Emplazamiento C.N. Almaraz

SOCIEDAD NUCLEAR ESPAÑOLA

Misión OSART (Otoño 1987)

SOCIEDAD NUCLEAR ESPAÑOLA

HERMANAMIENTO CON LA CENTRAL DE ROVNO (URSS)

Momento de la firma del Acuerdo de Hermanamiento entre las centrales de Almaraz y Rovno, por parte de los Sres. Bosch y Korovkin.

SOCIEDAD NUCLEAR ESPAÑOLA

VIAJE A UCRANIA PARA CONOCER LA CENTRAL DE ROVNO

SOCIEDAD NUCLEAR ESPAÑOLA

La delegación soviética acompañada por personal de la CNA ante el Centro de Información.

CHERNOBYL

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PRIPYAT

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GUARDERÍA (PRIPYAT)

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GUARDERÍA (PRIPYAT)

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GUARDERÍA (PRIPYAT)

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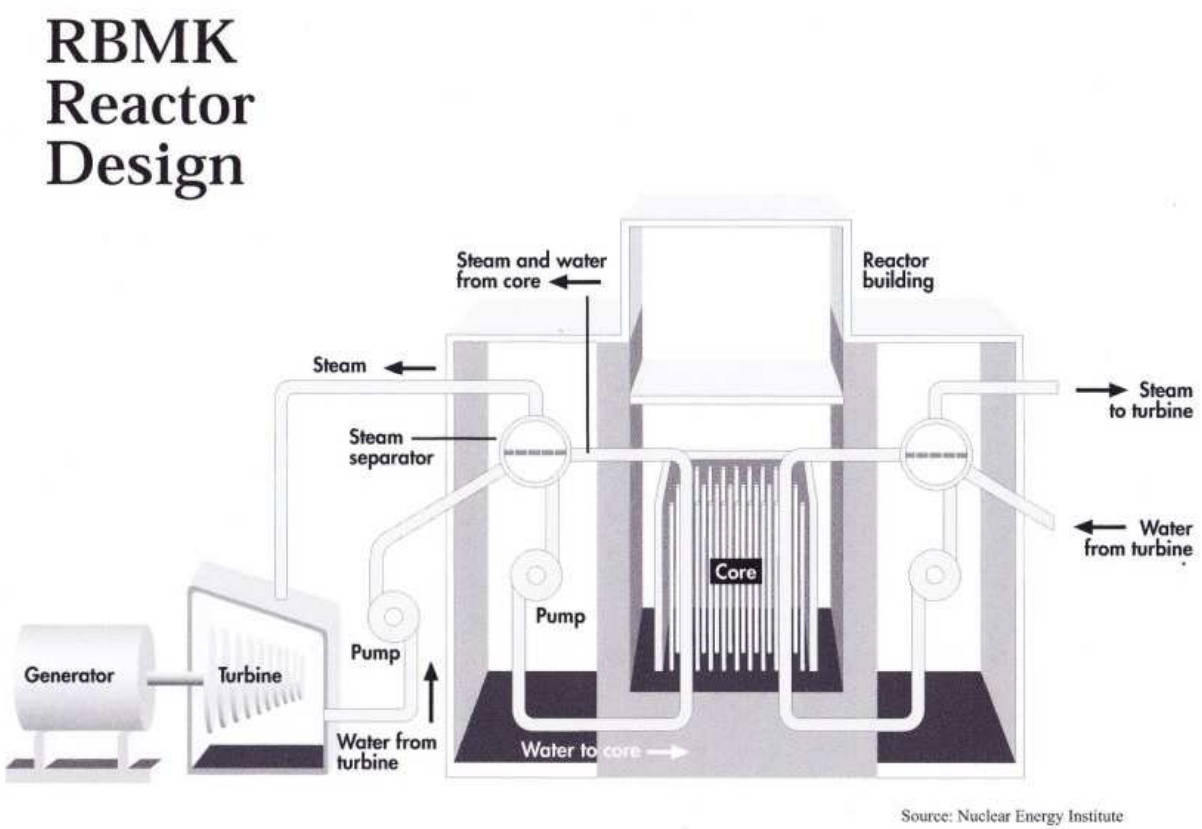
PISCINA (PRIPYAT)

SOCIEDAD NUCLEAR ESPAÑOLA

AUTOSUFICIENCIA

SOCIEDAD NUCLEAR ESPAÑOLA

ESQUEMA DE CHERNOBYL



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Responsables del programa nuclear soviético

Vasielivich Kurchatov (1903-60)
Anatoly Alexandrov (1903-1994)
Nicolai A. Dollezhall
Y. Koryakin

WIKIPEDIA (español)

- *"En agosto de 1986, en un informe enviado a la Agencia Internacional de Energía Atómica, se explicaban las causas del accidente en la planta de Chernóbil. Éste reveló que el equipo que operaba en la central el sábado 26 de abril de 1986 se propuso* ***realizar una prueba con la intención de aumentar la seguridad del reactor****. Para ello deberían averiguar durante cuánto tiempo continuaría generando energía eléctrica la turbina de vapor una vez cortada la afluencia de vapor. Las bombas refrigerantes de emergencia, en caso de avería, requerían de un mínimo de potencia para ponerse en marcha (hasta que se arrancaran los generadores diésel) y los técnicos de la planta desconocían si, una vez cortada la afluencia de vapor, la inercia de la turbina podía mantener las bombas funcionando".*

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WIKIPEDIA (v.inglesa)

- *"During the daytime of 25 April 1986, reactor 4 was scheduled to be shut down for maintenance as it was near the end of its first fuel cycle. An experiment was proposed to test a safety emergency core cooling feature during the shut down procedure.*
- *A very large amount of cooling water is needed to maintain a safe temperature in the reactor core. The reactor consisted of about 1,600 individual fuel channels and each operational channel required a flow of 28 tons of water per hour. There was concern that in case of an external power failure the Chernobyl power station would overload, leading to an automated safety shut down in which case there would be no external power to run the plant's cooling water pumps.* ***Chernobyl's reactors had three backup diesel generators. The generator required 15 seconds to start up but took 60–75 seconds to attain full speed and reach its capacity of 5.5 MW required to run one main cooling water pump."***

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PRUEBA NUCLEAR NUNCA REALIZADA

- El *Chief Design Engineer requería la refrigeración del reactor aprovechando el frenado de la turbina en caso de LOOP.*
- *TECHNICAL SAFETY REPORT (FSAR)*
- **“IN A DESIGN BASIS ACCIDENT, INVOLVING A TOTAL LOSS OF POWER FOR THE FOR THE UNIT´S INTERNAL REQUIREMENTS, COOLING WATER IS FED TO THE DAMAGED PART BY THE FEEDWATER PUMPS POWERED BY TG RUNDOWN”**
- **HOWEVER, CHERNOBYL 4 WAS COMMISSIONED IN DECEMBER 1983, WITHOUT HAVE BEEN TESTED UNDER THESE CONDITIONS. [INSAG-7, PAGE 51].**

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PRUEBA FALLIDA EN INTENTOS PREVIOS

- 1982 CHERNOBYL 3- FALLIDA, AJUSTES EN EL REGULADOR DE TENSIÓN DEL ALTERNADOR
- 1982-1984 TG→1 MCP ON EACH SIDE
- 1985-1986 TG→ 2 MCP ON EACH SIDE

- [INSAG- 7, p.51]

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Chernobyl 4

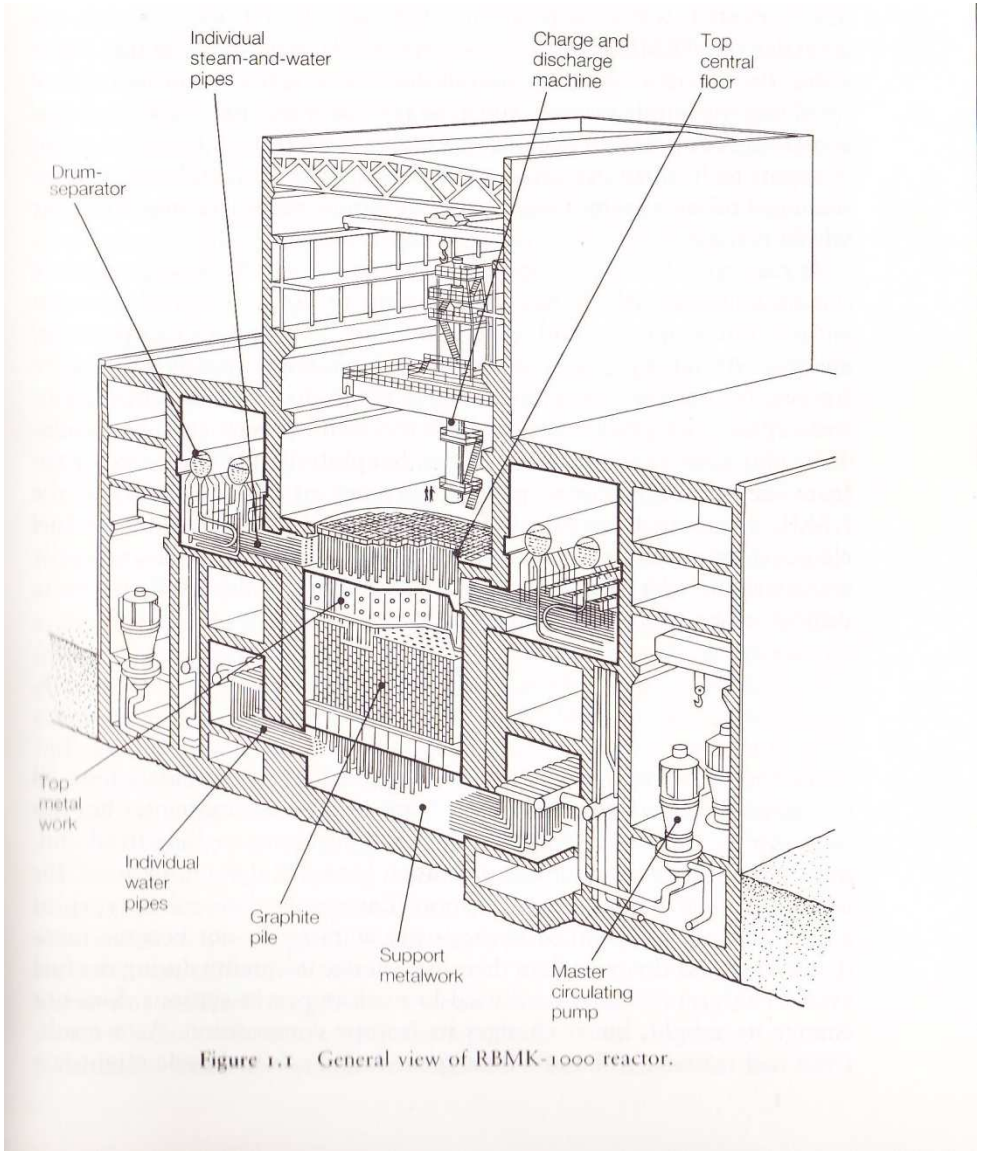

Figure 1.1 General view of RBMK-1000 reactor.

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PRUEBA NO DEBIDAMENTE AUTORIZADA (1)

- No es una prueba meramente eléctrica, afecta a equipo esencial.
- Prueba compleja, que debería haber sido autorizada por: *General Designer, Chief Design Engineer, Scientific Manager and the Regulatory Body* .
- **However, regulations NSR-04-74 and GPS-82, which were in force at the time of the accident, did not require the Plant Managers to obtain approval for such a tests from the aforementioned organizations.**
- **[INSAG- 7, PAGES 51-52]**

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PRUEBA NO DEBIDAMENTE AUTORIZADA (2)

- **“Who authorized the removal of all the protective systems stipulated in the design and in the rules for nuclear safety? No authorization was given. They simply took it upon themselves”.**

- **[Grigori, *“The Truth About Chernobyl”* p.40*]***

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PRUEBA NO DEBIDAMENTE AUTORIZADA (3)

- **“The mere fact that the operators were carrying out an experiment that had not been approved by higher officials indicates that something was wrong with the chain of command. The State Comittee on Safety in the Atomic Power is permanently represented at the Chernobyl station. Yet the engineers and officers were not informed about the program. In part, the tragedy was the product of the administration anarchy or the attempt to keep everything secret.**
- **[Zhores, *“The Legacy of Chernobyl”* p.20]**

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¿Por qué no se había hecho la prueba?

- “If Bryukhanov had not signed the act on 31 December 1983 thousands of workers, engineers and his own superiors in the ministries and committees **would have lost the bonuses, awards and other extras** (which often amount as two o three times a monthly salary).**”**
- [Zhores, p.13]

SOCIEDAD NUCLEAR ESPAÑOLA

¿Por qué no se había hecho la prueba?

- “Since salaries rarely increase in the Soviet Union, the bonuses paid for the fulfilment or overfulfilment of the plan become an increasingly important part of the average industrial income. This is one reason why output figures are often falsified (and why the usefulness of Soviet statistics has declined)”.
- [Zhores, p.13/14]

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Organización socialista soviética

- A) Ministry of Power &Electrification* (centrales eléctricas) (Ukranian Branch)
- B) Ministry of Power Machine Building (TG)
- C) Ministry of Medium Machine Building) (reactor & fuel cycle) (secretive)
- D)The State Committee on Utilization of Atomic Energy (supervision with C))
- E)The State Committe for Safety in Atomic Power Industry (1983), (Chernobyl start-up)
- JULY 1986: MINISTRY OF ATOMIC POWER STATIONS
- [Zhores, pag 22]

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PROCESADOS

- **Victor Bryukhanov**, Director, 10 years prison
- **Nicolai M. Fomin**, Chief Engineer, approved the test program.
- **Anotoly Dyatlov**, Deputy Chief Engineer, experienced and knowledgeable physicist, who was in overall charge of the experiment (not present in the control room but in the toilet). 10 year prison
- **Yuri Laushkin**, Inspector of the Committee for Reactor Safety.
- [Zhores, p.13/39/47]

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Academician Legasov´s posthumous statement (1/2)

- I have in my safe transcript of the operators´ telephone conversation on the eve of the accident. Reading the transcripts makes one´s flesh creep. One operator rings another and asks: “What shall I do? In the programme there are instructions of what to do, and then a lot of things are crossed out”. His interlocutor thought for a while and then replied: “Follow the crossed out instructions”.

SOCIEDAD NUCLEAR ESPAÑOLA

Academician Legasov´s posthumous statement (2/2)

- The level of preparation of serious documents for something like an atomic station: someone has crossed something out, and the operator could decide whether what was correct or not. He could take arbitrary actions. **One cannot lay all the blame on the operator because someone composed the plan... Someone signed it and someone did not approve it**".
- [Zhores, p.24/25]

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Perfil psicológico de los operadores

- “As a whole, the Chernobyl personnel in 1986 were characterized as a fairly typical, mature and stable group of specialists with qualifications regarded in the USSR as satisfactory. **They were not better, but no worse, than the personnel at other nuclear plants.**
- Alexander Akimov, (Sasha), SRO, +
- Leonid Toptunov, (Lenya), RO, +
- Kudryavtsev, operador en prácticas, +
- Proshuriakov, operador en prácticas, +

- [Prognoz Psychological Research Laboratory]
- [INSAG- 7, Page 31] [Medvedev, p.47]

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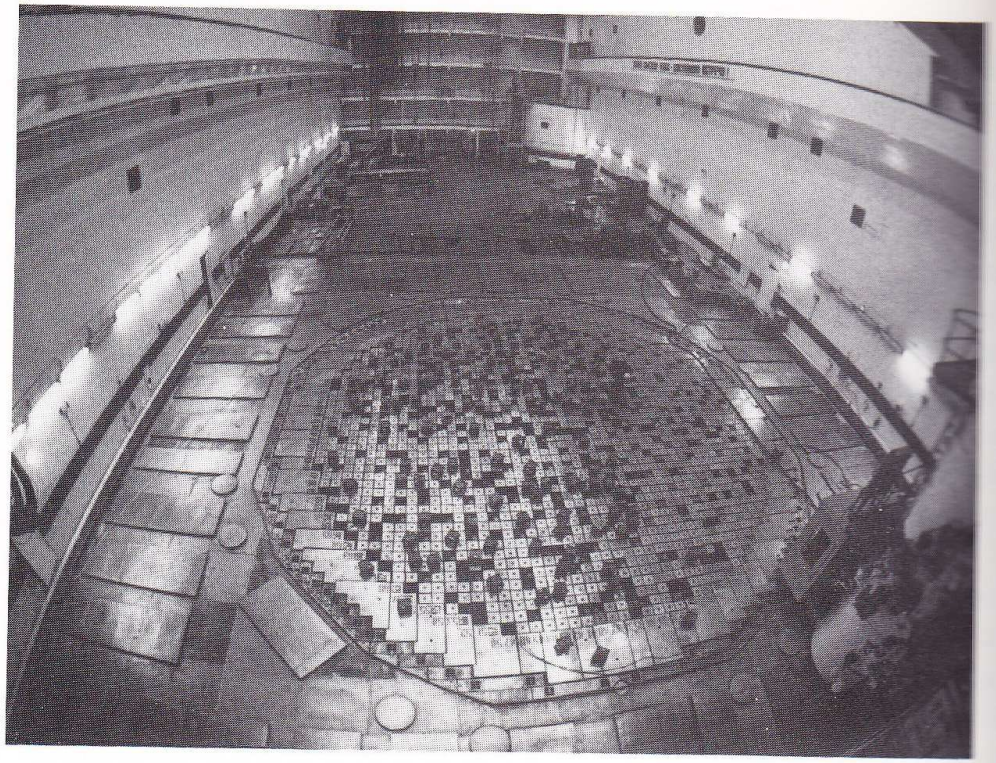
The central hall of Chernobyl 1



3 The central hall of Chernobyl reactor unit No. 1. The top part of the reactor, consisting of 1,700 individual nuclear fuel pressure tubes, has a surface area of more than 100 m².

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Formación de los operadores

- Aprendizaje de memoria.
- Practicaban directamente sobre el panel de control.
- Carecían de simulador de entrenamiento.
- El panel de control no estaba diseñado teniendo en cuenta los factores humanos.

- [Zhores, p. 272/273]

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Testimonio de los operadores supervivientes (1/3)

- **Igor Kazachkov (turno de mañana):**
- **“**I sometimes think now about what we need to prevent it happening again. I´m am not talking about techno-logy...but about people. There should not just highly qua-lified people at the control panels, **but freer people. People who aren´t afraid of the sword constantly hanging over their heads. You know...what does mean to be fired at Pripyat?** ...If Sasha Akimov (SRO) had been free, then he would have been able to take the correct decisions”.
- Zhores [p. 37]

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¿Sabe usted lo que es ser despedido de Pripyat?

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Testimonio de los operadores supervivientes (2/3)

- **A.G. Uskov (turno de mañana):**
- "If you have been in the place of engineers at the controls panel 4 on the night of 26 April 1986, woul you have infriged the regulations to condut that experiment ? If I´m completly honest, then I have to reply that I may have infringed tem. It have been working at the control panels, I might perharps have protested to the chief engineer, ***but I would not have enough spirit to refuse categorically out his command***".

[Zhores [p.38]]

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Testimonio de los operadores supervivientes (3/3)

- **A.G. Uskov (continuación):**
- "Why? Let me try explain...**Firstly, we often don´t the need to observe our laws to letter because these laws are broken all around us before our eyes – and quite often**!...Can it really be that the Government Commission that accepted unit 4 as ready for operation did not know that it was accepting incomplet? Of course they knew"....If you look more deeply, the accident started not at 1.23 on 26 April 1986, but in December 1983, when the director of the AES, Bryukhanov, put his signature on the document of the Government Commission..."
- Zhores [p. 38]

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Lord Acton

- El poder corrompe y el poder absoluto corrompe absolutamente.

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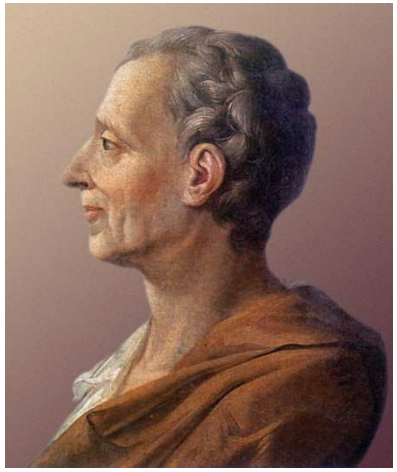
Separación de Poderes

- **MONTESQUIEU**



- *“Es una experiencia eterna que todo hombre que tiene poder siente la inclinación de él, yendo hasta donde encuentra límites. ¡Quién lo diría! La misma virtud necesita límites.* ***Para que no se pueda abusar del poder es preciso que, por la disposición de las cosas, el poder frene al poder”.***

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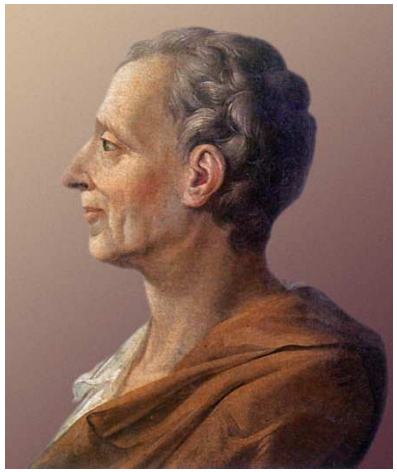
Separación de Poderes

- **MONTESQUIEU**



- *TEORÍA DE LOS ENGRANAJES*
- *PESAS Y CONTRAPESAS:*
- *EQUILIBRIO DE PODERES*

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La República romana

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Chernobyl: fracaso del socialismo soviético (1)

- **“The system of legal, economic and socio-political correlations that existed prior to the accident and still exists in the field of nuclear power has no legal basis, and did not and does not meet the requirements of ensuring the safe utilization of nuclear power in the USSR.**
- **[INSAG-7, I-5.3]**

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Chernobyl: fracaso del socialismo soviético (2)

- "**An abscess, long hidden within our society, had just burst: the abscess of complacency and self-flattery, of corruption and protectio-nism, of narrow- mindedness and self-serving privilege. Now, as it rotted, the corpse of a bygone age – the age of the lies and spiritual decay – filled the air the stench of radiation".**
- ***["The Truth About Chernobyl", p.161]***

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JJ.NN. en Chernobyl

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Héroes del pueblo

- Leonid Telyatnikov (1954-2004)

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Héroes del pueblo

Bomberos	**Operarios**	
Vaschuk	Akimov	Perchuk
Ignatenko	Toptunov	Vershinin
Pravik	Perevozchenko	Kurgus
Kibenok	Brazhnik	Novik
Titenok	Proskuryakov	Metlenko
Tishchura, etc.	Kudryavstsev	Sitnikov, etc.

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Mitino Cemetery, Moscow

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ENSEÑANZAS PARA ESPAÑOLES

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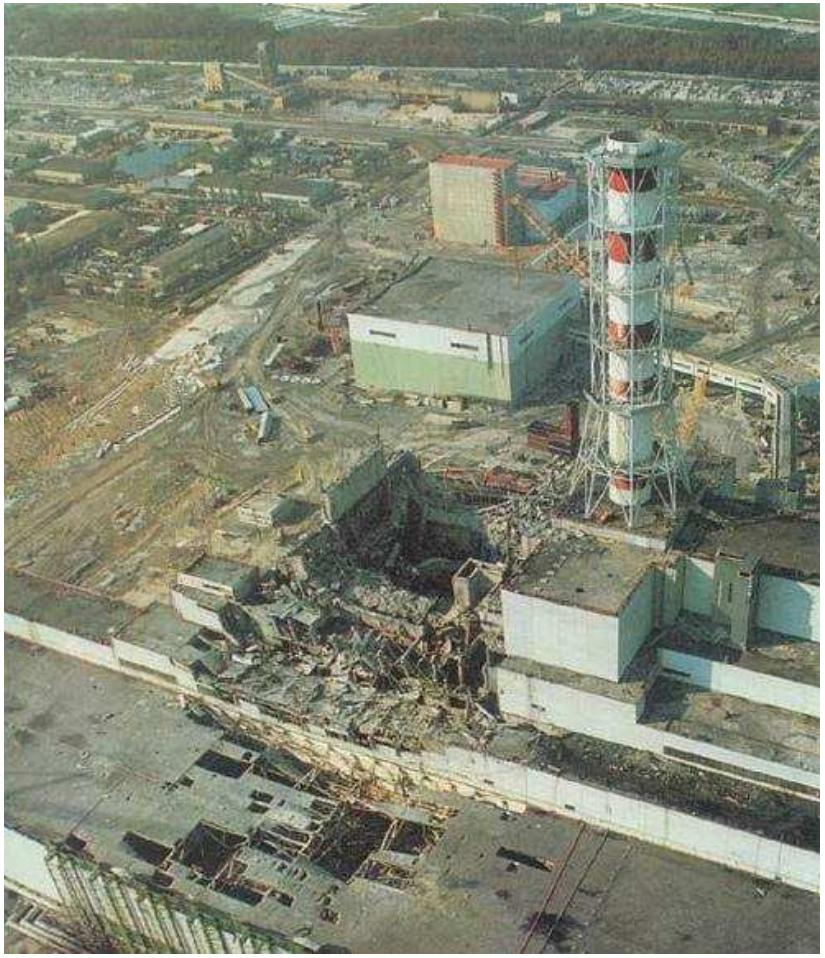
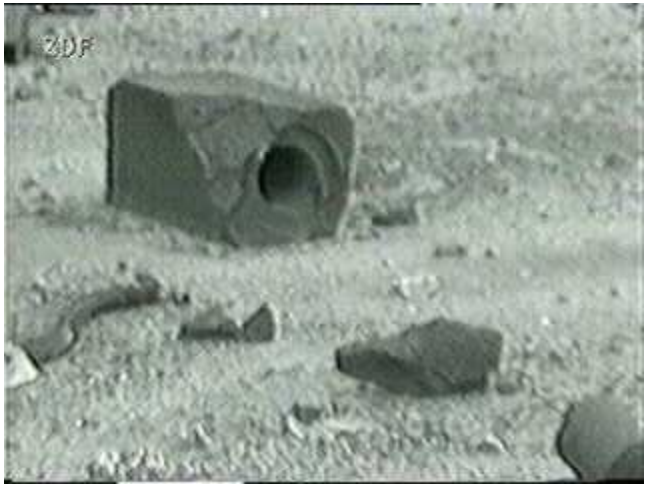
El reactor está intacto y lo estamos refrigerando





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Three Mile Island

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Accidente de TMI-2

- Fallo del operador.
- Fusión del núcleo.
- **SIN CONSECUENCIAS EN EL EXTERIOR, efectos confinados dentro de la contención.**

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Statement of the Reactor Operator

- **E.R. FREDERICK,** the American operator who made erroneous decisions on the night of 29 April 1979, but was not prosecuted for them, writes: “How I have wished to go back and change those two decisions. But the event cannot be undone - and it must not happen again. *An operator must never be placed in a situation which an engineer has not previously analysed. An engineer must never analyse a situation without observing an operator´s reaction on it”.*
- **[INSAG- 7,** p.86**]**

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ENRON (Kenneth Lay & Jeffrey Skilling)
Bernard Madoff

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Statement of the USA Nuclear Industry

- Experts in the USA understood that: "*some transients can be avoided completly through good design. If a transient can be imagined, a contingency can be designed to cope with it*"

- [INSAG- 7, p.86]

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NUREG-0737

Clarification of TMI Action Plan Requirements

Manuscript Completed: November 1980
Date Published: November 1980

Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ACCIONES CORRECTIVAS

- SUBCOOLING METER
- SPDS (SAMO)
- RCS VENTS
- PASS
- INSTRUMENTACIÓN POST ACCIDENTE
- EMERGENCY PREPAREDNESS
- ERG´s (POE´s)
- STA

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INDUSTRIA NUCLEAR
TRAS TMI-2

- **WOG**
- INPO
- WANO
- NEI

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ENFOQUES DISTINTOS

- **URSS: AUTOSUFICIENCIA**

- **OCCIDENTE: INTERDEPENDENCIA**

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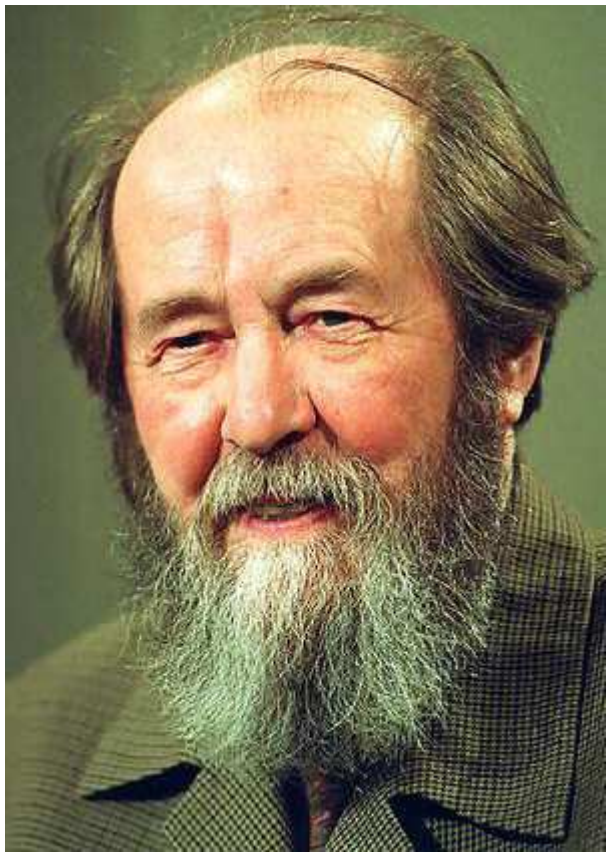
Conócete a ti mismo



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CULTURA DE SEGURIDAD

- **LICENCIAMIENTO**

- **SEGURIDAD**

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