BRUTA	MWd	
	ENERGIA ELÉTRICA BRUTA	MWd	
TEMPO	PERÍODO DE RELATO	dias	
	TEMPO EM OPERAÇÃO	h	
	TEMPO PARADO	h	
POTÊNCIA	NÚMERO DE PARADAS	—	
	POTÊNCIA ELÉTRICA MÉDIA NO PERÍODO	MW	
	POTÊNCIA ELÉTRICA MÉDIA EM OPERAÇÃO	MW	
QUEIMA NUCLEAR		MWd/ton	
QUEIMA NUCLEAR ACUMULADA		Mwd/ton	

PRÓXIMA PARADA PROGRAMADA

DATA / / MOTIVO: _____

OBSERVAÇÕES

RESPONSÁVEL PELA CONTABILIDADE E CONTROLE NA

ÁREA DE CONTABILIDADE. _____ NONE _____ ASSINATURA / / DATA	INSTALAÇÃO _____ NONE _____ ASSINATURA / / DATA
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SPECIFIED MATERIAL BALANCE REPORT - SMBR
COMISSÃO NACIONAL DE ENERGIA NUCLEAR - BRAZIL

FACILITY	MATERIAL	AGREEMENT	REPORTING PERIOD	REPORT Nº

MATERIAL BALANCE		NUMBER OF ITEMS	MASS (g)	
BEGINNING INVENTORY				
INCREASES	RECEIPT	INTERNATIONAL		
		DOMESTIC		
	OTHER			
	TOTAL INCREASES			
DECREASES	SHIPMENT	INTERNATIONAL		
		DOMESTIC		
	AUTOMATIC TERMINATION			
	OTHER			
	TOTAL DECREASES			
BALANCE ADJUSTMENT				
BOOK INVENTORY - PHYSICAL INVENTORY				
ENDING INVENTORY				

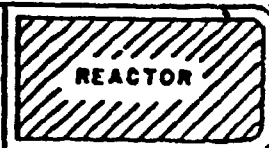
MATERIAL DISTRIBUTION	NUMBER OF ITEMS			MASS (g)		
	TUBE	ROD	SCRAP	TUBE	ROD	SCRAP
STORAGE AREA						
PROCESS AREA						
OTHER						

REMARKS

SIGNATURE

Safeguards Division Officer	Date
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MATERIAL BALANCE REPORT - MBR
COMISSÃO NACIONAL DE ENERGIA NUCLEAR - BRAZIL



FACILITY _____	ACCOUNTING AREA _____	REPORTING PERIOD _____	REPORT Nº _____
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MATERIAL _____	Unit. () G () Kg	AGREEMENT _____
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MATERIAL BALANCE		NUMBER OF ITEMS	U TOTAL	U 235	Pu TOTAL
BEGINNING INVENTORY					
INCREASES	RECEIPT	INTERNATIONAL			
		DOMESTIC			
	PRODUCTION (Pu ONLY)				
	OTHER				
	TOTAL INCREASES				
DECREASES	SHIPMENT	INTERNATIONAL			
		DOMESTIC			
	NUCLEAR LOSS (BURN UP)				
	OTHER				
TOTAL DECREASES					
ROUNDING ADJUSTMENT					
ENDING INVENTORY					

MATERIAL DISTRIBUTION	NUMBER OF ITEMS	U TOTAL	U 235	Pu TOTAL
FRESH FUEL STORAGE				
REACTOR CORE				
IRRAD. FUEL STORAGE				

REMARKS _____

SIGNATURE _____

Safeguards Division Officer

Date _____

