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ABBREVIATIONS AND DEFINITIONS

ABBREVIATION	DEFINITION
ACI	American Concrete Institute
ANSI	American National Standards Institute
ALARA	As Low As Reasonably Achievable
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
ATWS	Anticipated Transient Without a SCRAM
BOP	Balance of Plant
BTP	Branch Technical Position
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owner's Group
CA	Heating (Test Condition)
CFE	Comisión Federal de Electricidad (Federal Commission of Electricity).
CFR	Code of Federal Regulations
CIRO	Comité Independiente de Revisiones de Operaciones (Independent Operation Review Committee)
CLV	Central Nucleoeléctrica Laguna Verde (LVNPS)
CNA	Comisión Nacional del Agua (National Commission of Water)
CNSNS	Comisión Nacional de Seguridad Nuclear y Salvaguardias (National Commission of Nuclear Safety and Safeguards)
CONASUPO	Comisión Nacional de Subsistencias Populares (National Commission of Popular Supplies)
COPERE	Comité de Planeación de Emergencias Radiológicas Externas (External Radiological Emergency Planning Committee)
CROS	Comité de Revisión de Operaciones en el Sitio, (Operational Review On-Site Committee)
CSN	Convención Sobre Seguridad Nuclear (Convention on Nuclear Safety)
DID	Defence in Depth
DOF	Diario Oficial de la Federación (Official Gazette)
EAL	Emergency Action Levels
ECCS	Emergency Core Cooling Systems
EDG	Emergency Diesel Generators
EOP	Emengency Operation Procedures
ESPEC	Especificaciones de Diseño (Design Specifications)
ETO	Especificaciones Técnicas de Operación (Technical Specifications for Operation)
FSAR	Final Safety Analysis Report

GCN	Gerencia de Centrales Nucleoeléctricas (Nuclear Plant Management)
GDV	Gobierno del Estado de Veracruz (State Government of Veracruz)
GE	General Electric
GESO	Grupo de Evaluación de Seguridad Operativa (Operational Safety Assessment Review Team OSART)
HIC	High Integrity Containers
IAEA	International Atomic Energy Agency
IEEE	Institute of Electrical and Electronic Engineers
IIE	Instituto de Investigaciones Eléctricas (Institute for Electric Research)
IDI	Informe de Deficiencia Importante (Important Deficiency Report)
INEN	Instituto Nacional de Energia Nuclear (National Institute for Nuclear Energy - later ININ)
INES	International Nuclear Event Scale
ININ	Instituto Nacional de Investigaciones Nucleares (National Institute for Nuclear Research)
INPO	Institute of Nuclear Power Operations
IPE	Individual Plant Examination
IRS	Incident Reporting System
ISPE	Informe de Seguridad de Primera Etapa (Preliminary Safety Analysis Report)
ISSE	Informe de Seguridad de Segunda Etapa (Final Safety Analysis Report)
LER	License Event Report (Reporte de Evento de la Central)
LOCA	Loss Of Coolant Accident
LVNPS	Laguna Verde Nuclear Power Station
LWR	Light Water Reactor
MCR	Main Control Room
NAE	Niveles de Acción de Emergencia (Emergency Action Levels)
NEA	Nuclear Energy Agency
NER	Notificación de Evento Reportable (Reportable Event Notification)
NOM	Norma Oficial Mexicana
NPP	Nuclear Power Plants
NSSS	Nuclear Steam Supply System
NUMARC	Nuclear Utility Management and Resource Council
NUSS	Nuclear Safety Standards
ODCM	Off Site Dose Calculation Manual
OE	Procedimientos de Operación de Emergencia (Emergency Operation Procedures)
OECD/NEA	Organisation for Economic Co-operation and Development (Nuclear Energy Agency)

OSART	Operational Safety Assessment Review Team
PyD	Puente y Desconexión (Jumper and Disconnection)
PCPA	Paquete de Cambio de Punto de Ajuste (Set Point Change Package)
PEIR	Preliminary Environmental impact Report
PERC	Paquete de Evaluación de Reemplazo de Componentes (Component Replacement Evaluation Package)
PERE	Plan de Emergencia Radiológica Externa (External Radiological Emergency Plan)
PEMEX	Petróleos Mexicanos (The Mexican Petroleum Company)
PERC	Paquete de Evaluación de Remplazo de Componente (Component Replacement Evaluation Package)
PGCC	Plan de Garantia de Calidad de Construcción (Quality Assurance Construction Plan)
PGCO	Plan de Garantia de Calidad de Operación (Quality Assurance Operation Plan)
PI	Performance Indicators
PM	Paquete de Modificación (Modification Package)
PMDT	Paquete de Modificación Documental Técnica (Technical Documentary Modification Package)
PMM	Paquete de Modificación Menor (Minor Modification Package)
PMMD	Paquete de Modificación Menor Documental (Documentary Minor Documentation Package)
PMRC	Paquete de Modificación por Reemplazo de Componente (Component Replacement Modification Package)
PRA	Probabilistic Risk Analysis
PROC	Procedimientos (Procedures)
PROFEPA	Procuraduría Federal de Protección al Ambiente (Federal Department of Environmental Protection)
PSA	Probabilistic Safety Analysis (Análisis Probabilístico de Seguridad)
PSAR	Preliminary Safety Analysis Report
QA	Quality Assurance
RDCC	Revisión de Diseño del Cuarto de Control (Control Room Design Review)
REA	Event Report To Be Analysed (Reporte de Evento a Analizar)
RG	Regulatory Guide
RTP	Rated Thermal Power
RW	Radwaste
SBO	Station Black-Out
SCRAM	Sudden Control Rod Action Movement

SCT	Secretaría de Comunicaciones y Transportes (Secretariat of Communications and Transportation)
SE	Secretaria de Energia (Secretariat of Energy, previously: SEMIP)
SEDENA	Secretaría de la Defensa Nacional (Secretariat of Defence)
SETECO	Secretario Técnico del COPERE (Technical Secretary of the External Radiological Emergency Plan Committee
SG	Secretaria de Gobernación (Secretariat of the Interior)
SIIP	Sistema Integral de Información de Proceso (Process Information Integral System)
SM-AM	Secretaría de Marina y Armada de Mexico (Secretariat of the Navy)
SMT	Solicitud de Modificación Temporal (Temporary Modification Request)
SPCI	Sistema de Protección Contra Incendio (Fire Protection System)
SPDS	Safety Parameter Display System
SS	Secretaria de Salud (Secretariat of Health)
SSC	Estructuras, Sistemas y Componentes (Structures, Systems and Components)
SSE	Safe Shutdown Earthquake
SSEFPS	Safe Shutdown Earthquake Fire Protection System
ST	Verificación de Sistemas del Sistema de Suministro de Vapor Nuclear (Verification of Systems of the Nuclear Steam Supply System)
TMI	Tree Mile Island Plant
US	United States
USA	United States of America
USNRC	United States Nuclear Regulatory Commission
USQ	Unreview Safety Question
VA	Open Vessel (Test Condition)
VS	Verificación de Sistemas de Balance de Planta (Plant Balance System Verification)
WANO	World Association of Nuclear Operators

INTRODUCTION AND ELABORATION OF THE NATIONAL REPORT

In order to satisfy the obligations resulting from the Convention on Nuclear Safety (CSN, hereinafter denominated the "Convention") ratified by the Mexican United States for, this National Report is presented to signatory Member States of such Convention. The report is based on guidelines (CNS/PREP/FINAL DOCUMENT 2) proposed to this effect as a result of the preliminary meetings that took place at the headquarters of the IAEA in Vienna, Austria.

This National Report represents a summary of documents and activities performed up to date related to the only nuclear power plant existing in Mexico: Laguna Verde Nuclear Power Station.

Basically, this National Report is divided into two parts.

- The main body of the report describing how each Convention obligation is satisfied (Articles 6 to 19), and

- The Appendix referenced in the main body of the report, that summarizes in its annexes the series of Laws and Regulations supporting the nuclear and radiological activities within the country.

This report was prepared following the instructions of the *Secretaria de Energía: SE*, by the *Comisión Nacional de Seguridad Nuclear y Salvaguardias: CNSNS,* and the *Comisión Federal de Electricidad: CFE.*

By means of this document, the Mexican Government plainly recognizes its commitment to continue applying all basic principles on nuclear safety, radiological safety and physical security to its national nuclear installations in order to maintain and increase such level of safety.

Mexico believes that from the information given in this document it can be concluded that it fully complies with the obligations of the Convention.

NOTE: *This document was written originally in Spanish. In case of inconsistency or doubt, the reader must be guided by the Spanish version.*

ARTICLE 6. EXISTING NUCLEAR INSTALLATIONS

6.1 NUCLEAR INSTALLATIONS IN THE MEXICAN UNITED STATES

For purposes of the Convention on Nuclear Safety, there is a nuclear installation within Mexico: Laguna Verde Nuclear Power Plant Station. It consists of two Boiling Water Reactor (BWR) units having a net electrical power output of 675 Mwe each one.

The installation is located 75 kilometres North of the most important population centre within the State of Veracruz, the Port of Veracruz, at a point that could be considered the centre of the Gulf of Mexico.

The most important design characteristics of the installation are briefly described in Article 18 of this National Report.

Laguna Verde Nuclear Power Station was built and is operated by *the Comisión Federal de Electricidad* – CFE (Federal Commission of Electricity). By law, it is the only Electricity Company in the entire nation allowed to generate electricity through the use of nuclear energy. CFE is a decentralised public organism of the *Administración Pública Federal* (Federal Public Administration) and it is co-ordinated administratively and politically by the *Secretaria de Energía* – SE (Secretariat of Energy).

As described in Article 7 of this National Report, Mexico has an adequate legislative framework that makes of safety a priority in the utilisation of nuclear energy in all its phases and forms. Likewise, this legislation foresees the existence of a National Regulatory Body, the *Comisión Nacional de Seguridad Nuclear y Salvaguardias* (CNSNS) which has sufficient faculties and authority to dictate standards on nuclear and radiological safety matters, and look after their application. Also CNSNS has the authority to penalise any wrongdoing to comply with these standards.

This Regulatory Body is independent of the utility, CFE. Administratively, CNSNS is a semi-autonomous organism dependent of the SE from where its administrative authority over CFE arises, since it occupies a superior level in the Federal Public Administration.

As described in Article 7, the decision was made to apply USA regulations to LVNPS, which is the country of origin of the Nuclear Steam Supply System. According to such regulations, besides the general safety evaluations that enable the authorisation of the construction and later on the operation of a nuclear plant, as it is described in the same Article 7, a continuous safety assessment is performed to LVNPS, as it is described in Article 14 of this National Report.

Regardless of the above, CNSNS established the execution of a quinquennial overall safety assessment (Periodic Safety Assessment) for each LVNPS unit as a condition for the Operation License. After LVNPS-1 five years completion of operation, there were only established the technical and administrative bases to execute this overall safety assessment to be carried out initially within the first 10 years of operation and later on every 5 years.

Just as it may be deduced from the information given in this National Report, the Regulatory Body has maintained a continuous supervision of matters important to safety since the beginning of LVNPS' construction. And, it has anticipated as part of the Operation License, the development and implementation of a program for the continuous improvement of the installation's safety levels (see Article 14, Section 14.4 of this National Report).

6.2 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

According to what is generically described in this Article and in provisions in other Articles conforming this National Report, to satisfy the obligations derived from the Convention on Nuclear Safety, it is considered that in the Mexican United States there are laws, regulations and means for the adequate surveillance and supervision by a Regulatory Body which is independent of the utilities, and therefore ensures that the operation of Laguna Verde Nuclear Power Station does not represent an undue risk to public health or safety, neither to the environment.

In relation to the specific compliance with the obligations of the Convention on Nuclear Safety, the level of satisfaction attained for each one of such obligations is described in subsequent Articles.

The conclusion reached from the objective existing evidence, and a summary of which is given in this Report, is that Laguna Verde Nuclear Power Station presents a matching level of safety to that of similar types of plants in countries more developed than Mexico. Up to now, there are no conditions that could be identified as adverse to a safe operation and therefore, there is no plan to anticipate the installation's shutdown prior to the completion of its lifetime. However, this last affirmation is subject to a continuous evaluation process and to a quinquennial overall evaluation to the safety of the installation.

ARTICLE 7. LEGISLATIVE AND REGULATORY FRAMEWORK

7.1 INTRODUCTION

In this article it is presented a resume of the Legal, Standards and Rules framework to support the Mexican institution related with nuclear and radiological safety and the licensing process for nuclear power plants by the Regulatory Body. It must be understood that it is not the intention of this article to reproduce in full extension the Laws and Rules cited within; whatsoever additional information is presented in the Appendix and Annexes of this National Report, with the objective to provide a more wide vision from the national regulatory framework.

7.2 NATIONAL REQUIREMENTS AND PROVISIONS

The legislative and regulatory framework under which the principles and obligations deriving from the Convention on Nuclear Safety are supported, is based on the Political Constitution of the Mexican United States (hereinafter denominated “the Constitution”) from which a series of laws, regulations and standards are derived.

The Constitution, in its Article 27, establishes that nuclear energy must be only used for pacific applications and that the exploitation of nuclear fuels for the generation of nuclear energy as well as the regulation of its application to all areas corresponds to the Nation.

In accordance with the Constitution, the generation of electric power by nuclear means is considered a strategic area and the public sector is exclusively responsible of such activity. Consequently, the Mexican State has created the organisms and companies necessaries for the efficient handling of such strategic areas under its responsibility.

Likewise, the Constitution in its Article 89, Fraction I empowers the President of the Republic to *“promulgate and execute the laws issued by the Congress of yhe Union, providing the administrative support for allowing its exact observance”.* It is in this sense that the Federal Executive, through the Secretariat of Energy, regulates and supervises compliance with the provisions on matter of nuclear safety and radiological protection, attribution based on Article 33, Fraction X of the Organic Law of Federal Public Administration.

Moreover, this Law grants to the Secretariat of Energy*,* the warrant to exert the rights of the Nation on nuclear energy matters as well as regards to the utilisation of products and natural resources required to generate, transmit, transform, distribute and supply electricity having the objective to render public services and *“to direct the activity of the state entities whose objective is related to the*

generation of electric and nuclear energy in attachment to the law on ecological matters" (Article 33, Fractions II and III, respectively).

By virtue of Article 17 of the Organic Law on Federal Public Administration, Mexican State Secretariats are authorised to count on semi-autonomous administrative organisms hierarchically subordinated to the same in order to offer more effective attention as well as to settle affairs of competence efficiently. These organisms shall have specific faculties to resolve on the matter and within national territory which is determined in each case in accordance with legal provisions.

This Article supports from an administrative point of view, the creation of the *Comisión Nacional de Seguridad Nuclear y Salvaguardias "CNSNS"* (hereinafter denominated "the Commission"). Being a semi-autonomous organism dependent of the Secretariat of Energy, it operates as the Regulatory Body responsible for overlooking nuclear safety, radiological safety and physical security as well as safeguards within the national territory.

The Regulatory Law of the Constitutional Article 27 on Nuclear Matters (hereinafter denominated "the Nuclear Law") entered into effect on February 5, 1985, and awards the Federal Electricity Commission (*Comisión Federal de Electricidad: CFE)* in an exclusive manner, the faculty for generating electricity from the use of nuclear fuels. It also corresponds to this institution, the design and construction of nuclear power plants taking into account the opinion of the Instituto Nacional de Investigaciones Nucleares: ININ (National Institute for Nuclear Research). The Nuclear Law also establishes that the utilisation of nuclear reactors for non-energetic purposes shall only be taken up by the public sector and by universities, institutes and research centres authorised according to the Law.

CFE, upon being a parastate decentralised organisation of the Public Administration, has legal and patrimonial faculties of its own according to provisions foreseen in Article 45 of the Organic Law of Federal Public Administration.

As established in Article 17 of the Nuclear Law, being that the nuclear fuel is property of the Nation, the Federal Executive may only authorise its use under the terms settled by this Law and continuously under surveillance of CNSNS.

The Nuclear Law establishes in its Article 19 that *"safety is the prime importance for all activities involving nuclear energy and it should be considered during planning, design, construction and operation up to the definite shutdown and decommissioning of nuclear and radioactive installations as well as in the disposition and final fate of all its wastes".*

The Nuclear Law defines nuclear safety as the series of actions and measures lead to avoid nuclear equipment, material and installations as well as their functioning from producing a risk to the health of man and there property or damage to the quality of the environment (Article 20). It also defines as an objective of radiological safety *"to protect workers, the population and their property, and the environment in general, through the prevention and containment of the effects that could result from exposure to ionizing radiation"* (Article 21).

The Nuclear Law establishes the difference between a nuclear and a radioactive installation. A nuclear installation is defined as *"the installation in which nuclear fuel or material is manufactured, processed, used, reprocessed or stored".* A radioactive installation is an "installation in which radioactive material or equipment containing it is produced, *manufactured, stored or used ; or in which radioactive wastes are treated, conditioned or stored"* (Article 3, Fraction II and III, respectively).

Besides, the Nuclear Law establishes that nuclear and radioactive installations must count with nuclear safety systems to satisfy the requirements established to this respect in other ordinances and regulatory provisions of such Law (Article 22 Paragraph Two). In the same way, it anticipates in its Article 27, Paragraph Three that "*nuclear installations shall have the required nuclear and radiological safety personnel, and that the head of the corresponding public agency shall be responsible for the strict compliance with the applicable regulations".*

Article 23 of the Nuclear Law contemplates that when aware of an incident involving nuclear materials or fuels, radioactive materials or equipment containing the same or of conditions that could give rise to such an incident, the Commission shall be notified immediately. In such cases, the Commission may order or carry out the removal of equipment, implements or materials that imply some kind of risk, so that they may be deposit in places with the proper safety conditions.

The Nuclear Law establishes bases for implanting a system for awarding licenses both for nuclear and radioactive installations as well as for the suspension of such licenses in the event of non-compliance with some of the established conditions.

It is an indispensable requirement for nuclear and radioactive installations to satisfy the requirements established within the regulatory provisions of the Nuclear Law for siting (selection, survey and evaluation of location), design, construction, operation, modification, suspension of operations, definite shutdown and decommissioning. These requirements shall be determined attending the risk related to operations in which radioactive material is involved and as a function of the isotope activity and radiotoxicity present (Article 25).

According to provisions established in Article 26 of the cited Law, the actual Secretariat of Energy (former Secretariat of Energy, Mines and Parastate Industry) has the empower to award authorisations for siting, design, construction,

operation, modification, suspension of operations, definite shutdown and decommissioning of nuclear and radioactive installations. Similarly, it is established in this Article that authorisations for the construction and operation of such installations shall have a fix validity and their renovation, modification, suspension or cancellation shall be ruled by the respective regulations.

Authorisations for the construction and operation of nuclear installation shall be awarded only when accredited by presenting pertinent information on how the safety objectives are going to be reached and what procedures and methods shall be used during the siting, design, construction, operation, modification, definite shutdown and decommissioning phases including the corresponding Radiological Emergency Plan. Also, information must be provided on the installation's environmental impact (Article 28 of the Nuclear Law). Besides, authorisation is required for handling, transportation, storage and custody of nuclear materials and fuel, radioactive material and equipment containing them and shall be ruled by regulatory provisions in the Nuclear Law (Article 30).

For the license awarding process, the Nuclear Law anticipates that the Commission must forward an opinion on siting, design construction, operation, modification, suspension of operations, definite shutdown and decommissioning of nuclear installations, prior to authorisation by the Secretariat of Energy, (Article 50 Fraction IV).

7.3 REGULATORY AUTHORITY

The Nuclear Law empowers the CNSNS as the organism responsible for the revision, evaluation and authorisation of the bases for siting, design, construction, operation, modification, suspension of operation, definite shutdown and decommissioning of nuclear and radioactive installations as well as all related to the fabrication, use, handling, storage, reprocessing and transportation of nuclear materials and fuels, radioactive materials and equipment containing them; and for the processing, conditioning, release and storage of radioactive wastes and any disposal of them (Article 50 Fraction III).

7.4 LICENSING PROCESS

The Commission has established the so-called "Licensing Process" for the awarding of construction permits and operation licenses. It consists of two stages and initiates with the formal delivery of the construction permit application accompanied by a description of the features and safety systems the installation will have to assure it will not represent an undue risk. Among the documents of support for the request are the following:

a) Preliminary Safety Analysis Report (PSAR)
b) Preliminary Environmental Impact Report (PEIR)

The Preliminary Safety Analysis Report or ISPE (Informe de Seguridad de Primera Etapa) describes the plant, specifying the standards to be followed for the design, construction and operation of the plant as well as Quality Assurance plans to be applied during the installation's lifetime. The PSAR demonstrates that the plant does not affect the environment in a significant manner.

The PSAR must contain a generic description of the following aspects:

1. General features of the plant
2. Site characteristics
3. Design criteria
4. Reactor
5. Reactor cooling systems
6. Safety features
7. Instrumentation & Control
8. Electrical systems
9. Auxiliary systems
10. Steam systems and power conversion
11. Radioactive waste management
12. Radiological Protection
13. Operation organisation
14. Initial testing and operation
15. Accident analysis
16. Technical specifications
17. Quality assurance

7.5 ASSESSMENT SYSTEM AND REGULATORY INSPECTIONS

The role of the Commission consists in reviewing that the design, construction and operation criteria are in accordance with its own codes and regulations and those adopted from the nuclear industry.

An example of the most important aspects revised during this phase are those in relation to the site where the installation is to be constructed. That includes parameters that may affect the design, such as the site seismology, severe meteorology (probable maximum hurricane) as well as other aspects of interest. Information related to the distribution of the population, current and future, is reviewed.

Review of reports by the Regulatory Body includes the formulation of questions in order to eliminate concerns existing within the documents, specify modifications to

the design and impose additional requirements in the event that the existing ones are considered to not guarantee safety. After the assessment of these reports, a technical statement is forwarded to the Secretariat of Energy (SE) for issuance of the Construction Permit. This statement includes recommendations and conclusions on the installation's safety.

During construction, the Commission overlooks, by performing inspections and audits, that the plant is constructed in accordance with the provisions established in the safety report and in the construction permit as well as with specific conditions.

Inspections and audits performed by the Regulatory Body are aimed to verify the efficiency of the plant's internal control systems and organisations, including the Quality Assurance organisation as well as the direct verification of the correct performance of activities.

Irregularities detected are analysed in order to define their importance and according to formal procedures, these are followed-up until proved and documented corrective measures are implemented to ensure there non-recurrence.

Once the detailed design of the installation is finalised, the operation license can be demanded. For this, another detailed report is to be sent to CNSNS on the plant's safety. The report is known as the Final Safety Analysis Report (FSAR) and it contains the same information as the preliminary report (PSAR), only that the information doesn't have a generic character but specific of the installation. Likewise, a Final Environmental Impact Report is prepared in which the environmental surveillance program is included. It is to be maintained during the useful lifetime of the plant, to keep watch over the effect it has on the environment, having as a basis all measures performed during, at least, five years prior to the plant's operation.

The CNSNS review of the FSAR includes the evaluation of real operation conditions. Acceptance criteria applied to pre-operational tests, start-up tests (as well as how these impact on the analysis of accidents) and during commercial operation (in the first report these were generic) and proposed technical specifications are also evaluated. Once the Commission approves these operational technical specifications, they become part of the Operation License that rules over the installation's operation. Also, one assessment is made of the scope of the proposed activities to be developed in connection with the inspections to components important to safety during the installation's lifetime (in-service inspection) and it is verified that operation personnel is well trained.

When construction progress is such that safety-related equipment and component tests may be initiated, the Commission witnesses the execution of the tests and analyses the results in order to verify that the equipment satisfies design criteria.

The original version of the FSAR shows the recently completed detailed design of the plant. The FSAR is continuously updated until the plant is put into service, and thenceforth, in a periodic way, to reflect always the detailed “as built” description of the plant.

To provide a foundation for the awarding of the operation license, the Commission prepares a technical statement that includes recommendations and conclusions. This statement is submitted to the SE, whom based on the recommendations, proceeds to award or not the license.

Furthermore, the Commission continues its independent supervision during the whole operational life of the plant to verify compliance with the approved safety procedures and practices.

7.6 ASSURANCE OF COMPLIANCE WITH SUSPENSION, MODIFICATION AND REVOCATION MEASURES

In the event of an imminent risk or danger for personnel at a nuclear or radiological installation or for the general public, the Commission, by orders of the Secretariat of Energy, may provisionally occupy a nuclear installation (Article 34 of the Nuclear Law). Similarly, the Commission may order and execute as a preventive measure, the provisional, partial or total shutdown of radioactive or nuclear installations as well as effects contaminated, settling the periods to correct deficiencies and anomalies. In the case that those deficiencies or anomalies are not corrected within the period granted, the Commission with the help of the corresponding technical resolution shall proceed to its definite shutdown.

The safety measures above mentioned may apply to those cases in which construction, adaptation or preparation authorisations for an installation are cancelled or suspended, therefore, such actions shall not be continued. Likewise, these measures shall be carried out in those cases where activities involving nuclear materials and fuels, radioactive materials and equipment containing them are performed, without the required authorisation, permit or license (Article 35 of the Nuclear Law).

“Suspension and cancellation of authorisations granted as well as fines and safety measures shall be imposed by the Secretariat of Energy, Mines and Parastate Industry, through the National Commission on Nuclear Safety and Safeguards on the basis of the results of the checks, audits, verifications and inspections effected and bearing in mind the evidence and pleadings of the interested parties. In every case the decision handed down in this regard shall be motivated by and grounded on the provision of this law and its regulations, and other applicable ordinances” (Article 36 of the Nuclear Law*).*

As established in Article 32 of the Nuclear Law, nuclear and radioactive installations must be the object of inspections, audits, verifications and examinations by the Commission to confirm that nuclear and radiological safety conditions comply and observe legal provisions on such matter.

The Commission, according to the results of these inspections and audits, shall issue a statement denoting the deficiencies and anomalies that may have been detected as well as the terms for the corrections to be carried out. Subsequently, the Commission shall supervise that the measures adopted for correcting the anomalies and deficiencies detected satisfy established provisions (Article 33 Nuclear Law).

Articles 37, 38 and 39 of the Nuclear Law establish a penalty system to be applied in the event of violation to the precepts arising from the same and from regulatory provisions, regardless of whether such infraction is a cause for suspension, cancellation or revocation of the license awarded.

In addition to the Nuclear Law, there is the General Law of Ecological Equilibrium and Environmental Protection that became effective on January 29, 1998 and its Decree through which the same is reformed added and derogated becoming effective on December 14, 1996. Chapter VII “Nuclear Energy” of this Law (Article 154) establishes that the Secretariat of Energy and the Mexican Nuclear Regulatory Commission “*shall supervise that ... the use of nuclear energy and in general all activities related to the same are performed in adherence to the Official Mexican Norms on nuclear and radiological safety… of nuclear installations… in a manner to avoid human health risks and to ensure preservation of the ecological equilibrium and environmental protection…”.*

Such Law gives attributions to the *Secretariat of Environment, Natural Resources and Fishing* for the execution of an environmental impact evaluation. However, it is important to underline that the evaluation of the environmental effect on nuclear installations, from a radiological safety point of view, corresponds to the Commission.

7.7 LAWS, REGULATIONS AND REQUIREMENTS RELATED TO NUCLEAR SAFETY

Mexico has committed itself to apply safety and health protection measures observed in *Informative Circular No. 18/Rev. 1,*, upon signing an Agreement with the International Atomic Energy Agency (hereinafter denominated “the Organism”) whereby, the Organism would render support for the execution of a project related to a nuclear power plant (INFCIRC/203). Hence, Mexico applies and is committed to comply with the Basic Safety Standards of the Organism and with the safety conditions recommended in parts corresponding to the Organism’s practical guides. Guides related to the “*exploitation of nuclear plants without risk*” and to the

"*design and construction of reactors without risk*", including the Organism guides related to the "*organisation of regulatory activities for power reactors*" and the "*siting of reactors from a seismic land characteristic point of view*".

Furthermore, it is important to point out that from the beginning of the Laguna Verde project, governmental authorities decided that apart from applying the Organism's recommendations, to apply the regulatory standards of the country of origin of the steam supply system. This requirement appears in Condition No. 3 of the Operation License for both Laguna Verde Units. For this reason, Title 10 "Energy" of the Code of Federal Regulations of the United States of America was established as a regulatory requirement as well as all industrial standards and guides deriving from such Title. In a similar manner, US Regulatory Guides issued by the Nuclear Regulatory Commission have been adopted. A list of Regulatory Guides adopted and adapted, applied in Mexico and related with Nuclear Safety Convention obligations, is included in the Annex IV and the main purpose of these guides is mentioned.

Radiological Safety related aspects are regulated based upon the General Regulation for Radiological Safety in force since November 23, 1988. This regulation establishes requirements on the Dose Limit System (Title Three), on the Licensee, Head of Radiological Safety and Personnel Occupationally Exposed (Title Seven), on Radiological Accidents and Preventive or Safety Measures (Title Nine), on Authorisations, Permits, Licenses (Title Ten) and Administrative Procedures (Title Eleven), including inspections, audits, verifications and examinations as well as penalties and recourse of reconsideration.

There is also the Regulation for Road Transportation of Hazardous Materials and Residues, in force since April 8, 1993. Provisions of this Regulation apply to the transportation of Class No. 7 Materials "Radioactive Materials" in which the *Secretariat of Communications and Transports* is the competent authority. However, this does not exclude the faculty of the *Secretariat of Energy* , through the Commission, to award authorisations to transport nuclear and radioactive materials.

The Law on Civil Liability for Nuclear Damages is also part of the Mexican legislation. It has been in force since January 1, 1975. This Law establishes an indemnity financial system for people affected by a nuclear accident. As indicated in this Law, the operator is responsible for the damage occasioned by all nuclear accident that may occur within an installation under his/her responsibility. To this effect, the Nuclear Law establishes that the Federal Electricity Commission is the only organisation authorised to generate electricity, making use of nuclear fuels (Article 15).

International Treaty's are included in the Mexican Legislative Framework. Once approved by the Senate of the Republic, these Treaties' acquire the character of a

Mexican Law. To this effect, it is important to mention that Mexico forms part of the following Conventions:

Convention on the Prevention of Sea Contamination from Pouring Wastes and Other Materials. It came into effect for Mexico on May 27, 1974.

Convention on Physical Security for Nuclear Materials. It became effective in Mexico as of June 4, 1988.

Convention on Assistance in the Event of a Nuclear Accident or Radiological Emergency. It became effective in Mexico as of June 10, 1988.

Convention on Prompt Notification of Nuclear Accidents. It became effective in Mexico as of June 10, 1988.

Convention on Civil Liability for Nuclear Damages. It became effective in Mexico as of July 25, 1989.

Additionally, there are several technical standards that regulate more specific aspects. Such standards are mentioned into the second part of this national report, regarding of the legislative and regulatory framework.

7.7.1 Compendium of the National Legislative Framework

- Political Constitution of the United States of Mexico
- Organic Law of the Federal Public Administration
- Regulatory Law of the Constitutional Article 27 on Nuclear Matters (effective as of February 5, 1985).
- Law on Civil Liability for Nuclear Damages (effective as of January 1, 1975).
- General Law of Ecological Equilibrium and Environmental Protection (effective as of January 29, 1988). Decree by which it is reformed, added and derogated became effective as of December 14, 1996).
- Convention on the Prevention of Sea Contamination from Pouring Wastes and Other Materials (effective as of May 24, 1974).
- Convention on Civil Liability for Nuclear Damages (effective as of July 25, 1989).
- Convention on Physical Protection of Nuclear Materials (effective as of June 4, 1988).
- Convention on Technical Assistance in the Event of a Nuclear Accident or a Radiological Emergency (effective as of June 10, 1988).
- Convention on the Prompt Notification of Nuclear Accidents (effective as of June 10, 1988).
- Convention on Nuclear Safety (effective as of October 24, 1997).

- Agreement with the IAEA for the application of safeguards in relation to the Treaty of the Proscription of Nuclear Weapons in Latin America and the Treaty of Non-Proliferation of Nuclear Weapons (effective as of March 29, 1973).
- Agreement on Privileges and Immunities of the IAEA (effective as of December 29, 1983).
- General Regulations on Radiological Safety (effective as of November 23, 1988.
- Regulation on Road Transportation of Hazardous Materials and Waste (effective as of April 8, 1993).
- Official Mexican Standard NOM-001-NUCL-1994 related to dose calculation factors (effective as of October 29, 1994).
- Official Mexican Standard NOM-004-NUCL-1994 related to the classification of radioactive waste (effective as of March 21, 1994).
- Official Mexican Standard NOM-005-NUCL-1994 related to annual limits of incorporation (LAI) and radionuclide concentrations deriving in the air (CDA) for occupationally exposed personnel (POE'S) (effective as of October 29, 1994).
- Official Mexican Standard NOM-006-NUCL-1994 related to criteria for the application of annual limits of incorporation for critical public groups (effective as of October 29, 1994).
- Official Mexican Standard NOM-008-NUCL-1994 related to radioactive material superficial contamination limits (effective as of March 24, 1994).
- Official Mexican Standard NOM-012-STPS-1993 related to safety and health conditions at centres where ionising radiation generating or emitting sources are handled, stored or transported, capable of producing contamination within the work environment (effective as of July 21, 1997).
- Official Mexican Standard NOM-018-NUCL-1995 "Methods for Determining the Concentration of Activity and Total Activity in Radioactive Waste Packages".
- Official Mexican Standard NOM-020-NUCL-1995 "Requirements for Radioactive Waste Incinerating Installations".
- Official Mexican Standard NOM-021-NUCL-1996 "Requirements for Lixiviation Tests for Solidified Radioactive Waste Specimens".

The Appendix in this National Report gives a brief explanation on the contents of each one of the Technical Standards. It also includes a scheme showing the hierarchisation of the Mexican Legislative Framework.

7.8 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

As observed in the preceding sections, the Mexican United States relies on a legislative and regulatory framework that adequately rules the safety of nuclear installations in the national territory.

The legal and regulatory framework anticipates the establishment and application of:

i) National requirements and provisions applicable to safety matters; including all related to the implantation of International Treaty's and Conventions signed on this subject;

ii) A license awarding system related to nuclear installations as well as the prohibition of the exploitation of a nuclear installation without a license;

iii) A nuclear installation regulatory evaluation and inspection system to verify compliance with applicable provisions and those stipulated in the licenses;

iv) Measures to ensure compliance with applicable provisions and those stipulated in licenses, inclusive suspension, modification or revocation measures.

Based on the aforementioned, it is concluded that obligations in Article 7 of the Convention on Nuclear Safety are entirely satisfied.

ARTICLE 8. REGULATORY BODY

8.1 INTRODUCTION

The Mexican Regulatory Body in matters of nuclear safety, radiological safety and safeguards is the *Comisión Nacional de Seguridad Nuclear y Salvaguardias* (National Commission of Nuclear Safety and Safeguards). CNSNS was stated from The Regulatory Law of the Constitutional Article 27, on January 26, 1979. According to provisions in section 7 of this National Report, Articles 13, 17, 18, 19, 23, 28, 29, 32, 33, 34, 35, 36, 37 and 50 of the Nuclear Law (see Annex I), amended in 1985, provided full support to its functions.

According to results of a strategic planning carried out by the Regulatory Body and initiated in 1993, the mission of CNSNS was defined as follows: ***To ensure that activities involving nuclear materials, radioactive materials and ionising radiation sources be carried out exclusively for pacific uses and with maximum safety for the public and environment, considering the current technological development.***

8.1.1 Historical Evolution of the Regulatory Body

So far the most important events in the history of the Mexican Regulatory Body (*Comisión Nacional de Seguridad Nuclear y Salvaguardias*) are as follows:

1955. On December 19, the National Commission for Nuclear Energy (*Comisión Nacional de Energía Nuclear)* was created as an organism responsible for managing all affairs related to nuclear resources, including the control and surveillance function for the nuclear energy generation.

1979. The Regulatory Law of the Constitutional Article 27 on Nuclear Matters was published on the 26th of January in the Official Gazette (*Diario Oficial de la Federación),* giving rise among other organisms, to the CNSNS as a semi-autonomous organism reporting to the Secretary of Patrimony and Industrial Development *(Secretaria de Patrimonio y Fomento Industrial).* Its primary objective is to impose the standards that apply to nuclear safety, physical security, radiological safety and safeguards for the operation of nuclear and radioactive installations to be performed with maximum safety for the country's inhabitants.

1985. The issue of the new Regulatory Law of the Constitutional Article 27 on Nuclear Matters dated February 4, that abrogates the one published on January 26 of 1979, assigns new attributions to the CNSNS which leads to the reorganisation of internal areas.

8.2 ATTRIBUTIONS AND RESPONSIBILITIES

According to provisions stipulated in The Regulatory Law of the Constitutional Article 27 on Nuclear Matters, specifically Article 50, the primary attributions of CNSNS are to establish and verify that the application of nuclear safety, radiological safety, physical security and safeguards standards and regulations for the operation of nuclear and radioactive installations as well as usage, handling, transportation and possession of nuclear and radioactive materials are carried out with a maximum of safety by direct users and for the public in general.

In view of such attributions, CNSNS performs several activities that include:

Elaboration of standards and regulations
Licensing of nuclear and radioactive installations
Quality Assurance and Environmental Radiological Surveillance Programs Assessment.
Audits, supervisions, technical visits, inspections and verifications to nuclear and radioactive installations.
Examination and licensing of nuclear installations operators.
Inspections and audits related to physical security and safeguards.
Issue of licenses and permits for the importation, use, transportation and storage of radioactive material.
Assessment and licensing of permanent radioactive waste repositories.
Take part in agreements for assistance and international co-operation.
Execution of research and development projects independently or in association with other regulatory bodies or research centres.

Figure 8.1 shows the position of CNSNS within the Federal Government energy sector.

8.2.1 Interrelation of the Regulatory Body with other Entities of the Nuclear Sector.

CNSNS establishes and maintains a close relationship with organisations that perform similar functions or whose co-operation and support is useful in the performance of its functions. Referring to the national scenario, the following organisations can be mentioned:

- **ININ National Institute for Nuclear Research *(Instituto Nacional de Investigaciones Nucleares***). Contractor of CNSNS to perform research on topics related to Probabilistic Safety Analysis within specific areas of External Events and the development of Improved Technical Specifications.
- **IIE Institute for Electric Research (Instituto de Investigaciones Eléctricas).** This institute has provided technical and scientific support,

including training on matters such as power systems, impact of the quality of the power supplied on safety systems, etc.

As part of the tasks for the evaluation and verification of the adequate preparation and execution of External Radiological Emergency Plan (PERE) for LVNPS, CNSNS has the authority to evaluate the behaviour of the following dependencies taking part of this Plan:

- Secretaria de Gobernación - SG (Secretariat of the Interior)
- Comisión Federal de Electricidad - CFE (Federal Electricity Commission)
- Secretaria de Comunicaciones y Transportes -SCT (Secretariat of Communications and Transportation)
- Secretaria de la Defensa Nacional -SEDENA (Secretariat of Defence)
- Secretaria de Marina y Armada de Mexico, SM-AM (Secretariat of Navy)
- Gobierno del Estado de Veracruz - GDV (State Government of Veracruz)
- Secretaria de Salud -SS (Secretariat of Health)
- Instituto Nacional de Investigaciones Nucleares - ININ (National Institute for Nuclear Research)
- Comision Nacional del Agua - CNA (National Commission of Water)
- Secretario Técnico del COPERE (Technical Secretary of COPERE, SETECO)
- Comisión Nacional de Subsistencias Populares (National Commission of Popular Supplies, CONASUPO)
- Procuraduría Federal de Protección al Ambiente (Environmental Protection Agency, PROFEPA)

In the International Context, agreements are maintained with the following organisations:

- IAEA (International Atomic Energy Agency). CNSNS maintains agreements, treaties and projects, primarily on technical and scientific co-operation.

- OECD/NEA (Organisation for Economic Co-operation and Development/Nuclear Energy Agency). CNSNS participates in the following committees: Steering Committee of the NEA, Nuclear Regulatory Activities Committee, Radiological Protection and Public Health Committee, Nuclear Science Committee and Safety of Nuclear Installations Committee (Group 2 – Cooling Systems Behaviour and Group 5 –Risk Assessment).

- US NRC (US Nuclear Regulatory Commission). CNSNS has signed agreements to exchange information on nuclear and radiological safety and for personnel technical training.

- Nuclear Safety Council of Spain. CNSNS holds a technical co-operation and operational experience information exchange agreement.

- Executive Secretary of Nuclear Matters of Cuba. CNSNS has a technical co-operation and operational experience information exchange agreement.

- Nuclear Safety Centre of Cuba. CNSNS has a bilateral covenant to exchange information on nuclear safety and training of personnel.

- Iberoamerican Nuclear Regulatory Forum. This Forum discusses the progress and improvements of national regulatory systems in Ibero American countries that have nuclear power plants in operation and under construction, propitiating technical co-operation and exchange of information on nuclear and radiological subjects.

8.3 REGULATORY BODY ORGANISATION

Figure 8.2 shows the actual organisational structure of CNSNS.

Responsibilities for each committee, division and department are provided below.

❑ General Direction

Ensure that all activities performed by users of nuclear material, radioactive material and ionising radiation sources are carried out with maximum safety for the public and environment, exclusively having pacific purposes and taking into account current technological development.

- **Emergency Committee:** This committee establishes the organisation and general response scheme of CNSNS which is to put into practise in the event of an emergency in any nuclear installation in the country, or upon accidents occurring in neighbour countries that may have consequences in the national territory. The Emergency Committee structure is shown in Figure 8.3.

- **Department of Legal and International Affairs:** Lay the foundation of and reviews the studies, acts, projects or conventions in which the Commission intervenes; passes judgement, advises, reviews, approves and assess legal ordinances related to its performance; establishes bases for formulating agreements of bilateral or multilateral co-operation with institutes and organisms of foreign countries.

❑ Division of Technology, Regulation and Services

Responsible for maintaining the human capability required by CNSNS to perform research and technological development. Co-ordinates the training and standards proposal in areas of nuclear and radiological safety to support the activities and functions of the Nuclear and Radiological Safety Divisions. Also provides technical services as required by such divisions.

- **Department of Regulations and Services.** Promotes and co-ordinates the elaboration of standards on nuclear safety, radiological safety, physical security and safeguards; systematising their revision in order for such standards to be maintained according to technological development. Define and establishes basic programs for training, taking into account CNSNS present and future needs as well as to maintain the document and computer services up-dated to support the development of activities of CNSNS divisions.

- **Department of Technology.** Provides elements of knowledge obtained through technological studies and research on nuclear safety, physical security, radiological safety and safeguards; putting them to the availability of internal interested units.

❑ **Radiological Safety Division**

Responsible for establishing and applying the licensing and surveillance standards for activities involving ionising radiation exposure in order for such activities to be performed under radiological safety conditions so not to affect the population, their property and/or the environment.

- **Assessment and Licensing Department.** Evaluates and rules activities related to the issue of licenses, authorisations and permits related to handling, use, possession, transfer, transportation, importation, exportation of radioactive material for medical or research purposes as well as to radioactive and nuclear fuel cycle facilities. In a similar way, evaluates and rules over radiological safety conditions and activities related to handling, use, possession and importation for industrial, medical and research facilities where X-ray and particle accelerators are used.

- **Department of Operational Supervision.** Verifies by means of inspections, audits, check-ups and examinations that authorised industrial and medical radioactive installations operate in accordance with the radiological safety standards in force and specific license conditions.

- **Environmental Radiological Surveillance Department.** Develops activities in support to regulations related to the environmental radiological surveillance from routine operations at nuclear and radioactive license

installations within the country and other anthropogenic and natural situations.

- **Nuclear Safety Division**

Co-ordinates the review and assessment of nuclear safety, radiological safety, physical security and safeguards technical reports of nuclear installations, verifying that such installations satisfy the safety standards imposed by the CNSNS.

- **Department of Assessment.** Evaluates safety levels at national nuclear installations by means of assessing safety reports and data generated by such installations. Verifies safety conditions at nuclear installations through evaluating the design basis, operation, and modification of systems, structures and components important to safety. Evaluates both national and international operational experience in order to evaluate its applicability to national installations so to prevent, or if that were the case, avoid its recurrence and improve the safety levels.

- **Department of Licensed Installations.** Permanently maintain updated the records and controls of special nuclear material in the country; evaluates and verifies the applicability of standards related to physical security of nuclear installations.

- **Department of Operational Verification.** Overlooks, through inspections and audits, the safety conditions during the operation of nuclear installations. Applies licensing exams to nuclear installation personnel; in a similar way, evaluates the performance of nuclear installations by comparing their behaviour with other installations of the same type as well as with the industry average.

  Laguna Verde Residence. Surveys on-site that the safety conditions of nuclear installations are maintained under all operating conditions, reporting any deviation to the CNSNS Headquarters .

8.4 HUMAN RESOURCES

The Regulatory Law of The Constitutional Article 27 on Nuclear Matters empowers CNSNS to have the human resources required to carry out its functions. To attend this faculty, the organisation needs to be integrated by personnel highly qualified in nuclear safety, radiological safety and physical security areas as well as in other disciplines that support fundamental activities of the Commission.

The great attention this Commission dedicates to training and updating of its personnel derives from the above, therefore it requires to impart courses and internal seminars and primarily through continuous on-the-job training. Likewise, personnel participate in as many technical events as possible, both national and international.

Currently, CNSNS has the following technical personnel:

	NUMBER	%
Specialised Technicians or equivalent.	18	15.04
Professionals with a Bachelor's Degree or equivalent	64	53,4
Professionals with a Master's Degree or equivalent	31	25.8
Professionals with a Ph. D.	7	5,8
TOTAL	120	100

8.4.1.1 Training of Personnel of the Regulatory Body

In order to ensure that the human resources of the Regulatory Body satisfy the technical requirements to perform efficiently, the institution has established two complementary programs. The first program is addressed to newly hired personnel and its purpose is to provide basic knowledge on topics relevant to the Regulatory Body functions. This program includes among others:

1) Seminar of Induction to CNSNS Activities
2) Course on Fundamentals of Nuclear Engineering.
3) Course on the Technology of Boiling Water Reactors
4) Course on Applied Radiological Protection

This program is mandatory, regardless of the professional and academic background of CNSNS personnel.

The purpose of the second program is to train personnel on advanced topics of their speciality, and furthermore keeping them updated as regards to recent developments and innovations of their fields. For this, personnel takes part in courses and workshops offered by national and international institutions. Part of this training is achieved thanks to agreements of co-operation with regulatory bodies from other countries, sponsored by the IAEA, USNRC and/or contracts signed for this purpose. Some organisations with which CNSNS has participated in this aspect include the Technical Training Centre of the USNRC in the USA; TECNATOM in Spain; Rensselaer Polytechnic Institute in the USA; Massachusetts Institute of Technology, USA; University of California, Santa Barbara, USA; Eidgenossische Technische Hochschule in Zurich, Switzerland; Sandia National

Laboratories in USA; Argonne National Laboratories, in the USA; Nuclear Regulatory Authority in Argentina; The Institute of Nuclear Engineers, in Great Britain; and, in Mexico, Polytechnic National Institute; Mexican Autonomous National University, State of Mexico Autonomous University, National Institute for Nuclear Research, Federal Electricity Commission (CFE), etc.

In addition, CNSNS encourages its personnel and their work teams to take part in diverse international programs developed by the IAEA and the Nuclear Energy Agency of the OECD,

8.4.2 Financial Resources

The financial resources of CNSNS are conformed as follows:

> 80% of the budget is constituted by the payment under covenant that the CFE covers for the concept of maintenance of the Operation License for both LVNPS1-& 2.; this includes the cost of assessment, inspection, audit and surveillance activities performed by the Regulatory Body to verify the operation of such nuclear power plant.
>
> 20% of the budget comes from funds assigned on behalf of the Federal Government by the Secretariat of Treasure.
>
> The annual budget for 1998 amounts to $ 4,000,000 US dollars.

In the event of a user of nuclear material, radioactive material or ionising radiation sources falls in a violation of a requirement, a fine is imposed and such amount is deposited directly to the Federation's Treasury.

Therefore, the resources granted to the Regulatory Body are considered sufficient to satisfy its responsibilities as assigned in the Nuclear Law.

8.4 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

As described in this Article, CNSNS is a semi-autonomous federal organism designated as the National Regulatory Organism in matters of nuclear safety and responsible for applying the legislative and regulatory standards described in Article 7 of this National Report. It has adequate authority, competence, financial and human resources to fulfil the responsibilities conferred by The Regulatory Law of the Constitutional Article 27.

Based on the aforementioned, it is concluded that the obligations contained in Article 8 of the CSN are fully satisfied.

POSITION OCCUPIED BY CNSNS IN THE FEDERAL GOVERNMENT

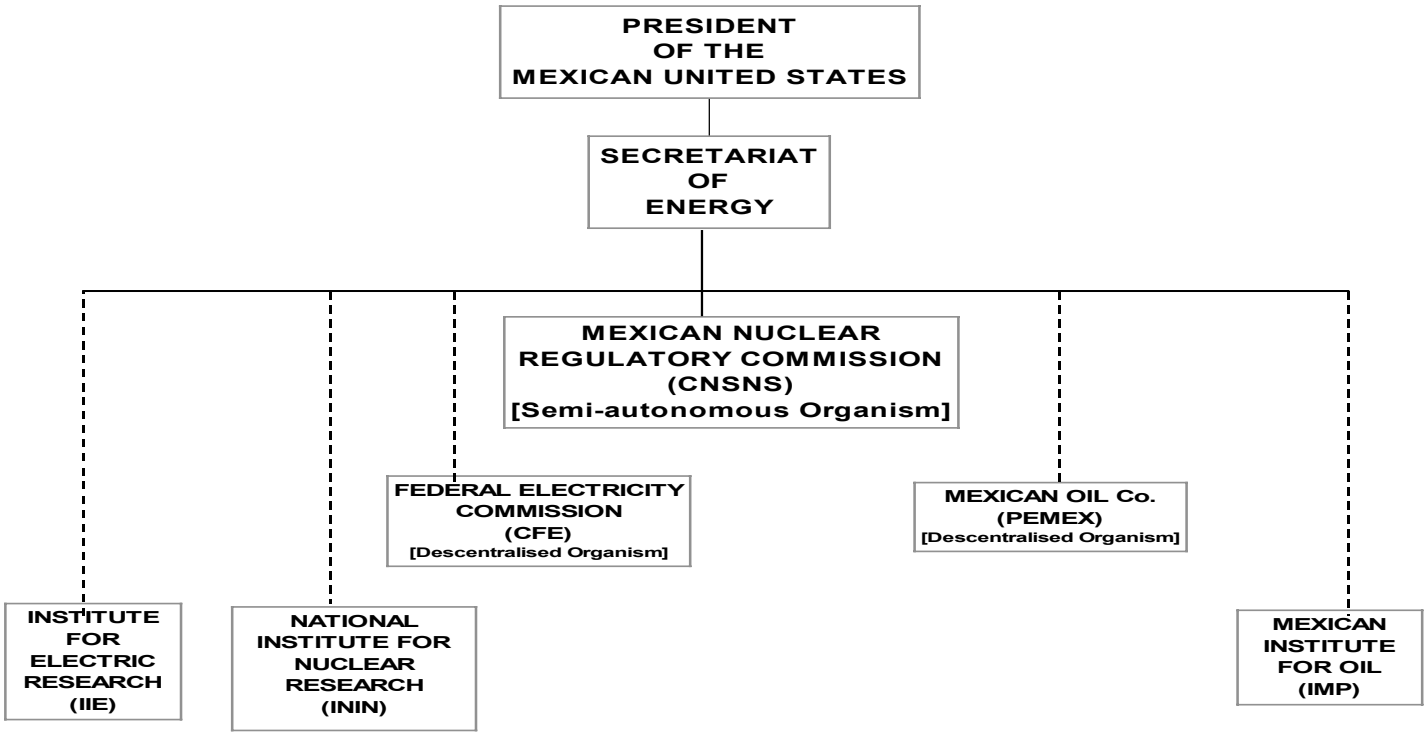

FIGURE 8.1

MEXICAN NUCLEAR REGULATORY COMMISSION

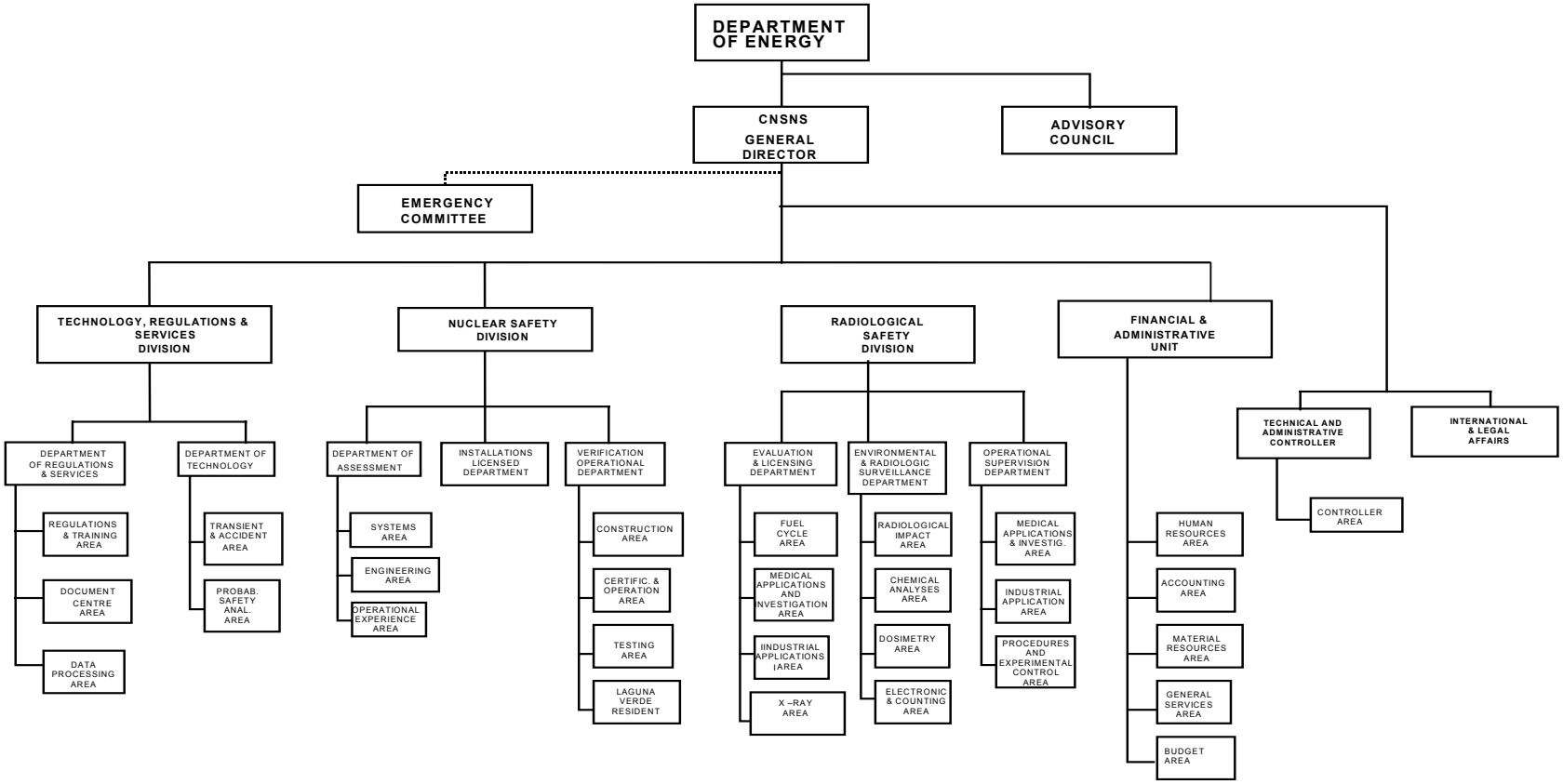

FIGURE 8.2

EMERGENCY COMMITTEE ORGANIZATION
CNSNS

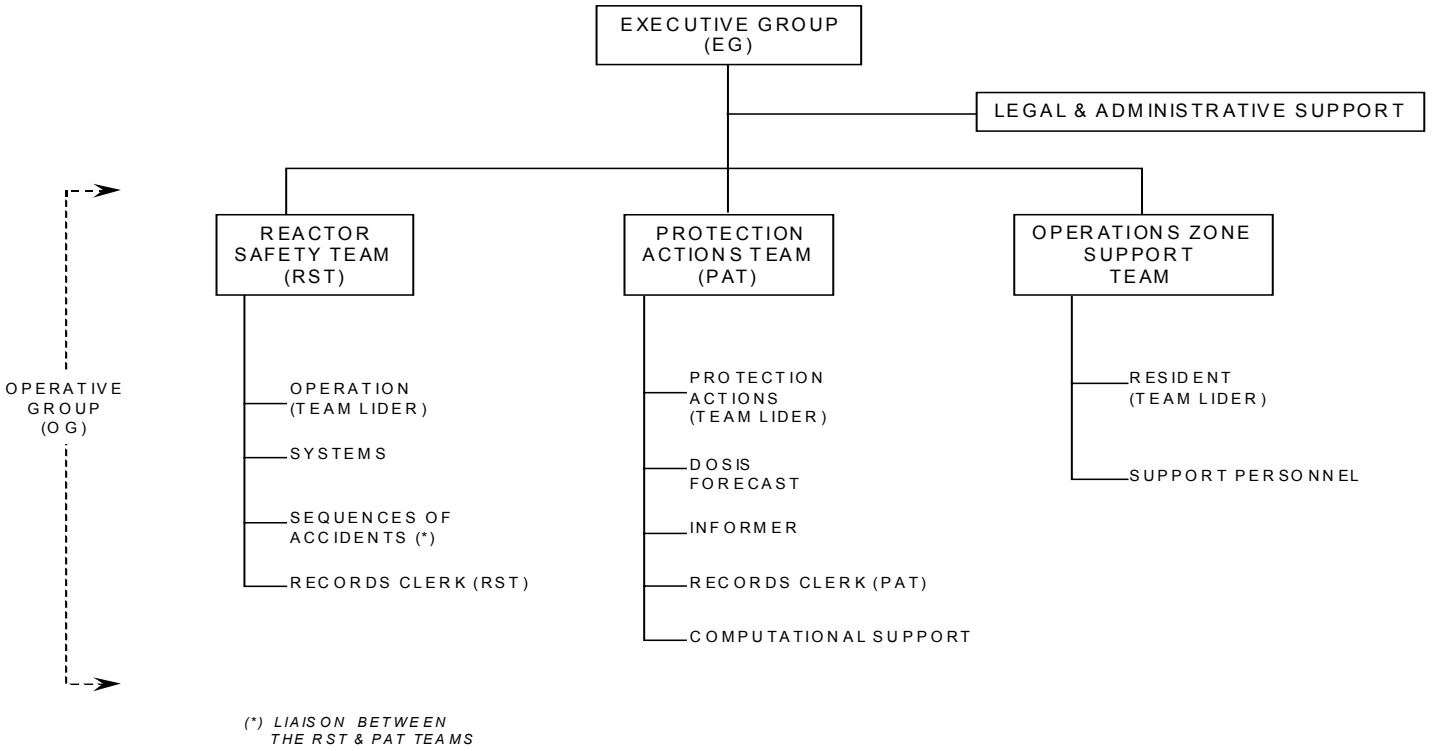

FIGURE 8.3

ARTICLE 9. RESPONSIBILITY OF THE LICENSEE

9.1 INTRODUCTION

Regarding the facility operator's responsibility, Articles 15, 18, 22, 25, 26, 27, 28, 32, 33, 34, 35, 36 and 50 of The Regulatory Law of the Constitutional Article 27 on Nuclear Matters (see Annex I), establish the responsibilities for each one of the institutions related to the fields of usage, handling and possession of nuclear material in all its forms. Thus, the Mexican State, empowers the Federal Commission of Electricity *(Comisión Federal de Electricidad-CFE*) is the only entity allowed to operate nuclear power plants with the purpose of producing electricity. From this same series of Articles, it is concluded that the responsibility to ensure the safe operation of the plant is entirely of the operator of such kind of installations.

Furthermore, it is established that nuclear facilities must count on the nuclear safety and radiological personnel required and, the holder of any kind of license shall be responsible for its strict compliance with the applicable laws.

From a financial backing point of view in the event of an accident, since 1989, Mexico deposited the document of assent to the Convention on Public Liability for Nuclear Damages (referred to as the Vienna Convention); therefore, the Mexican State becomes the guarantor of the minimum amount established by such Convention in the event of an accident at any nuclear facility. To this respect, it is important to mention that the CFE, a Federal Organism and proprietor of Laguna Verde's Nuclear Power Plant, maintains an insurance to comply with this requirement.

It is important to reference that Article 4 of the Law of Public Liability for Nuclear Damages dated December 29, 1974, points out in Article 4*: "The operator's public liability for nuclear damages is objective";* that is, the operator of LVNPS is responsible for potential damages originated by the installation.

The main responsibilities defined by the CNSNS and to be fulfilled by the CFE Laguna Verde's operator are contained within document *"Conditions for Operation"* of each one of such facilities. The Appendix of this National Report reproduces specific conditions related to the Convention on Nuclear Safety (CSN) settled by the Regulatory Body to minimise the risk from the operation of both Units of Laguna Verde's Nuclear Power Plant.

9.2 RESPONSIBILITY OF THE LICENSEE

Regarding the nuclear safety of Laguna Verde's Nuclear Power Station Units-1 & 2, CFE's responsibility, through the Nuclear Power Plant's management, is recognised and observed in the Quality Assurance Plan of the Operation Organisation detailed in Article 13 of this National Report.

The Quality Assurance Plan of the Operation Organisation for Units 1 & 2, includes measures that permit to ensure the establishment of an appropriate organisation by CFE in order to execute each and every one of the important safety activities performed within Laguna Verde's Nuclear Power Station during the operation of Units 1 and 2. The scope of the policies established within this Plan define, among others, the following responsibilities:

a) that the entire responsibilities for the Quality Assurance Program are held and executed by the Licensee.

b) the delegation of the Licensee's duties to other organisations is identified and described for the establishment and execution of the Quality Assurance Program or part of it.

According to the aforementioned and as established in Section 1.2.2 of the Quality Assurance Plan of the Operation Organisation of Laguna Verde's Nuclear Power Station Units-1 and 2, the General Director of CFE is responsible before the CNSNS for conducting safe operation and design modifications to Laguna Verde's Nuclear Power Station Units-1 and 2 in accordance with the directives established within the Regulatory Framework, Operation Licenses, Technical Specifications of Operation and Quality Assurance Plan.

Upon accepting the license, the primary responsible for it also accepts the conditions settled by the Regulatory Body.

9.3 MEASURES ADOPTED BY THE REGULATORY BODY TO ENSURE THE FULFILLMENT OF THE LICENCEE'S RESPONSIBILITIES.

The CNSNS, as the National Regulatory Body, has established several mechanisms to guarantee that the licensee satisfies each one of the items related to the obligations acquired through the license. To this effect, audits, surveillance's, inspections and periodic assessments of all important activities at LVNPS-1 & 2 are carried out following an annual program.

The program of inspections and audits is based on the importance of the activities performed by the primary responsible, the facility's behaviour and the personnel taking part in previous audits and inspections, the number and amount of findings raised by the Regulatory Body as well as by internal instances of control.

Multiple disciplinary engineer-inspector groups are formed to carry out inspections. Each inspection or audit takes a period of one to two weeks. Among other areas of interest, the following have been examined: administrative controls, instrumentation and control, fire protection programs, environmental equipment qualification, reactor engineering, radiological protection programs, spare parts, purchasing of articles and services, service inspection, pump and valve operability programs, personnel qualification programs, and surveillance's of Technical Specifications of Operation fulfilment.

During the refuelling period, the Regulatory Body has integrated a 24-hour permanent program of inspection in which, two inspectors participate per shift. These inspectors have the authority to impose stop work orders.

During normal operating periods, a resident inspector keeps watch on the most relevant, day to day activities, also performing programmed inspections of activities recommended by the CNSNS Headquarters, who permanently and in an integral manner, assess the plants behaviour.

Another mechanism by which the Mexican Regulatory Body verifies that CFE complies with the safety obligations established in the operation license is, the design modification assessment process as well as operational events and safety improvements result of the application of operational experience. These assessments lead to a frequent interrelation between CNSNS and LVNPS; the agreements resulting from the meetings and assessments performed are documented in an appropriate manner and on occasions mandatory technical compliance positions are generated.

Additional information on CNSNS responsibilities and duties as well as specific activities to verify that CFE assumes its responsibility as regards to safety are described in Articles 8 and 11 of the National Report.

9.4 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE OBLIGATIONS IMPOSED BY THE CONVENTION.

Considering what has been mentioned in previous sections of this Article, it is observed that the primary responsible as regards to the safety of LVNPS is the CFE and that CNSNS, as the Regulatory Body, verifies that CFE fulfils its responsibilities. Moreover, as stated in Section 9.1 of this National Report, the public liability of the operator for nuclear damages is objective. Therefore, it is concluded that those obligations in Article 9 of the Convention on Nuclear Safety are fully satisfied.

ARTICLE 10. PRIORITY TO SAFETY

10.1 INTRODUCTION AND SAFETY POLICIES

As regarding priority to safety, Articles 19, 20, 21, 28, 32, 34, and 50 of The Regulatory Law of the Constitutional Article 27 on Nuclear Matters (see Annex I) establish that of all installation activities performed by the proprietary, including planning, design, construction and operation as well as definite shutdown and dismantling, safety always has a first order hierarchy.

In addition to the articles cited on The Nuclear Law, the following regulations are applied to establish a mechanism through which the above affirmation is confirmed in its design and operation:

Part 20, “Standards for Protection Against Radiation”; Part 50, “Domestic Licensing of Production and Utilisation Facilities”; Appendix A, “General Design Criteria for Nuclear Power Plants”; Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants”; Appendix E, “Emergency Planning and Preparedness for Production and Utilisation Facilities”; Appendix G, “Fracture Toughness Requirements”; Appendix H, “Reactor Vessel Material Surveillance Program Requirements”; Appendix I, “Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion “As Low as Reasonably Achievable” for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents”; Appendix J, “Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors”; Appendix K, “ECCS Evaluation Models”; Part 100, “Reactor Site Criteria”, all Title 10 of the Code of Federal Regulations of the USNRC (Annex IV), Condition 3, LVNPS-1 & 2 operation licenses (Appendix) as well as USNRC “Branch Technical Position ASB 9.5-1 Guidelines for Nuclear Power Plants”.

In Mexico, the establishment of leading criteria on nuclear safety has three main objectives.

a) To ensure that nuclear installations operate normally without excessive risks for personnel on the facility, the population and the environment.

b) Prevent incidents, and

c) Mitigate consequences of any incident, if occurring.

This leads to the general purpose of nuclear safety, which is to protect man and environment, limiting radioactive material releases under any circumstance. In other words, ensuring the confinement and control of such materials.

To manage the safety, in conceptual terms, two strategies are applied to prevent and control radioactive material mobility, especially when incidents occur:

i. Provision of “non-leaking” barriers between the radioactivity source and the public. These barriers are four: fuel cladding, reactor coolant pressure boundary (includes reactor vessel), primary containment and secondary containment (reactor building).

ii. Application of the concept of Defence in Depth (DID) to both design and operation of LVNPS-1 & 2. This concept consists of three levels as detailed in Section 18.3 of this National Report.

Additionally and as an extension to the concept of DID, there is the external radiological emergency planning in the event of accidents of consequences beyond design basis. According to probabilistic analysis results, these accidents have a very low probability of occurrence.

10.2 SAFETY CULTURE AND GOOD PRACTISES

In Mexico, the concept of safety culture is of a relatively recent application. This concept parts from an initiative of the Regulatory Body, whose interest is to consider the safety factor as first in importance at LVNPS. Since 1993 to this day, both CFE and the Regulatory Body initiated a combined effort to include the concept of Safety Culture within the strategic factors.

As of 1993, CFE has achieved the following:

The establishment of a management level group to follow-up the Safety Culture aspects; Safety Culture Management Seminars in which experts from the IAEA participate; incorporation of the Safety Culture concept as one of the modules of the Total Quality Control Program, consisting of 9 modules: Safety Culture Results and Improvements, Client’s Satisfaction, Leadership, Human Resources, Information and Analysis, Strategic Planning, Quality Assurance and External Factors.

CFE, as proprietary of LVNPS, is a member of several International Organisations that seek to interchange experiences to improve the safe operation of nuclear installations. Among these organisations are INPO (“Institute of Nuclear Power Operations”); WANO (“World Association of Nuclear Operators”), and BWROG (“BWR Owners Group”); added to this voluntary incorporation, Mexico is part of the International Nuclear Event Scale (INES), and of the Incident Reporting System (IRS). The General Director of CFE, declare to its workers in its Quality Control Plan Policy Report Statement of the success that such plan has had, exhorting them, regardless of the obligatory nature of such plan, to give their best

effort and disposition to satisfy the directives and policies established in that document.

Below are some good practises, among others, recognised by OSART (Operational Safety Assessment Review Team) personnel. OSART visited LVNPS in 1997.

- LVNPS Emergency Action Levels (EAL) are based on guide NUMARC NESP-007. It includes an excellent description of the basis of each one of the Emergency Action Levels. Personnel are trained on such document, producing as a result, a reduction in deviation during emergency classifications.
- LVNPS has developed flow charts used during the application of the Emergency Plan that eliminate the potential error of consulting different documents during tense situations.
- Constantly, CFE and Regulatory Body maintain good communication as well as an agile and open flow of information.
- LVNPS observes good housekeeping.
- Within the Emergency Operation Procedures (EOP´s) the flow charts referenced the Emergency Action Level used for Emergency Plans.
- The application of the Probabilistic Safety Analysis (PSA) and Job and Task Analysis that include human factors allow to perform a more detailed analysis, complementing the deterministic analysis.
- Setting up of the Operational Review On-Site Committee (CROS) as ALARA Committee.

10.3 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

From the legislative framework, as settled in this Article, it is clearly established that Nuclear Safety has priority over any other concept within the nuclear power industry. This, its diffusion over the regulatory framework, the authority conferred to the Regulatory Body as well as the administrative and management means required for the nuclear facilities construction permits and operation licenses, guarantee nuclear safety to be considered a priority for each and every nuclear unit’s design, construction, testing and operation activity.

Therefore, it is considered that the definition, application and surveillance’s of the priority character of safety within the Mexican United States, fulfils the obligations in Article 10 of the Convention on Nuclear Safety.

ARTICLE 11. FINANCIAL AND HUMAN RESOURCES

11.1 FINANCIAL RESOURCES

The financial resources for LVNPS-1 & 2 surveillance, regulation, maintenance and operation derive from government expenditures according to the following process:

In accordance with Article 74, Fraction IV of the Political Constitution of the Mexican United States, annually the Federal Executive (President of the Republic) submits to the consideration of the Honourable Congress of The Union for approval, a government expenditure budget project for the fiscal year to come.

In addition to the previously cited Article of the Constitution, the following regulations are applied:

Article 33, Fraction III of the Organic Law on Federal Public Administration; Articles 50, 51, 52, 53, 55 and 58 of the Federal Law of Parastate Entities; the Law of Federal Public Budgets, Accounting and Expenditures and its Bylaws; Articles 15 and 50 of the Regulatory Law of Article 27 of the Constitution on Nuclear Matters (see Annex I).

11.1.1 Financial Resources for CNSNS

CNSNS, as a semiautonomous organism, elaborates its budget annually through the Finance and Administration Unit, based upon specific needs identified by its different departments and areas.

In addition to the Federal Budget granted, CNSNS receives resources through convene entered with the CFE to maintain LVNPS-1 & 2 operation licenses. This convene is revised and entered on an annual basis.

Section 8.4.2 of this National Report describes in more detail, the distribution of revenues. Figure 11.1 schematically shows such distribution of the CNSNS.

11.1.2 Financial Resources for CFE

CFE, reporting to the Secretariat of Energy (SE), is the decentralised public entity in charge of producing, transmitting and distributing electric energy throughout the country.

Annually, Sub-directions and Autonomous Divisions, which conform CFE, prepare their budgets in order to comply with provisions established in sectorial programs of development committed by the entity.

In particular, LVNPS, as an autonomous unit, prepares its budget annually based upon specific needs identified by its different sub-divisions and department areas Such identification is carried out based on plans established for refuelling, maintenance and continuous improvement on both LVNPS units.

Once budgets are approved, the General Direction of CFE through its financial authorities distributes the resources assigned to each autonomous Sub-direction and Divisions, giving priority to LVNPS.

11.2 HUMAN RESOURCES

The following regulations apply to the human resources topic:

Article 123, Fraction XIII of the Political Constitution of the Mexican United States; Conditions 2 of LVNPS-1 & 2 Operation Licenses (Appendix); LVNPS-1& 2 Technical Specifications for Operation; Title 10 of the Code of Federal Regulations of the United States of America, Part 55 (10CFR55) “Operator’s Licenses”; USNRC Regulatory Guide 1.8 “Selection and Training of Nuclear Power Plant Personnel”; Regulatory Guide 1.70, “Standard Format and Contents of Safety Analysis for Nuclear Power Plants” Chapter 13; ANSI/ANS 3.1-1981, “Selection, Qualification and Training of Personnel for Nuclear Power Plants”; NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants” (see Annex IV).

11.2.1 Human Resources for CNSNS

See Section 8.4 in this National Report for information regarding to human resources for CNSNS.

11.2.2 Human Resources for CFE/GCN

11.2.2.1 Organisational Structure at CFE

CFE is a decentralised public entity having its corresponding legal capacity and inheritance. Its objective is to render electrical power public services under terms and in compliance with Article 4 and 5, respectively of the Law of Electrical Power Public Services.

The CFE is ruled and presided by a Board of Governor’s formed by the Secretariat of Treasure, Secretariat of Social Development, Secretariat of Trade and Industrial Development, Secretariat of Agriculture and Hydraulic Resources, and Secretary

of Energy. Also, the General Director of the Mexican Petroleum Company (PEMEX) and three representatives of the worker´s union form part of the Board of Governor.

Among others, it is responsibility of the Board of Governor's, to approve the Annual Plan of Resources and Annual Expenditure Budget as well as to approve the Annual Patrimonial and Financial Balance.

Figure 11.2 shows CFE's structure.

- **Production**

During 1990, LVNPS-1 initiates commercial operation with 675 MWe. By 1993, the capacity installed ascends to 29,204 MWe, 28% corresponding to Hydroelectric Plants and 72% to Thermoelectric Plants, including LVNPS, contributing with 3% of the total generation.

In 1995, LVNPS-2 initiates commercial operation, contributing with 675 additional MWe. This way, currently the total effective capacity installed ascends to 33,037 MWe distributed as follows:

THERMOELECTRIC	**19,394 MWe**	**59%**
HYDROELECTRIC	**9,329 MWe**	**28%**
COAL FIRED	**2,250 MWe**	**7%**
NUCLEAR	**1,309 MWe**	**4%**
GEOTHERMAL	**735 MWe**	**2%**
WIND POWERED	**33,037 MWe**	**0%**
T O T A L		**100%**

- **Transmission and Transformation**

During 1994, the National network system counted on 31,127 km of lines of transmission of voltages of 400, 230, 161, 105 and 138 kV, having 39,296 km of sub-transmission lines of voltages of 115, 85 and 69 kV. As a whole, for that year there were 70,423 km of transmission and sub-transmission lines nation-wide.

Since 1996, there is a total of 354,034 km of transmission and sub-transmission lines as well as transformation capacity of 115, 173 MVA.

Currently, the different voltages of the transmission and distribution system are normalised to voltages of 400, 220, 115 and 85 kV.

For operation, the National Electric System of Energy has been divided into 8 areas of control, each one co-ordinated by the National Centre of Energy; which it is in charge of establishing operation policies, criteria and standards as well as planning and analysis of installation and organisation matters.

11.2.2.2 LVNPS Direction and Organisation

CFE is proprietary of LVNPS. Through LVNPS, CFE is totally responsible for its design, engineering, construction, operation, maintenance and decommissioning.

The General Director of CFE is responsible before the CNSNS for conducting the operation and modifications to LVNPS-1 & 2 in compliance with operation licence requirements.

In order to fulfil this responsibility, the Manager of GCN counts on the organisation shown in Figure 11.2. in which, the lines of authority and communication between the organisations forming part of such Management are indicated.

Technical and support services for the Operation organisation are available during the useful life of both Units. Personnel reporting to the Sub-divisions of Engineering carry out these services, Figure 11.3 shows the organisation of the same. Engineering personnel demonstrate to have the qualification, experience and knowledges required to carry out their responsibilities in relation to:

a) Materials, metallurgy, mechanic, electric, thermodynamic, structural and instrumentation & control engineering.
b) Plant chemistry
c) Radiological Protection
d) Fuels and Re-loading
e) Maintenance
f) Environmental Engineering
g) Applied Physics
h) Air Conditioning
i) Environmental Qualification, etc.

Personnel qualifications are in accordance with applicable requirements in Standard ANSI/ANS 3.1-1981 “Selection, Qualification and Training of Personnel for Nuclear Power Plants”.

In addition to the Technical Support Organisation, GCN Management counts on the Quality Control and Licensing and Nuclear Safety Organisations, independent

from the Production Organisation, which perform audits, surveillance and independent reviews to all operation, maintenance and support service activities.

11.2.2.3 Operation Organisation

The structural organisation used to operate and maintain LVNPS as well as the lines of reporting and communication are given in the organisational chart in Figure 11.4. The main functional areas under direct supervision of the General Superintendent of Operation are the Production Superintendent, Technical Superintendent, Refuelling and Administrative Control Superintendent, Labour and General Services Area, Training Centre and Access Control.

The authority and general plant operation responsibility line of command and issuance of special orders in the presence of contingencies of temporal nature is as follows:

a) General Superintendent of LVNPS.
b) Production Superintendent
c) Technical Superintendent
d) Operations Supervisor
e) Shift Supervisor

On-shift Operation Groups are assigned both for Unit 1 and Unit 2 based on shift roles. Personnel are not shared between Units (except yard personnel); however, they may be completely transferred if training requirements are previously satisfied.

There are 6 shift groups per unit to cover the 24 hours of the day, 7 days of the week, the Continuous Retraining Program, vacations and unpredicted situations that may arise.

- **Production Superintendent**

Production Superintendence reports to the General Superintendent of LVNPS. He is responsible for the operation, control of functioning of the plant, electromechanical maintenance and instrumentation & control, water chemistry, and correct operation of the reactor core. To carry out these activities, he counts on the Operation, Maintenance, Reactor Engineering and Chemistry Areas.

- **Technical Superintendent**

The Technical Superintendent reports to the General Superintendence of Operation. It is his responsibility to provide day by day technical support to Production Superintendence as well as to the corresponding Refuelling and Management Control Superintendence.

He is responsible for the Radiological Protection Program, ALARA Program, and Quality Control Program, Document Control and Quality Records, incorporation of External and Internal Operational Experience in procedures and/or training, In-service Inspection Program, Special Tests, Modification Program as well as the Spare Parts Program. In order to satisfy these responsibilities, he counts on the Quality Control, System Engineering, Radiological Protection and Regulations Areas.

- **Refuelling and Management Control Superintendent**

He reports to the General Superintendent of Operation and is responsible for co-ordinating the planning of works proposed, and to be performed, during programmed refuelling and shutdowns. During these activities, he is in charge of controlling their development and he provides programming, data and storage handling services. In addition, he controls the indicators and results of LVNPS-1 & 2 performance.

11.2.2.4 Head of Training Centre

The person in charge of the Training Centre reports to the General Superintendent of Operation. It is his responsibility to plan, co-ordinate and carry out training programs for LVNPS licensing and non-licensing personnel.

In addition to this, he is responsible for the use and maintenance of the simulator's software and hardware.

11.2.2.5 Physical Security Supervisor

The Physical Security Supervisor reports to the General Superintendent of Operation at LVNPS. It is his responsibility to conduct the Physical Security Group, develop and administrate the Physical Security Plan and procedures of implantation.

He has the empowers to declare, in combination with the Shift Supervisor, a state of emergency facing a Physical Security contingency and request for the intervention of Civil and Military Forces.

The Physical Security Group maintains order and physical control against intrusions, sabotages, etc. within LVNPS' installations. This group is formed of personnel armed and trained to respond to contingencies that may place critical installations of the plant at risk.

11.2.2.6 Reviews and Audits

The review and audit program serves to review important changes and proposals to systems or procedures, tests and experiments and for the prompt investigation

and correction of the probable recurrence of unusual events having an operational safety meaning as well as to detect tendencies unnoticed during casual observations.

In order to review safety related operational activities, the review program has been developed on two levels. Firstly, on an operation level of the plant: Site Operations Review Committee (CROS). Secondly, on a corporate level: Independent Operation Review Committee (CIRO). The CROS composed by plant personnel, performs an operation review and advises the General Superintendent of LVNPS. The CIRO, composed mainly by members not directly responsible for the operation of LVNPS, acts as an independent peer review organisation performing reviews, assessments and audits.

In addition to the above, and routinely, the Quality Assurance Organisation formulates and executes an audit/surveillance program to verify compliance with the Quality Assurance Operation Program (see Article 13 of this National Report). Such program ensures an audit is performed to all safety-related functions within a period of two years. Furthermore, the following elements are audited with specific frequency:

a) Results of corrective actions at least every six months.

b) Conformance with Technical Specifications and Operation License at least every twelve months.

c) Performance, training and qualification of LVNPS personnel, at least, every twelve months.

- **Operational Review On-Site Committee (CROS)**

The CROS is a Committee presided by the General Superintendent of LVNPS, Production Superintendent acts as Vice-president; Head of Training Centre as Secretary; and, Technical Superintendent as Alternate Vice-president. Operation, Maintenance, Reactor Engineering and Chemistry, Quality Assurance, System Engineering, Radiological Protection and Regulations Heads act as permanent members. Their responsibilities are as follows:

a) Review of:

   1) All Administrative and Internal Emergency Plan procedures including modifications to such procedures.

   2) All programs required by Technical Specification 6.8 “Procedures and Programs” including modifications to such programs.

3) Any other procedure, or changes to a procedure that according to the General Superintendent of Operation, affects nuclear safety.

b) Review of all tests and experiments proposed affecting nuclear safety.

c) Review of all changes proposed to Technical Specifications of Operation License.

d) Review of all changes or modifications proposed to unit systems or to equipment, which may affect nuclear safety.

e) Investigation of all violations to Technical Specifications, including elaboration and delivery of reports to GCN Manager and covering the assessment, recommendations and corrective action dispositions to prevent recurrence.

f) Review of all Reportable Events.

g) Review of unit operations to detect potential nuclear safety risks.

h) Execution of special reviews, investigations or analysis and corresponding reports requested by General Superintendent or the CIRO.

i) Review of the Physical Security Plan and procedures of execution, submitting recommended changes to the CIRO.

j) Review of Emergency Plan and procedures of execution, submitting recommended changes to the CIRO.

k) Review of any unplanned release of radioactive material to the environment, including elaboration and delivery of reports to LVNPS Manager and to the CIRO, covering the assessment, recommendations and corrective action dispositions to prevent recurrence.

l) Review of changes to Process Control Program and/or On-Site and Off-Site Dose Calculation Manual as well as to Radioactive Waste Treatment Systems classified as Category QA-RW.

❑ **Independent Operation Review Committee (CIRO)**

The CIRO is a Committee presided by the Manager of GCN. The Engineering/ Technical Support, Quality Assurance, General Superintendence of Operation and Licensing and Nuclear Safety Department heads are permanent members of this Committee.

The CIRO provides independent reviews and audits to activities designated in the following areas:

a) Operation of nuclear power plants
b) Nuclear engineering
c) Chemistry and Radiochemistry
d) Metallurgy
e) Instrumentation & Control
f) Radiological Safety
g) Mechanical and Electric Engineering
h) Quality Assurance practises

The CIRO has the following responsibilities:

- **Revision**

a) Safety evaluations to (1) procedures, equipment or system changes and (2) tests or experiments carried out under provisions in 10CFR50.59, to verify these do not constitute an Unreview Safety Question (USQ).

b) Changes proposed to procedures, equipment or systems which involve a non-revised safety matter as defined in 10CFR 50.59.

c) Tests or experiments proposed, involving a non-revised safety matter, as defined in 10CFR50.59.

d) Changes proposed to Operation License Technical Specifications.

e) Violations to codes, rules, licensing and technical specification obligations, license requirements, or other instructions or procedures important to nuclear safety.

f) Important anomalies in operation or deviations of normal and expected behaviour of unit equipment which affect nuclear safety.

g) Review of all reportable events.

h) All recognised indications of a deficiency not foreseen as part of any design aspect or any operations of structures, systems or components that could affect nuclear safety.

i) CROS Meeting Minute and Reports.

- **Audits**

Audits to unit activities are to be carried out under acknowledgement of the CIRO. Such audits must cover:

a) Conformance to unit operation provisions contained in Technical Specifications and applicable license conditions, at least every 12 months.

b) Performance, training and qualifications of all unit personnel, at least every 12 months.

c) Results of actions taken to correct deficiencies in unit equipment, systems or operation methods and which affect nuclear safety, at least once every 6 months.

d) Execution of activities required by Quality Assurance Operation Program to satisfy criteria in 10CFR50, Appendix B, at least once every 24 months.

e) The Emergency Plan and its procedures of execution, at least once every 12 months.

f) The Physical Security Plan and its procedures of execution at least once every 12 months. (By means of an independent inspection instead of an audit, in accordance with LVNPS Physical Security policy description).

g) Any other area of operation of the unit considered appropriate by the CIRO or by the General Director of CFE.

h) The Fire Protection Program and its procedures of execution at least once every 24 months.

i) An independent inspection and audit to Fire Protection and Prevention of Losses Program, including equipment and procedures, at least once every 12 months, either using qualified personnel of licensee located off-site or an external fire protection company. The latter must be used at least once every three years.

j) The Radiological Environment Monitoring Program and its results at least once every 12 months.

k) The Off-Site Dose Calculation Manual (ODCM) and its procedures of execution at least once every 24 months.

l) The Process Control Program and its procedures of execution for solidifying radioactive waste, at least once every 24 months.

m) The execution of activities required by the Quality Assurance Operation Program in order to meet criteria in Regulatory Guide 1.21 and Regulatory Guide 4.1 (Annex IV).

11.3 TRAINING AND RETRAINING PROGRAM

The Training Program for LVNPS-1 & 2 personnel is based on three programs:

a) Initial Training Program
b) Retraining Program
c) Replacement/Substitute Training

Appropriate personnel are obtained through these three programs, in number, qualification and training for the different functions and responsibilities.

11.3.1 Initial Training Program

Training of licensing personnel is developed based upon CNSNS standards requirements to ensure the availability of qualified personnel to operate LVNPS. Training of personnel whom do not require to be licensed is implemented based upon specific area needs.

11.3.1.1 Training of Licensed Personnel

Basically, training for personnel requiring a license from CNSNS is designed for candidates who have never received previous formal nuclear station training.

This program is formed by the following phases:

a) Introduction to Nuclear Power Plants (Selection)
b) Laguna Verde Orientation
c) Basic Nuclear Course
d) BWR Technology
e) BWR Simulator Training
f) Course on Observation
g) Core Damage Mitigation
h) Transient Analysis
i) Heat Transfer, Fluid Flow and Thermodynamics.
j) Refuelling Training Activities
k) License Preparation Review
l) Nuclear Plant Engineering
m) On the Job Training

Training initiates with the integration of personnel to routine activities as candidates to the corresponding active position upon terminating their initial

training. It concludes obtaining the license (reactor operator and senior reactor operator or instructor certificate).

In addition to the fulfilment of the aforementioned program, licensing personnel are submitted to training at the full scope LVNPS simulator.

The simulator course consists of seven to twelve weeks of theory and 120 hours of practise in the simulator control room. This control room was designed to provide inexperienced BWR operator and senior operator license candidates the skills required for operating Laguna Verde's nuclear reactor in a safe and efficient manner. Experienced training instructors impart theory and practise to the candidates, suggesting on a daily basis lecture and study assignment. Written and oral tests are applied to monitor candidate progresses. During practises at the simulator, candidates are rotated on the different control room positions, including the Shift Supervisor position; this way, all candidates have equal opportunity to perform evolutions from each operation position.

11.3.1.2 Training of Non-Licensed Personnel

Training for LVNPS personnel not requiring a CNSNS license is classified into three levels:

Level A – Directors and Supervisors
Level B – Technicians
Level C -- Others from maintenance, substation and calibration.

11.3.2 Retraining Program

11.3.2.1 Licensed Personnel

Retraining of licensed personnel initiates one month, to the latest, after CNSNS awards the license. It is carried out in a continuous two-year cycle manner to maintain the validity of the license.

11.3.2.2 Non-Licensed Personnel

Retraining of non-licensed personnel is developed based upon their specific responsibility needs, including recommendations from Radiological Protection, ALARA and Emergency Planning areas.

11.3.2.3 Substitute Program

The objective of this program is to train personnel that will entitle a job position, once satisfied educational, experience and health requirements. In this way, substitutions at least satisfy the same requirements of personnel to substitute.

11.4 FUNDS FOR HANDLING LVNPS RADIOACTIVE DISPOSAL AND DECOMMISSIONING

Article 18, Fraction VII of The Regulatory Law of the Constitutional Article 27 establishes that the Federal Executive through the Secretariat of Energy *"Be responsible for the storage, transportation and depositing of nuclear fuels and radioactive wastes regardless of their origin".* Under this premise, the Federal Executive through the Secretariat of Energy is responsible, with all his resources, for handling the radioactive waste coming from LVNPS fuel cycle.

Even though this would satisfy the requirement of the Convention, the Mexican State continues to develop more effective mechanisms to control radioactive waste and for decommissioning both LVNPS units. These mechanisms are the National Policy of Radioactive Waste Management Control and the Trusteeship for Decommissioning LVNPS. Such mechanisms are in the initial state of implementation at the time of preparation of this National Report.

11.4 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

From the information given in previous sections, it is concluded that the Mexican United States has adopted adequate measures to ensure the availability of sufficient financial resources to enable the preservation and continuous improvement of nuclear facilities and permanent training and development of personnel working within them. At the same time, ensuring a high level in the quality and actualisation of its installations and the qualification of its human resources during its lifetime.

Based upon the above, it is concluded that both the regulatory standards and their implementation fulfil the obligations in Article 11 of the Convention on Nuclear Safety.

CNSNS FINANCIAL RESOURCES DISTRIBUTION

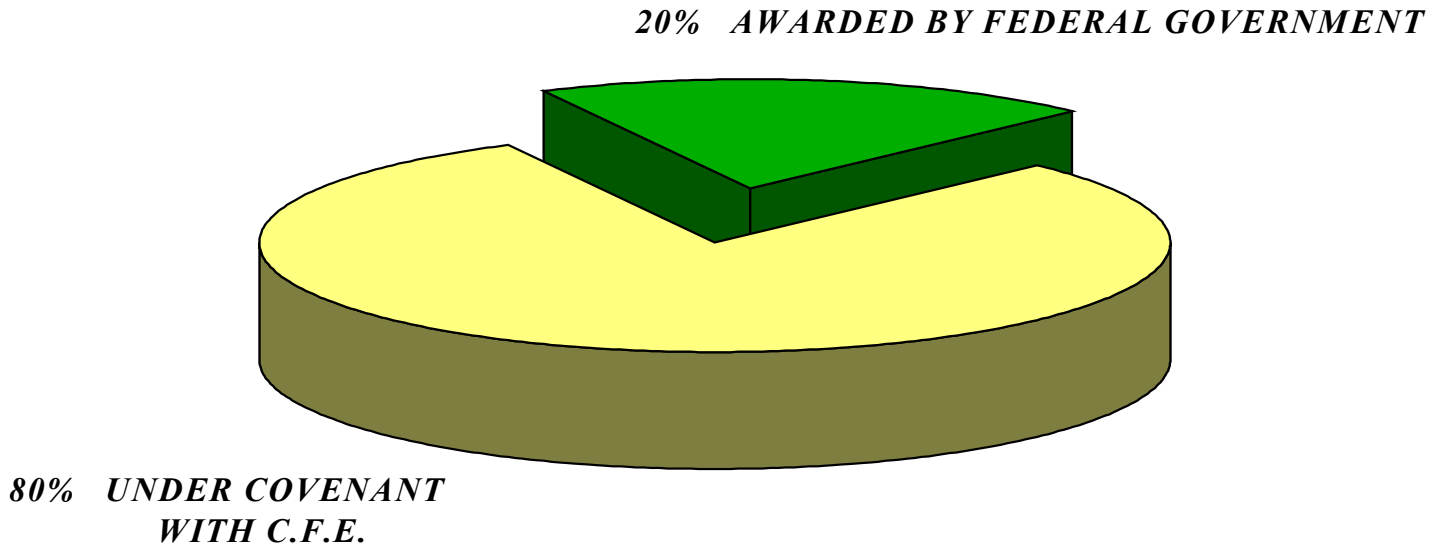

FIGURE 11-1

C.F.E. & LVNPS ORGANIZATION

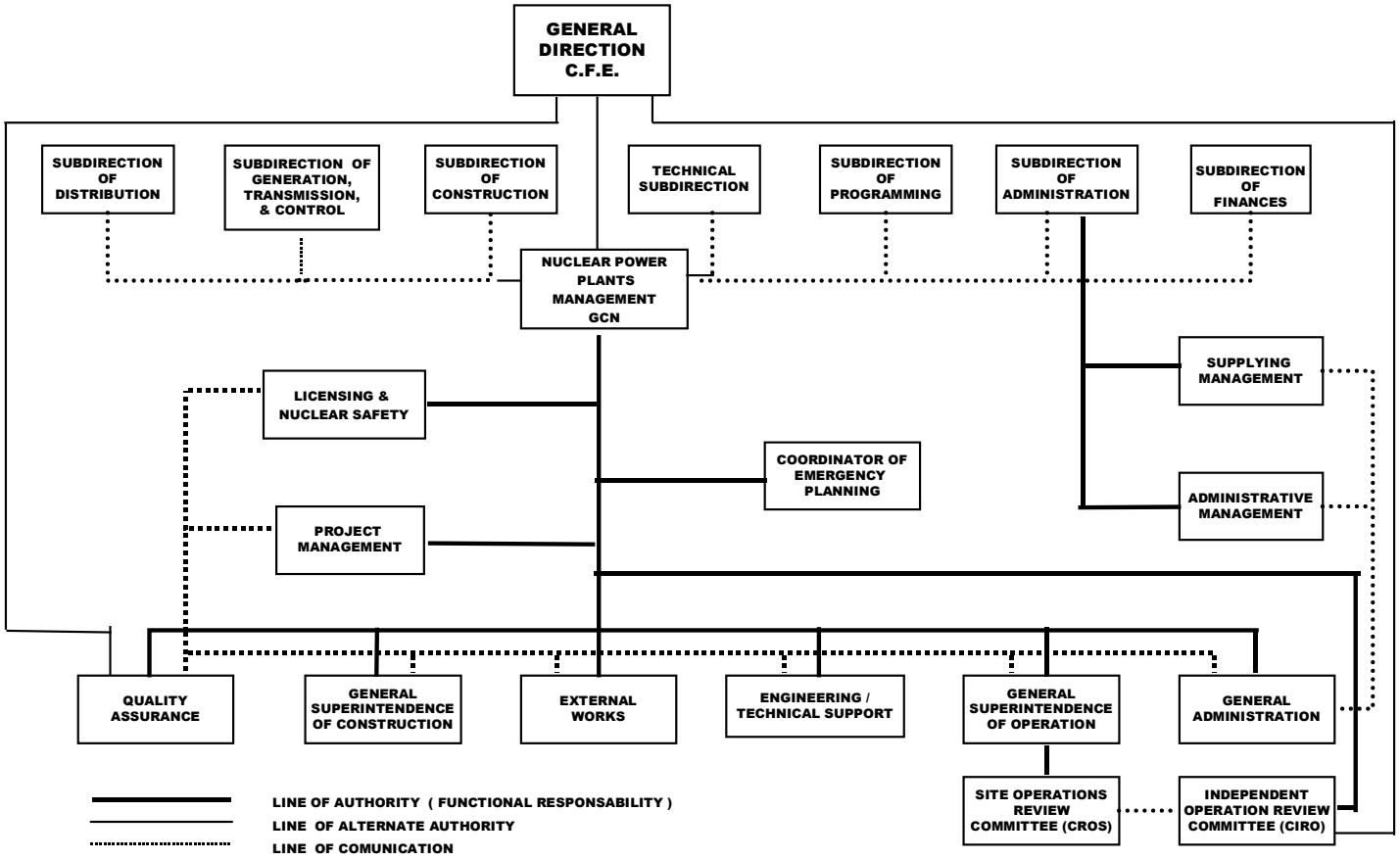

FIGURE 11.2

ENGINEERING/TECHNICAL SUPPORT ORGANIZATION

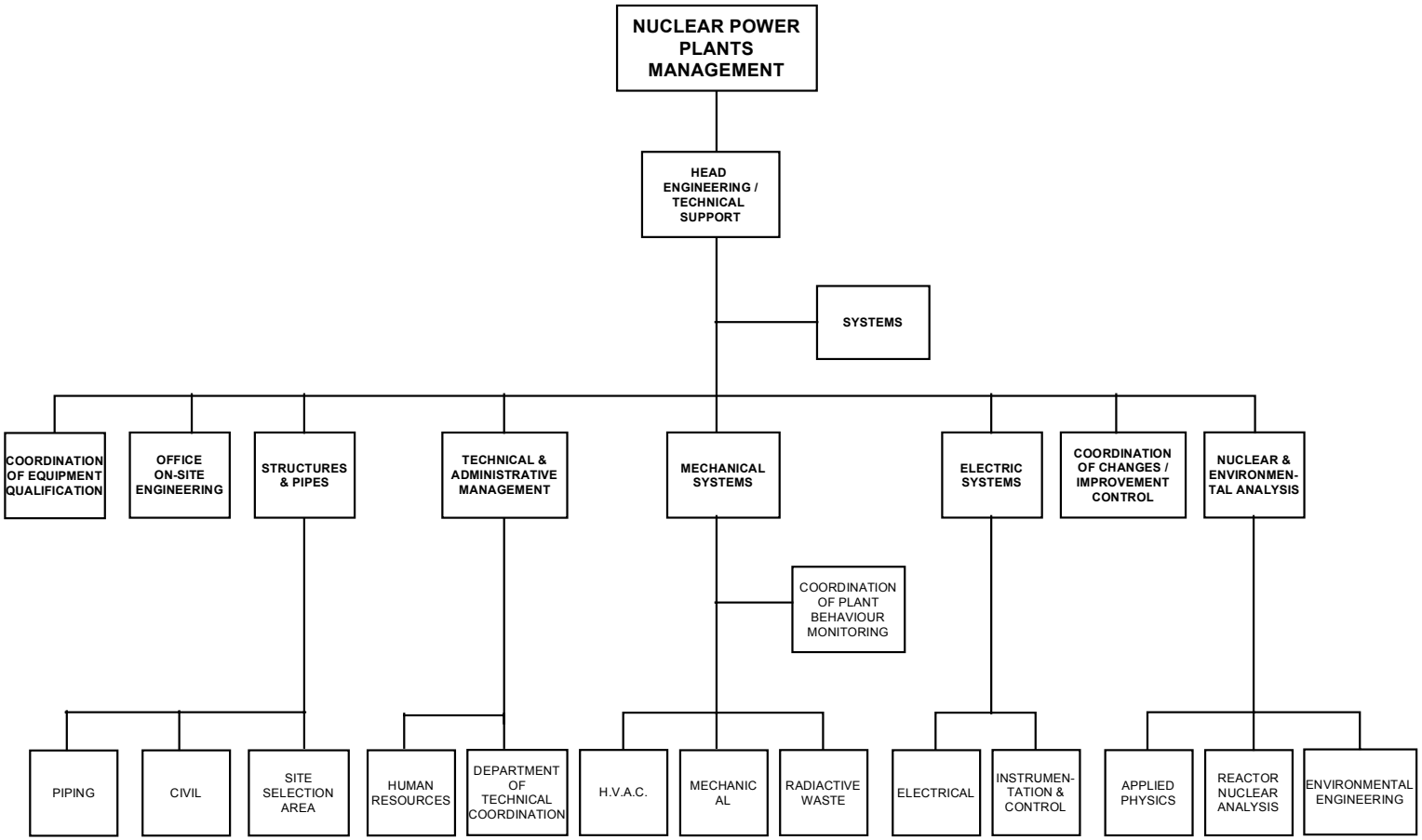

FIGURE 11.3

OPERATION ORGANIZATION

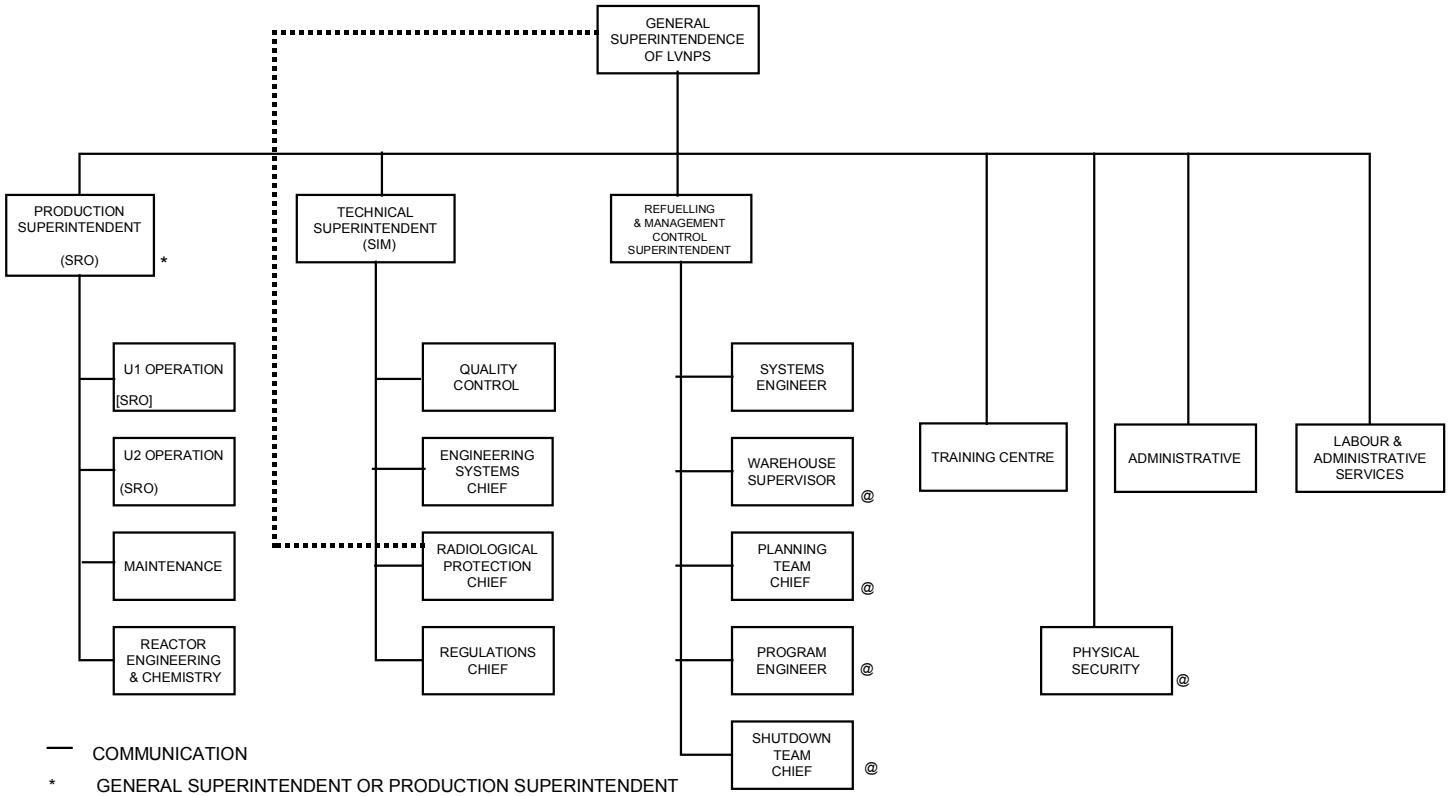

FIGURE 11.4

ARTICLE 12. HUMAN FACTORS

12.1 BACKGROUND

As a result of the accident at Three Mile Island Nuclear Power Plant in 1979, the USNRC published the document NUREG-0660, and later on NUREG 0737 and its Supplement No. 1. These documents required a detailed revision be performed as regards to the design of control rooms (item I.D.1) at nuclear power plants in operation and under construction as well, to be equipped with a Safety Parameter Display System (SPDS) (item I.D.2) in order to improve the operator-process interface, and this way, reduce the probability of occurrence and the severity of the operator's errors as well as to help them in their decision-making during anomalous and emergency conditions.

Something to be considered a positive situation in relation to LVNPS' delay in going into operation is that it allowed to identify and establish the operating programs for resolving the requirements observed in NUREG-0737 and its Supplement No. 1 before its start-up as well as one of the requirements to authorise the continuation of the construction at a previous stage of Laguna Verde's start-up, in which the Regulatory Body establishes the following:

"Up to date, Laguna Verde Nuclear Power Station has performed the control room inspection identifying instrument discrepancies and/or details of arrangement of such instruments. Most of these discrepancies have been corrected; however, some things remain pending for this case to be closed. CNSNS established the date for closing the remaining matters to be the day of the plant's first refuelling. Given that the inspection must be permanent in order to continuously update the main control room, CFE shall present before CNSNS a continuous evaluation program".

Regulations applicable to this Article are as follows:

LVNPS-1 & 2 Technical Specifications of Operation, Section 6.0 (Appendix); the US 10CFR Part 50, Section 50.34, Subsection (f);"Contents of Applications, Technical Information" ; General Design Criteria 19, 20, and 21 of the US 10CFR Part 50, Appendix A ; Regulatory Guide 1.78, "Assumptions for Evaluating the Habitability of the Control Room During a Postulated Hazardous Chemical Release" ; Regulatory Guide 1.97, "Instrumentation for Light-Water Cooled Nuclear Power Plant to Access Plant Conditions During and Following an Accident" ; NUREG-0660, "NRC Action Plan Developed as a Result of TMI-2 Accident" ; NUREG-0700, "Guidelines for Control Room Design Reviews" ; NUREG-0737, "Clarification of TMI Action Plan Requirements" , Supplement 1 to NUREG-0737, "Requirements for Emergency Response Capability (Generic Letter 82-33)"; NUREG-0800, "Standard Review Plan for the Review of Safety Analysis

Reports for Nuclear Power Plants", LWR Edition ; NUREG-0801, "Evaluation Criteria for Detailed Control Room Design Review" (See Annex IV).

12.2 CURRENT SITUATION

As a result of the above-cited requirements, CFE issued the CLV-1 "General Control Room Design Review Plan". Upon completing the activities considered in such plan, CFE forwarded the report titled "Control Room Design Review Report" to CNSNS in compliance with the requirement established in 10CFR50.34(f)(2)(iii).

In order for LVNPS-2 to satisfy the requirements in NUREG-0700 and NUREG-0801 and being that Unit 1 and 2 are of an identical design, except for a few very punctual differences, an activity plan consisting of two phases was agreed for this unit.

During the first phase, all changes were performed in Unit 1, meanwhile during the second phase, all specific differences between what was installed in Unit 1 and 2 control rooms were identified. Based on this, inspections were performed in accordance with the documents cited.

During the second phase, Job and Task Analysis of the Emergency Procedures is carried out and exercises were performed with Unit 2 shift personnel by developing scenarios at the Simulator located at LVNPS' Training Centre.

In order to be able to fulfil the activities of the second phase, CFE issued and put to the consideration of CNSNS, the "LVNPS-2 General Control Room Design Review Plan".

Additionally, CFE has been carrying out a systematic execution of reduction program alarms presenting problems in order to achieve the "Black Panel" Condition, in where a list of alarms was determined to operate inadequately from the original design of Units 1 & 2; design modifications required to eliminate the alarms having problems were carried out in accordance with the program established.

As part of the improvements introduced to the design since the LVNPS-1 & 2's start-up, there is a Safety Parameter Display System in each unit's control room that is an integral part of a system which is used to monitor all process parameters (Process Data Integral System). This system allows the operator to have an actual vision as well as a retrospective vision of the behaviour of the most important process parameters, allowing appropriate decision-making and reducing possible errors.

Progress, evaluation of results and activity follow-up are carried out by CNSNS through a review of periodic reports submitted by CFE for this effect as well as

inspections and walkthroughs to the Main Control Room of both U1 and U2 at LVNPS performed by the resident inspectors.

Besides, as part of the Internal and External Operational Experience programs, the identification of human error as a root cause or accident contributor has been particularly considered; thus, in those cases in which this is identified as such, recurrence of the same is to be prevented by the corresponding corrective actions, trying to reduce human error as much as possible. Article 19 of this National Report provides details regarding to the application and scope of the Operational Experience Program.

12.3 FURTHER STEPS CONTRIBUTING TO PREVENT HUMAN ERROR AND IMPROVE MAN-MACHINE INTERACTION

As part of the individual plant examination required by CNSNS, currently, there are Level 1 and 2 PRA (Probabilistic Risk Analysis) results, and as part of the same, the analysis of human reliability which has permitted to identify accident sequences where the human factor is a major contribution to the core melt frequency. The application of these results as regards to this particular topic has been through the reproduction of dominant sequences in LVNPS' simulator to train and test appropriate operator responses.

In addition and within what may be considered as a LVNPS good practise, there are procedures for handling operational transients and accidents based on symptoms, including flow charts and operational support devices to allow the operators an adequate response in this kind of events. Currently, necessary arrangements are being carried out to install the SPDS as part of the simulator in order to provide training on its use under anomalous or emergency conditions.

12.4 THE ROLE OF THE REGULATORY BODY IN REDUCING EVENTS CAUSED BY HUMAN FACTORS.

As part of the operational event assessment process, the Regulatory Body has implemented mechanisms to reduce the frequency of events imputable to human factors.

Among other mechanisms, the following can be identified; the establishment of requirements to improve LVNPS´s simulator operability conditions to full scale (the program is known as New Simulator Platform); a detailed Control Room Review of both LVNPS-1 & 2 identifying discrepancies as regards to the Job and Task Analysis presented; the establishment of requirements for the improvement of the training program for technicians and instrumentalists by means of work mock-up´s; systematic re-evaluation of operational events by means of appropriate root cause searching techniques and follow-up on corrective actions proposed by the plant.

12.5 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

As appreciated in the previous sections, the consideration of Human Factors through the execution of a detailed control room inspection, its resulting modifications, the implantation of a Safety Parameter Display System, the development and implantation of symptomatic emergency procedures, the alarm cleaning program and the practise of tasks on the simulator as well as the inclusion of operational experience on human error and the results of surveillance and inspection activities performed by CNSNS, allow to consider that the Human Factor for LVNPS has been taken into account since its design, during routine operation and during the eventual occurrence of transients and operational incidents; therefore, obligation in Article 12 of the Convention on Nuclear Safety is considered to be met.

ARTICLE 13. QUALITY ASSURANCE

13.1 QUALITY ASSURANCE POLICIES

LVNPS Quality Assurance Policies are as follows:

- All design, construction and operation activity for Structures, Systems and Components important to safety must be conducted under strict management and administrative controls to ensure that the operation of LVNPS Units -1 & 2 does not cause an undue health and public safety hazard.

  These controls consist of planned and systematic actions that guarantee the adequate accomplishment of its design, purchasing, fabrication, handling, shipping, storage, cleaning, assembling, installation, inspection, testing, operation, maintenance, reparation, refuelling and changes, are realised in such a manner that the structures, systems and components important to safety, perform satisfactorily in service.

- The activities above mentioned are to be performed by adopting approved procedures as well as by duly qualified trained personnel.

- Duly qualified personnel alien to activities under control must perform the actions of control.

CFE, represented by its General Director, holds the total responsibility for the implementation of the Quality Assurance Program through LVNPS' Manager, who at the same time delegates the responsibility for the development, verification and control of its effective execution to the Quality Assurance Department. In order for the Quality Assurance Head to be able to carry out his responsibilities in an efficient and opportune manner, he has sufficient organisational authority, freedom and support from management as well as from the General Direction observed through an alternate line of authority. See Figure 11.1.

Four categories were settled as part of the Quality Assurance Program. These four categories define the required Quality Assurance effort for structures, systems and components, as well as towards suppliers, service contractors, in terms of the importance such components or services have as regards to safety.

Quality Assurance (QA) Categories

QA-1 Category:

Assigned to components, subsystems, systems, structures, processes and services requiring the highest level of reliability in their functioning. It applies to components of the reactor coolant pressure boundary and core support structures wherein a failure may cause loss of the reactor coolant at a greater rate than the normal capacity of the back up water system.

QA-2 Category:

Classification assigned to structures, systems, subsystems, components, processes and services required to:

- Insert negative reactivity for shutting down the reactor.
- Prevent rapid insertion of positive reactivity.
- Maintain appropriate core geometry under any plant process condition.
- Provide emergency core cooling.
- Provide and maintain contention.
- Remove reactor and core residual heat.

QA-3 Category:

Classification assigned to components, subsystems, systems, Class 1E equipment, structures, processes and services that:

- Provide or support any safety system function.
- Process or contain radioactive waste whose release in the event of a component failure may cause a person within the limits of the site, a whole body dose or its equivalent in any part of the body, greater than 5 mSv.

QA-4 Category:

Classification assigned to components, subsystems, systems, structures, processes and services which do not have a safety function assigned, but are Seismic I Category. It also applies to supports that do not have a Seismic I Category, but are designed in such a manner to not harm seismic or safety-related components upon failure.

Two additional categories were defined, and partial fulfilment's of 18 Quality Criteria in 10CFR, Appendix B (Annex IV) were set, in order to maintain a very high level of quality in other systems necessary to comply with the objectives of minimising fire risks and radioactive waste control. These categories are:

QA-SPCI Category:

Classification assigned to fire protection components that do not belong to SSEFPS (*Safe Shutdown Earthquake Fire Protection System*), but are used to protect areas containing QA category equipment.

QA-RW Category:

Classification assigned to process equipment, pipes and valves that are not Class 1, 2 or 3, but form the radioactive waste pressure barrier.

The six quality categories include the application of quality principles to equipment and components in which the function is: to maintain the structural integrity of the coolant pressure boundary, control essential functions (reactivity, core cooling, containment integrity) and handling of radioactive waste (in which a failure would produce doses greater than 5 mSv).

Regulations applicable to this Article are as follows:

The Regulatory Law of the Constitutional Article 27 on Nuclear Matters (Annex I); Conditions 3 of the Unit 1 & 2 Operation Licenses (Appendix); and from the US 10 CFR the following Parts and Sections; Part 50; Appendix A “General Design Criteria for Nuclear Power Plants”, Criteria 1. “Quality Standards and Records”; “Appendix B - Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants”, Sections: 50.34a) “Preliminary Safety Analysis Report” and b) “Final Safety Analysis Report”; and the USNRC Regulatory Guides: 1.28, “Quality Assurance Program Requirements (Design and Construction)”; 1.30, “Quality Assurance Requirements for the Installation Inspection”, and Testing of Instrumentation and Electric Equipment”; 1.33, “Quality Assurance Program Requirements (Operation)”; 1.38, “Quality Assurance Requirements for Cleaning of Fluid System and Associated Components of water Cooled Nuclear Power Plants”; 1.38, “Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items for Water Cooled Nuclear Power Plants”; 1.54, “Quality Assurance Requirements for Protective Coatings Applied to Water Cooled Nuclear Power Plants”; 1.58, “Qualification of Nuclear Power Plant Inspection Examination, and Testing Personnel”; 1.64, “Quality Assurance Requirements for the Design of Nuclear Power Plants”; 1.70, “Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants - LWR Edition”; 1.74, “Quality Assurance Terms and Definitions”, 1.88, “Collection, Storage, Maintenance of Nuclear Power Plant Quality Assurance Records”; 1.94, “Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants”; 1.116, “Quality Assurance Requirements for Installation, Inspection and Testing of Mechanical Equipment and Systems”; 1.123, “Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants”; 1.144, “Auditing of Quality Assurance Programs for Nuclear Power Plants”; 1.146, “Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants”; 4.15, “Quality Assurance for Radiological Monitoring

Programs (Normal Operations) - Effluent Streams and the Environment"; as well as NUREG-*0800*, "Standard Review Plan (Formerly NUREG-75/087)" (for USNRC regulations see Annex IV); and industrial standards as ANSI/ASME N45.2, "Quality Assurance Program Requirements for Nuclear Facilities"; ANSI/ASME NQA-1-1979, "Quality Assurance Program Requirements for Nuclear Power Plants"; Article NCA-4000, "Quality Assurance" of Subsection NCA "General Requirements for Division 1 and Division 2" of ASME Code "American Society for Mechanical Engineers", Section III "Rules for Construction of Nuclear Power Plant Components".

13.2 QUALITY ASSURANCE PLAN DURING THE CONSTRUCTION STAGE (Section 17.1 of the ISPE)

The Quality Assurance Plan during the construction stage constitutes Section 17.1 of the Safety Analysis Report, it was applied to all participants of the plant performing structure, system, equipment, component or service safety-related activities, during its design, procurement, fabrication, construction, handling, storage, shipping, cleaning, assembling, installation, inspection, construction tests, maintenance, reparation and commissioning stages.

13.3 QUALITY ASSURANCE PLAN DURING THE OPERATION STAGE (Section 17.2 of the ISSE)

During the operational stage of LVNPS Units-1 & 2, the execution of activities important to safety is ruled by the Quality Assurance Operation Plan. It was designed to meet the requirements established in 10CFR50, Appendix B, in accordance with the regulatory frame required for LVNPS' license. The Quality Assurance Operation Plan includes as a method for achieving its implementation of a set of procedures comprising all activities covered in the Plan; these procedures are revised every two years.

The Quality Assurance Operation Plan describes the Quality Assurance requirements and controls to be applied to LVNPS Units-1 & 2 during its useful life, including dismantling. Apart from the scope established within the Quality Assurance Construction Plan related to the four categories (plus fire protection and radioactive waste), the Quality Assurance Operation Plan has a more extended scope, as it covers the Technical Specifications for Operation (Especificaciones Técnicas de Operación ETO´s) as well as the External Radiological Emergency Plan.

13.3.1 Periodic Evaluation of the Adequacy of the Quality Assurance Operation Plan.

The GCN management, in compliance with Condition 11 of LVNPS Units-1 & 2 operation licenses and by means of qualified external personnel, (including international consultants), evaluates every two years, the scope, state, capability, adequate fulfilment of the Quality Assurance Operation Plan and reports its results to the Independent Operation Review Committee (CIRO). In a similar way, management carries out a periodic analysis of the behaviour of personnel participating in the operation of LVNPS as regards to the quality and safety that must prevail in the development of its functions to determine the behaviour and tendency of each organisation in the direction of the quality and safety of the plant's operation.

Resulting recommendations of this periodic assessment are attended by the CIRO.

The Quality Assurance Department follows-up on the deficiencies and recommendations identified in the aforementioned evaluations until their closure.

The Licensing and Nuclear Safety Department is responsible for revising the results obtained from the evaluations in case non-compliance's arise affecting license obligations or arising of a possible nuclear safety concern.

13.3.2 Audits and Surveillance's

The Quality Assurance Operation program includes measures for establishing and executing a planned and periodic audit and surveillance system to verify the adequate implantation of program requirements by all organisations responsible for the rendering of services required. Audits include an objective evaluation of practises, procedures, instructions, activities and items as well as documents review and records important to safety to ensure that the Quality Assurance Program is implanted in an appropriate and effective manner. Both the Quality Assurance Organisation and the Quality Control Organisation of LVNPS perform surveillance's.

13.3.3 Corrective Actions

The Quality Assurance Program establishes measures to ensure that adverse quality conditions identified are promptly controlled, analysed, corrected, and according to their grade of importance, let known to the appropriate managing levels.

13.3.4 Procurement of Parts and Components

LVNPS' process for the procurement of spare parts and components of nuclear quality as well as the nuclear quality condition qualification process is subject to an approved and scrutinised program by CFE's Quality Assurance organisation. In those particular cases when CFE, due to supplying problems, has had the necessity to install commercial grade components at LVNPS through a validate dedicate process, CFE opportunely has submitted to CNSNS these cases before its implementation.

13.4 REPORTABILITY

An utility-regulatory body interface has been established by means of a report system based on regulations above mentioned. These reports are classified as follows:

REPORT OF	APPLICABLE REGULATION
Defects in Components	10CFR21
Important Deficiencies (IDI's)	10CFR 50.55(e)

The Quality Assurance Department administrates the Reportability System.

Reports of defects in components correspond to non-conformances in the component/equipment design and fabrication phases, which affect performance. Normally, these are exterior to the owner of the plant and are generated for manufacturers and suppliers of equipment and components important for safety, except for commercial grade equipment and components purchased by the owner and upgraded to nuclear usage.

The "Important Deficiency" Report corresponds to an important rupture with the Quality Assurance Program and despite that the original regulation is only meant for the construction phase, the owner of the plant and Regulatory Body have determined to maintain it during the plant's operation stage.

13.5 OTHER QUALITY ASSURANCE PROGRAMS

Since 1997, in an effort to include all non-nuclear services within the quality system, LVNPS' Quality System has been complemented and certified to satisfy Standard ISO-9001: 1994. Mexican Standard NMX-CC-003: 1995 is equivalent to this international standard.

13.6 REGULATORY BODY ACTIVITIES.

CNSNS, within its objective to ensure that all activities in which nuclear material is involved are performed under maximum safety conditions, has reviewed and approved each one of the versions obtained from the Quality Assurance Plan, both for construction and operation, before being implemented.

CNSNS, during its reviews, verifies that the Quality Assurance Plan at LVNPS abides by the directives of the applicable standard, also considers the surveillance and audit results to the Quality Assurance Plan; that is, CNSNS takes into account the deviations detected during these activities as well as possible improvements. As a result, the inclusion of important requirements and adaptations to the Quality Assurance Plan has been achieved.

The Regulatory Body, through its participation, has supervised the development of LVNPS' Quality Assurance Program as regards to suppliers. Initially, the requirement was that the supplier had to work with the Quality Assurance Program of the plant; currently, it is observed that several suppliers and contractors, qualified by LVNPS Quality Assurance Department, have their own Quality Assurance Plan which has been adapted to their organisation needs, highlighting the criteria required, always focused on satisfying the plant's requirements.

It is responsibility of CNSNS to evaluate and approve, if that be the case, corrective and preventive actions defined by the owner in regards to closing of reports on defective components (10CFR21) and reports of important deficiencies (10 CFR50.55(e)).

On the other hand, CNSNS is currently in the process to implement a Quality Assurance Program applicable to its internal activities.

13.7 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

As described in previous sections of this Article, the implantation of Quality Assurance Programs is a requirement that has been demanded, applied and surveyed for all activities important to safety from the early stages of design, construction, tests and operation of LVNPS Units-1 & 2.

Therefore, it is concluded that the obligations established in Article 13 of the Convention on Nuclear Safety have been fully met.

ARTICLE 14. SAFETY ASSESSMENT AND INSPECTION

14.1 INTRODUCTION

CNSNS has requested to Laguna Verde Nuclear Power Station a number of analyses in order to prove it satisfies all safety requirements. Although, it has already been established in previous sections within this same Report, it is important to mention that the methodology followed for licensing the plant was that of the format of the reactor's country of origin (United States of America). That is, two authorisations: one for the construction stage which comes to an end with the issuance of the Construction Permit and another where the scope covers the portion of pre-operational and start-up testing that concludes upon granting of the Operation License.

Even though there are other intermediate and posterior stages to these two events, such as the authorisation for dismantling the facility or the license to construct peripheral installations for the temporary storage of radioactive waste, this portion of the report shall describe only assessments performed within LVNPS' Construction Permit and License Operation stages.

Regulations applicable to this Article are as follows:

Articles 32, 33, 50 (Subparagraphs III, IV, V, VI, VII, IX, X, XII) of The Regulatory Law of the Constitutional Article 27 on Nuclear Matters (Annex I); US 10CFR, Part 50 (Annex IV); Conditions 5 and 10 of LVNPS Operation Licenses (Appendix), USNRC Regulatory Guide 1.9, “Selection, Design, Qualification and Testing of EDG Units used as Class 1E on Site Electric Power Systems at NPP”; Regulatory Guide 1.45, “Reactor Coolant Pressure Boundary Leakage Detection Systems”,; Regulatory Guide 1.56, “Maintenance of Water Purity in BWR’s”; Regulatory Guide 1.99 "Radiation Embrittlement of Reactor Vessel Materials", Regulatory, Guide 1.150, "Ultrasonic Testing of Reactor Vessels Welds During Pre service and In service Examination"; Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance for Nuclear Power Plants"; Regulatory Guide 4.1, "Programs for Monitoring Radioactivity in the Environments of NPP", NUREG-0800 "Standard Review Plan for the Review of Safety Analysis Reports for NPP", NUREG-1335, "Individual Plant Examination Submittal Guide"; US Generic Letter 88-20, "Individual Plant Examination" (Annex IV).

14.2 SAFETY ASSESSMENT - CONSTRUCTION STAGE

In accordance with the normative and prior to construction, CFE presented to the Department of Reactors of the National Institute for Nuclear Energy (INEN) (identified at that time as the "Regulatory Authority") in 1973, a safety analysis corresponding to: the Preliminary Safety Analysis Report, Preliminary Environmental Impact Report and Quality Assurance Construction Program.

During this period, the installations were submitted to diverse evaluations, inspections and audits as part of the licensing process. These activities were performed by both the Regulatory Body and organisations of the plant as well as independent technical auditors.

14.2.1 LVNPS Internal Audits/Inspections

The Quality Control and Quality Assurance Departments carried out such audits. Activities of both organisations were performed in a continuous manner and under a specific program during the activities of design, construction, purchasing, acquisition, shipment, etc.

14.2.2 Regulatory Activities Performed by CNSNS

For the Construction Permit to be awarded, CNSNS evaluated the Preliminary Safety Analysis Report. Eight hundred questions were generated from this, resulting in the issuance of 44 amendments to the PSAR.

The process of evaluation allowed for of several Provisional Construction Permits to be awarded, the Definite Construction Permit for LVNPS was awarded in 1979. Later, in September 1992, an extension to such Definite Permit was issued. Specifically, for completing the construction of LVNPS-2.

During the construction of LVNPS-1 & 2, CNSNS performed inspections and surveillances to activities of design, engineering, installation, special processes and non-destructive testing. Similarly, following a continuous and systematic program, CNSNS performed audits and inspections to the main suppliers of services and equipment important to nuclear safety.

In addition to the aforementioned activities, resident inspectors were assigned to the construction site. In order to carry out some of these assessment activities the IAEA provided technical assistance to CNSNS through experienced personnel.

14.2.3 External Assessments

See Article 7, Section 7.2.1 of this National Report in which Safety Operational Assessment Group (GESO) activities are mentioned.

14.2.4 Pre-operational Test Program

The preoperacional test program initiated with the transfer of systems and components from the construction organisation to LVNPS operation personnel. As of the date of assessment of this program, CNSNS developed a work plan which among other activities, included: evaluation of safety-related test procedures, witness tests and evaluation of test results. All concerning to these tests is discussed in more detail in Section 19.2.2 of this National Report.

14.3 SAFETY ASSESSMENT, OPERATION STAGE

CFE, on June 29 of 1979, submitted to CNSNS a Final Safety Analysis Report (FSAR) to back up the application for the operation license of LVNPS-1 & 2; In view of the differences between both units, a FSAR was submitted to CNSNS for LVNPS-2 and such differences were analysed, its Operation License was awarded in 1995.

14.3.1 Evaluations/Surveillance by LVNPS Organisations

(a) Audits and safety evaluations of independent character from the Production organisations are carried out in strict accordance with the directives in the Quality Assurance Operation Plan, Independent Review Program and Technical Specifications for Operation of LVNPS-1 & 2. The participating organisations are as follows:

- Quality Assurance: Quality Assurance audits are performed under a regular and systematic program involving all activities important to safety. The scope of audits includes all technical areas of LVNPS: Production, Technical Support and Engineering.

- The Independent Operations Review Committee is responsible for the following evaluations and audits:

    1. To evaluate that a change or modification to a system or procedure does not constitute an Unreview Safety Question (USQ); changes to Technical Specifications and reports of events occurring at the station, among others.

    2. Audits contemplated under the responsibility of this Committee include those related to compliance with operation license conditions, preparations and execution of the Emergency Plan, the capability of response provided by the Physical Safety Program, Fire Protection Program (Independent) and Environmental Radiological Surveillance Program, among others.

For more details, refer to Section 11.2.2.6 in this National Report.

During these evaluations and/or audits, deficiencies and deviations are documented as findings, establishing their follow-up and adoption of corrective actions until their closure.

(b) As part of the modification process, compliance with 10CFR50.59 "Changes, Tests and Experiments" is demanded. This rule has the following objective:

- To permit licensee to perform modification to the installation as described in the Final Safety Analysis Report (FSAR)
- To permit licensee make changes to procedures.
- Carry out tests or experiments not described in the FSAR without previous approval of CNSNS, unless the activity involves a change to Technical Specifications or results in an USQ by the Regulatory Body.

Periodically, the licensee must submit a report to CNSNS containing summaries of the evaluations of all activity implemented at LVNPS without previous approval of the Regulatory Body. By means of this methodology of evaluation, the following is assured:

- That modifications performed without previous approval of CNSNS are in compliance with the bases with which LVNPS-1 & 2 were evaluated for the awarding of operation licenses.
- That Technical Specifications for Operation are not modified.
- FSAR is maintained up to date.

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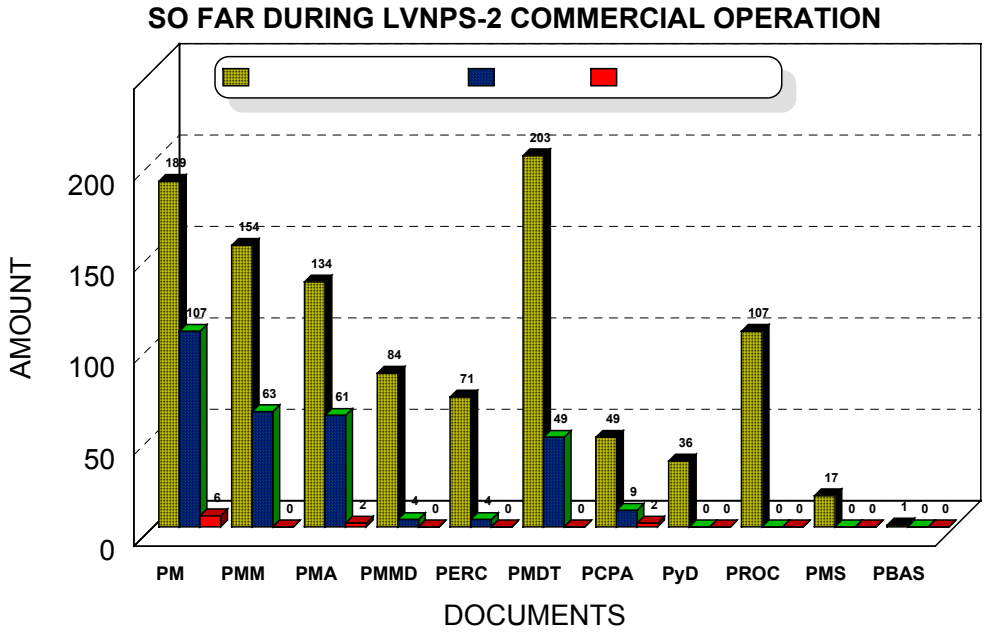

FIGURE 14.2

PM- Modification Package
PMM- Minor Modification Package
PMMD- Documentary Minor Modification Package
PERC- Component Replacement Evaluation Package
PMDT- Technical Documentary Modification Package
PCPA- Set Point Change Package
PyD- Jumper and Disconnection
PROC- Procedures
PMRC- Component Replacement Modification Package
SMT- Temporary Modification Request
ESPEC- Design Specifications

14.3.2 External Evaluations/Verifications to LVNPS

14.3.2.1 External Evaluations/Verifications Performed by CNSNS

A) Start-up Tests

Just like for the pre-operational stage, prior to Initial Nuclear Fuel Loading in October 1988 for LVNPS-1 and June 1994 for LVNPS-2, CFE presented a start-up test generic program in order to demonstrate that LVNPS-1 & 2 can handle foreseen transients with sufficient safety margins during its operational lifetime. On the other hand, CNSNS developed a work plan including among other activities: evaluation of test procedures for safety-related systems, witness of tests and evaluation of test results. All that concerns to start-up tests is discussed in more detail in Section 19.2.2 of this National Report.

B) Commercial Operation

- CNSNS performs two kinds of assessment activities:

  (i) Periodic activities. Referring to the evaluation of matters related to:

  - Technical Specifications for Operation based on operational experience.
  - Pump & Valve Operability Programs under ASME Code, Section XI, based on operational experience.
  - In-service Inspection Programs under ASME, Section XI for active and passive components.
  - Licensing of reactor cores for each fuelling cycle.
  - Maintenance of qualified lifetime for equipment important to safety.
  - LVNPS-1 & 2 Internal and External Operational Experience.
  - Modification to systems, structures and components important to safety.
  - Implementation of new regulations.

(ii) Special activities. Interdisciplinary work groups are formed specifically for the activity and then documented in particular dossiers. Other activities of this nature include reportable events relevant to safety, design or plant operation conditions out of license operation conditions.

From the moment the construction works began and up to the actual operation stage of LVNPS-1 & 2, a series of evaluations have been performed in detail for special problems and topics which have drawn attention due to their relevance to nuclear safety. Examples of theses cases are as follows:

a) Structural-seismic design of piping systems and reduction in supports.

b) Power operation equivalent to 85% of steam flow rate due to blockage of a main steam isolation valve having a 113% flow in each operable main steam line (3 of 4 lines)

c) Single Loop Operation of the reactor recirculation system. Unbalanced flow between loops due to internal failure of discharge valves and rupture of recirculation control valve drainage lines.

d) Mechanic and electric dynamic-seismic qualification.

Regarding to CNSNS inspections, all results have been documented in the corresponding inspection reports. These are filed in CNSNS. Findings generated were informed of to the organisations involved for their closure, previous approval of CNSNS. Continuously, and up to this date, CNSNS keeps a special control on a six-month basis to follow up on issues important to safety. Within such control, priority levels are assigned to this issues according to their impact on safety.

14.3.2.2 External Assessments Performed by Others.

Prior to LVNPS-1 Commercial Operation, there have been visits or safety missions by the IAEA and during commercial operation by WANO; LVNPS is a domestic member of the INPO of the United States of America and therefore LVNPS is periodically inspected by this Institute.

14.4 SAFETY ASSESSMENT, ACTIONS FOR ITS CONTINUOUS IMPROVEMENT

As of the date of award of the operation license for LVNPS-1, certain directives or specific conditions were established to guarantee that both LVNPS units would be maintained not only within a process of continuous improvement, but also to resolve issues which had not obtained consensus within the nuclear industry at the time the license operation was awarded. See below for other relevant information worth mentioning in this sense:

a) Process Information Integral System (SIIP). At the time the operation license was granted, LVNPS did not count on a Safety Parameter Display System (SPDS), part of the SIIP. Therefore, a requirement was established for such subsystem to be operative during the third cycle of operation. The SPDS-subsystem was adapted, improved and implemented by the IIE of Mexico in association with the original designer of the NSSS (General Electric), satisfying reliability requirements and scope established within regulatory documents.

b) Loose Parts Monitor. Even though the requirement did not impose as a unique option, the installation of a loose parts monitor to resolve potential problems of loose or detached components within the primary circuit, the Regulatory Body requested for the possibility of installing such system; CFE determined that an event of this nature could arise, causing potential damage to the fuel or distortion to the cooling flow patterns, reason for which such system was installed. Personnel were specifically trained for the interpretation of the graphical results.

c) Instrumentation of Vacuum Breaker Valves at the discharge of Safety/Relief Valves. Instrumentation for one of the vacuum breaker valves was requested to measure vibrations, opening times, temperatures, etc., in order to verify the fatigue analysis of components for which a modification of the design was based on. This, due to an event occurring during the execution of one of the start-up tests for LVNPS-1 in which a pressurisation of the primary containment was produced due to the failure of one of the vacuum breaker valves located at the safety/relief valves' discharge lines.

d) Station Blackout (SBO) Analysis. The Regulatory Body made a request to the owner of LVNPS to analyse the possibility of a SBO and carry out all necessary modifications to ensure that this setting was not the dominant sequence for the core damage frequency . For this effect, the requirement established in the USNRC Code of Federal Regulations, 10CFR50.63, was cited. Upon the presentation of this National Report, LVNPS has 5 lines of connection to the network, one of these denominated dedicated, in which it is a priority and immediate obligation of the Temascal Hydroelectric Station in the Mexican State of Puebla to provide power to Laguna Verde in the event LVNPS demands it to do so. The SBO analysis shown that LVNPS can cope up to 4 hours of SBO condition.

e) Environmental Equipment Qualification. The Mexican Regulatory Body requested LVNPS for the establishment of a Qualified Life Maintenance program for equipment important to safety; this, in accordance with the classification of environmental severity zones discussed and approved. Such program has required the continuous surveillance by of the Regulatory Body although, it is considered that except for two deviations from the obligations

agreed, the program is adequately instrumented, enabling to identify and replace components in which component lifetime has come to an end.

f) High Density Racks for Irradiated Fuel. Prior to initiating Unit-1 start-up tests, both the Regulatory Body and LVNPS proprietary, CFE, forecasted that due to the non-existence of a national regulation for handling radioactive waste (which corresponds to others instances within the Federal Government), there was a need to establish requirements to enable the safe storage of irradiated fuels in storage pools; for this effect, CFE presented for evaluation, a design of high density racks for irradiated fuel. After the design was evaluated and nuclear and mechanic design characteristics were considered, the instalment of such racks was authorised in each one of LVNPS Units irradiated fuel pools. These racks will allow storing the fuel produced during LVNPS' operational life.

g) Simulator Training Requirements. Even before simulators became an essential operator's training requirement, in Mexico, both Regulatory Body and CFE agreed the best means for training operators would be a full scope simulator. The development of such tool was carried out by the IIE, totally developing it, including mathematical models, computer models and control panels. Actually LVNPS' simulator is going through a process of modernisation required by the Regulatory Body. Some mathematical models found to not be concurrent with reality shall be corrected and taking advantage of the opportunity the computer system speeds will be improved, using "State of the Art" machines.

h) Probabilistic Safety Analysis (PSA). The Regulatory Body requested, in accordance with USNRC regulations, the development of Individual Plant Examination (IPE). During the elaboration of this National Report, CFE delivered the result of its work to satisfy this requirement, the analysis known as PRA levels 1 and 2 for review and evaluation by the Regulatory Body. Details on this topic are discussed in Section 14.5 of this National Report.

i) Periodic Safety Review. Though this requirement was imposed as part of the operation license conditions, nationally there was not a format establishing the methodology to satisfy this. It was not until 1997 when the Regulatory Body issued the document Periodic Safety Review Form and Contents. Such requirement, as originally appearing in LVNPS-1 license operation, establishes a five year period; however, after consulting several experts, this period is considered to be too short. Therefore, it has been studied the convenience of setting the standard 10 year period appearing on many International Regulatory documents, some edited by IAEA.

14.5 PROBABILISTIC SAFETY ANALYSIS (PSA)

- Probabilistic Safety Analysis (PSA) Level 1: CFE developed and presented for evaluation of CNSNS, a Level 1 Probabilistic Safety Analysis for LVNPS-1. It

determines the core damage frequency based upon safety system and plant balance system responses as well as on the evaluation of human factors, taking into consideration conditions established in LVNPS-1 Emergency Operation Procedures (OE's), Rev. 5.

The contribution of different initiating events can be resumed as follows:

CONTRIBUTION CHART PER SCENERY TYPE

SCENERY	CONTRIBUTION
Total Loss of Alternate Current (SBO)	45.15%
Loss of Alternate Current having Success with some Diesel Generator.	40.55%
Anticipated transients without a SCRAM	0.67%
Loss of Coolant outside Containment (Interface LOCA)	9.22%
Transients	4.41%

Results of Level 1 PSA have shown that the core damage frequency is similar to that obtained by the International Community for this type of reactors.

- Probabilistic Safety Analysis (PSA) - Level 2: As part of the obligations of the Individual Plant Examination (IPE), CFE developed a Level 2 PSA, being the objective to determine the source term and containment response in the event of a severe accident occurrence.

  In order to evaluate containment response during a severe accident, LVNPS' contention was analysed, showing several favourable design characteristics, such as its high structural capacity, its specific high volumetric capacity and its seismic design.

  The MAAP Code was the main tool used for LVNPS' Individual Plant Examination to model the severe accident phenomenology occurring in the vessel and containment as well as to determine the release of fission products to the off-site.

14.6 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

As described in this article, the National Law and regulations adopted and imposed on LVNPS have provided appropriate measures for detailed and systematic safety assessments to be performed by the Regulatory Body. Firstly the satisfactory results of such assessments enabled the issuance of the corresponding

construction and pre-operational test permits and later, the awarding of LVNPS-1 & 2 operation licenses.

Furthermore, the operation license requires for the execution of periodic safety assessments to ensure LVNPS validity in the light of operational experience and of any other new and significant information on safety matters, which may arise during LVNPS' lifetime.

Besides, In-Service Inspection and Test programs for structures and components as well as the Maintenance of Environmental Qualification of electrical and instrumentation equipment important to safety, prove that the physical condition of nuclear installations and their operation is maintained in accordance with its design, applicable national requirements as well as limits and conditions identified in Technical Specifications for Operation.

From the above cited, it is concluded that the measures adopted within the Mexican United States fully satisfy the obligations in Article 14 of the Convention on Nuclear Safety.

ARTICLE 15. RADIOLOGICAL PROTECTION

15.1 INTRODUCTION

The spirit of the Regulatory Law of the Constitutional Article 27 on Nuclear Matters maintains the protection of its employees, civil population and that of their property as its centre of attention, establishing that nuclear and radiological safety is a priority for all activities involving the use of nuclear energy.

It is purpose of the General Regulation on Radiological Safety, published in 1988, to provide mechanisms for the observance of the Law on Radiological Safety Matters; whereas the design of LVNPS to limit personnel doses and instrument the ALARA concept (as low as reasonably achievable) was carried out prior to the formulation of the National Radiological Safety Regulation, the philosophy of radiological safety during design follows the concept applied in the USA.; that is, criteria from 10CFR Part 20 and all related Regulatory Guides.

Likewise, operation licenses for LVNPS-1 & 2 contemplate the need for an effective and permanent implementation of the ALARA policies on the part of all plant personnel, appealing to management of the facility to provide all resources required to achieve this.

15.2 DOSE LIMITATION SYSTEM

The fundamental bases for the dose limitation system with which nuclear and radioactive facilities are to comply and that the Regulatory Body verifies its fulfilment, in a summarised manner, are as follows:

- Practises that may produce doses to workers shall not be approved unless a positive net benefit is obtained.
- All practises are to be performed in a manner that exposures are to be maintained as low as reasonably achievable, taking into account both, social and economic factors.
- Dose limits shall be applied taking into consideration whichever may result most restrictive for the irradiated organ or tissue.

At the present time, the equivalent dose limits for occupational exposure is based on 10CFR20, which is similar to ICRP 26.

15.3 LVNPS RADIOLOGICAL PROTECTION

The means were established from the design stage by shielding, physical separation, air conditioning and ventilation systems, to delimit the radiation zones of equipment, component and systems which would be potential radiation sources during the operation stage.

The buildings considered in where radiological protection criteria was taken into account for the design include: reactor, turbine, radioactive wastes, fluid-purification, Unit-1 & 2 control rooms, heat shops and open areas of a potentially low contamination.

In order to limit operation personnel doses, LVNPS buildings were divided into zones. These zones include five categories that consider radiation levels according to the following extreme cases:

Zone 1 - of unlimited permanence with an exposure rate of less than 25 E-7 Sv/hr, when integrated per year does not exceed the 0.005 Sv/year dose limit.
Zone 5 - it is the highest radiation level zone. Its access is restricted and controlled.

15.3.1 Radiological Protection Program

The main purpose of the Radiological Protection Program is to establish procedures and practises that in conjunction with the design, generate the radiological protection characteristics required to maintain the radiation exposure dose received by persons working within the site as low as reasonably achievable (ALARA).

Maintenance and operation procedures are periodically reviewed, updated and modified to guarantee that occupational exposures are maintained within the ALARA criteria; these reviews are carried out by personnel conforming a special group of analysis (ALARA group).

In accordance with the ALARA policy, not just on-site but also off-site, important efforts are made to limit liquid and gaseous effluent releases to the environment to minimise radiation exposures affecting the public. For this effect, there is an off-site dose calculation manual (ODCM) consisting of:

a) Methodology and parameters to be used to calculate plant concentrations and doses due to liquid and gases effluents releases from LVNPS during normal operation, transients and anticipated operational events.

b) Methodology and parameters to determine LVNPS liquid and gaseous radioactive effluent monitor´s set points.

c) Methodology and parameters to determine dose levels on the boundaries of the non-restricted area by direct radiation from normal operation and transients.

The radiological protection manual is used to govern the radiological protection actions and consists of the following:

i) Radiological protection procedures

ii) Analysis procedures

15.3.2 Environmental Radiological Impact

The impact to the environment depends on the radioactive material released.

Effluent and radiological process monitoring and sampling systems are provided to determine the contents of radioactive material in diverse process flows gas and liquid effluent streams.

There are two types of surveillance systems. The first one consists of instrumentation systems required for safety and, the second consists of instrumentation systems required for the operation of LVNPS.

The main purpose of radiation monitoring systems required for safety, in the event that predetermined radiation levels in effluent streams are exceeded, is to initiate appropriate protective actions to limit the potential release of radioactive material from the reactor vessel, reactor building and protect the environment of the main control room in both units of the LVNPS.

The radiation monitoring systems required to operate LVNPS provide operation personnel the measurement of the contents of radioactive material in all important liquid and gas effluents streams and process flows. This enables to demonstrate compliance with the Technical Specifications for Operation by providing monitoring of gross radiation levels and the collection of halogens and particles in filters. Additionally, in the event that predetermined release rates are exceeded, these provide initiation of the isolation of the main condenser discharge valve towards the mechanical vacuum pumps and steam jet air ejectors. Likewise, these systems provide the obtention of radiation samples within certain locations to determine specific radionuclide contents.

From the initial fuel load, the radioactive material released has resulted in concentrations shown in Figure 15.1 and exposure levels shown in Figure 15.2.

15.3.3 Regulatory Body Radiological Protection Verification

Regarding to surveillance of public exposure from the normal operation of the plant, CNSNS counts on several independent means by which compliance’s with the normative on matter of environmental impact are verified:

a) Analysis of the radioactive emission section of the daily exploitation report in which actual time data from process instrumentation and radiological effluent is contained.

b) Assessment of biannual effluent accounting reports remitted by LVNPS, containing data resulting from isotopic sampling and analysis of liquid and gaseous emissions during the period informed of. Actually, the reports for each second semester are annual compendiums also including dose calculations and meteorological information of interest. A part of CNSNS' assessment consists of an independent reproduction of such dose calculations in order to verify their consistency. These assessments are carried out in compliance with Regulatory Guide 1.109 of the USNRC (Annex IV).

c) Evaluation to the Environmental Radioactive Surveillance Program Report containing information on isotopic sampling and analysis from different environmental strata and performed at LVNPS' off-site laboratory.

d) Independent isotopic analysis of samples collected periodically by CNSNS from locations around the plant site to be process and analyse at CNSNS laboratory.

Both CFE and CNSNS laboratories take part in International Programs of Inter-comparison to ensure the reliability of their measurements. For more details, see Section 17.3 of this National Report.

CNSNS, as the National Regulatory Body, carries out periodic audits, surveillance's, inspections and assessments to radiological protection activities at LVNPS-1 & 2.

At the present time, discussions are held with the owner of LVNPS to value the impact of the modification to the General Regulation on Radiological Safety to be based on ICRP 60.

15.4 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

Based on that established in previous sections of this Article as well as to the fact that until now, no occupational exposed person has exceeded the specified regulatory limits and that radioactive material releases and the resulting doses have remained very much below corresponding regulatory limits, it is concluded that both the regulatory framework and its implantation as regards to the requirement and establishment of a program to maintain occupational or public

radiation exposure to the lowest level as reasonably achievable fulfils the obligations stated in Article 15 of the Convention on Nuclear Safety.

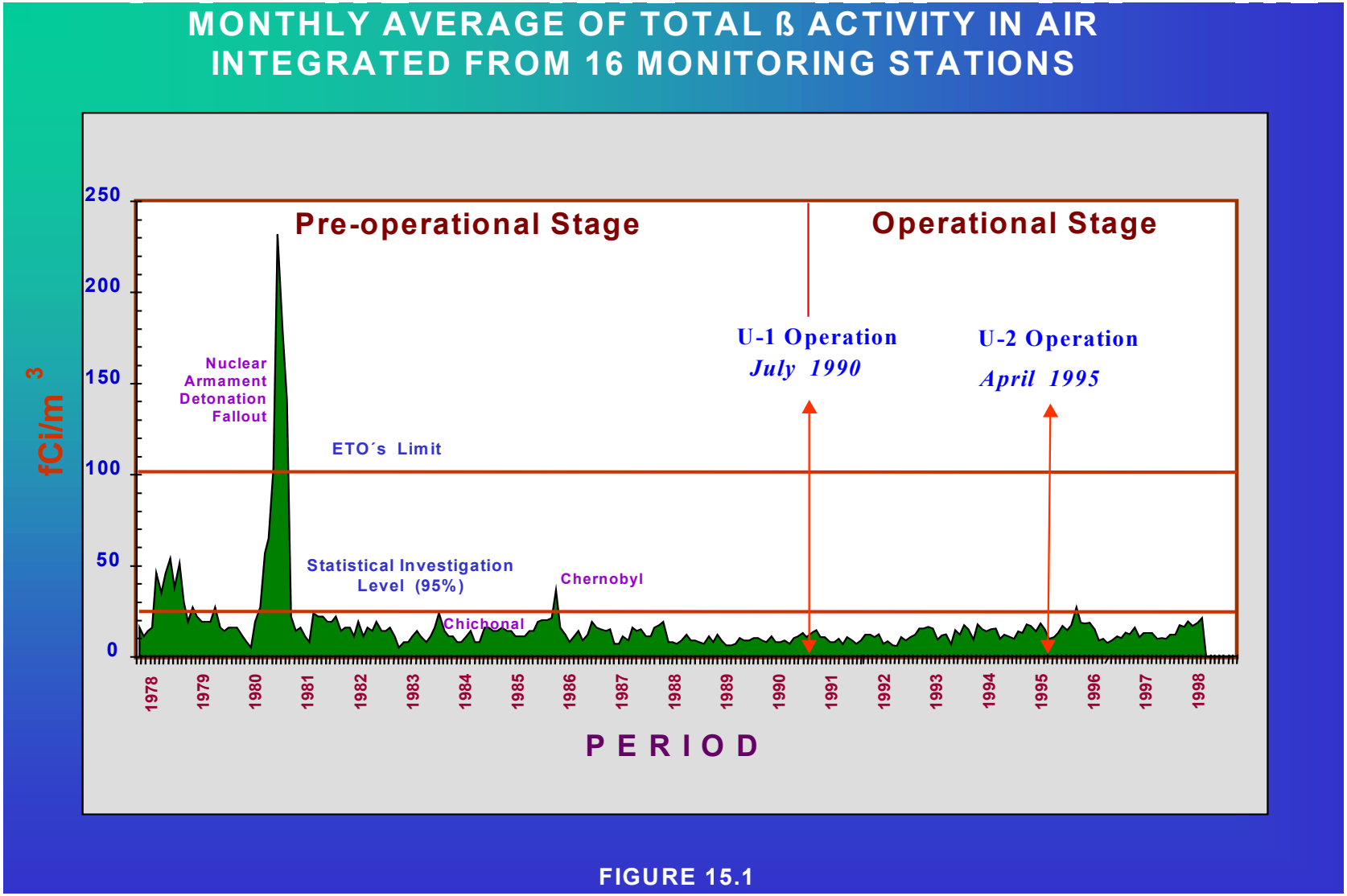
MONTHLY AVERAGE OF TOTAL ß ACTIVITY IN AIR
INTEGRATED FROM 16 MONITORING STATIONS
Pre-operational Stage
Operational Stage
U-1 Operation
July 1990
U-2 Operation
April 1995
Nuclear Armament Detonation Fallout
ETO´s Limit
Statistical Investigation Level (95%)
Chernobyl
Chichonal
fCi/m 3
250
200
150
100
50
0
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
PERIOD

FIGURE 15.1

ENVIRONMENTAL RADIATION LEVELS IN THE PROXIMITIES OF LVNPS

MONTHLY AVERAGE OF 32 STATIONS

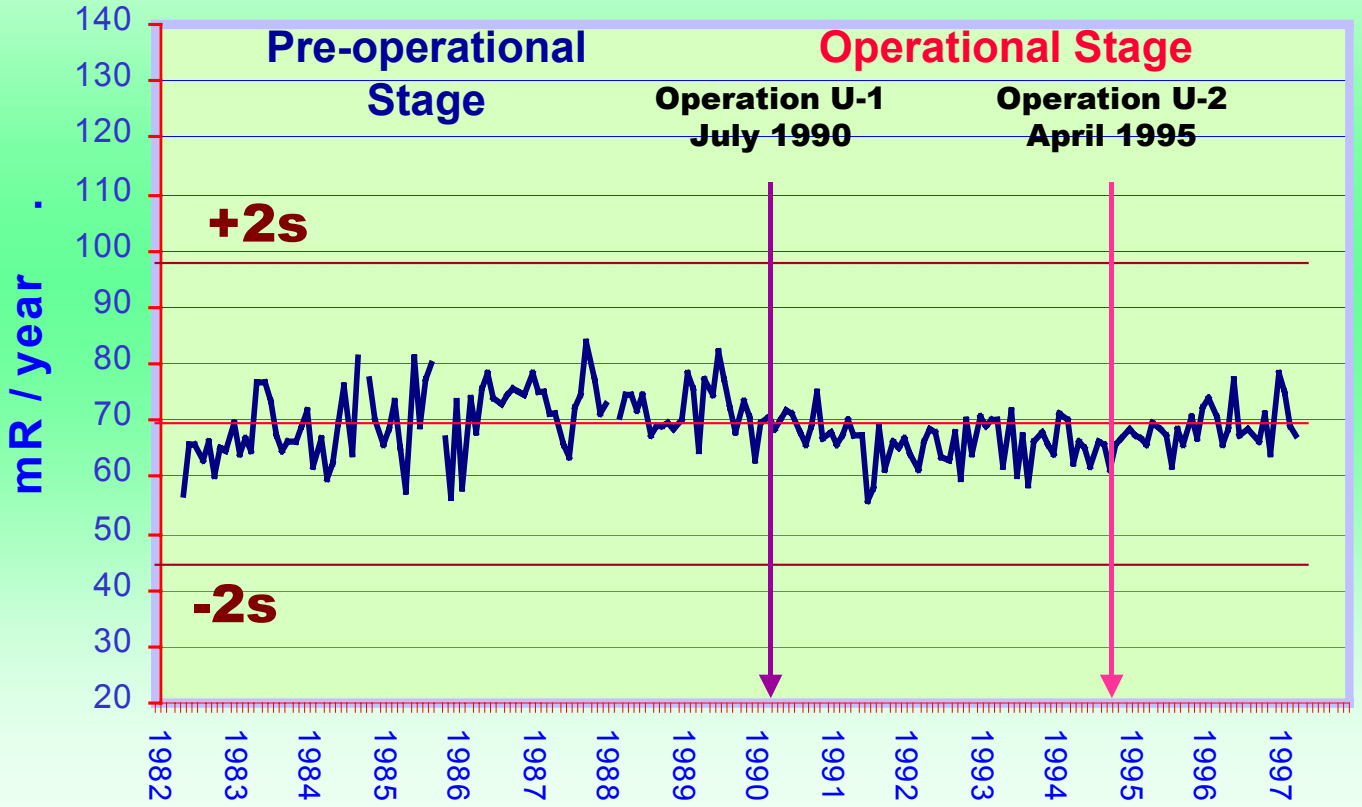

FIGURE 15.2

ARTICLE 16. EMERGENCY PREPAREDNESS

16.1 LVNPS EMERGENCY PLANS

16.1.1 Regulatory Aspects

Article 28 of the Nuclear Law stipulates: *"Authorizations for construction and operation of a nuclear installation shall be issued only when it can be demonstrated, by presenting the pertinent information, how safety objectives are to be attained and which procedures and methods will be used during the siting, design, construction, operation, modification, final closing down and dismantling stages. In addition, the corresponding radiation emergency plan shall be presented. Such information should follows the terms and forms stipulated in the regulatory provisions of this Law"*.

In the same way, Article 50, Fraction VII, defines Regulatory Body attributions and responsibilities: *"Prior to the start-up of operations, review, assess and authorize the plans that should be in place for dealing with anomalous or emergency conditions in nuclear and radioactive installations".*

The General Regulations on Radiological Safety establish in a particular manner, in Article 124, that: *"Prior to initiating operations, all radioactive (and nuclear) installation must count on a congruent Emergency Plan having guidelines contained in the National System for Civil Protection and based on a survey of the radiological consequences of accidents which could occur at the installation".*

Condition 12 of LVNPS-1 & 2 operation licenses, defines not only the need to maintain environmental surveillance programs and physical security plans updated but also to update radiological emergency plans, putting more emphasis on their continuous improvement.

The normative framework previously described determines the attributions and responsibilities for each of the main parties in the elaboration and execution of the radiological emergency plans; these shall be considered complete with the incorporation of the requirements established in the following standards:

Article 125 of the General Regulations on Radiological Safety (Annex III), US Title 10 of the Federal Code of Regulations: Part 50, Appendix E "Emergency Planning and Preparedness for Production and Utilisation Facilities"; and Sections: 50.47 "Emergency Plans"; 50.54 (t) "License Conditions"; USNRC Regulatory Guides: 1.97 "Instrumentation for Light-Water-Cooled NPP's to Access Plant and Environs Conditions During and Following an Accident"; 1.101 "Emergency Planning and Preparedness for Nuclear Power Reactors"; as well as the regulatory document NUREG-0654 "Criteria for Preparation and Evaluation of Radiological Emergency

Response Plans and Preparedness in Support of Nuclear Power Plants" (for the USNRC regulations see Annex IV).

16.1.2 Emergency Response Organisation

The Radiological Emergency Response Organisation is composed of Federal and State entities listed below. These entities form the External Radiological Emergency Plan Committee (COPERE):

- Secretaría de Gobernación - SG (Secretariat of the Interior)
- Comisión Federal de Electricidad - CFE (Federal Commission of Electricity)
- Secretaría de Comunicaciones y Transportes -SCT (Secretariat of Communications and Transportation)
- Secretaría de la Defensa Nacional -SEDENA (Secretariat of Defence)
- Secretaría de Marina y Armada de Mexico, SM-AM (Secretariat of the Navy)
- Gobierno del Estado de Veracruz - GDV (State Government of Veracruz)
- Secretaría de Salud -SS (Secretariat of Health)
- Instituto Nacional de Investigaciones Nucleares - ININ (National Institute for Nuclear Research)
- Comisión Nacional del Agua - CNA (National Commission of Water)
- Secretario Técnico del COPERE -Technical Secretary of COPERE (SETECO)
- Comisión Nacional de Subsistencias Populares – National Commission of Popular Supplies (CONASUPO)
- Procuraduría Federal de Protección al Ambiente –Federal Department of Environmental Protection (PROFEPA)

Representatives of these Dependencies with attributions in the Plan, participate in updating the Plan and its procedures, training personnel, informing the public, verifying human and material resources as well as in the planning and performing of drills and exercises.

The Secretariat of the Interior directs both planning activities and tasks during an emergency condition. During conditions of activation of the Emergency Plan, CFE takes leadership in establishing protective actions (informing the public, evacuation, establishment of lodgings, decontamination and monitoring centres, dose calculation and projection, etc.), to then cede these as soon as the governmental entities groups are ready to assume their responsibility. Table No. 16.1 shows the matrix of responsibilities of the External Radiological Emergency Plan.

The Radiological Emergency Response Organisation is responsible for establishing the interrelation with other civil protection plans.

16.1.3 Emergency Assessment Actions

The Emergency Plan describes a means for determining the magnitude of a radioactive material release as well as its continuous assessment. It includes emergency levels used as criteria in determining the need for notification and participation of local and state authorities. Based on emergency action levels, it is determined when and what kind of personnel and public protective measures are to be used on and off site boundaries. In order to define emergency action levels, plant & instrumentation conditions are used in addition to radiological surveillance on and off-site. There are four classes of emergencies defined as follows:

Unusual Event: referring to events in process or which have occurred, not common, indicating a potential degradation in the plant's safety level. In an event of radioactive releases, the value of these exceeds 2 times the ETO´s limits for a period greater than 60 minutes, not requiring a response or off-site monitoring, unless degradation of safety systems persists.

Alert: those events in process or which have occurred involving a real or potential substantial degradation in LVNPS' safety level. In the event of radioactive releases, it is expected for such releases to exceed 200 times the ETO´s limit for a period greater than 15 minutes.

On-Site Emergency; referring to events in process or which have occurred involving real or probable mayor failures of operations necessary for public protection. In the event of radioactive releases, it is expected for these to exceed the integrated whole body dose of 1 mSv (100mR) or infant thyroid's dose of 50 mSv (5000 mR) during release duration up to site boundary.

General Emergency: those events in process or which have occurred involving a substantial degradation of the core, real or imminent, or melting of the core having a potential to lose contention integrity. Discharges are expected to exceed the integral whole body dose of 10 mSv (1000 mR) or infant thyroid's of 5 mSv (5000 mR) beyond site boundary.

Two zones are defined for those areas or zones surrounding LVNPS that require of population protective measures: Plume Zone (a radio of 15 km from LVNPS) and Ingestion Zone (a radio of 70 km from LVNPS).

16.1.4 Installations and Emergency Equipment

The Emergency Plan includes as part of the material, human resources and agreements (with state and local authorities):

- Monitoring equipment for response personnel
- Equipment to determine the magnitude and continuous assessment of a radioactive material release to environment.
- Equipment to notify the emergency, on-site and off-site.
- Equipment to evacuate personnel on-site and public from affected area sectors.
- Site installations and supplies to decontaminate individuals on-site.
- Off-site installations and supplies to decontaminate response personnel and the public.
- Off-site medical installations and supplies to provide first aid treatment during an emergency.
- Off-site medical installations and supplies to provide first aid treatment and specialised medical attention to response personnel and the public.
- Medical services and qualified medical arrangements to handle on-site radiological emergencies.
- Medical services and qualified medical arrangements to attend patients as a result of radiological emergencies.
- Arrangements for transporting injured and contaminated people on-site and public affected.
- Technical Support installations, installations for operation near the site and from where a good management and effective control can be achieved during an emergency.
- At least one communication system on-site and another off-site, each counting on their own back-up power system.
- Arrangements to provide sheltering to public evacuated.
- Arrangements for surveillance of the emergency zone as well as for the rescue of people possibly affected.
- Arrangements to control water and foods required within the zone.

16.1.5 Emergency Plan Activation Exercises/Drills

Drills have been carried out, both internal (Internal Emergency Plan) and external (External Emergency Plan) to verify the adequacy as well as the validity of preparations for facing a radiological emergency at LVNPS, in which human response is evaluated as well as systems, devices, material resources in general, being an additional purpose to find areas of improvement in emergency planning. The main areas studied during these exercises have been: fire at the station, notifications and communications, first aid and medical care, radiological surveillance at the station, dose projection, radiological control, on-site emergency and environmental radiological surveillance. An integrated drill is carried out at least every two years as part of the requirements to maintain the operation license.

16.2 MEASURES FOR INFORMING THE PUBLIC IN RELATION TO EMERGENCY PREPAREDNESS

A section in the Emergency Plan includes a permanent program of divulgation in order to familiarise the public with such plan as well as to orient them, for their own safety, on the conduct to be observed during the execution of it. LVNPS owner, the State Government of Veracruz and Secretariat of the Interior are in charge of the application of this program. Part of the strategy of divulgation of preparations for an emergency consists of the distribution of written information and public informative programs by LVNPS personnel. To this respect, permanent contact is maintained with the population leaders of the zone whom assist in the program of public divulgation on LVNPS and the Emergency Plan. Moreover, a calendar is prepared each year, in co-ordination with all dependencies participating in the Emergency Plan, and distributed to the inhabitants of the zone. This calendar describes actions to be taken in case of an emergency at LVNPS.

16.3 INTERACTION WITH NEIGHBOURING STATES

Mexico is part of the Convention on Prompt Notification of Nuclear Accidents and also of the Convention on Assistance in the Event of a Nuclear Accident or Radiological Emergency since 1988 and in the event of a radiological emergency at a Mexican nuclear facility in which the probability of affecting neighbouring state territories exists, there is a procedure under the responsibility of CNSNS whose objective is to notify under the terms of the aforementioned Convention on Prompt Notification, the occurrence of such kind of events. Regardless of the above, Mexico holds bilateral agreements for exchanging technical information (including the occurrence of important events) with it's nearest neighbours.

Mexico is also part of the World-wide System of Early Communication of the IAEA, through which immediate information is provided to the IAEA in the event of a radiological emergency at LVNPS. In general, this same information is available for neighbouring countries. Likewise, as indicated in Section 9.1 of this National Report, Mexico is signatory of the Convention on Civil Liability for Nuclear Damages. It is important to mention that LVNPS is located more than 500 km away from the nearest country.

Mexico counts on with a National System of Civil Protection. In the event of a Radiological Emergency at a US´nuclear station near to the mexican border which has a probability of affecting the national territory, then the DN3 Plan would be activated. The Secretariat of Defence, under the direction of the Secretariat of the Interior, is responsible for the application of such Plan, Secretariat of Health and CONASUPO. The DN-3 Plan includes the infrastructure necessary to establish adequate communication, capacity of evacuation, and to establish centres of control that allow taking appropriate actions during the emergency. However, it is important to mention that nuclear stations in the USA are located more than 100

km away from the border with Mexico. Other bordering countries, like Guatemala have no nuclear power stations and therefore they are not expected to affect the national territory.

16.4 REGULATORY BODY ACTIVITIES

During the occurrence of an accident, the main responsibilities of the Regulatory Body are to advise the Federal Government in decision-making process. For this, a Emergency Committee is installed immediately after the notification of any radiological incident and in particular upon the activation of the LVNPS Emergency Plan. See Article 8 in this National Report.

As regards to LVNPS' Emergency Plan, an important duty of CNSNS is to carry out inspections and audits on the grade of fulfilment of the preparations within each one of the dependencies forming part of the Plan. CNSNS designs integral drills both for the Internal and External Plans and it assess the performance of each one of the dependencies participating. In a similar manner, CNSNS reviews and evaluates the Emergency Plan document and related procedures.

16.5 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

In the contents of the preceding sections of this Article, it is established that the Mexican United States counts on adequate planning to minimise consequences for the population in the event of a condition which could result in a radiological emergency at LVNPS and affect its surroundings. This along with integral and individual periodic exercises of each and every one of the radiological emergency response activities and assessment and surveillance activities by CNSNS allows to conclude that obligations in Article 16 of the Convention on Nuclear Safety are fully satisfied.

ARTICLE 17. SITING

17.1 REGULATORY ASPECTS

Prior to grant of the Construction Permit, the owner of LVNPS provided information in order for the location of the site where the construction was to initiate to be authorised; even though the Nuclear Law is posterior to the initiation of the construction work, the regulatory standards to approve this stage of installation were 10CFR 100 and Appendix A, Part 50 of the same title, the following Regulatory Guides (RG) were added as soon as edited: R.G. 1.29 defining seismic design classification; R.G. 1.59, related to design basis for floods; R.G. 1.60 defining seismic design response spectrum; R.G. 1.61 establishing seismic design damping values; R.G. 1.70 on safety report standard forms and contents; R.G. 1.76 on design basis tornado; R.G. 1.91 considering human activities nearby nuclear installations, defining explosion characteristics occurring within the vicinity of the plant; R.G. 1.102 on protection against floods; R.G. 1.111 on radioactive effluent dispersion; R.G. 1.132 on foundation investigations and R.G. 4.2 on environmental impact reports (for the USNRC regulations see Annex IV).

17.2 LAGUNA VERDE NUCLEAR POWER STATION SITE

After performing an analysis, in combination with experts from the IAEA (in 1968), to the different sites proposed, it was decided that the site gathering seismic, accessibility, cool water supply, demographic and location characteristics was the place located on geographic co-ordinates UTM Latitude 19° 43’ 30” North and Longitude 96° 23’ 15” West, in the State of Veracruz.

Once the preliminary selection was made, detailed studies were initiated, considering Geography, Demography, Meteorology, Hydrology, Geology, Geotectonics, and Seismicity as well as the impact these would have on the installations, occurrence of diverse weathering and activities generated by man.

This information was provided as part of the Preliminary Analysis Safety Report (PSAR), later updated in the Final Safety Analysis Report and submitted to CNSNS as a support of the request of license to operate LVNPS-1 & 2 (see Article 7 of this National Report). Besides, CNSNS requested the delivery of an Environmental Report in addition to the information presented in the Final Safety Analysis Report.

17.2.1 Design Basis as Regards to LVNPS-1 & 2 Siting

Main site characteristics (Geography and Demography, Impact of Industrial Installations and Geology, Seismology an Geotectonic Engineering) used in defining design basis related to LVNPS-1 & 2 Siting are briefly identified below.

- **Geography and Demography**

The geography analysis performed took into account population growth perspectives, zones of its influence and changes in the land uses up to the year 2020. Areas of property over which CFE has authority were defined exactly as required by the applicable standards, for instance the Restricted Area, Controlled Area and Exclusion Area:

There are no high-density population areas within a vicinity of 10 km from LVNPS. Similarly, there is only one settlement of 5 inhabitants within a radio of 2 km from the plant. The low population area, as defined in 10CFR100 (Annex IV), consists of an area of a radio of 15 km from the site. Population projected within this zone for the year 2020 is approximately 34,530 inhabitants, being considered a low density population. Population centres currently of over more than 20,000 inhabitants covering a radio of 70 km from LVNPS are:

CITY	POPULATION	DISTANCE FROM SITE (KM)	DIRECTION
Coatepec	28,499	65.6	WSW
Jalapa	204,594	57.5	WSW
Veracruz	284,822	65.0	SSE
Veracruz and surrounding suburbs	~ 1,000,000	70.0	SSE

- **Impact of Industrial Transportation and Military Facilities Nearby the Site.**

There are no military, chemical or fabrication industry, airport or chemical storage facilities within a radio of 8 km from the site which could potentially affect the operation of LVNPS-1 & 2.

The most important route of transportation within a radio of 10 km is Federal Road No. 180 running North to South and 2 km East from the site. This road serves as the means of access to LVNPS having a vehicle flow of less than 3000 vehicles per day.

The nearest commercial railway is located at 40 km from the site and there is a private industrial railway extension 15 km from the site, which is rarely used.

The nearest airport is located 70 km South from Laguna Verde, in Veracruz. The main runway is 2500 m long and 45 m wide.

A maritime route between Veracruz and Tampico passes in front of the site at an approximate distance of 83 km. In addition, small fishing boats operate over 5 km away from Laguna Verde's coast. The design of the intake structure of LVNPS-1 & 2 considers breakwaters to protect it from any impact produced by this kind of boats.

A 7.5 cm diameter oil pipe and another 121 cm diameter pipe for natural gas, property of the national oil company (PEMEX) passes by LVNPS' installations (Reactor Building) at approximately 1200 m.

As part of the Impact Assessment of facilities within the vicinity against LVNPS-1 & 2, the following events were analysed:

Explosions

a) Due to the distance between the road and maritime routes, and LVNPS, no event postulated on such routes represents a risk for structures important to safety, since the effects caused are involved in considerations of the seismic design basis, tornado design basis and hurricane design basis.

b) Hypothesis of gas pipe line incidents were analysed as regards to:

   Explosion and thermal load through ignition of leaked gas.

   Results of the analysis show both that the pressure peak caused as well as the thermal load produced by explosion are inferior to the hurricane design basis and thermal structural design.

Toxic Chemicals

No important amounts of toxic chemicals are used or stored within the vicinity (8 km) of LVNPS.

Fires

There are not any external installations within the vicinity of LVNPS, which could lead to producing fire conditions.

Therefore, considering the above-cited information, it is observed that there aren't any installations within the vicinity that may be considered as a basis for the design of Laguna Verde.

The design of structures, systems and components for LVNPS-1 & 2 was based upon normal and extreme meteorological and hydrological conditions, which could hypothetically appear at site. This includes the consideration of maximum sustained winds, tornado winds, effects from a maximum possible hurricane, maximum probable flooding and seige, surge and tsunami wave effects. Furthermore, and in a conservative manner, structures important to safety have been analysed against stresses resulting from an elevated 3 m high flood above the installation's ground level.

- **Geology, Seismology and Geotectonic Engineering.**

LVNPS's siting is located at the intersection of parallel 20 and the Trans-Mexican volcanic belt. The facility is founded on a mass of Pliocene-Pleistocene basaltic rocks running along the Gulf of Mexico over an approximate 1.4 km extension of a variable 30 to 50 metre thickness. Stratigraphic studies show the existence of a subjacent layer of alluvium consolidated deposits of a 40 to 65 metre thickness deposited over andesitic material, extending itself 150 metres in depth. The basaltic layer presents a columnar fracture of thermal nature of lengths going from 6 to 8 metres.

In order to satisfy the regulatory requirements, CFE performed the following studies: Phisiography, Geological History, Differential Settlements and Upheavals, Stratigraphy, Faulting, Chemical Weathering, Cavernous and Carstic Terrain, Subsoil Faults Under Dynamic Load, Pre-consolidation Evidence through Volcanic Erosional Processes, Liquefaction, Slope Stability, Permeability and Phreatic Levels, Seismic Stability of Alluvium Materials subjacent to Superficial Basalt and Flow of Ashes and Lava from a Potential Volcano Eruption.

The following regional environmental studies were performed covering a radio of 320 km: Volcanic activity, Superficial faulting, Tsunami and Tectonic of sea bed, Attenuation of vibratory movements of trans-mexican volcanic belt terrain, Tectonic provinces and maximum historically-related earthquakes, Acellerograms, Determination of Design Basis and Operation Basis Earthquakes, Geological-Seismic conditions on continental platform and Sea bed boundary, Correlation of regional seismicity with that of the site, Structural relations between "Graben", "Palma Sola", "Cofre de Perote" and "El Farallon", Related tectonics; Analysis of two faults parallel to volcanic cones of "El Abra", Related tectonics; Distribution of mine fracture systems and the zone of "La Viga-

Tuxtla" as well as distinction fracture system of "El Abra, Tectonics related.

Particularly, in relation to the volcanic risk and as an example of the detail and deepness of the studies performed, both active and non-active volcanos within a radio of 150 kms from the site, including those corresponding to the sea bed, were analysed. In order to provide conservative results of the effect of a volcano eruption, the following was considered as an analysis basis event: (1) The birth of a new volcano 13.5 km away from the site in direction of the ash volcanoes "El Abra", producing quantities of ash and lava equivalent to data on the Paricutin Volcano, and (2) The eruption of the "Peak of Orizaba", considering the amount of ash expulsed equivalent to that of Mount St. Helen in U.S.A. on May 18, 1980. Results determined that the effect of a nearby ("El Abra") or so far ("Peak of Orizaba") volcano eruption would not affect the safe condition of LVNPS-1 & 2.

From the above, Operating Basis Earthquake and Safe Shutdown Earthquake were obtained with their respective values of 0.14 and 0.26 g horizontal and vertical acceleration.

17.3 CONSEQUENCES TO THE LVNPS SURROUND DUE TO OPERATION

In compliance with the General Law of Ecological Equilibrium and Environmental Protection and requirements for awarding LVNPS' operation license, CFE submitted to CNSNS, an Environmental Report following lineaments in Regulatory Guide 4.2 of the USNRC. The main purpose of this report is to show that the impact of LVNPS' operation will not cause important disturbances within the immediate siting environment.

An evaluation was performed on LVNPS' effect of operation to environment, both under normal operating conditions, in function of liquid and gaseous radioactive effluents, chemicals, biocides and sanitary and under abnormal accident conditions resulting from the postulation of very low probability occurrences, being the objective to verify the installation's capability for their control and mitigation.

For effects of normal operation, an environmental monitoring program has been implemented. It is ruled by LVNPS-1 & 2 Technical Specifications for Operation. This program initiates during the pre-operational stage to determine the baseline of comparison to detect, in an immediate and early manner, any effect of environmental deterioration.

Previous to the awarding of LVNPS-1 & 2 operation licenses, CNSNS evaluated the environmental report, determining that the real impact of LVNPS operation

resulted in effects within the environment that entirely satisfy the installation's design objectives. In relation to the monitoring program, regardless of how adequate and reliable the program developed and implemented for CFE is and of the International Inter-Comparison Analysis to which its results are subject, CNSNS, as of 1979, initiated an environmental sampling survey program to determine the baseline and monitoring during operation in a totally independent manner from CFE. To this day, the results obtained by CFE have proved to fit the results obtained by CNSNS. No significant statistical differences were identified in relation to environmental radioactivity pre-operational values.

17.4 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

Based on previous sections, it can be stated that appropriate legislative and regulatory measures have been adopted within the Mexican United Sates for the establishment and application of procedures satisfactorily used to evaluate and maintain the effectiveness of all important factors related to siting and from which corresponding bases have resulted for the design, testing and operation of structures, systems and components important to the safety of LVNPS-1 & 2. Also, to evaluate the appropriateness of its siting as regards to probable consequences to the surround both normal operation as well as very low probability incidents.

From the above cited, it is concluded that obligations provided in Article 17 of the Convention on Nuclear Safety are met.

ARTICLE 18. DESIGN AND CONSTRUCTION

18.1 REGULATORY ASPECTS

The Regulatory Law of the Constitutional Article 27 on Nuclear Matters in its Articles 15, 19, 20, 21, 25, 26, 28, 32, 34 and 50 (Annex I), in general terms, establishes the requirements to be satisfied by nuclear installations from the design phase, during construction and the operation stage.

Since the first edition of the Nuclear Law that dates from 1979, when the design of LVNPS was found to be quite advanced and the construction already had initiated four years back, the criteria that ruled the general conception of the original design was based on the philosophy that “any nuclear installation built in Mexico shall satisfy the applicable requirements as it should be licensed in the country of origin of the nuclear steam supply system”. Due to this, the first agreement of the referenced standard for licensing was based on Title 10 “Energy” or 10CFR of the Code of Federal Regulations of the United States of America, (Annex IV).

In particular, the 10CFR and its Appendix A, establish fundamental criteria for design, fabrication, construction, testing and performance requirements for structures, systems and components important to safety. This ensures in a reasonable manner that the installation may be operated without undue risk to health and safety of operational personnel’s and that of the public and their property.

Based on this regulatory framework, basic design criteria satisfied the following six groups: General Requirements, Protection by Means of Multiple Boundaries against Fission Products, Protection Systems and Reactivity Control, Fluid Systems, Reactor Containment, and Fuel and Radioactivity Control.

On the other hand, the constructive process was performed in compliance with industrial standards, codes, industrial and quality standards corresponding to the quality required by the nuclear industry in the USA. For example concrete structures were raised under the standards of the American Concrete Institute (ACI), mechanic systems and components under the standards of the ASME Code. Section III, Division I and USNRC Regulatory Guides 1.20, 1.46, 1.60, 1.61, 1.92 y 1.122 (Annex IV), among others.

Electrical and electronic components were constructed, fabricated and qualified taking into account the standards requirements of the Institute of Electrical and Electronic Engineers” (IEEE); the selection of special materials, welds, paint, etc were performed in accordance with standards of the “American Society of Testing Material” (ASTM).

Other aspects such as the Pre-service and In-services Inspections of the coolant pressure boundary part components were carried out based on ASME Code, Section XI and the assessment of the Quality Assurance Programs based on standards from the “American National Standards Institute” (ANSI), Series ANSI N45.2.

18.2 DESIGN ASPECTS

LVNPS, own by CFE, is located at “Punta Limon”, Municipality of “Alto Lucero” in the State of Veracruz.

LVNPS consists of two units, each one having a direct nuclear steam supply system (NSSS) known as boiling water reactor (BWR) and supplied by General Electric of the United States of America. The containment is Mark II of the type pressure suppression.

The nuclear system operates by a direct water cycle, which recycles in the reactor vessel. This system has a rated power of 1931 MWt and a design power rate of 2015 MWt (thermal megawatts).

Each LVNPS unit generates a gross electric power of 675 MWe (electric megawatts) and a net power of 654 MWe (21 MWe correspond to the consumption of auxiliaries).

The reactor vessel is fabricated of a steel alloy having low carbon contents and an inner liner of stainless steel except for the top head.

Fuel is uranium dioxide slightly enriched in form of small ceramic pellets contained in metallic tubes of a Zirconium alloy base. The original design contemplates 62 of these tubes arranged in 8 x 8 assemblies with two hollow tubes. The total core holds 444 fuel assemblies; the fuel design has been modified in accordance with technical advances in this field, maintaining safety standards relative to the generation of lineal heat and peak factors.

Reactor control is carried out by means of 109 cruciform rods containing boron carbide as a neutron absorbent. Insertion mechanisms are located at the inferior part of the reactor vessel.

LVNPS units 1 & 2 have similar characteristics to other installations built in the USA, such as Washington Nuclear Power 2, La Salle 1 & 2, Nine Mile Point 2 and Susquehanna which have been in operation since the 80’s.

General Electric has been the company responsible for the design, fabrication and delivery of the nuclear steam supply system of both units. It has provided direction

and advisement during the installation and start up of the equipment, continuing to this day as Assessor. The turbo-generator unit was fabricated and mounted by the Mitsubishi Company of Japan, the company assists in modifications and major maintenance to such unit.

18.3 IMPLEMENTATION OF THE PHILOSOPHY OF DEFENCE IN DEPTH

The maintenance of the integrity of barriers to avoid the leak of radioactive material was adopted from the siting selection, conceptual and specific design stage including LVNPS construction.

The focus covered three levels:

- **Level One:** LVNPS has been demanded a high level of reliability to prevent the occurrence of abnormal situations by means of the incorporation in the design of the redundancy and diversity necessary to guarantee that critical functions (reactivity control, core cooling and control of radioactive material) are permanently guaranteed, relying for this purpose on methodologies such as quality assurance and the capability of important systems to be tested and inspected.

- **Level Two:** LVNPS postulated that despite the care adopted in Level One, occasional abnormal situations should arise; therefore, all necessary devices should be incorporated in the design to avoid such situations from becoming an accident.

  Level One and Two were evaluated in Chapter XV of the Final Safety Report and in the PSA Level 1 & 2 (Individual Plant Examination).

- **Level Three:** The presence of a very low probability event exceeding design basis is supposed, resulting in damage to the core and release of radioactive material to the environment. Developing and implanting the External Radiological Emergency Plan (PERE) performed a practicable application of this level.

18.4 LVNPS DESIGN CRITERIA AND STRUCTURE, SYSTEM AND COMPONENT CLASSIFICATION

18.4.1 General Design Criteria

a) Residual heat removal systems are provided with sufficient capacity and an adequate operation to remove the heat generated in the reactor for the totality of normal operation conditions and abnormal operational transients.

b) Backup heat removal systems are provided to remove decay heat generated in the reactor under inoperable conditions of normal heat removal systems. The capacity of these systems must be adequate to prevent damage to fuel cladding.

c) Fuel cladding in conjunction with other systems are designed to remain integral in such way that any failure will be within the acceptable limits considering the totality of normal, and abnormal transients conditions of operation.

d) Control equipment is provided to enable the reactor's automatic response to fuel changes and abnormal operational transients.

18.4.2 Safety Design Criteria

LVNPS was designed following standards approved for nuclear installations.

LVNPS was designed and raised in a manner that the release of radioactive material to environment does not exceed the limits and values determined in the applicable standards and regulations in relation to normal operation releases, abnormal transients and accidents.

1. The reactor is designed in such a way that it's nuclear characteristics does not contribute to the generation of a divergent power transient.

2. The reactor is designed to not present a tendency towards divergent oscillations of any of the operation parameters, considering for this, the interaction of the reactor with other LVNPS systems.

3. Installations for disposing of solid, liquid and gaseous waste are designed so that discharges of radioactive effluents and the transportation of radioactive materials off-site can be performed in accordance with the standards and regulations established by the Regulatory Body

4. The Main Control Room's design provides a means to be able to determine that the reactor is operated within envelop conditions considered in the Safety Analysis for LVNPS and to alert LVNPS operators when radioactive releases approach their limits.

5. Shielding are provided against radiation and access routes are established in a manner that allows duly trained operation personnel to control radiation doses within the limits established in applicable regulations.

6. Portions of the nuclear system forming part of the coolant pressure boundary are designed to maintain their integrity as a contention barrier for the

radioactive material resulting from abnormal operational transients and accidents.

7. Safety-related and engineering safeguards systems and engineering safety features must function to ensure that the reactor coolant pressure boundary does not suffer damage from internal pressure produced by abnormal operational transients and accidents.

8. If an immediate and precise action is required in response to abnormal operational transients and accidents, such action is automatic, no decision or manipulation of controls is required by LVNPS operation personnel.

9. Essential safety actions are performed by equipment having sufficient redundancy and independence, so that no single failure of certain passive or active components impair the function required, even in certain long-term cases.

10. The control of safety and safeguards and engineering safety features system passive components is capable of being operated from the control room.

11. The design of the nuclear and safeguards and engineering safety features systems demonstrates its workability.

12. The design of the nuclear and engineering safety features systems includes factors for considering natural environmental disturbances such as, earthquakes, floods and storms that may occur at LVNPS.

13. The electric power reserve sources have sufficient capacity to energise all nuclear safety and engineering safety features systems that may require so.

14. The design incorporates electric power back up sources in order to allow for a prompt reactor shutdown and decay heat removal, under circumstances in which the normal auxiliary power is not available.

15. A primary containment is used to envelope the reactor system, using the concept of pressure suppression.

16. The integrity and tightness of the primary containment may be tested periodically.

17. There is a secondary containment that completely envelope the primary containment. This secondary containment has a system to minimise off-site effects produced by any radioactive material release from the primary containment.

18. Primary and secondary containment's in combination with other engineering safety features systems limit radiological accident effects, resulting in radioactive material releases of a volume of containment inferior to prescribed acceptable limits.

19. In order to maintain the integrity of the primary containment posterior to an energy release accident occurrence within the same, means are provided to remove such energy.

20. Piping penetrating to the primary containment and which may represent a pathway of uncontrolled releases to environment are isolated automatically when the release of radioactive material is imminent. Such isolation is executed punctually to limit radiological effects below the specified acceptable limits.

21. Emergency cooling systems to limit the fuel cladding temperature were designed in such a manner that such parameter is maintained at values inferior to limits given in 10CFR50.46 for loss of coolant accident events.

22. Core emergency coolant systems ensure the continuity of the reactor coolant for the total range of rupture sizes postulated in the reactor coolant pressure boundary.

23. Operation of the reactor emergency coolant systems is automatic when required, regardless of the availability of external power supplies or LVNPS' normal generating systems.

24. The control room is shielded in order to guarantee its habitability under any possible accident condition.

25. In case of inhabitability in the control room, it is possible to conduct the reactor from its rated operation power to cold shutdown conditions, using local controls and equipment available outside the control room.

26. Redundancy capacity is provided having functional independence for reactor shutdown, regardless of the normal reactivity control measures. This support system has the capacity to shutdown the reactor at any normal condition and from there, maintains the shutdown condition.

27. Fuel storage and handling installations are designed to avoid inadvertent criticality, maintain shields and cooling of spent fuel. Installations allow storing spent fuel during the plants operative lifetime.

28. Systems having redundant or backup safety functions are physically separated and arranged in a way that any believable event that could cause damage to a region of the nuclear island complex does not compromise the functional capacity of the system designed as a counterpart.

29. No equipment or systems required for the reactor's safe shutdown is shared between Unit 1 and Unit 2.

18.4.3 LVNPS Structure, System and Component Classification

In order of importance to safety, structures, systems and components at LVNPS are classified as follows:

Safety Class 1

Applying to reactor coolant pressure boundary components or core support structure, in which a failure may cause the loss of reactor coolant at a greater rate than the normal reposition system.

Safety Class 2

Applying to structures, systems and components in which processes and services are essential to:

- Reactivity Control
- Maintain the Core's Cooling Geometry
- Core Emergency Cooling
- Provide and maintain Containment
- Remove reactor and Core Residual Heat

Safety Class 3

Applying to structures, systems and components that:

a) Transfer or contain radioactive material that if released due to a failure in the component, would result in an exceeding 5mSv whole body dose (500 mrem) at the site boundary or its equivalent to any part or organ.

b) Provide in an essential manner, support to any safety-related structure, system or component.

Class 1E

Applying to electrical and instrumentation & control systems essential for reactor safe shutdown, containment isolation, reactor core coolant and, reactor and containment heat removal or for preventing a significant radioactive material release to environment.

Seismic Classification

LVNPS-1 & 2 safety-related structures, systems and components designed to remain operable during and/or after a Design Basis Earthquake or Safe Shutdown Earthquake; these are defined as Seismic Category 1. Specifically instrumentation & control components as well as electric components considered Class 1E are required to be seismically qualified by means of tests and/or analyses. Such qualification minimises the possibility of failure of electric equipment/components and of instrumentation as a result of an earthquake occurring, which would appear as a common failure cause.

Environmental Qualification

Class 1E equipment and components are submitted to tests to certify their capacity in performing their safety function under normal, abnormal and environmental accident conditions specific of its localisation, including: temperature, humidity, pressure, radiation, chemical sprinkling, and vibrations.

The methodology of qualification demonstrates that the equipment/components retain their functional capacity under accident conditions even upon at the end of their life service.

In addition to the above, LVNPS considers structures, systems and components forming part of the fire protection system as important to safety. These serve to protect areas containing equipment important to safety and from process systems, which even though are not Class 1, 2 or 3, form part of the radioactive material pressure boundary.

18.5 PROVED VALIDITY OF LVNPS 1 & 2 DESIGN AND CONSTRUCTION

Subsection 1.3 “Comparison Tables” in the Final Safety Analysis Report ISSE/FSAR of LVNPS, underlines the main design characteristics of the plant. These important characteristics are compared with those of other Boiling Water Reactor installations. It is also determined that the design of these installations is based on approved technology obtained during the development, design, construction and operation of similar types of boiling water reactors. It is deduced from the data, characteristics and other information shown that LVNPS is an approved design and no characteristics were incorporated to the same to classify it as a “unique type”.

In general, the design of LVNPS-1 & 2 components, structures and systems was prepared applying methodologies and criteria accepted and validated by the industry.

Codes, specifications and standards used for the design are the same as those applied in the nuclear industry in the United States of America: LVNPS-1 & 2 Seismic Category I structures; mechanical components; instrumentation and control systems and electric systems.

All LVNPS-1 & 2 design, purchasing and construction activities have been performed according to requirements in CFE's Construction Quality Assurance Plan. Particularly, Section 9 of this plan establishes criteria to be met for the optimal execution of the constructive processes considered which due to their characteristics are considered "Special Processes". For more details, refer to Article 13 of this National Report.

The construction finalised with the execution of a pre-operational testing program that consisted of transferring 168 systems from personnel whom constructed to personnel whom would operate the plant. This program had the following purposes: guarantee that the plant was completed satisfactorily; that the construction was performed according to its design; that the systems and component of the plant had the same margins of design to respond to expected transients; and, that the procedures for operating the plant were adequate.

The stage of validity of the design and construction finalised upon the execution of the nuclear test program (start-up tests), which validated design suppositions and that the safety criteria and margins during transients were adequately incorporated to the systems.

18.6 CNSNS ACTIVITIES

CNSNS watched over all LVNPS-1 & 2 design, purchasing, construction and test activities through the execution of evaluations, inspections and audits as well as continuous witnessing through its Resident Inspectors. Any change modifying the fulfilment of the codes (for example, ASME Code, Code Cases) and standards has been approved by CNSNS.

During the design, construction, pre-operational test and start-up test stages, the Regulatory Body has exercised its authority to perform inspections, raise findings and demand corrective actions in order to avoid recurrence of deviations. Likewise, CNSNS has determined that the obligations as regards to standards and standards involved were met during these stages.

Modification to the original design performed during the construction and pre-operational test stages were revised and approved by the Regulatory Body prior to awarding the Initial Fuel Loading Permit.

18.7 RELIABLE OPERATION

In relation to the existence of reliable levels and methods of protection, refer to Article 10 in this National Report.

As regards to the consideration of human factors and a reliable operation, see Articles 12 and 19 respectively, in this National Report.

18.8 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE CONVENTION OBLIGATIONS

Observing this Article, it is established that in the Mexican United States the Law, Regulations, Implementation's and Surveillance's of the same by CNSNS as well as the principle of Defence In Depth have been fundamental for the design and construction of LVNPS-1 & 2. These have provided several levels of protection against the emission of radioactive material in order to prevent accidents and minimise radiological consequences in the remote event of occurrence.

Furthermore, technologies adopted in the design and construction are of proven validity in similar reactors operating in the United States of America and Europe, in general, there are no unique characteristics and in special cases the acceptance of CNSNS has been based on specific tests and analyses.

The above added to the consideration of the limitation of human performance in the design both under normal and abnormal conditions and postulated accidents, ensure the reliable, stable and easily controlled operation of LVNPS.

Therefore, compliance with obligations in this Article 18 of the CSN is satisfied.

ARTICLE 19. OPERATION

19.1 INTRODUCTION

The CNSNS is, as mentioned in previous sections, a semi-autonomous unit of the Secretariat of Energy and among its functions it verifies the compliance with national and international regulations applicable to the design, construction, putting into service and operation of nuclear installations.

In order to carry out this function, the Regulatory Body has established the so-called “Licensing Process”. This process consists of two stages. The first stage initiates with the formal delivery of the Construction Permit Application, which is accompanied by a description of the characteristics of the installation and basically its safety systems; this, to guarantee that the installation does not represent an undue risk. The following reports were sent by CFE to the Regulatory Body among with other documents in support of the cited application for LVNPS:

- Preliminary Safety Analysis Report (PSAR)
- Preliminary Environmental Impact Report (FSAR)

At this stage, the Regulatory Body revised the design criteria (structure, system and component characteristics, nuclear analysis, etc.). Particularly all issues related to the impact of the characteristics of the site on the structure, system and component design of the installation and the impact of the installation itself as regards to environment. Once these reports were revised, a technical statement was issued in order for the Secretariat of Energy to have a basis for awarding the Construction Permit.

During the construction itself of LVNPS, the Regulatory Body verified, (by performing audits and inspection) that it was built in accordance with provisions established in the safety analysis report and under terms established in the Construction Permit.

Once the detailed design of the installation was completed, as part of the second stage of the licensing process, the owner applied for the Operation License, for which the following information was sent:

- Final Safety Analysis Report (FSAR)
- Final Environmental Impact Report

The Regulatory Body evaluated these documents, including sections related to the criteria applied to the development of pre-operational and start-up tests as well as Technical Specifications for Operation. The above, in combination with results of

the audits and inspections carried out by CNSNS, allowed for the issue of a technical statement for LVNPS to obtain its Operation License.

The legal framework establishing the standards required for the safe operation of LVNPS-1 & 2 is given below:

Articles 14, 18, 25, 26, 28, 29, 30 and 50 (III, VI, XI and XII) of The Regulatory Law of the Constitutional Article 27 on Nuclear Matters (Annex I); Article 206 of The General Regulations on Radiological Safety (Annex III); NOM-004-NUCL-1994, "Radioactive Waste Classification"; NOM-018-NUCL-1995, "Methods for Determining Activity and Total Activity Concentration in Radioactive Waste Packages"; NOM-020-NUCL-1995, "Radioactive Waste Incineration Installation Requirements"; NOM-021-NUCL-1996, "Solidified Radioactive Waste Specimen Lixiviation Test Requirements" (Appendix); US 10CFR, Part 20 "Standard Radiation Protection"; US 10CFR, Part 50, "Domestic Licensing of Production and Utilisation Facilities"; LVNPS-1 & 2 Operation Licenses, Conditions 4, 5 and 9; Regulatory Guide 1.21, "Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquids and Gaseous Effluents from Light-Water Cooled Nuclear Power Plants", USNRC Branch Technical Position, 11.1 "Design Guidance for Radioactive Waste Management Systems, Structures and Components Installed in Light-Water-Cooled Nuclear Power Plants" (for the USNRC regulations see Annex IV)

19.2 ADMINISTRATION AND MANAGEMENT CRITERIA

Once nuclear safety levels are defined over the design, there is a need for criteria to be established to ensure that the erection of structures, systems and components at the construction stage are in accordance with design criteria and applicable standards, codes and standards, and quality requirements, commensurable to its importance in nuclear safety, satisfying the corresponding regulatory requirements. Similarly, at the operational stage, it is required to continuously maintain and optimise the capability and quality of structures, systems and components important to safety during the installation's lifetime in order to ensure that the plant's operation does not represent an undue risk to public health and safety.

19.2.1 Construction Stage

At this stage, the main means for achieving the safety levels required was strict compliance with LVNPS' Construction Quality Assurance Plan (PGCC) (see Article 13 of this National Report, for details on Quality Assurance Plans and Programs).

Compliance with PGCC requirements was applied both to the behaviour of individuals and organisations.

The application of the PGCC is a means for guaranteeing, in a highly reliable manner, that structures, systems and components important to safety shall be built, installed, inspected and tested in conformance with applicable design specifications, codes and regulations.

19.2.2 Operation Stage

The following means have been implemented for the operation stage to maintain the installation at the highest safety levels required by the Regulatory Body:

- **Technical Specifications for Operation (ETO's)**

The document that regulates the operation of nuclear installations within the limits deriving from the safety analysis is denominated Technical Specifications for Operation (ETO's). It existence is ruled by the 10CFR50.36.

LVNPS was designed under criteria directed to avoid radioactive material releases to environment. In order to demonstrate the adequacy of its implementation, accidents hypothetically postulated were analysed and results were presented as part of the information in the Final Safety Analysis Report. This served to establish safety parameters or limits and conditions that restrict the operation of the installation beyond the same.

The Technical Specifications for Operation were developed based on USNRC NUREG-0123, parameters identified in the FSAR and recommendations in standard ANSI/ANS 5.8.4 in which it is specified that:

a) Each nuclear plant license application must include in the request "Technical Specifications" proposed, bases and administrative controls.

b) Each license shall include Technical Specifications deriving from safety analysis and their evaluation by the Regulatory Body.

The ETO's are incorporated in the operation license and they contain guidelines and conditions under which the plant must operate. Compliance with the ETO's ensures that the operation is maintained within the limits determined by the safety analysis. Any deviation requires corrective actions to be taken and immediate notification to the Regulatory Body. Sections that correspond to constitute the ETO's are: Definitions, Operation Limit Conditions, Surveillance Requirements, Core Characteristics and Administrative Controls.

As part of the Operation License, a modification to ETO's requires authorisation of the Regulatory Body.

- **Maintenance of Safety Reports**

In order to assure that LVNPS-1 & 2 shall operate during their lifetime in conformance with the bases (Safety Reports) that served for awarding the Operation License, all change/modification to the installation, procedures or execution of tests or experiments are submitted to the Regulatory Body for a Safety Evaluation. The purpose for such evaluation is:

a) To review that all change proposed be covered by license bases; that is, by analyses, models, methods and suppositions made in Safety Reports. This way, it is ensured that these bases are not modified and therefore do not require previous approval of the Regulatory Body.

b) For those cases in which it is identified that the change proposed is not covered by the license bases, to ensure that approval of the Regulatory Body is required prior to the implementation of the change.

c) To identify whether the change proposed modifies or affects a Technical Specification for Operation, in which case previous authorisation and the modification to the ETO´s shall be requested to the Regulatory Body.

d) To request a periodic summary report briefing each and every change performed, that due to their nature are not submitted to approval of the Regulatory Body previous to implementation, so that the Regulatory Body is informed of the nature of all changes.

This process allows maintaining the Safety Reports effective, implying that the operation of LVNPS-1 & 2 is always covered by the license bases as well as by ETO´s approved.

19.3 LVNPS SAFETY ANALYSIS AND START UP PROGRAM

19.3.1 Safety Analysis

Preliminary and Final Safety Reports were defined within the regulatory framework and according to the format requested by USNRC Regulatory Guide 1.70.

For the Operation License awarding stage, the Regulatory Body reviewed the FSAR taking advantage of the experience obtained from the review of the construction stage document. In the case of special topics, the Regulatory Body seeked for support of IAEA experts provided through the Technical Co-operation Programs.

19.3.2 Start Up Program

As part of the obligation of compliance with USNRC Regulatory Guide 1.68, a start-up program was carried out at LVNPS. This program started with the initial fuel loading for which Technical Specifications for Operation were applied. The Putting into Service Program was divided into four main phases:

Phase I. Tests with Reactor Vessel Open (initial fuel loading)
Phase II. Initial Heating
Phase III. Power Tests
Phase IV. Warranty Tests

- **Test Conditions**

Within the previous mentioned test phases, the start-up program was divided into 8 test conditions in which specific Structure, System and Component (SSC) tests were performed.

TEST CONDITION	CONDITIONS/REGION OF FLOW-POWER MAP
VA	From fuel loading up to the time of installation of the dry well cover.
CA	After installing the dry well cover and up until the reactor was settled at pressure and temperature rated conditions.
C1	Before and after synchronisation of main generator at 5% to 20% of Rated Thermal Power (RTP), with reactor

	recirculating pumps at low speed and the control valve between the maximum and minimum position.
C2	After main generator synchronisation, with a control rod pattern of 50% to 75% at or below the recirculating flow master control lower analytical limit, up to a 50% RTP.
C3	From 50% to 75% of the control rod pattern, above 80% of the core flow and within the maximum allowable valve control opening up to a 75% RTP.
C4	At the natural circulating line and its intersection with the lines between 95% and 100% of rod patterns up to a 75% RTP.
C5	From the lines of 95% to 100% of the control rod patterns and between those of a minimum flow at the recirculating pumps' (control valve in minimum position) rated speed and 5% above the inferior analytical limit of the recirculating flow's automatic control up to a 75% RTP.
C6	Within 95% to 100% of RTP and between 95% and the maximum allowable flow through the core.

❑ General Acceptance Criteria

Three general acceptance criteria were established to validate the start-up tests:

a. Level 1 Acceptance Criteria
Failure to meet this level obliges the unit to be lead to an observant situation until considered satisfactory and safe based on test results previously performed.

b. Level 2 Acceptance Criteria
Failure to satisfy this situation does not require altering of the program or of unit operation. It is recommendable to investigate adjustments required as well as analytical and surveillance methods

c. Level 3 Acceptance Criteria
Failure to satisfy this level does not require altering of the test program neither of unit operation. Limits established under this category are related to individual component expectations or transient behaviour of control loops. This level is not associated to vessel or fuel protection systems.

❑ Start-up Tests Performed

The number of start-up tests performed for each one of the tests conditions to verify Plant Balance (VS) and System Test (ST) for the Nuclear Steam Supply System is shown below.

TEST CONDITION	(ST) TEST PERFORMED	(VS) TEST PERFORMED
Open vessel (VA)	15	3
Heating (CA)	28	11
Condition 1 (C1)	15	18
Condition 2 (C2)	21	36
Condition 3 (C3)	35	22
Condition 4 (C4)	6	-
Condition 5 (C5)	7	-
Condition 6 (C6)	47	40
Warranty	2	-
T O T A L:	**176**	**130**

19.3.3 Regulatory Body Activities

Revision to Section 14 “Test Programs” in FSAR was performed to determine the capability of the initial test program for LVNPS-1 &/ 2 as well as the evaluation of the execution of such tests and verification of the acceptance of the final results from a point of view of safety. All the above, as a requirement for the initial authorisation of the operation of both LVNPS units.

In order to establish a very strict control over the performance of tests and over the power increase program and so to have no doubt about the reliability of the steps and the decisions made on the route to 100% of power, CNSNS established a requirement through which different power stages would be subject to an evaluation of LVNPS’ behaviour as regards to the tests performed at the preceding stage. From here, it was established that LVNPS had to achieve authorisation from the Regulatory Body to carry on. This process, during the tests to be performed, ensured that LVNPS would maintain itself within the standards established by the acceptance criteria. If for some reason, these tests did not satisfy the acceptance criteria, the corresponding immediate analyses were demanded.

During the start-up phase, the Regulatory Body carried out 39 inspections to Unit 1 and 17 inspections to Unit 2. These inspections were intended to verify groups and activities related to the start-up tests, such as Instrumentation & Control, Reactor Engineering, Maintenance, Start-up Superintendence, Quality Assurance and Quality Control. Based on the above, Operation Licenses were awarded on August 24, 1990 for LVNPS-1 and April 10 of 1995 for LVNPS-2.

19.4 USE OF APPROVED PROCEDURES

As described in Article 13 of this National Report, all activities important to safety related to the operation of LVNPS-1 & 2 are developed under strict adherence to the Quality Assurance Operation Plan (PGCO). This obliges to the use of procedures approved by qualified personnel.

For control of all activities ruled by the PGCO, LVNPS has divided its procedures into the following groups.

a) Administrative Procedures
b) Operation Procedures subdivided into General Operation, System Operations, Abnormal Operation, Alarm Response, Emergency Operation, and Operation Verification.
c) Maintenance Procedures divided into Preventive, Corrective, Refuelling, Special Processes and Generic Maintenance.
d) Reactor Engineering: Reactor Verification, Reactor Analysis and Fuel Handling.
e) Radiological Protection: Radiological Protection (Generic) and Reduction in Personnel Exposure (ALARA).
f) Internal Emergency Plans.
g) Instrumentation: Instrumentation Maintenance and Instrumentation Verification.
h) Chemistry and Radiochemistry.
i) Material Control
j) Physical Security
k) Training
l) Quality Control: Quality Control Generic Activities, Non-destructive Examination and Functional Tests.
m) Document Control
n) Fire Protection, and
o) Programming and Results Planning.

19.5 PROCEDURES FOR OPERATIONAL INCIDENTS PREDICTED AND ACCIDENTS

❑ Abnormal-Operation Procedures

An evaluation was performed on the design of LVNPS-1 & 2 to verify its response against unforeseen operational incidents and accidents considered as design basis. These are classified in five categories as follows:

		OCURRENCE

CATEGORY	TYPE OF EVENT	EVENT/YEAR
I	Normal Operation	Normal
II	Expected Transients	1 – 1/20
III	Infrequent Transients	< 1/20 –1/100
IV	Design Basis	1/100 – 1/10,000
V	Special	N/A

- **Emergency-Operation Procedures**

As a result of the accident at Three Mile Island Nuclear Power Plant in the USA, the Regulatory Body requested CFE for the review of procedures existing for handling transients and accidents. This motivated the application of Emergency Procedure Guidelines to LVNPS-1 & 2 that were developed in a generic manner for BWR designed reactors within the attention of the Group of Owner's of this type of reactors (BWROG's) of which CFE forms part. This procedures for emergency response conditions are based on the symptoms shown as initiator to the response actions.

Modifications to the units' design basis are not required to incorporate Emergency Procedures (OE's) and these are in no way design basis considerations, but guidelines to attend conditions far beyond license basis.

CFE developed Emergency Procedures for LVNPS using guidelines in NEDO 31331 "BWR Owner's Group Emergency Procedures Guidelines" and for which Control Room personnel have received complete training on their use.

19.6 TECHNICAL SUPPORT SERVICES DURING INSTALLATION'S LIFETIME

Technical support services for the operation of LVNPS-1 & 2 are provided by GCN organisations and include Design Engineering, On-site Support Engineering and Planning, additionally the GCN counts with other Departments as Radiological Protection, Licensing and Nuclear Safety and Quality Assurance which are not directly related to the obligation of producing electric energy, being the objective to guarantee the safety conditions of the installation, that of the workers and environment, from the installation owner's point of view.

In addition, technical support has been developed throughout the country within national institutes (ININ and IIE) in support of LVNPS' operation and such institutes count on a technological infrastructure to continue doing so. Likewise, an

industry for rendering professional services and supplying services in the nuclear field has been created.

19.7 NOTIFICATION OF INCIDENTS

According to the regulatory framework, LVNPS must report to CNSNS the occurrence of all incidents covered by categories defined in 10CFR50.72 and 10CFR73 using the format identified as "*Notification of Reportable Event"* (NER). This format includes a summary of the event, immediate corrective actions, core emergency cooling system and engineering safeguards system conditions as well as information on radiological conditions.

This notification is sent to the Resident Inspector on-site as well as to the Regulatory Body's headquarters. According to the importance of the incident is whether the notification is to be sent immediately: within 1 hour and within four hours.

In compliance with 10CFR50.73, LVNPS must send a *"License Event Report" (LER)* within 30 days posterior to the occurrence of the event to completely describe the event, the result of the root cause analysis and corrective and preventive actions proposed.

19.8 OPERATIONAL EXPERIENCE

GCN has developed a means to collect and analyse its own operational experience as regards to Units 1 and 2 as well as the acquisition and analysis of nuclear industry experiences in general.

19.8.1 Internal Operational Experience

GCN has developed a specific program to review Internal Operational Experience at LVNPS-1 & 2, being the purpose to ensure that such experiences are incorporated as corrective actions to avoid recurrence as well as to improve the safety and reliability of LVNPS units.

This program includes all abnormal events evaluated and reported by any organisation of the GCN, mainly by those related with its operation. Under this context, the scope of the program covers the event's investigation, its analysis to determine the root cause, definition of corrective actions (remedying and preventive).

Apart from the events that due to their nature generate a LER, LVNPS has decided to analyse other events which, although they do not reach the category for being notified to the Regulatory Body, are of importance because of their

consequences on the reliability of LVNPS-1 & 2. These analyses have been denominated “To Analyse Event Report” (REA), among these, the following can be mentioned:

- Unplanned decreases in power <10%
- Unplanned ½ SCRAM (during operation or start-up)
- Unplanned ½ isolation (during operation or start-up)
- System or component inoperabilities, which oblige to request an Exception to ETO’s to avoid unit shutdown.
- Any other having important consequences for reliability such as, damage to equipment having impact on plant reliability factors or sensible systems; unplanned radioactive releases on or off-site; release of explosive gases at the plant; mistakes (non-assigned tasks, outages, cross-connections or badly installed/removed disconnection’s, applying procedures, etc.)

19.8.2 External Operational Experience

Besides that described in the previous section, GCN has implemented since the Initial Fuel Loading at LVNPS, an acquisition and review program of external operational experiences. Its purpose is to ensure that experiences in the nuclear industry applicable to LVNPS be incorporated as corrective actions to improve the safety and reliability of the same. Basically, the scope of this program includes experiences from the following sources INPO, WANO, General Electric, Salesman and Engineering Architects, US Nuclear Regulatory Commission.

19.8.3 Regulatory Body Activities

It is responsibility of the Regulatory Body (see Articles 7 and 8 of this National Report) to evaluate NER’s and LER’s. A characteristic of the process of evaluation is periodic meetings between Regulatory Body and Licensee personnel to discuss every aspect of each event reported. Emphasis is put on root causes analyses and their corresponding corrective actions, and when applicable, on the evaluation and witnessing of tests and verifications to ensure the effectiveness of corrective actions.

The Regulatory Body takes part in the “Incident Reporting System” – IRS of the NEA and IAEA. Also, as part of the bilateral agreements with other Regulatory Organisms from other countries (see Section 8.2.1 of this National Report), operational experience exchanges and regulatory action exchanges are maintained. Depending on the type of information, these experiences are sent to GCN for their inclusion in the External Operational Experience Program or inclusive, to form part of the regulatory framework of the Operation Licenses.

19.9 RADIOACTIVE WASTE TREATMENT SYSTEMS

This section describes design capability and characteristics to control, handle, store and dispose of liquid, solid and gaseous waste resulting from the operation of the plant and which contain, or constitute, or are contaminated with radioactive material.

There are three radioactive waste treatment subsystems that correspond to one of the material phases: liquid, solid or gaseous wastes.

19.9.1 Liquid Waste Treatment

Liquid treatment subsystems allow processing of all fluids that for diverse reasons come from the system containing the same, and require for analysing and treating. These subsystems are classified according to the quality of the liquids they process: floor and equipment drains, chemical and regenerating wastes, detergent wastes and preliminary solidification process.

Equipment drainage subsystems are those capable of processing low conductivity-high activity liquids coming from equipment handling potentially contaminated liquids at LVNPS and from the backwash of filter and demineralizer resins used for cleaning condense water. As regards to the subsystem's design capacity, 10% of the quantity processed shall be released to environment in a controlled manner combined with the condenser cooling water outlet flow ($28.5 m^3$/seg). Ninety-percent (90%) of remaining liquids treated shall be reused by LVNPS as condense reserve.

The floor drains subsystem processes high-conductivity liquids although low-activity to start with. The margin of design against daily process needs is of roundabout 20 times, having the purpose of accepting common surges during LVNPS start-up after a cold shutdown.

Another source of production of contaminated liquids is the laundry, since work clothes of employees working in restricted areas are washed here. Also, processed liquids are used in cleaning solid waste containers as well as solutions used in decontaminating external components.

Regenerating waste and preliminary solidification subsystems are two additional contaminated liquid sources. The first subsystem collects and treats regenerating solutions from demineralizing resins and the second subsystem collects concentrated solutions from evaporators.

The design of the buildings containing tank and sampling recipient systems for the aforementioned subsystems as well as piping systems connecting the same, satisfy design basis to support Operation Basis Seismic without damage.

19.9.2 Gaseous Waste Treatment

Gaseous treatment systems are designed according to the origin and radiation levels expected in the extraction and ventilating systems at LVNPS: off-gas, turbine steam seals and ventilation of buildings.

It has been verified that the off-gas treatment system is designed to collect and delay exhaustion of noble gases produced by fission, which are removed from the condenser by means of steam jet ejectors. The noble gas process continues through a hydrogen recombiner, 10-minute retention tanks, and pre-filter systems, activated carbon beds and high-efficiency air filters and then, finally, through a ventilating air current, monitored to the atmosphere.

This system's hydrogen recombiner is designed to support the postulation of hydrogen explosions (generated by radiolysis). It has high concentration alarm detection, which alert the main control room operator if the recombiner has problems so it is isolated and the redundant train is put into service.

Environmental dosimetry studies performed considering LVNPS in operation have demonstrated that design basis suppositions of gas treatment systems are adequate. Based on the above, it is considered that gas treatments satisfy their function of limiting the release of radioactive material in a gaseous form.

19.9.3 Solid Waste Treatment

This subsystem is designed to collect and process humid and dry wastes generated at LVNPS in order to confine such waste within an asphalt or concrete matrix and later dispose of them at a definite or provisional storage site. Such wastes are handled by remote control, in a manner that LVNPS personnel is maintained within the allowable dose limits established in the Radiological Safety General Regulations issued by CNSNS. In a similar way, it is designed according to Seismic Design and Quality Assurance requirements. Humid solid wastes come from spent resins of ionic exchange, sludge from phase separators, chemical concentrations from laboratory wastes, regenerating and decontaminating solutions.

Dry solid wastes come from contaminated cartridge filters, clothing and articles.
Humid wastes are stored in 200 litre capacity high-integrity containers. These containers satisfy the quality standard guaranteeing resistance against corrosion and structural stability. Then, the containers are transported to a provisional warehouse within the same radioactive waste building and later to another provisional warehouse at the same place built on modules, each of a capacity of 5

years of operation for both LVNPS units. It is important to mention that these wastes are of low and medium material activity category.

As regards to reactor waste, such as spent control rod blades, fuel rods, etc., these are stored in the storage pool.

19.9.4 Spent Fuel Storage

The storage pool (one per LVNPS unit) was originally designed (in 1972) for a capacity of just 580 fuel assemblies, for an 18-month storage capacity. Towards the end of 1989, analyses were performed for the definite arrangement of fuel racks in the storage pool, based on the use of steel racks having special receptacles to retain Boron. LVNPS presented an analysis to the Regulatory Body, who after evaluating the heat removal capacity from the pool cooling systems as well as the sub-criticality factor, gave authorisation to increase the capacity of each storage pool to up to 7.16 cores (3177 fuel assemblies), from which 6.16 cores (2733 assemblies) are designated for routine storage and a complete core for emergency situations. The above cited represents a storage capacity for the total estimated operational lifetime of LVNPS.

19.9.5 Radioactive Waste Production-Reduction Program

With respect to a reduction in the volume of radioactive waste, up to this day, LVNPS is carrying out the following actions: For dry solid waste – compacting with a 3 to 1 reducing ratio. In the case of process waste (sludge), cement and asphalt as well as for resins, these are being introduced into high-integrity containers (HIC's).

As for minimising radioactive waste, LVNPS is currently applying and improving the corresponding administrative controls in order to optimise the use of protective clothing and equipment as well as to minimise the amount of rubbish generated in radioactive zones.

As part of the radioactive waste reduction and minimisation activities, LVNPS has initiated a Dose Reduction Program. It includes among other activities: injection of Zinc, removal of reactor vessel corrosion products, reactor recirculating system loop chemical decontamination, substitution of valve seats containing Cobalt generating material, instalment of fixed and semi-fixed shields, etc.

As for future activities, LVNPS is studying several waste minimisation and reduction alternatives; some examples are incineration, super-compression and drying.

19.10 LVNPS-1 & 2 PERFORMANCE INDICATORS (PI´s)

In order to monitor the performance of LVNPS-1 & 2 and promote its continuous improvement, 21 performance indicators have been defined to identify parameters that are evaluated on a monthly and annual basis.

Particularly, indicators related to safety and reliability is considered. Specifically the world's nuclear community (WANO) as a means for collecting and exchanging operational experience uses such indicators. LVNPS-1 & 2 applies such operational experience as a means of comparison of performance with other similar plants and to emulate the best international practises.

INDICATORS OF PERFORMANCE OF LVNPS-1 & 2 (1997)

INDICATOR (PI)	UNIT OF MEASUREMENT	LVNPS-1	LVNPS-2	WANO GOAL FOR THE YEAR 2000
NUCLEAR SAFETY				
RHR System Unavailability	%	0.00643	0	0.025
Diesel Generator Unavailability	%	0	0.001037	0.025
High-pressure Injection System Unavailability	%	0.0032	0.000619	0.025
Automatic SCRAM's X 7,000 Critical Hours	Number	0.81	0.87	1
Chemical Factor	Number	1.006	1.40	1
Collective Exposure to Radiation	Rem-Man	194.8	255.3	NA
RELIABILITY				
Unplanned Lost Capacity	%	3.47	0.49	3.00

NA = Non Applicable

19.11 EVALUATION OF THE LEVEL OF COMPLIANCE WITH THE OBLIGATIONS IMPOSED BY THE CONVENTION

The information contained in this Article and preceding Articles of this National Report demonstrate that within the Mexican United States, the implementation and surveillance of the National Law and Nuclear Regulations adopted entirely satisfy the obligations postulated in Article 19 of the Convention on Nuclear Safety.

APPENDIX

LEGISLATIVE AND REGULATORY FRAMEWORK BY WHICH THE SAFETY OF NUCLEAR INSTALLATIONS IS PRESCRIBED IN THE MEXICAN UNITED STATES

I. POLITICAL CONSTITUTION OF THE MEXICAN UNITED STATES

Article 25, Paragraph four

In an exclusive manner, the public sector shall be in charge of strategic areas given in Article 28, paragraph four of the Constitution, maintaining the Federal Government ownership and control over organisms which in may be established.

Article 27, Paragraph seven

It also corresponds to the nation to exploit nuclear fuels for the generation of nuclear energy as well as to regulate its application for other purposes. Nuclear energy may only be used for pacific purposes.

Article 28, Paragraph four

Functions executed by the State in an exclusive manner and within the following strategic areas shall not constitute monopolies: post office, telegraph and radiotelegraphy; petrol and other hydrocarbons; basic petrochemistry; radioactive minerals and the generation of nuclear energy; electricity and activities expressly determined by the laws issued by the Congress of the Union.

II. INTERNATIONAL TREATIES

1. Treaty for the Proscription of Nuclear Weapons in Latin America and the Caribbean (Tlatelolco Treaty), taking effect on September 19, 1967.

2. Treaty on the Non-Proliferation of Nuclear Weapons (TNP), taking effect on December 7, 1968.

3. Agreement between the Mexican United States and the International Atomic Energy Agency for the application of safeguards related to the Treaty for the Proscription of Nuclear Weapons in Latin America and the Caribbean, taking effect on March 29, 1973.

4. Agreement between the International Atomic Energy Agency and government of the Mexican United States (INFCIRC/203), for which the organism shall provide support in the execution of a project related to a nuclear plant. This agreement took effect on February 12, 1974.

5. Convene on the Prevention of Sea Contamination from the Dumping of Waste and Other Matter, taking effect on July 17, 1975.

6. Convention on Physical Protection of Nuclear Materials, put into force on June 4, 1988.

7. Convention on Assistance in the Event of Nuclear Accident or Radiological Emergency, put into force on June 10, 1988.

8. Convention on Prompt Notification of Nuclear Accidents, put into force on June 10, 1988.

9. Convention on Civil Liability for Nuclear Damages, put into force on July 25, 1989.

10. Convention on Nuclear Safety, put into force on October 24, 1996.

III. NATIONAL LAWS AND REGULATIONS

1. The Regulatory Law of the Constitutional Article 27 on Nuclear Matters. This Law entered into effect on February 6, 1985. Annex I includes the complete text of such Law (unofficial translation to English).

2. Law on Civil Liability for Nuclear Damages. This Law entered into effect on January 1, 1975. Annex II contains the complete text of this Law.

3. General Law of Ecological Equilibrium and Environmental Protection. This Law entered into effect on December 14, 1996.

Chapter VII, Article 154. *The Secretariat of Energy and CNSNS, including the participation of the Secretariat of Health, shall assure that the exploration, exploitation and benefit of radioactive minerals, the development of nuclear fuels, the utilisation of nuclear energy in general, activities related to the same, are carried out in adherence to official Mexican standards on nuclear, radiological safety and physical security for nuclear or radioactive installations and, in such a manner that human health risks are avoided and the preservation of the ecological equilibrium and environmental protection are ensured. It corresponds to the Secretariat of Environment, Natural Resources and Fishing to perform the environmental impact assessment.*

4. General Regulations for Radiological Safety. These regulations entered into effect on November 23, 1988. Annex III shows the entire regulation.

5. Regulations for Road Transportation of Hazardous Materials and Wastes. These regulations entered into effect on April 8, 1993.

6. CNSNS has generated a series of technical standards on diverse topics of nuclear and radiological safety. These standards are listed below:

Technical Norm 316. It establishes maximum allowable limits of radioisotopes of Sr^{90}, I^{131}, Cesio - total and Pu^{239} for dehydrated, imported milk (August 25, 1988).

NOM-002-SSA2-1993. For the organisation, functioning and sanitary engineering of radiotherapy services (October 11, 1994).

NOM-001-NUCL-1994. Related to dose calculation factors (October 28, 1994).

NOM-002-NUCL-1994. Related to leak and tightness tests for sealed sources (March 20, 1994).

NOM-003-NUCL-1994. Related to the classification of installations or laboratories using open sources (March 20, 1994).

NOM-004-NUCL-1994. Related to the classification of radioactive waste (March 20, 1994).

NOM-005-NUCL-1994. Related to annual radionuclide incorporation limits and derived concentrations in air for occupationally exposed personnel (POE's).

NOM-006-NUCL-1994. Related to criteria for the application of annual incorporation limits for critical public groups (October 28, 1994).

NOM-007-NUCL-1994. Related to radiological safety requirements that must be observed in permanent implants of radioactive materials for therapeutic purposes in human beings (March 23, 1994).

NOM-008-NUCL-1994. Related to radioactive material surface contamination limits (March 23, 1994).

NOM-012-STPS-1993. Related to safety and health conditions within work centres in which ionising radiation generator or emitter sources capable of producing contamination in the occupational environment are handled, stored or transported (July 20, 1997).

NOM-018-NUCL-1995. “Methods to Determine Activity and Total Activity Concentrations in Radioactive Waste Packages”. It establishes the methods for determining radionuclides, activity and activity concentration per mass or volume unit contained in a package of radioactive waste.

NOM-020-NUCL-1995. “Requirements for Radioactive Waste Incineration Installations”. It establishes the requirements to be met by a radioactive waste incineration installation in order to guarantee that exposure to radiation on behalf of the public and operation personnel shall be maintained as low as reasonably achievable.

NOM-021-NUCL-1996. “Requirements for Solidified Radioactive Waste Specimen Lixiviation Tests”. It establishes the requirements under which lixiviation tests by water are to be performed in low level specimens of solidified radioactive wastes to not exceed the radionuclide release limits, in the event water enters in contact with the same.

IV. LVNPS-1 & 2 OPERATION LICENSE CONDITIONS

Commercial operation licenses for both LVNPS-1 & 2 issued based upon Article 26 of The Regulatory Law of the Constitutional Article 27 on Nuclear Matters (Annex I), include a series of conditions in which requirements additional to those contained in Technical Specifications for Operation are specified. These requirements are mentioned below and have been referenced in some Articles of this National Report.

Condition 2

Only personnel who maintain valid their corresponding license awarded by the National Commission on Nuclear Safety and Safeguards may operate LVNPS-1.

Condition 3

In agreement with the Definitive Construction Permit and its five extensions, CFE must continue to comply with standards approved by the International Atomic Energy Agency (IAEA) in the field of radiological, nuclear safety and physical security. CFE must also comply with the technical standards analogous to those contained in regulatory system generated by the country of origin of the reactor and which has been adopted by the Mexican Regulatory Body. All of the above without prejudice to the Mexican regulatory systems applied by CNSNS.

Condition 4

The document Technical Specifications for Operation (ETO's) which CNSNS attached to the fuel loading authorisation, including the modifications agreed and imposed by the CNSNS up to date, must continue to be the normative document for the operation of the power plant for which this License is granted. Any deviation to the fulfilment of the same shall be notified to CNSNS within the periods determined in such document.

Condition 5

Apart from a continuous national and international operation experience feedback performed by CFE, CFE must implement design modifications in accordance with the normative of reference considered by CNSNS, property of the population. Regardless of the above, every five years as of this date, in accordance with CNSNS, CFE must carry out a general evaluation of LVNPS' safety conditions, including the situation of radioactive wastes, taking into account the operational experience accumulated as well as the existent technological improvements.

Condition 7

Taking into account socio-economic and technical factors, the criteria for maintaining personnel doses as low as reasonably achievable (ALARA) must be adopted by plant mangers as a permanent work policy, during the validity of the operation license.

Condition 10

CFE must submit to evaluation and authorisation of CNSNS, all modifications proposed to its design that involve safety-related systems or components or their procedures as well as modifications to Technical Specifications for Operation and Safety Analysis as appearing in FSAR. Design modifications defined as a previously revised safety related matter must be included in a document that briefly describes such modifications along with the justification for the same. This document must to be yearly submitted to CNSNS. This document is to be sent to CNSNS for evaluation, on a yearly basis.

Condition 12

CFE must continue to operate environmental monitoring and physical security programs as well as to maintain the emergency plans of the plant currently updated ensuring their continuous improvement.

V. TECHNICAL SPECIFICATIONS FOR OPERATION

Purpose

The Licensee's Technical Specifications for Operation are a requirement that must be attached to the application for license. The technical specifications comes from analyses and evaluations presented in the safety analysis report. This document establishes the surveillance requirements to ensure the operability of equipment systems important to safety within terms of the Operation License.

VI. IAEA SAFETY STANDARDS

CNSNS carried out a comparative analysis of the scope of the IAEA´s NUSS standards as regards to the scope of the norms and guides generated by the USNRC; it was found that the latest standards and guides cover that described in those of the IAEA, therefore, it is a common practise to apply the USNRC standards and guides.

VII. SAFETY STANDARDS OF THE COUNTRY OF ORIGIN OF THE NUCLEAR STEAM SUPPLY SYSTEM (NSSS)

In the case of LVNPS, safety regulations, standards and guides from the United States of America were applied in detail as the origin of the nuclear steam supply system is the USA. Annex IV of this National Report lists the main regulations, standards and guides applied to LVNPS.

ANNEX I

THE REGULATORY LAW OF THE CONSTITUTIONAL ARTICLE 27 ON NUCLEAR MATTERS

(ENGLISH VERSION)

(Published in the Official Gazette on February 4, 1985)

In the margin, a seal with the National Emblem, which reads: Mexican United States.- Presidency of the Republic.

MIGUEL DE LA MADRID H., Constitutional President of the Mexican United States, to its citizens, know:

That the Honorable Congress of the Union has sent me the following

DECREE:

"The Congress of the Mexican United States decrees the

THE REGULATORY LAW OF THE CONSTITUTIONAL ARTICLE 27 ON NUCLEAR MATTERS

CHAPTER I

General Provisions

Article 1.- This is the Regulatory Law of the Constitutional Article 27 on Nuclear Matters and regulates the exploration, exploitation and extraction of radioactive minerals, as well as the development of nuclear fuels, uses of nuclear energy, research in nuclear science and techniques, the nuclear industry and related areas.

The provisions of this law are of public order and for observance throughout the Republic.

Article 2.- The use of nuclear energy shall be for peaceful ends only, in accordance with the provisions of Article 27 of the Political Constitution of the Mexican United States.

The Federal Executive shall issue the regulatory provisions to which the energy or non-energy use of radioactive materials shall be subject.

Article 3.- The following definitions will be used for the purposes of this Law:

I.- Nuclear fuel: any material composed of natural, enriched or depleted uranium, to the degree established by the Secretariat of Energy, Mines and Parastate Industry, or special fissionable material used in any nuclear reactor.

II.- Nuclear installation: that in which nuclear fuel or material is manufactured, processed, used, reprocessed or stored.

III.- Radioactive installation: that in which radioactive material or equipment containing it is produced, manufactured, stored or used; or in which radioactive wastes are treated, conditioned or stored.

IV.- Nuclear material: any source material or special fissionable material.

V.- Source material:

a) Natural uranium;

b) Uranium in which the proportion of isotopes 235 is lower than normal;

c) Thorium;

d) Any of the above-mentioned elements in the form of metal, alloy, chemical compound, or concentrate;

e) Any other material containing one or more of the above-mentioned elements in the concentration determined by the Secretariat of Energy, Mines and Parastate Industry, and

f) Other materials determined by the aforementioned Secretariat at the appropriate time.

It will be understood that the expression "source material" refers neither to minerals nor to their residues or gangue.

VI.- Special fissionable material:

a) Plutonium 239 and 241;

b) Uranium 233;

c) Uranium enriched in isotopes 235 or 233;

d) Any material containing one or several of the elements mentioned, and

e) Any other fissionable materials determined by the Secretariat of Energy, Mines and Parastate Industry.

VII.- Radioactive material: any material containing one or several nuclides that spontaneously emit particles or electromagnetic radiation, or that fission spontaneously.

VIII.- Radiation source: any device or substance that emits ionizing radiation in quantifiable form.

IX.- Radioactive mineral: that containing uranium, thorium or combinations of both in a concentration equal to or higher than 300 parts per million, and other minerals susceptible of being used for the manufacture of nuclear fuels, as expressly determined by the Secretariat of Energy, Mines and Parastate Industry.

Similarly, any mineral containing less than 300 parts per million shall be considered a radioactive mineral if determined to be so by the aforementioned Secretariat; and

X.- Non-energy use of radioactive material: the use of radioactive material and equipment containing it, and generators of ionizing radiation, for industrial, medical, agricultural or research purposes.

The determinations mentioned in this Article shall be set forth in declarations issued by the above-mentioned Secretariat and published in the Official Gazette of the Federation.

Article 4.- The Secretariat of Energy, Mines and Parastate Industry shall apply the present Law within its sphere of competence.

CHAPTER II

Exploration, Exploitation and Extraction of Radioactive Minerals

Article 5.- Pursuant to the terms of Article 27 of the Political Constitution of the Mexican United States, radioactive minerals are the property of the Nation; and their exploration, exploitation and extraction shall not be the subject-matter of any concession or contract.

For the exploration, exploitation and extraction of the radioactive minerals defined in paragraph IX of Article 3 of this Law, the Secretariat of Energy, Mines and Parastate Industry shall grant the corresponding assignments to the public bodies provided for in Articles 9 and 10 of this Law. Such assignments shall also include related non-radioactive minerals.

Article 6.- Any person having knowledge of the existence of radioactive mineral deposits should immediately advise the Secretariat of Energy, Mines and Parastate Industry.

Article 7.- The holders of concessions and mining assignments who discover radioactive minerals on their respective sites should advise the Secretariat of Energy, Mines and Parastate Industry in writing within a period of ten days following the discovery so that this agency:

I.- Immediately appoints a supervisor to safeguard ownership of the Nation over radioactive minerals;

II.- Carries out the necessary work to determine whether exploitation of the radioactive minerals discovered is technically and economically viable, bearing in mind the opinions of the Mineral Resources Council and the Commission on Mining Promotion.

III.- If the determination referred to in the preceding paragraph is positive, the necessary steps will be taken to modify the concession or assignment so that the assignment of the exploitable radioactive minerals is turned over to the competent public bodies. In such a case, the concession or assignment holder may continue, outside the affected sphere, with the mining of other minerals.

If, owing to a high concentration of radioactive minerals, the Secretariat of Energy, Mines and Parastate Industry rules that the cancellation of the concession or assignment is in order, this shall be carried out in accordance with The Regulatory Law of the Constitutional Article 27 on Mining Matters, and

IV.- If the determination is negative because exploitation of the radioactive mineral discovered, which is the property of the Nation, is not technically and economically viable, the concession or assignment holder shall remain the depositary of the tailings that contain said mineral.

Article 8.- The holders of concessions or assignments for exploration, exploitation and extraction who, in contravention of the preceding provision, have exploited or processed the radioactive mineral discovered, shall be liable to the cancellation of the concession or assignment and to a fine of up to five thousand times the current daily minimum wage in the Federal District. Any person failing to advise as indicated in the preceding article shall be liable to a fine of up to five thousand times the current daily minimum wage in the Federal District.

Article 9.- The exploration of radioactive minerals shall be under the exclusive and direct responsibility of the decentralized federal public agency known as the Mineral Resources Council, on both free and non-free lands. This activity will be adjusted to the program and technical conditions established by the Secretariat of Energy, Mines and Parastate Industry, which will assign to the above-mentioned agency the sites required for the prospecting and exploration of said minerals.

Article 10.- The Secretariat of Energy, Mines and Parastate Industry may award assignments for the exploitation of radioactive minerals only to the decentralized public agency known as the Commission on Mining Promotion, in accordance with the policies established for the attainment of national or sectoral development-planning objectives or priorities. Likewise, authorizations for the installation and functioning of processing plants that utilize the mineral substances to which this precept alludes may be awarded only to the above-mentioned agency.

The Commission on Mining Promotion shall carry out the above-mentioned activities directly and exclusively.

CHAPTER III

The Nuclear Industry

Article 11.- For the purposes of this Law, the nuclear industry includes:

I.- The phases of the fuel cycle, from "refining" until prior to the "burn-up" of the fuel, that is, until the manufacture of fuel elements, including uranium enrichment, if applicable;

II.- The "burn-up", that is, the utilization of fuel elements for energy purposes resulting in electricity generation or in other uses for the heat released;

III.- The "reprocessing" of fuel;

IV.- The final phases of the fuel cycle, including definitive and temporary storage of the irradiated fuel or of the radioactive wastes derived from reprocessing;

V.- Production of heavy water, if applicable, and its use in nuclear reactors;

VI.- Design of nuclear steam supply systems;

VII.- Design and manufacture of equipment and components for nuclear steam supply systems in nuclear power plants or other nuclear reactors;

VIII.- Production and applications of radioisotopes, as well as the processing, conditioning and final disposal of their radioactive residues, and

IX.- Design, manufacture and use of nuclear reactors and radiation sources for research and technological development.

The nuclear industry is for public purposes.

Article 12.- The activities referred to in the preceding article, with the exception of paragraph IX, shall be carried out in accordance with the guidelines and programs approved by the Federal Executive, through the Secretariat of Energy, Mines and Parastate Industry, in keeping with the policies established for the attainment of the objectives and priorities of national development planning.

Article 13.- National research and technological development activities in the nuclear field will be oriented towards achieving scientific and technical self-determination, as well as towards the most efficient use of the application of nuclear materials and fuels and radioactive materials, with the aim of strengthening the economic and social progress of the Nation.

The use of nuclear reactors shall be subject to the regulations issued to that end by the Secretariat of Energy, Mines and Parastate Industry, and to supervision by the same.

Article 14.- In accordance with paragraph four of Article 28 of the Constitution, the following activities are considered strategic:

I.- Extraction of radioactive minerals;

II.- The nuclear fuel cycle which includes: "refining" of uranium concentrate, "conversion", "enrichment", "reconversion", fabrication of "pellets", fabrication of "fuel rods", and the fabrication of "fuel assemblies";

III.- Fuel "reprocessing", which consists of a series of chemical processes to recover unused uranium as well as the plutonium produced;

IV.- Storage, either definitive or temporary, and transportation of irradiated fuel or wastes produced during reprocessing;

V.- Production of heavy water and its use in nuclear reactors, and

VI.- Application of nuclear energy for the purpose of generating steam for use in industrial complexes, water desalting and other applications that may be necessary to promote the country's economic and social progress.

Article 15.- The use of nuclear fuel elements for energy purposes corresponds, in all cases, to the Nation.

Electricity generation based on the use of nuclear fuels will be carried out exclusively by the Federal Electricity Commission. The Commission is responsible for the design and construction

of nuclear power plants, taking into account, to that end, the opinion of the National Nuclear Research Institute.

Nuclear reactors for non-energy purposes will be used only by the public sector and by universities, institutes and research centers authorized to do so in accordance with this Law.

Article 16.- The production, use and application of radioisotopes, as well as the manufacture of components for nuclear steam supply systems, with the exception of nuclear fuel, are priority activities for national economic development in accordance with paragraph 5 of Article 25 of the Constitution.

The above-mentioned activities may be carried out by the public sector, on its own or in conjunction with the social and private sectors, with prior authorization from the Secretariat of Energy, Mines and Parastate Industry. Production of radioisotopes through the use of nuclear reactors shall only be carried out by the public sector and by the universities, institutes and research centers authorized to do so in accordance with this Law.

Authorizations for production of radioisotopes based on the use of nuclear fuel shall be issued by the incumbent of the Secretariat of Energy, Mines and Parastate Industry in accordance with the regulatory provisions and shall be published in the **Official Gazette** of the Federation.

The aforementioned authorizations shall be issued after hearing the opinions of the National Nuclear Research Institute and the competent authorities, depending on whether the radioisotopes are to be used in the areas of health care, industry or agriculture.

Article 17.- Nuclear fuel is property of the Nation; the Federal Executive may only authorize its use in accordance with this Law and always under the surveillance of the National Commission on Nuclear Safety and Safeguards.

Article 18.- The Federal Executive, through the Secretariat of Energy, Mines and Parastate Industry shall:

I.- Establish guidelines relative to the utilization and development of nuclear energy and technology, in keeping with national energy policy;

II.- Promote, supervise and, if applicable, approve the work programs of the Mineral Resources Council and the Mining Promotion Commission in relation to radioactive minerals, in order that they be consistent with programs and projects for research, application in energy generation, and development of the nuclear industry;

III.- Regulate nuclear and radiological safety, physical security, and safeguards, and ensure that they are complied with;

IV.- Carry out the different steps in the nuclear fuel cycle and reprocessing, except burn-up, and coordinate and supervise, if applicable, any steps that cannot be carried out within the country;

V.- Carry out the import and export of nuclear materials and fuels, with the due participation of other government agencies.

Exports of radioactive minerals or materials will always be carried out in keeping with the country's needs as regards self-sufficiency. In such event, authorization may not exceed 5 percent per annum of the proven reserves that the country will require according to the program drawn up in keeping with the National Development Plan provided for in Article 26 of the Constitution.

VI.- Establish research and technological development policy in the nuclear industry;

VII.- Be responsible for the storage, transportation and depositing of nuclear fuels and radioactive wastes, regardless of their origin;

VIII.- Authorize the corresponding public bodies to effect the temporary storage of nuclear fuels and the radioactive wastes derived from their use, and

IX.- Be responsible for observance of the international treaties and other juridical instruments signed in nuclear matters, within the sphere of its competence.

CHAPTER IV

Nuclear and Radiological Safety, Physical Security, and Safeguards

Article 19.- Safety is of prime importance in all activities involving nuclear energy and should be taken into account at every stage, from planning, design, construction and operation to the final closing down and dismantling of nuclear and radioactive installations, as well as in the disposal and final destination of all their wastes.

Article 20.- Nuclear safety consists of all actions and measures aimed at preventing nuclear equipment, materials and installations and their functioning from constituting risks to human beings and their property or from being detrimental to the quality of the environment.

Article 21.- The purpose of radiological safety is to protect workers, the population and their property, and the environment in general, through prevention and containment of the effects that could result from exposure to ionizing radiation.

Article 22.- The object of physical security in nuclear or radioactive installations is to prevent intentional acts that cause or could cause damage or alterations either to health or to public safety, such as robbery or unauthorized use of nuclear or radioactive material.

Nuclear and radioactive installations should have physical security and nuclear and radiological safety systems that satisfy the requirements established in this regard in other ordinances and in the regulatory provisions of this Law.

Article 23.- Any person having knowledge of an incident involving nuclear materials or fuels, radioactive materials or equipment containing them, or conditions that could give rise to such an incident, should immediately advise the National Commission on Nuclear Safety and Safeguards of the Secretariat of Energy, Mines and Parastate Industry. Individuals or companies authorized to carry out any of the activities regulated by this Law should communicate immediately, by whatever means, as soon as they are cognizant of any event to which this Article refers, and should formalize their report in writing and turn it in to the aforementioned Commission within the

following 24 hours. In such cases, the Commission in question may order or carry out the removal of the equipment, implements or materials that imply some kind of risk, so that they may be deposited in places that possess the proper safety conditions.

Article 24.- The object of safeguards is to organize and maintain a national system of registration and control of all nuclear materials in order to verify that there is no deviation of said materials from peaceful uses to the manufacture of nuclear weapons or other unauthorized uses.

The Federal Executive shall establish the applicable regulations and shall ensure compliance with the international agreements or treaties signed by Mexico in this respect.

Article 25.- Nuclear and radioactive installations should meet the requirements for siting (selection, study and evaluation of the site), design, construction, operation, modification, end of operations, final closing down and dismantling, established in the regulatory provisions of this Law.

The above-mentioned requirements shall be determined according to the risk related to operations involving radioactive material and according to the activity and radiotoxicity of the isotopes present.

Article 26.- The siting, design, construction, operation, modification, end of operations, final closing down and dismantling of nuclear and radioactive installations require authorization from the Secretariat of Energy, Mines and Parastate Industry.

Authorizations for the construction and operation of such installations shall be effective for a specified period, and their renewal, modification, suspension and cancellation shall be regulated by the provisions contained in the respective regulations.

Article 27.- Individuals and companies authorized to operate nuclear and radioactive installations in accordance with this Law and its regulations should have the required radiological safety personnel, who will be responsible for advisory assistance, training, evaluation of working procedures, preparation of safety manuals, surveillance and application in all matters related to radiological protection within the work center. The holder of the authorization shall be directly responsible for radiological safety.

Both the holder of the authorization and the radiological safety personnel should comply with the requirements and obligations established in the regulatory provisions of this Law.

Nuclear installations should have the required nuclear and radiological safety personnel, and the head of the corresponding public agency shall be responsible for strict compliance with the applicable regulations.

Article 28.- Authorizations for construction and operation of a nuclear installation shall be issued only when it can be demonstrated, by presenting the pertinent information, how safety objectives are to be attained and which procedures and methods will be used during the siting, design, construction, operation, modification, final closing down and dismantling stages. In addition, the corresponding radiation emergency plan shall be presented. Such information should be in keeping with the terms and forms stipulated in the regulatory provisions of this Law.

Furthermore, any request for authorization shall contain the necessary information on the environmental impact of the installation for evaluation by the National Commission on Nuclear Safety and Safeguards and by other authorities, in accordance with their attributions.

Article 29.- The acquisition, import, export, possession, use, transfer, transportation, storage and destination or final disposal of radioactive material and devices generating ionizing radiation shall be carried out only with authorization issued by the Secretariat of Energy, Mines and Parastate Industry, through the National Commission on Nuclear Safety and Safeguards, independently of any other authorizations. The radioactive materials and devices in question used for medical purposes shall require prior authorization from the Secretariat of Health and Welfare.

Article 30.- The handling, transportation, storage and custody of nuclear materials and fuels, radioactive materials and equipment containing the latter, shall require authorization and shall be governed by the regulatory provisions of this Law.

Article 31.- The mining of radioactive mineral deposits, treatment plants for such minerals, their tailings dams and adjacent work areas shall be subject, with regard to radiological safety, to the provisions issued by the competent authorities, without prejudice to the provisions of other safety ordinances.

Article 32.- Nuclear and radioactive installations shall be the object of checks, audits, verifications and inspections by the National Commission on Nuclear Safety and Safeguards, in order to verify nuclear and radiological safety and physical security conditions and compliance with safeguards on same.

Article 33.- Based on the results of the inspections and measures pointed out in the preceding Article, the National Commission on Nuclear Safety and Safeguards shall issue a report indicating any deficiencies and anomalies found, if applicable, and the deadline for their correction. Subsequently, the above-mentioned agency shall ensure that the measures taken to correct anomalies or deficiencies comply with the indications made.

Article 34.- In cases of danger or imminent risk to personnel in a nuclear or radioactive installation, or to society in general, the National Commission on Nuclear Safety and Safeguards shall order and execute, as appropriate, the retention, seizure or depositing of sources of ionizing radiation or equipment containing them, as well as any contaminated property, in accordance with the respective regulations.

It may also order and execute, as a preventive measure, the temporary, partial or total closing down of nuclear and radioactive installations, as well as of contaminated real estate, establishing deadlines for correcting deficiencies or anomalies. In cases in which deficiencies or anomalies are not rectified before the established deadline, the above-mentioned Commission, based on the corresponding technical report, shall proceed to the final closing down.

The Head of the Secretariat of Energy, Mines and Parastate Industry may also order the National Commission on Nuclear Safety and Safeguards to temporarily occupy nuclear or radioactive installations, and the Commission should at all times observe the provisions issued by the Federal Executive in that regard.

Any of the above-mentioned measures adopted do not exclude the holder of the authorization from civil, penal or labor liability, if applicable, for damage caused to persons or their property.

Article 35.- Suspension or cancellation of authorizations granted shall entail adoption of the safety measures referred to in the preceding Article in regard to sources or equipment. The same measures may be adopted when authorizations for construction, adaptation or preparation of the installations in question are cancelled or suspended, and therefore such actions may not continue. These measures shall also be applied and executed by the National Commission on Nuclear Safety and Safeguards in cases in which activities involving nuclear fuels and materials, radioactive materials and equipment containing the latter are carried out without the authorization, permit or license required by this Law and its regulations.

Article 36.- Suspension and cancellation of authorizations granted, as well as fines and safety measures, shall be imposed by the Secretariat of Energy, Mines and Parastate Industry, through the National Commission on Nuclear Safety and Safeguards, on the basis of the results of the checks, audits, verifications and inspections effected and bearing in mind the evidence and pleadings of the interested parties. In every case, the decisions handed down in this regard shall be motivated by and grounded on the provisions of this Law and its regulations, and other applicable ordinances.

Article 37.- Any infringement of the stipulations of this Law and its regulatory provisions, regardless of whether they constitute grounds for suspension, cancellation or annulment of the authorizations granted, shall be sanctioned with a fine of between five and five thousand times the current general minimum wage in the place in which the violation is committed. If the infringement should persist and if the deadline granted for its correction has failed to be met, the above-mentioned Commission may impose fines for every day that goes by without the respective order having been obeyed, as long as the above maximum limit is not exceeded.

Article 38.- In order to set the fines referred to in the preceding Article, the gravity of the infringement committed, the economic conditions of the infringer and recurrence, if any, will be taken into consideration.

Article 39.- In case of recurrence, the fine originally imposed shall be doubled, as long as it does not exceed twice the maximum amount established in Article 37 of this Law.

For the purposes of this Law and its regulations, recurrence is understood as every subsequent, separate infringement of the same stipulation committed within two years of the date of resolution of the preceding infringement, as long as the latter has not been nullified.

Article 40.- Any decision handed down on the basis of this Law or of other provisions stemming from same may be appealed within 15 working days following the date of notification. Such an appeal shall be addressed and presented in writing to the Head of the Secretariat of Energy, Mines and Parastate Industry, and should offer evidence related to the disputed act of the governmental authority. After submitting documentary evidence and taking the steps ordered, the corresponding decision will be handed down within the following 30 working days.

Lodging an appeal shall only suspend execution of the appealed decision if the latter involves the payment of fines and the affected party guarantees payment in accordance with the Fiscal Code of the Federation.

CHAPTER V

The National Nuclear Research Institute

Article 41.- The National Nuclear Research Institute is a decentralized public agency of the federal government with its own legal status and assets.

Article 42.- The object of the National Nuclear Research Institute will be to carry out research and development in the field of nuclear science and technology, as well as to promote peaceful uses of nuclear energy and disseminate the advances made in order to link them to the country's economic, social, scientific and technological development.

The research and development carried out by the Institute should be consistent with national policies and will be carried out in accordance with the programs approved for that purpose.

Article 43.- In order to fulfill its objectives, the National Nuclear Research Institute will have the following attributions:

I.- Carry out and promote activities leading to scientific and technological development in the field of nuclear science and technology, and promote the transfer, adaptation and assimilation of technology in this field;

II.- Provide technical assistance to public and private agencies and entities when required in the design, construction and operation of radioactive installations, and, if applicable, in contracting said services; it will also provide such services to authorized bodies in connection with nuclear installations;

III.- Promote national development of technology in the nuclear industry by carrying out and fostering innovation, transfer and adaptation of technologies for the design, manufacture and construction of components and equipment;

IV.- Carry out research and development activities relative to the applications and utilization of nuclear systems and radioactive materials for non-energy uses required by national development. Furthermore, it will promote applications of radiation and radioisotopes in their different fields.

V.- Promote specific activities in the country's research institutes and institutes of higher education in the field of research and development in nuclear science and technology, in keeping with the Institute's projects and dissemination programs;

VI.- Carry out training and updating programs on the uses and applications of nuclear technology, as required by the country's development; and make arrangements with national institutions of higher education for the teaching of specialized courses in nuclear science and technology;

VII.- Propose and arrange with similar institutions within the country and abroad, or with international organizations, joint research projects and exchanges of information, with prior authorization from the Secretariat of Energy, Mines and Parastate Industry;

VIII.- Maintain a documentation center with the aim of receiving, analyzing and disseminating information and new developments in nuclear matters;

IX.- Issue opinions on agreements signed by the Secretariat of Energy, Mines and Parastate Industry on nuclear research and technological development, and, in general, provide advisory assistance to the federal government in all consultations referred to it for that purpose, and

X.- Carry out other activities connected with the above; and any determined by law or by applicable provisions, by its internal regulations and those established, in keeping with its aims, by its Board of Directors.

Article 44.- The Institute shall have the following Bodies:

I.- Board of Directors;

II.- General Directorate, and

III.- Surveillance Committee.

Article 45.- The Board of Directors shall be chaired by the Undersecretary appointed by the Secretary of Energy, Mines and Parastate Industry and shall be made up of the Directors General of the Federal Electricity Commission, the National Science and Technology Council and the National Polytechnic Institute, and the Rectors of the National Autonomous University of Mexico and the Autonomous Metropolitan University, as well as by two persons appointed by the above-mentioned Secretary. An Alternate shall be appointed for each Director.

The Board of Directors should hold regular meetings at least once every three months; special meetings will be held as often as necessary.

Article 46.- The Board of Directors is the Institute's highest authority and shall have the following functions:

I.- Approve the Institute's internal regulations;

II.- Issue general guidelines for the proper fulfillment of the Institute's functions;

III.- Review and, if applicable, authorize the Institute's annual and medium- and long-term work programs;

IV.- Be informed of and, if applicable, authorize the draft budget necessary for the execution of the corresponding programs;

V.- Approve the appointment of those proposed by the Director General to occupy posts ranked immediately below;

VI.- Ensure that the activities carried out by the Institute comply with the applicable legal, technical and administrative provisions, and with the approved programs and budgets;

VII.- Verify that financial resources are correctly allocated and approve the Institute's financial statements;

VIII.- Evaluate administrative operations and the results obtained by the Institute in relation to its own ends and to national, regional or sectoral objectives;

IX.- Authorize any action for the acquisition and disposal of real estate that forms part of its assets, and

X.- Delegate to the Director General the duties it deems advisable for better performance of the Institute's functions.

Article 47.- The Director General of the Institute shall be appointed by the Secretary of Energy, Mines and Parastate Industry and shall have the following functions:

I.- Legally represent the Institute before all authorities, public and private agencies, and other persons in general, without restriction, with all the general powers and special powers requiring express clauses according to the Law, including to substitute or delegate such representation, as well as to grant general or special powers to carry out administrative actions in labor matters, to delegate the authority for legal representation so that the person delegated may appear on behalf of the Institute at conciliation, complaint and objections hearings and other steps in labor proceedings and trials;

II.- Execute and promote compliance with the agreements and decisions of the Board of Directors;

III.- Propose to the Board appropriate measures for the improved functioning of the Institute;

IV.- Formulate and submit to the Board draft internal regulations and income and expenditure budgets;

V.- Formulate and submit to the Board annual and medium- and long-term programs, in accordance with the policies, priorities and objectives of national planning;

VI.- Submit an annual report on the activities carried out and the results obtained with regard to the objectives defined in its programs;

VII.- Appoint and remove the public servants of the Institute, as well as contract the services required in accordance with the provisions in effect, and propose to the Board of Directors the appointments and removals of officials at the level immediately below the Board, and

VIII.- All other functions stemming from provisions applicable to agencies of the Parastate Public Administration and those entrusted to the Director General by the Board of Directors.

Article 48.- The Surveillance Committee shall be responsible for ensuring compliance with the programs and budgets approved, as well as with the measures adopted for efficient administration and correct management of funds. To that end, it may carry out the inspections and audits it deems necessary. This Committee shall submit an annual report to the Board of Directors prior to the authorization of programs for the following financial year and shall inform the Board of any irregularities it may encounter, so that the latter may take the measures it deems pertinent.

The Committee shall be composed of one representative of the Institute, one from the Secretariat of Energy, Mines and Parastate Industry and one from the Office of the Comptroller-General of

the Federation; the latter shall be responsible for coordination of the Committee and shall act as the channel for informing the Board of Directors of the results of its work.

Article 49.- The assets of the National Nuclear Research Institute are made up of the goods it receives, the appropriations made in its favor by the federal government, the income it receives from the delivery of services related to its objective and, if applicable, any returns and contributions received in accordance with applicable regulations.

CHAPTER VI

The National Commission on Nuclear Safety and Safeguards

Article 50.- The National Commission on Nuclear Safety and Safeguards is a semi-autonomous body under the Secretariat of Energy, Mines and Parastate Industry, with the following attributions:

I.- Ensure the application of nuclear and radiological safety and physical security regulations and safeguards so that the functioning of nuclear and radioactive installations is carried out with maximum safety for the country's inhabitants;

II.- Ensure compliance, within the territory of the Mexican United States, with the legal provisions and international treaties on nuclear and radiological safety and physical security, and safeguards, to which Mexico is a signatory;

III.- Review, assess and authorize the bases for the siting, design, construction, operation, modification, end of operations, final closing down and dismantling of nuclear and radioactive installations; as well as all aspects of the manufacture, use, handling, storage, reprocessing and transportation of nuclear materials and fuels, radioactive materials and equipment containing the latter; and the processing, conditioning, dumping and storage of radioactive wastes, and the manner in which they are disposed of.

IV.- Issue an opinion prior to any authorization granted by the Secretary of Energy, Mines and Parastate Industry in connection with the siting, design, construction, operation, modification, end of operations, final closing down and dismantling of nuclear installations;

V.- Issue, revalidate, replace, modify, suspend and revoke the permits and licenses required for radioactive installations in accordance with the legal provisions, as well as collect and remove, if applicable, the existing implements, equipment and materials, and in general, any contaminated movable property in said installations;

VI.- Make recommendations and provide advisory assistance in regard to measures for nuclear and radiological safety and physical security, and for safeguards, as well as administrative measures, that are in order in anomalous conditions or emergencies in the case of nuclear and radioactive installations; and determine and execute in these cases, when technically recommendable, the retention, seizure or depositing of sources of ionizing radiation or equipment containing them, or the partial or total, temporary or final closing down of the site where they are located, or any other that may have been affected, without prejudice to measures adopted by other competent authorities.

VII.- Prior to the start-up of operations, review, assess and authorize the plans that should be in place for dealing with anomalous or emergency conditions in nuclear and radioactive installations.

VIII.- Establish and manage the national system for registration and control of nuclear materials and fuels;

IX.- Issue an opinion prior to the authorization of imports and exports of radioactive materials and equipment containing them, as well as of nuclear materials and fuels, for the purpose of safety, registration and control;

X.- Propose regulations, review, assess and, if applicable, authorize bases for the design, construction, adaptation, preparation, operation, modification and stopping of operations of installations for the extraction and treatment of radioactive minerals, as well as establish criteria for interpreting the above-mentioned regulations;

XI.- Propose regulations and establish criteria for interpretation relative to nuclear and radiological safety, physical security, and safeguards in all matters concerning the activities referred to in paragraph III above, and propose the safety, registration and control criteria governing imports and exports of nuclear materials and fuels;

XII.- Order and practice audits, checks, verifications and inspections to confirm compliance with and observance of legal provisions in regard to nuclear and radiological safety, physical security, and safeguards; and impose the enforcement measures and administrative sanctions that are in order in accordance with the provisions of this Law and its regulations;

XIII.- Require and verify the information and documentation it deems pertinent for the exercise of the attributions that this Law confers on it, in accordance with applicable provisions;

XIV.- Participate in the cooperation agreements entered into by the Secretariat of Energy, Mines and Parastate Industry with other national agencies in matters related to nuclear and radiological safety, physical security, and safeguards;

XV.- Establish the requirements to be met by technical training programs in matters related to nuclear and radiological safety, physical security, and safeguards, and provide advisory assistance for the same;

XVI.- Assist the authorities in charge of prevention, law enforcement and administration of justice in cases in which nuclear materials and fuels or radioactive materials are the object of offenses, are lost or misplaced or are involved in incidents, as well as customs authorities, in accordance with the respective Law;

XVII.- Request assistance from public forces whenever necessary in order to ensure compliance with its determinations, according to Law, and

XVIII.- Any other attributions conferred on it in this Law and in the legal provisions in force.

The Federal Executive, through the Head of the Secretariat of Energy, Mines and Parastate Industry, may also exercise the attributions contained in the above paragraphs.

Article 51.- The National Commission on Nuclear Safety and Safeguards shall be headed by a Director General and shall have a Consultative Council, as well as the personnel necessary to exercise the attributions entrusted to it. The Director General shall be appointed to and removed from office by the Secretary of Energy, Mines and Parastate Industry. The requirements for occupying the said post are to be Mexican by birth, over 30 years old, with a professional title and at least five years' experience in the field.

Article 52.- The purpose of the Consultative Council is to provide advisory assistance to the National Commission on Nuclear Safety and Safeguards and to that end it shall provide the technical cooperation requested and shall carry out the studies required in processing the consultations submitted to it by its Chairman.

The Consultative Council shall be chaired by the Head of the Secretariat of Energy, Mines and Parastate Industry or by the public servant appointed for that purpose, and shall be composed of one representative each of the Secretariats of the Interior, Foreign Affairs, National Defense, the Navy, Agriculture and Water Resources, Communications and Transportation, Urban Development and Ecology, Health and Welfare, and Labor and Social Welfare.

Representatives of other secretariats and institutions of the federal public administration, of the states of the federation and of municipalities, as well as professionals of recognized capacity and experience in the nuclear field, may also form part of the Consultative Council, with the prior approval of the Head of the Secretariat of Energy, Mines and Parastate Industry.

PROVISIONAL ARTICLES

ARTICLE ONE.- This Law shall enter into force on the day after its publication in the Official Gazette of the Federation.

ARTICLE TWO.- The Regulatory Law of the Constitutional Article 27 on Nuclear Matters published in the Official Gazette of the Federation on January 26, 1979, is hereby annulled.

ARTICLE THREE.- The Secretariat of Energy, Mines and Parastate Industry shall relocate the workers of the National Atomic Energy Commission in the areas which, according to their experience, will permit the best use of their capabilities, respecting their labor rights in accordance with the applicable provisions. The above-mentioned Secretariat shall also determine the use made of the assets of the above-mentioned Commission.

ARTICLE FOUR.- The Federal Executive, through the Secretariat of Programming and Budget and with the participation of the Office of the Comptroller General of the Federation and the Secretariat of Energy, Mines and Parastate Industry, shall take the pertinent steps to draw up a program to liquidate Uranio Mexicano and shall determine the regulations and guidelines regulating such a program, including those relative to the use or disposal of its assets. The liquidation process shall be concluded before December 31, 1985.
The labor rights of the workers of Uranio Mexicano should be protected in accordance with the provisions of the Federal Labor Law and of the corresponding Collective Contract.

At the proposal of the coordinating agency of the corresponding sector, the Federal Executive shall appoint the liquidator who will carry out said process, who shall have the faculties inherent to his responsibilities, which shall be set forth in the document of appointment.

ARTICLE FIVE.- The universities, institutes and research centers that own or have nuclear fuels on lease may conserve such fuels as long as they adjust to the regulations of this Law and to the provisions issued in this regard by the Secretariat of Energy, Mines and Parastate Industry. Said Secretariat shall abstain from authorizing extensions to loan contracts or any act by means of which the use or possession of nuclear fuels is permitted, except those established by this Law.

The federal government shall provide, in accordance with the programs and policies of national development planning, the nuclear fuels required by the above-mentioned institutions in order to carry out their projects.

ARTICLE SIX.- The Federal Executive may authorize the Federal Electricity Commission to temporarily perform some of the activities included in paragraphs IV and V of Article 18 of this Law, as long as the Secretariat mentioned in the provision is able to carry them out.

ANNEX II

LAW OF CIVIL LIABILITY FOR NUCLEAR DAMAGES

(TRANSCRIPTION FROM THE OFFICAL GAZETTE DATED DICIEMBER 31, 1974)

LEY DE Responsabilidad Civil por Daños Nucleares

Al margen un sello con el Escudo Nacional, que dice: Estados Unidos Mexicanos .-Presidencia de la República.

LUIS ECHEVERRIA ALVAREZ, Presidente Constitucional de los Estados Unidos Mexicanos, a sus habitantes, sabed:

Que el H. Congreso de la Unión, se ha servido dirigirme el siguiente

DECRETO:

"El Congreso de los Estados Unidos Mexicanos, decreta:

LEY DE RESPONSABILIDAD CIVIL POR DAÑOS NUCLEARES

CAPITULO PRIMERO

Objeto y Definiciones

ARTICULO 1.- La presente ley tiene por objeto regular la responsabilidad civil por daños que puedan causarse por el empleo de reactores nucleares y la utilización de substancias y combustibles nucleares y desechos de estos.

ARTICULO 2.- Las disposiciones de la presente ley son de interés social y de orden público y rigen en toda la República.

ARTICULO 3.- Para los efectos de la presente ley se entiende:

a) Accidente nuclear. El hecho o sucesión de hechos que tengan el mismo origen y hayan causado daños nucleares;

b).- Combustible nuclear. Las substancias que puedan producir energía mediante un proceso automantenido de fisión nuclear;

c).- Daño nuclear. La pérdida de vidas humanas. las lesiones corporales y los daños y perjuicios materiales que se produzcan como resultado directo o indirecto de las propiedades radioactivas o de su combinación con las propiedades tóxicas, explosivas u otras propiedades peligrosas de los combustibles nucleares o de los productos o desechos radioactivos que se encuentren en una instalación nuclear, o de las substancias nucleares peligrosas que se produzcan en ella, emanen de ella, o sean consignadas a ella;

d).- Energía atómica. Toda energía. que queda en libertad durante los procedimientos nucleares;

e).- Operador de una instalación nuclear. La persona designada, reconocida o autorizada por un Estado en cuya jurisdicción se encuentre la instalación nuclear;

f).- Por instalación nuclear:

1.- El reactor nuclear, salvo el que se utilice como fuente de energía en un medio de transporte;

2.- Las fábricas que utilicen combustibles nucleares para producir substancias nucleares peligrosas y la fábrica en que se proceda al tratamiento de éstas, incluidas las instalaciones de regeneración de combustibles nucleares irradiados; y,

3.- El local de almacenamiento de substancias nucleares peligrosas, salvo cuando las substancias se almacenen provisionalmente en ocasión de su transporte.

Se considera como una sola instalación nuclear a un grupo de instalaciones ubicadas en el. mismo lugar;

g).- Producto o desecho radioactivo. El material radioactivo, producido durante el proceso de producción o utilización de combustibles nucleares o cuya radioactividad se haya originado por la exposición a las radiaciones inherentes a dicho proceso;

h).- Reactor nuclear. El dispositivo que contenga combustibles nucleares, dispuestos de tal modo que, dentro de él, pueda tener lugar un proceso automantenido de fisión nuclear, sin necesidad de una fuente adicional de neutrones;

i).- Remesa de substancias nucleares. El envío de aquellas que sean peligrosas, incluyendo su transporte por vía terrestre, aérea, o acuática, y su almacenamiento provisional con ocasión del transporte; y,

j).- Substancia nuclear peligrosa:

1.- El combustible nuclear, salvo el uranio natural y el uranio empobrecido, que por sí mismo o en combinación con otras substancias, pueda originar un proceso automantenido de fisión nuclear fuera de un reactor nuclear.

2.-Los productos o desechos radioactivos, salvo los radioisótopos elaborados que, se hallen fuera de una instalación nuclear, y se utilicen o vayan a utilizarse con fines médicos, científicos, agrícolas, comerciales o industriales.

CAPITULO SEGUNDO

De la Responsabilidad Civil por Daños Nucleares

ARTICULO 4.-La responsabilidad civil del operador por daños nucleares es objetiva.

ARTICULO 5.-El operador será responsable de los daños causados por un accidente nuclear que ocurra en una instalación nuclear a su cargo, o, en el que intervengan substancias nucleares peligrosas producidas en dicha instalación siempre que no formen parte de una remesa de substancias nucleares.

ARTICULO 6.-El operador de una instalación será responsable de los daños causados por un accidente nuclear, por la remesa de substancias nucleares:

I- Hasta que dichas substancias hubiesen sido descargadas del medio de transporte respectivo en el lugar pactado o en el de la entrega; y

II.- Hasta que otro operador de diversa instalación nuclear hubiere asumido por vía contractual esta responsabilidad.

Las disposiciones del presente artículo también son aplicables a la remesa de reactores nucleares.

ARTICULO 7.- Podrá el porteador o transportista asumir las responsabilidades que correspondan al operador respecto de substancias nucleares siempre y cuando satisfaga los requisitos establecidos por la presente ley y su reglamento.

ARTICULO 8.- Cuando la responsabilidad por daños nucleares recaiga en más de un operador, todos serán solidariamente responsables de los mismos.

ARTICULO 9.- La responsabilidad de todos los operadores no excederá del límite máximo fijado en esta ley.

ARTICULO 10.- En toda remesa de substancias nucleares el operador expedirá un certificado en el que haga constar su nombre, dirección, la clase y cantidad de substancias nucleares, y el monto de la responsabilidad civil que establece la ley. Además, acompañara al certificado, la declaración de la autoridad competente haciendo constar que reúne las condiciones regales inherentes a su calidad de operador. Asimismo entregará la certificación expedida por el asegurador o la persona que haya concedido la garantía financiera. La persona que haya extendido o haya hecho extender el certificado de remesa no podrá impugnar los datos asentados en el mismo.

Cuando el operador sea una dependencia u organismo oficial, no será necesario que al certificado se acompañen los anexos de que trata el párrafo anterior.

ARTICULO 11.- El operador no tendrá responsabilidad por daños nucleares, cuando los accidentes nucleares sean directamente resultantes de acciones de guerra, invasión, insurrección u otros actos bélicos o catástrofes naturales, que produzcan el accidente nuclear.

ARTICULO 12.- Cuando un daño haya sido causado en todo o en parte por un accidente nuclear y otro u otros sucesos diversos, sin que pueda determinarse con certeza qué parte del daño corresponde a cada una de esas causas, se considera que todo el daño se debe exclusivamente al accidente nuclear.

ARTICULO 13.- Si el operador prueba que la persona que sufrió los daños nucleares los produjo o contribuyó a ellos por negligencia inexcusable o por acción u omisión dolosa, el tribunal competente atendiendo a las circunstancias del caso o de la víctima, exonerará total o parcialmente al operador de la obligación de indemnizarla por los daños sufridos.

CAPITULO TERCERO

Del Límite de la Responsabilidad

ARTICULO 14.-Se establece como importe máximo de la responsabilidad del operador frente a terceros, por un accidente nuclear, determinado la suma de cien millones de pesos.

Respecto a accidentes nucleares que acaezcan en una determinada instalación nuclear dentro de un periodo de doce meses consecutivos, se establece como límite la suma de ciento noventa y cinco millones de pesos.

La cantidad indicada en el párrafo anterior incluye el importe de la responsabilidad por los accidentes nucleares que se produzcan dentro de dicho periodo cuando en el accidente estén involucradas cualesquiera substancias nucleares peligrosas o cualquier remesa de substancias nucleares destinadas a la instalación o procedentes de la misma y de las que el operador sea responsable.

ARTICULO 15.- El transportista o porteador cuando asuma la responsabilidad por accidentes nucleares, deberá garantizar los riesgos de los mismos durante el tránsito, en la misma forma y términos exigidos al operador.

ARTICULO 16.- Cuando los daños nucleares sean efecto de accidentes simultáneos en los que intervengan dos o más remesas de substancias nucleares peligrosas transportadas en el mismo medio de transporte o almacenadas provisionalmente en el mismo lugar con ocasión del transporte la responsabilidad global de las personas solidariamente responsables, no rebasará el limite individual más alto, ni la responsabilidad de cada una de ellas será superior al limite fijado en su propia remesa.

ARTICULO 17.-El importe máximo de la responsabilidad no incluirá los intereses regales ni las costas que establezca el tribunal competente en las sentencias que dicten respecto de daños nucleares.

ARTICULO 18.- El importe de la responsabilidad económica por daños nucleares personales es:

a).- En caso de muerte el importe del salario mínimo general vigente en el Distrito Federal multiplicado por mil;

b).- En caso de incapacidad total el salario indicado en el inciso a) multiplicado por mil quinientos; y,

c).- En caso de incapacidad parcial el salario indicado a) multiplicado por quinientos.

El monto de esta indemnización no podrá exceder del límite máximo establecido en la presente ley y en su caso se aplicará a prorrata.

Los daños de esta índole causados a trabajadores del responsable se indemnizarán en los términos de las leyes laborales aplicables al caso.

CAPITULO CUARTO

De la Prescripción

ARTICULO 19.- El derecho a reclamar la indemnización al operador por daños nucleares, prescribirá en el plazo de diez años contados a partir de la fecha en que se produjo el accidente nuclear.

ARTICULO 20.- Cuando se produzcan daños nucleares por combustibles nucleares, productos o desechos radioactivos que hubiesen sido objeto de robo, pérdida, echazón o abandono, el plazo fijado en el articulo anterior se contará a partir de la fecha en que ocurrió el accidenté.

ARTICULO 21.- El plazo de la prescripción será de quince años computados a partir de la fecha en que se produjo el accidente nuclear, cuando se produzcan daños nucleares corporales mediatos que, no impliquen pérdida de la vida ni su conocimiento objetivo inmediato.

ARTICULO 22.- La acción por daños nucleares ejercitada en tiempo ante el tribunal competente, se podrá ampliar por la agravación de los daños producidos, antes que se pronuncie sentencia definitiva.

CAPITULO QUINTO

Disposiciones Generales

ARTICULO 23.-Los organismos o entidades públicos se encuentran exentos de otorgar seguros y garantías financieras, para garantizar los daños a que se refiere esta ley.

ARTICULO 24.-El operador sólo tendrá derecho de repetición:

I.- En contra de la persona física que, por actos u omisiones dolorosas causó daños nucleares;

II.- En contra de la persona que lo hubiere aceptado contractualmente, por la cuantía establecida en el propio contrato; y,

III.- En contra del transportista o porteador que, sin consentimiento del operador hubiere efectuado el transporte, salvo que éste hubiere tenido por objeto salvar o intentar salvar vidas o bienes.

ARTICULO 25.- Los Tribunales Federales del domicilio del demandado, conocerán de acuerdo a las normas del Código Federal de Procedimientos Civiles, de las controversias que se susciten con motivo de la aplicación de la presente ley.

ARTICULO 26.-Las sentencias definitivas extranjeras dictadas por daños nucleares, no se reconocerán ni ejecutarán en la República Mexicana, en los siguientes casos:

I.- Cuando la sentencia se hubiere obtenido mediante procedimiento fraudulento o por colusión de litigantes;

II.- Cuando se le hubieren violado garantías individuales a la parte demandada o aquella en cuya contra se pronunció;

III.- Cuando sea contraria al orden público nacional; y,

IV.- Cuando la competencia jurisdiccional del caso, debió corresponder a los Tribunales Federales de la República Mexicana.

ARTICULO 27.- El operador de una instalación nuclear está obligado a informar inmediatamente a las autoridades federales competentes, del acaecimiento de cualquier accidente nuclear o de cualquier extravío o robo de substancias o materiales radioactivos.

Igual obligación tendrá cualquier persona que tenga conocimiento de esos hechos.

ARTICULO 28.- Son nulos de pleno derecho, los convenios o contratos que excluyan o restrinjan la responsabilidad que establece la presente ley.

ARTICULO 29.- De acuerdo a la presente ley y acorde con sus términos, la Secretaria de Gobernación coordinará las actividades de las Dependencias del Sector Público, Federal, Estatal y Municipal, así como la de los organismos privados, para el auxilio, evacuación y medidas de seguridad, en zonas en que se prevea u ocurra un accidente nuclear.

ARTICULO 30.- El reglamento de esta Ley establecerá las bases de seguridad en las instalaciones nucleares; de ingresos o acceso; egreso o salida de todo su personal incluyendo el sindicalizado; y todas las demás que se requieran para la ejecución de la presente ley.

ARTICULO 31.- Las disposiciones de la presente ley sólo son aplicables a los casos expresamente previstos en la misma.

ARTICULO TRANSITORIO:

La presente ley entrará en vigor al día siguiente de su publicación en el "Diario Oficial" de la Federación.

México, D. F., a 29 de diciembre de 1974.- "Año de la República Federal y del Senado".- **Píndaro Uriostegui Miranda**, D. P.- **Francisco Luna Kan**, S. P.- **Feliciano Calzada Padrón**, D. S.- **Agustín Ruiz Soto**, S. S.- Rúbricas.

En cumplimiento de lo dispuesto por la fracción I del artículo 89 de la Constitución Política de los Estados Unidos Mexicanos y para su debida publicación y observancia, expido el presente Decreto, en la Residencia del Poder Ejecutivo Federal, en la ciudad de México, Distrito Federal, a los veintinueve días del mes de diciembre de mil novecientos setenta y cuatro.- "Año de la República Federal y del Senado".- **Luis Echeverría Alvarez**.- Rúbrica.- El Secretario de Gobernación, **Mario Moya Palencia**.- Rúbrica.- El Secretario de Hacienda y Crédito Público, **José López Portillo**.- Rúbrica.- El Secretario del Patrimonio Nacional, **Horacio Flores de la Peña**.- Rúbrica.- El Secretario de Relaciones Exteriores, **Emilio 0. Rabasa.- Rúbrica**.

ANNEX III

THE GENERAL REGULATIONS ON RADIOLOGICAL SAFETY

ANNEX IV

SAFETY RULES, STANDARDS AND GUIDES OF THE COUNTRY OF ORIGIN OF THE NUCLEAR STEAM SUPPLY SYSTEM (NSSS)

ANNEX IV

U.S. TITLE 10 OF THE CODE OF FEDERAL REGULATIONS

From the beginning of Laguna Verde Nuclear Power Station as a project, in 1972, following the example of countries like Japan and Spain, the governmental instances involved in the project made the decision of applying, apart from the regulations of the International Atomic Energy Agency, the normative of the country of origin of the nuclear vapour supply system; that is, the normative of the United States of America. The above cited is contained in Condition No. 3 of the operation license for both LVNPS units.

In the above context, Title 10 “Energy” of the Code of Federal Regulations of the United States of America was adopted as a primary requirement.

Particularly, the regulatory standards for licensing LVNPS-1 & 2 were defined upon agreement between the Regulatory Body and CFE, specifying the fulfilment with the parties:

Part 20 “Radiation Protection Standard”

Part 50 “Production and Utilisation Installations” and Appendixes:

- A “General Design Criteria”
- B “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants”.
- E “Production and Utilisation Installation Emergency Preparedness and Plans”.
- G “Fracture Toughness Requirements”
- H “Vessel Material Surveillance Program Requirements”
- I “Numerical Guide for Design Objectives and Operation Limit Conditions to Satisfy the “As Low As Reasonably Achievable” Criteria for Radioactive Materials in Nuclear Power Plant Effluents”.
- J “Light-Water-Cooled Reactor Primary Containment Leak Tests”
- K “Emergency Cooling System Assessment Models”

Part 55 “Operator Licenses”.

Part 73 “Physical Protection of Nuclear Plants and Materials”.

Part 100 “Reactor Location Criteria”

USNRC REGULATORY GUIDES APPLIED TO LVNPS-1 & 2.

USNRC regulatory guides provide acceptable methods to meet the regulatory requirements for nuclear power plants in the U.S.A. To this respect, CNSNS in agreement with CFE decided upon the specific adoption of the regulatory guides and compliance methods previously shown. Since the settlement of the Normative Standards, the Mexican Regulatory Organism (CNSNS) established that Laguna Verde Nuclear Power Station should satisfy the safety requirements of the country of origin of the nuclear steam supply system, adapting itself according to the circumstances and time of application, in accordance with the agreements reached case by case.

The series of Regulatory Guides applied to LVNPS are as follows:

- Series 1, Power Reactors and Nuclear Installations
- Series 4, Environmental Radiological Surveillance
- Series 7, Radiological Protection
- Series 8, Physical Protection
- Series 9, Radioactive Waste Management

Regulatory Guides applicable to the Convention on Nuclear Safety are as described below:

USNRC Regulatory Guide 1.8, "Selection and Training of Nuclear Power Plant Personnel".

Purpose:

To provide criteria for the selection, qualification, responsibility and training of nuclear power plant personnel.

USNRC Regulatory Guide 1.9, "Selection, Design, Qualification and Testing of EDG Units Used as Class 1E on Site Electric Power Systems at NPP".

Purpose:

To provide acceptable basis to the Regulatory Body in order to comply with the requirements when using Emergency Diesel Generators (EDG) as an emergency source on site upon events producing loss of external energy and design basis accident.

USNRC Regulatory Guide "Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquids and Gaseous Effluents from Light-Water-Cooled Nuclear Plants".

Purpose:

This guide describes programs accepted by the Regulatory Body to measure, report and assess the release of radioactive material in liquids and gases; the classification and report of categories as well as the contents of solid waste.

USNRC Regulatory Guide 1.28, "Quality Assurance Program Requirements (Design and Construction)",

Purpose:

To provide requirements for the Quality Assurance Program.

USNRC Regulatory Guide "Seismic Design Classification".

Purpose:

To describe an acceptable method for the Regulatory Body to identify and classify light-water nuclear plant aspects to be designed to support the effects of a safe shutdown earthquake (SSE).

USNRC Regulatory Guide 1.30, "Quality Assurance Requirements for the Installation, Inspection and Testing of Instrumentation and Electric Equipment".

Purpose:

To provide Quality Assurance requirements to install, inspect and test electrical equipment as well as instrumentation and control.

USNRC Regulatory Guide 1.33 "Quality Assurance Program Requirements (Operation)".

Purpose:

To provide Quality Assurance requirements for the operation stage.

USNRC Regulatory Guide 1.37, "Quality Assurance Requirements for Cleaning of Fluid System and Associated Components of Water Cooled Nuclear Power Plants".

Purpose:

To provide Quality Assurance requirements for cleaning of fluids systems and associated components.

USNRC Regulator Guide 1.38, "Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items for Water-Cooled Nuclear Power Plants".

Purpose:

To provide Quality Assurance requirements for packaging, shipping, receiving, storage and handling of power plant items.

USNRC Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems".

Purpose:

To describe acceptable methods to implant requirements for the selection of leak detection systems as well as allowable leakage limits covered in Technical Specifications for Operation.

USNRC Regulatory Guide 1.54, "Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants".

Purpose:

To provide Quality Assurance requirements for protective coatings used at nuclear power plants.

USNRC Regulatory Guide 1.56, "Maintenance of Water Purity in BWR's.

Purpose:

To describe the acceptable Regulatory Body method for implanting a criteria for the reduction in the probability of an induced failure caused by corrosion of the reactor coolant pressure boundary in BWR's, maintaining acceptable purity levels established in Technical Specifications for Operation.

USNRC Regulatory Guide 1.58, "Qualification of Nuclear Power Plant Inspection, Examination and Testing Personnel"

Purpose:

To provide Quality Assurance requirements for Inspection, Examination and Testing Personnel at Nuclear Power Plants.

USNRC Regulatory Guide 1.59, "Design Basis for Floods for Nuclear Power Plants"

Purpose:

Discuss design basis for floods that nuclear power plants are to support without losing capacity for a safe reactor shutdown and its maintenance under such conditions.

USNRC Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants"

Purpose:

Describe an acceptable procedure for the Regulatory Commission in order to define seismic design spectra response for nuclear power plants.

USNRC Regulatory Guide 1.61 "Damping Values for Seismic Design of Nuclear Power Plants"

Purpose:

To delineate acceptable damping values for the Regulatory Commission to be used in the structural mode elastic dynamic seismic analysis of seismic category I structures, systems and components.

USNRC Regulatory Guide 1.64, "Quality Assurance Requirements for the Design of Nuclear Power Plants".

Purpose:

To provide Quality Assurance requirements for the design of nuclear power plants.

USNRC Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis for Nuclear Power Plants Chapter 13".

Purpose:

To establish scope and deepness of information contents and form required presenting to the Regulatory Body in order to request Construction and Operation License Permits.

USNRC Regulatory Guide 1.74, "Quality Assurance Terms and Definitions"

Purpose:

To provide Terms and Definitions used in Quality Assurance.
Assurance requirements.

USNRC Regulatory Guide 1.76, "Design Basis Tornado for Nuclear Power Plants".

Purpose:

To describe design basis tornado that is to be considered during the design stage of nuclear power plants in order to support the effects without a undue risk to public health and safety.

USNRC Regulatory Guide 1.78, "Assumptions for Evaluating the Habitability of the Control Room during a Postulated Hazardous Chemical Release".

Purpose:

To identify chemical agents that when appearing in sufficient amounts may cause the Control Room to turn uninhabitable.

In Section B "Discussion", it is determined that *"human tolerance to dangerous chemicals must be considered during the design stage of nuclear power plants".*

USNRC Regulatory Guide 1.88, "Collection, Storage, Maintenance of Nuclear Power Plant Quality Assurance Records".

Purpose:

To provide requirements for the collection, storage and maintenance of nuclear power plant quality assurance records.

USNRC Regulatory Guide 1.91, "Evaluation of Explosions Postulated to Occur in Transportation Routes near Nuclear Power Plants".

Purpose:

To describe a method to determine the distances there must be between critical structures of a nuclear plant and railroads, roads or navigating routes (maritime or fluvial) far beyond which any explosion may occur on such transportation routes, not having an adverse effect on the plant's operation or avoiding a safe shutdown.

USNRC Regulatory Guide 1.94, ”Quality Assurance Requirements for Installation, Inspection and Testing of Structural Concrete and Structural Steel During the Construction Stage of Nuclear Power Plants”.

Purpose:

To provide Quality Assurance requirements for the installation, inspection and test of steel and concrete structures during the construction stage of nuclear power plants.

USNRC Regulatory Guide 1.97, “Instrumentation for Light Water Cooled Nuclear Power Plant to Access Plant Conditions during and following an Accident”.

Purpose:

To provide a minimum number of variables to be surveyed by personnel operating the control room during and after an accident, and in such a manner to enable to take controlled manual actions for which automatic controls are not provided and that are required by the safety systems in order to satisfy safety functions during design basis accident events.

USNRC Regulatory Guide 1.99, “Radiation Embrittlement of Reactor Vessel Materials”.

Purpose:

To establish acceptable procedures for the Regulatory Body to calculate embrittlement effects due to neutron irradiation in light water cooled reactor vessels of a low steel alloy fabrication.

USNRC Regulatory Guide 1.101, “Emergency Planning and Preparedness for Nuclear Power Reactors”.

Purpose:

To provide criteria to satisfy guidelines described in 10CFR Part 50, Section 50.47. These criteria provide a basis for state and local authorities to develop an acceptable radiological emergency plan and to improve emergency preparedness.

USNRC Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, App. I":

Purpose:

To satisfy 10CFR50, Appendix I. This guide describes basic calculation model features for pre-operational estimates of effluent releases, dispersion of the same, to the atmosphere and diverse water bodies as well as an estimate of radiation doses equivalent related to man. Also, parameters are suggested for this last estimate.

Methodologies described in the guide and developed by NRC, are generic, due to the lack of specific parameters for particular sites. Therefore, the use of specific site values is recommended. However, suppositions and methods used to obtain such parameters must be described in detail and documented.

USNRC Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors".

Purpose:

To describe basic aspects of calculation models and suppositions used to estimate transportation and atmospheric dispersion of gaseous effluents in routine releases from light-water cooled reactors.

USNRC Regulatory Guide 1.116, "Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems".

Purpose:

To provide Quality Assurance requirements for installation, inspection, and testing of mechanical equipment and systems.

USNRC Regulatory Guide 1.123, "Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants".

Purpose:

To provide Quality Assurance requirements for the control of procurement of items and services for nuclear power plants.

USNRC Regulatory Guide 1.132, "Site Investigations for Foundations of Nuclear Power Plants".

Purpose:

To provide a generic guide and recommendations for developing specific investigation programs of each site as well as a specific guide to conduct subsoil investigations, space and deepness of holes and sample taking.

USNRC Regulatory Guide 1.144, "Auditing of Quality Assurance Programs for Nuclear Power Plants".

Purpose:

To provide audit and quality assurance program requirements for nuclear power plants.

USNRC Regulatory Guide 1.146, "Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants".

Purpose:

To provide audit personnel qualification requirements of quality assurance programs for nuclear power plants.

USNRC Regulatory Guide 1.150, "Ultrasonic Testing of Reactor Vessel Welds during Pre-Service and In-Service Examination".

Purpose:

To describe acceptable procedures for Regulatory Body in order to implant the same during the pre-service and in-service examination of the plant for reactor vessel welds ultrasonically inspected.

USNRC Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants".

Purpose:

To describe acceptable criteria for Regulatory Body in order to carry out effective maintenance to structures, systems and components important to safety.

USNRC Regulatory Guide 4.1, "Programs for Monitoring Radioactivity in the Environment of NPP".

Purpose:

To describe the acceptable basis for Regulatory Body in the design of environmental radiation and radioactivity monitoring level programs.

USNRC Regulatory Guide 4.2, "Preparation of Environmental Reports for Nuclear Power Stations".

Purpose:

To provide standard form and environmental report contents. This report contains the following sections: Purpose of the installation proposed, site and environmental interfaces, the station and its environmental effects, environmental surveys and its effluents, site alternatives and energetic sources, and cost-benefit analysis.

USNRC Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment".

Purpose:

To provide quality assurance guidelines for radiological monitoring programs (normal operation) - effluent streams and environment.

USNRC Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Plants will be As Low As Reasonably Achievable".

Purpose:

To provide relevant information to reach the goals and objectives for planning, design, construction, operation and decommissioning of light-water reactors in order to satisfy the as low as reasonably achievable (ALARA) radiation exposure criteria for personnel during routine operation of the installation.

USNRC Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable".

To describe a necessary basis for a program to maintain the occupational radiation exposure as low as reasonably achievable (ALARA).

NUREG's AND OTHER USNRC DOCUMENTS.

In addition to the documents originally established within the Regulatory Norms and according to the improvements in nuclear safety, CNSNS has agreed with CFE, to instrument new requirements; these without doubt shall provide an

increase in the safety levels of the plant. Among these requirements, the following documents are included:

- NUREG-0654,“Criteria for Preparation and Assessment of Radiological Emergency Response Plans and Preliminary Activities for Nuclear Power Plants.
- NUREG-0660, “Plan of Action Developed as a Result of TMI-2 Accident”.
- NUREG-0700, “Control Room Design Review Guides”.
- NUREG-0737, “Explanation of TMI Plan of Action Requirements”.
- NUREG-0800, “Standard Review Plan to Review Safety Reports for Nuclear Power Plants”.
- NUREG-0801, “Assessment Criteria for a Detailed Review of the Control Room”.
- NUREG-1335 “Guide for Sending Individual Plant Analysis”.
- US Generic Letter 88-20 “Individual Plant Analysis”.
- Generic Letter 89-10 Motor-Operated Valve Behaviour in Nuclear Power Plants”.