Attachment 2

Cogema Handout

COGEMA

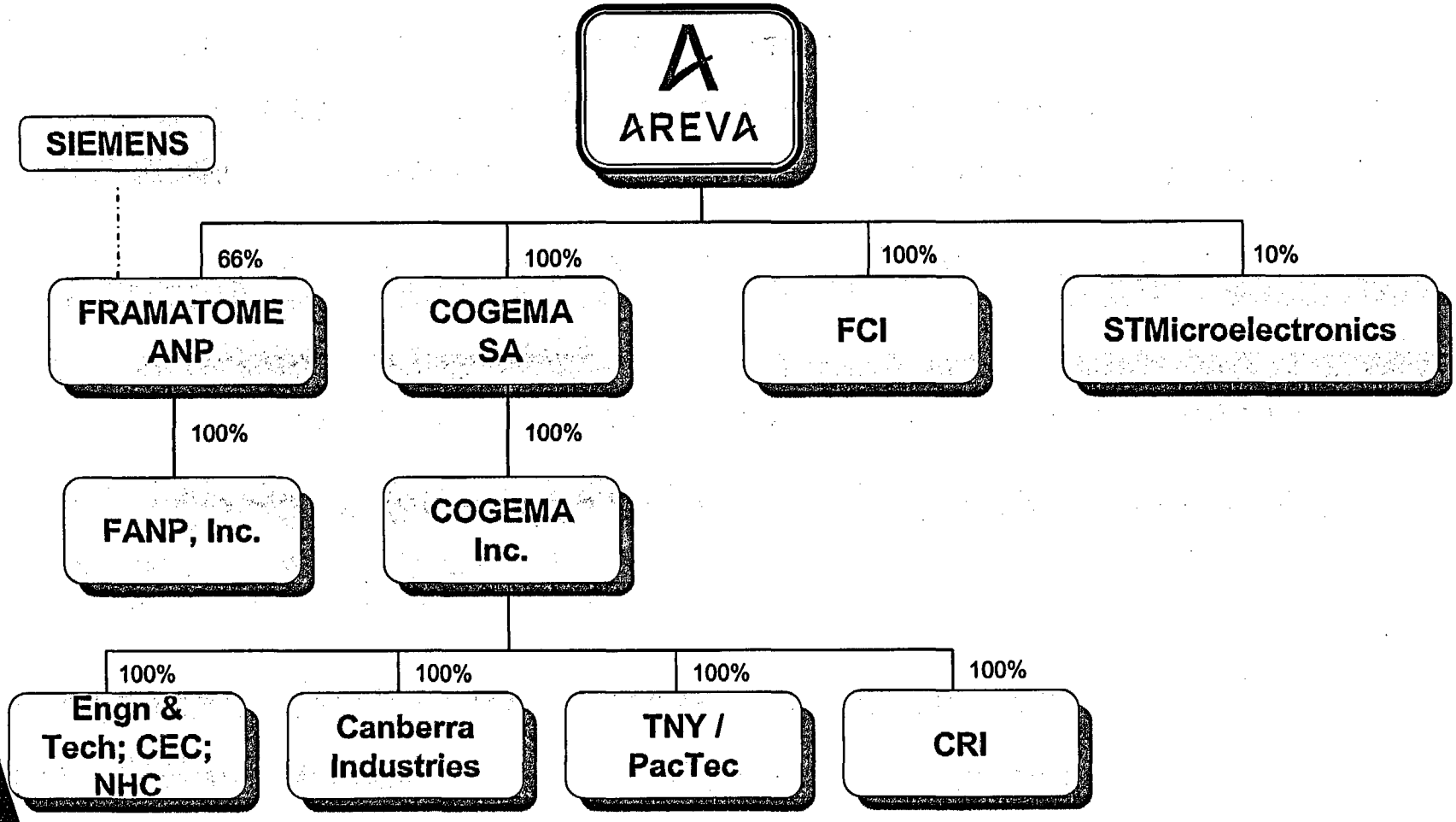
La Hague Experience with Unloading and Handling of Spent Nuclear Fuel

Presentation to NRC
September 3, 2003

Frederic Bailly
Manager, Spent Fuel Management Strategy
COGEMA, Inc.

COGEMA

AREVA Organization



COGEMA

AREVA

- Founded in 2001
- 50,000 employees; $9B in sales
- The AREVA group unites
  - COGEMA, the world's largest nuclear fuel cycle company, and
  - FRAMATOME ANP, the leading nuclear reactor constructor, and their subsidiaries
- AREVA is active in every aspect of nuclear power
  - mining, chemistry, enrichment, fuel, services, engineering, nuclear propulsion and reactors, reprocessing and recycling, nuclear cleanup and decommissioning

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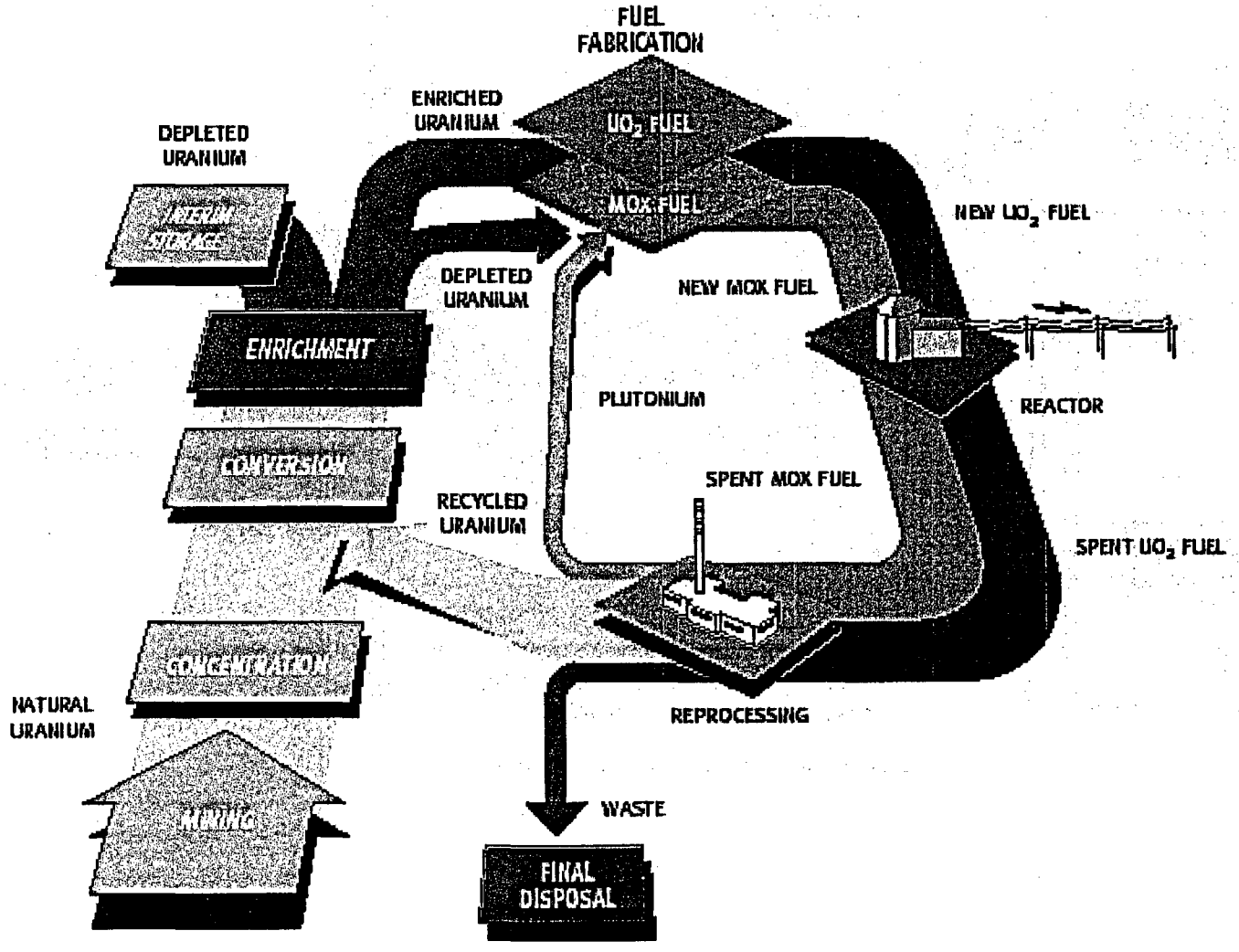
AREVA : the Nuclear Fuel Cycle company



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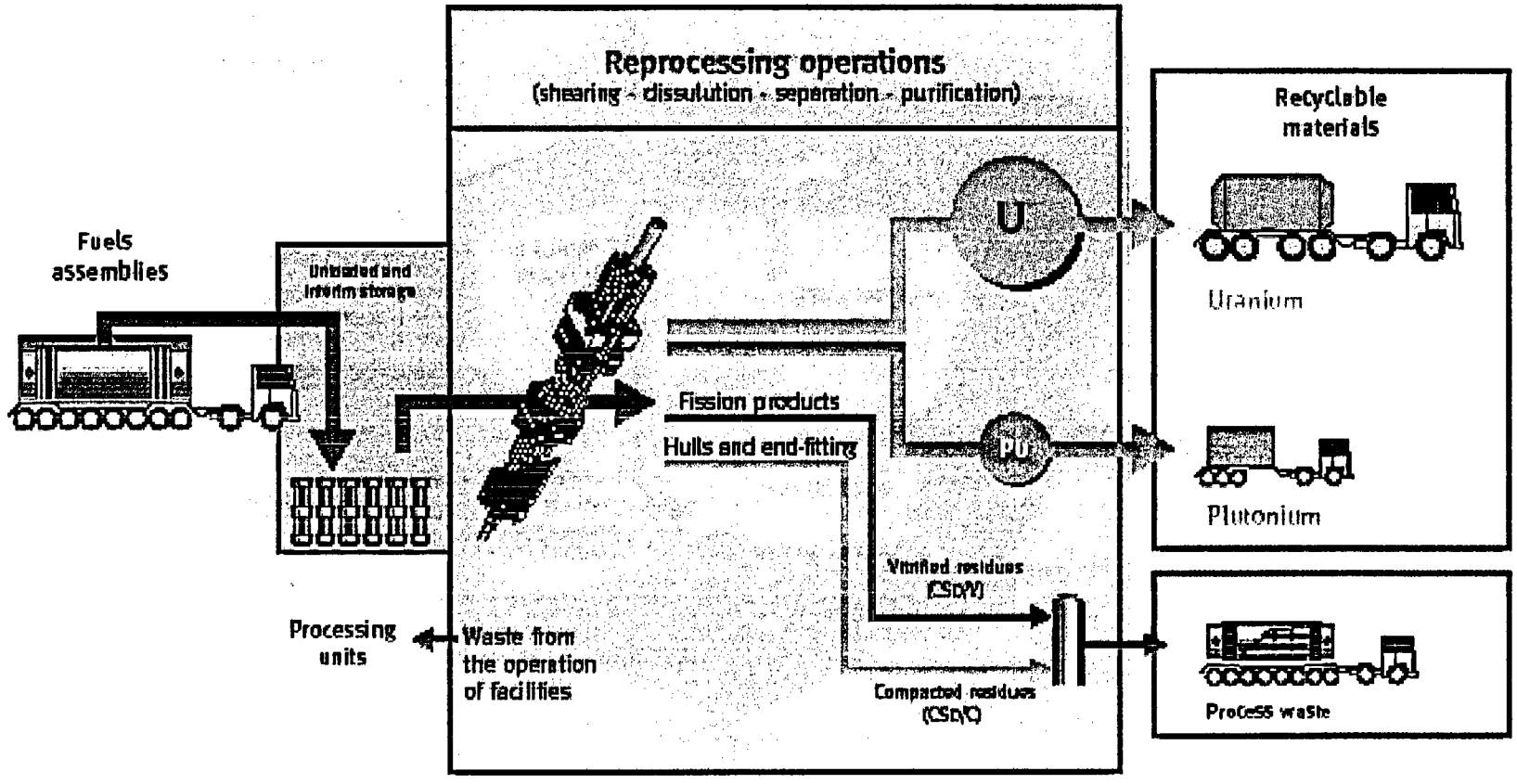
Reprocessing at La Hague



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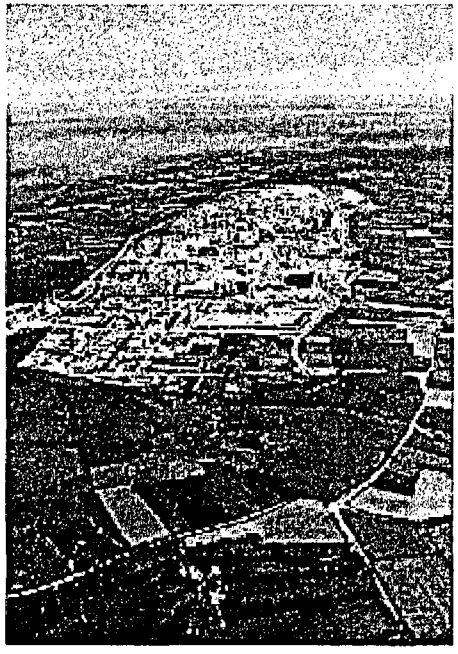
Introduction to La Hague (1)



- Spent Nuclear Fuel Reprocessing Complex
- Two large plants (UP3 & UP2-800)
- 1700 metric ton of SNF processed / year
- 750 acres. ~ 30 nuclear waste handling facilities. First commissioning in 1966
- Wet and Dry unloading and storage of a wide range of Spent Nuclear Fuel (SNF) and High Level Waste (HLW)
- Customers : 28 utilities in seven countries (France, Japan, Germany, The Netherlands, Switzerland, Belgium, Australia)

- By the end of year 2002 successfully unloaded :
  - 6,072 SNF casks
  - 70,824 Fuel Assemblies
  - 23,865 Tons U

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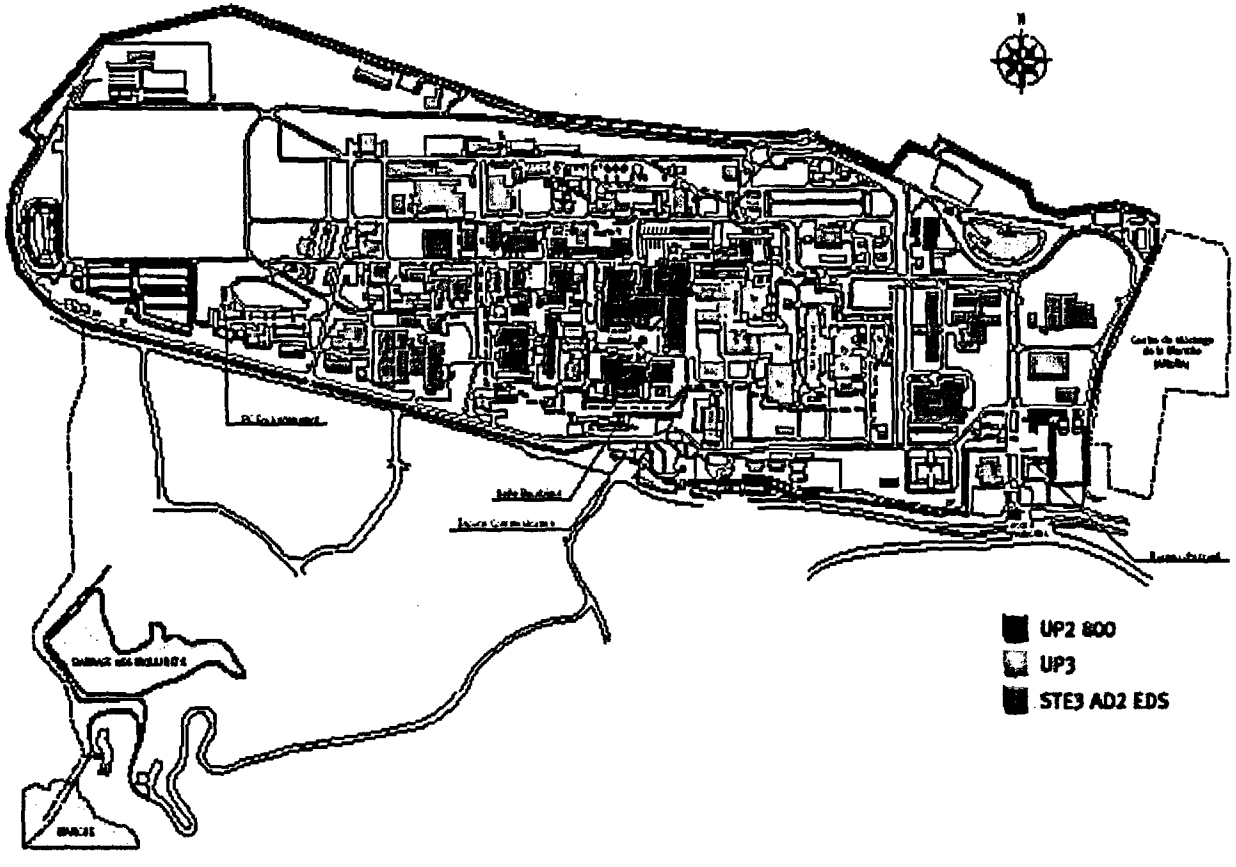
Introduction to La Hague (2)



- *5,600 workers including 3,200 COGEMA personnel*
- *50 to 70 external audits (including EURATOM and unexpected customers audits)*

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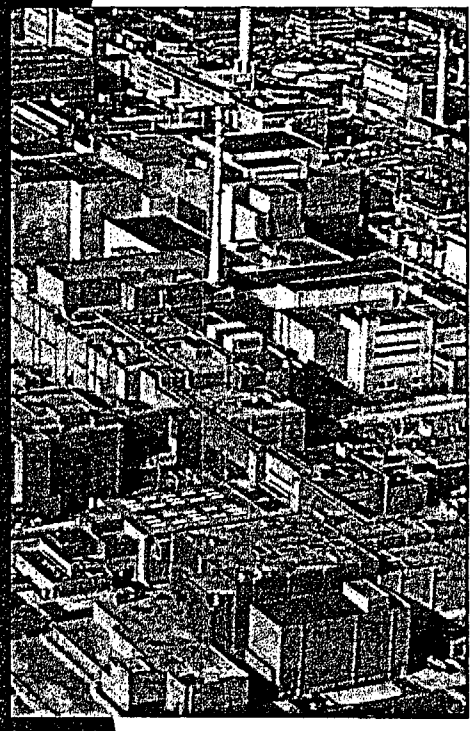
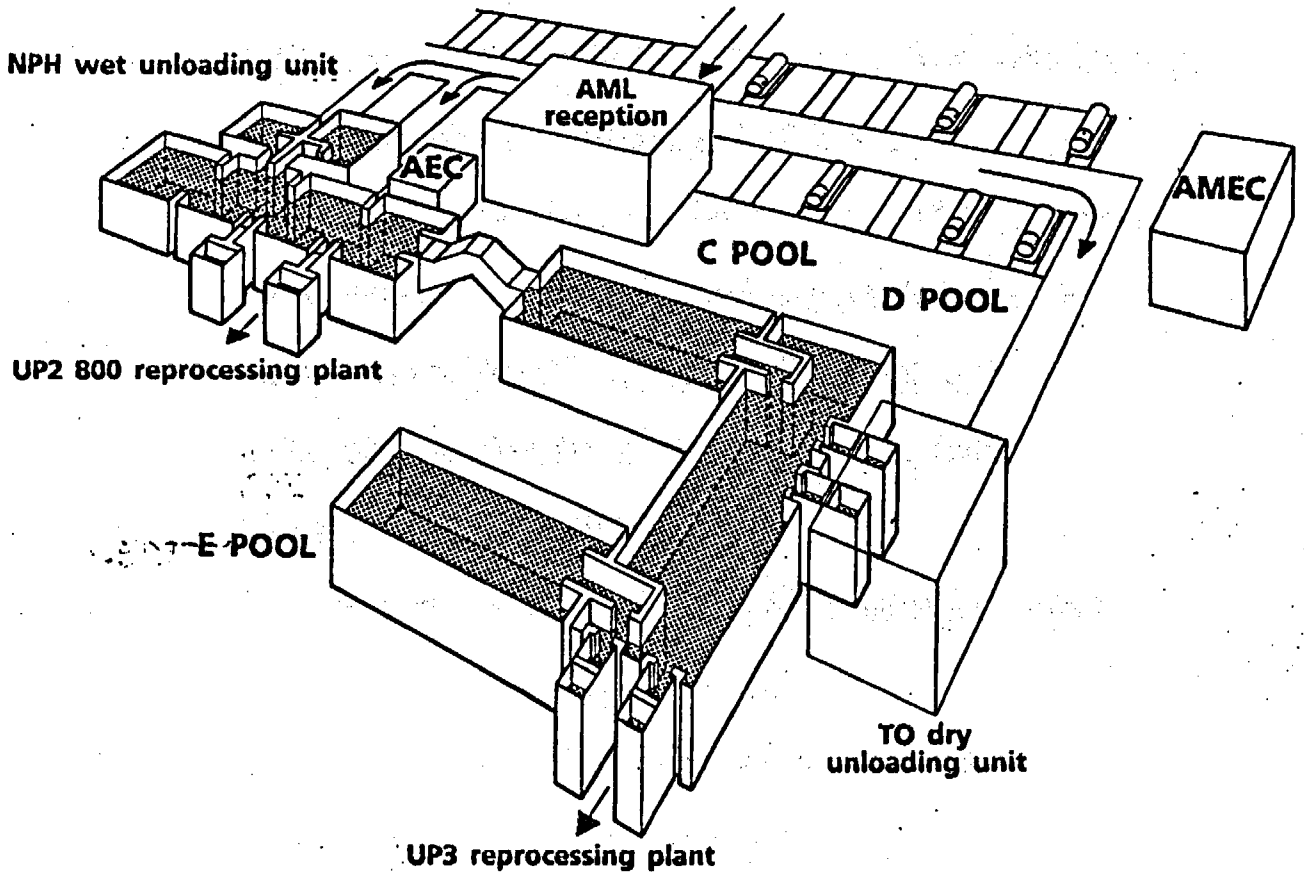
La Hague front end facilities overview





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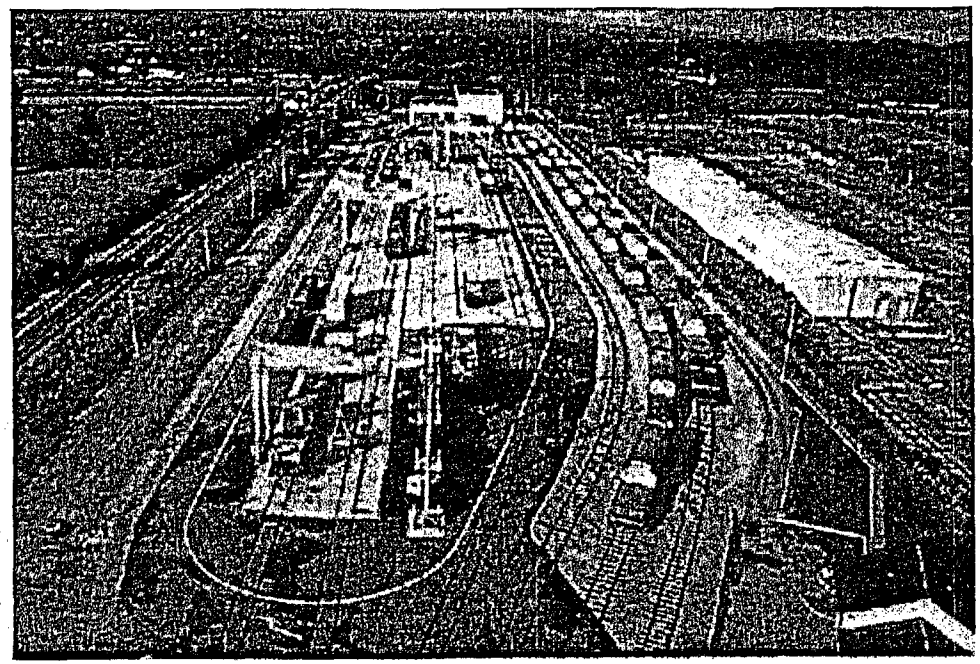
La Hague facilities to be discussed

Valognes Station	Intermodal Transfer facility
AML	Casks receipt and transfer on lorries
T0	Casks dry unloading facility
NPH / AEC	Casks wet unloading facility + Maintenance
AMEC	Casks maintenance facility
R1 / T1	SNF shearing and dissolution hot cells
R7 / T7	High Level Waste vitrification facilities
EVSE	HLW canisters interim dry storage facility
DRV	HLW cask loading for return to waste owners
ACC	HL solid waste conditioning facility
ECC	High Level Solid waste canisters storage facility
STE3	LL Liquid effluent treatment facility
AD2	LL Solid Waste treatment facility

Valognes Station : Intermodal Transfer facility



- SNF and HLW casks
- Casks transported by train (or boat + train)
- Casks checking
- Unload/Load railcars
- Transfer to special Road Trailer -> road transport to La Hague site
- Maintain Railcars

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AML : Casks receipt & transfer building (1)

- Casks transferred from road transporter to rail guided Lorries
- Lorries used for on site transfer between buildings at La Hague
- Casks remain horizontal with impact limiters in place (safety)
- Lorries also used for casks staging (85 storage locations for 82 lorries)
- Additional staging available on fixed supports (40 locations)
- Typical staging time before unloading : between 1 day and 3 weeks

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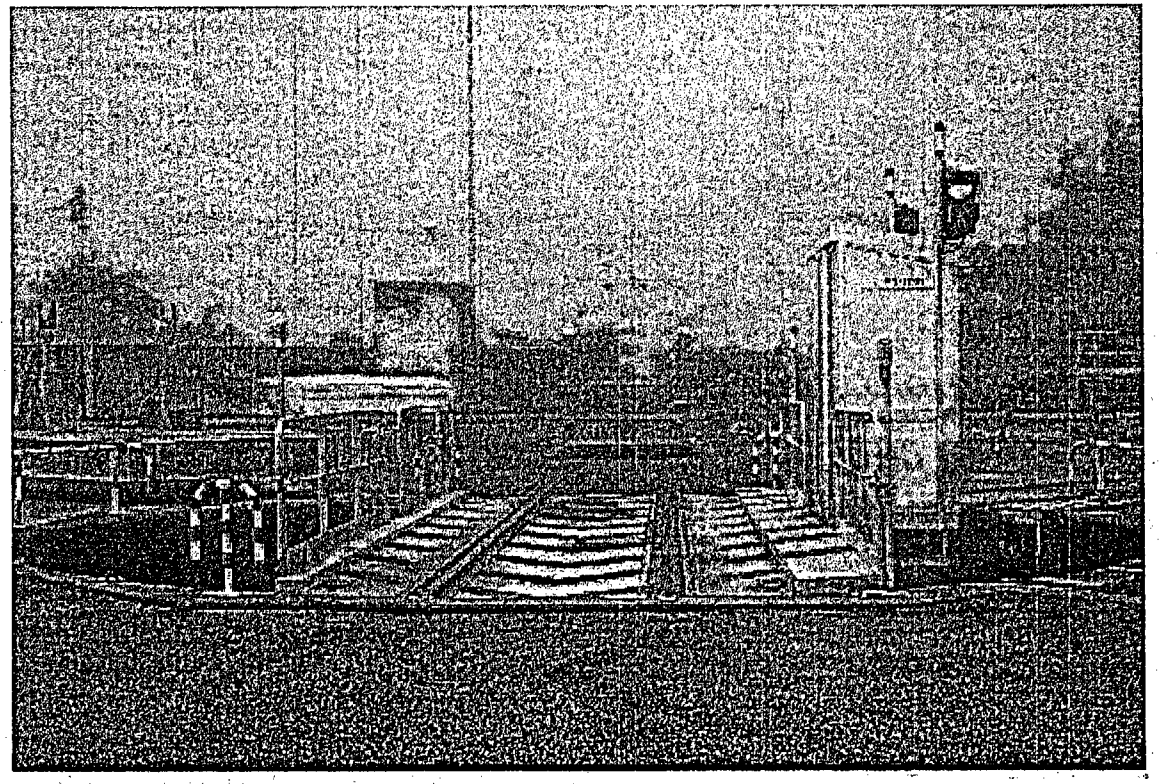
AML : Casks receipt & transfer building (2)



- *Direction changes by means of turntables*
- *Saves space (turning radius)*

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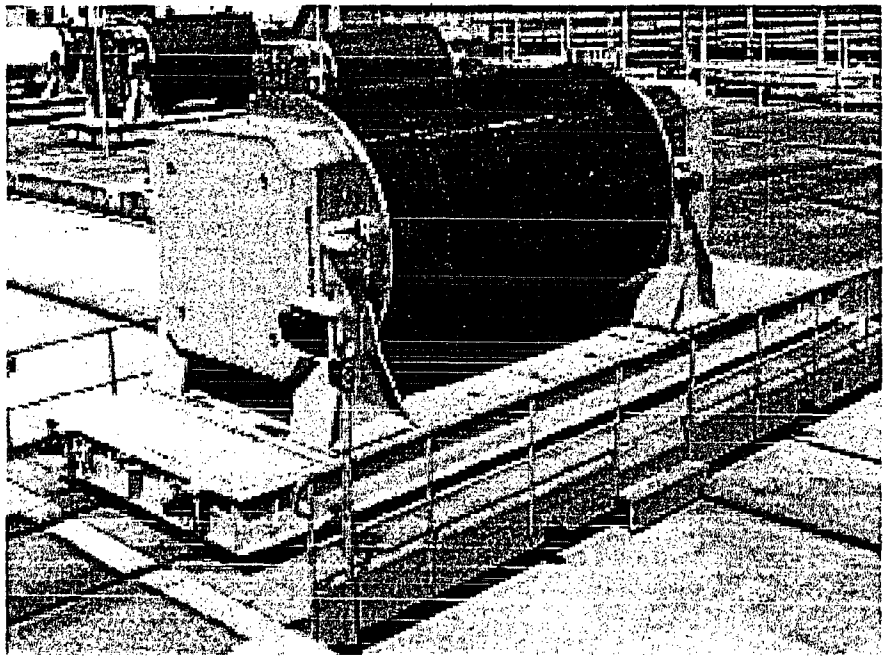
AML : Casks receipt & transfer building (2)



- AML facility was commissioned in 1981
- 22 years of successful operation
- Actual throughput is 950 casks handling operations per year (about 350 full casks and 600 empty casks)

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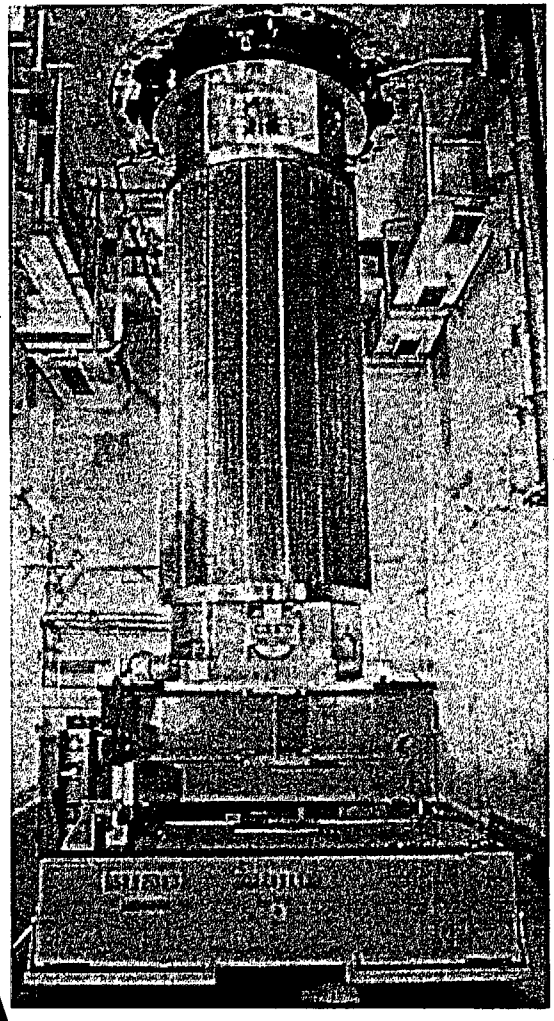
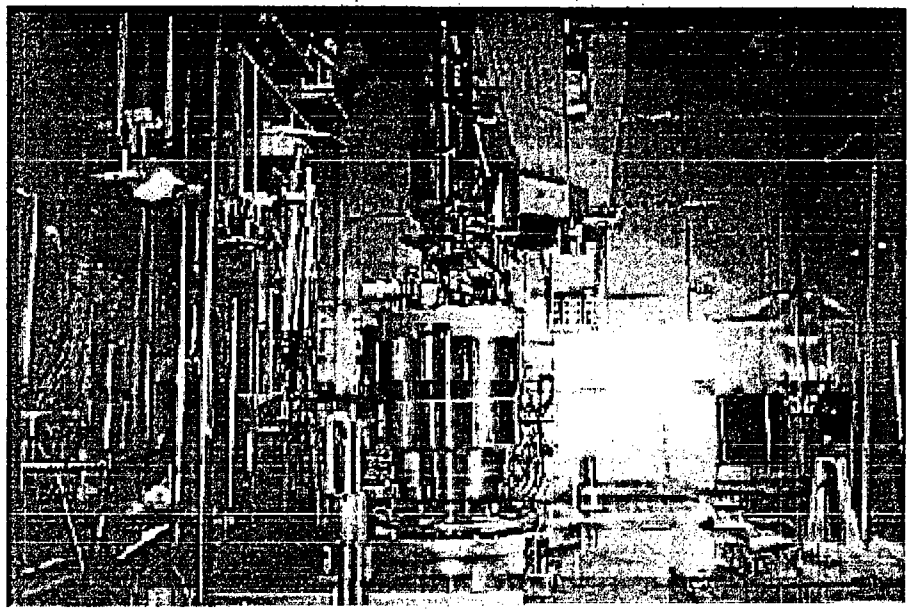
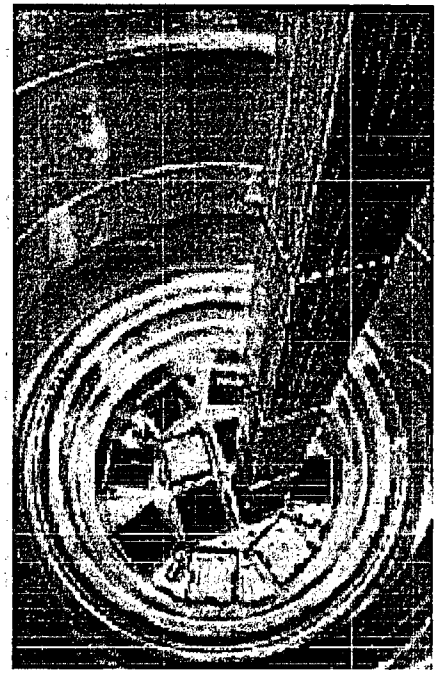
T0 : Dry unloading facility (1)



- Cask receipt on its Lorry from AML staging area
- Remove impact limiters
- Cask tilting
- Low height lift and transfer on a rail guided « cart »
- The cart transfers the cask to different working stations (preparation, docking & transfer, closure ...) through a central turntable
- Seismic design

T0 : Dry unloading facility (2)





- *Fuel retrieval and transfer in a hot cell (14,7m L x 6,75m W x 10,5m H)*
- *Commissioned in 1986 ; 17 years of successful operations*
- *Throughput capacity is : 800 to 1250 metric tons of Uranium per year*
- *Rate of unloading is currently : 230 to 240 casks per year (one cask per working day)*

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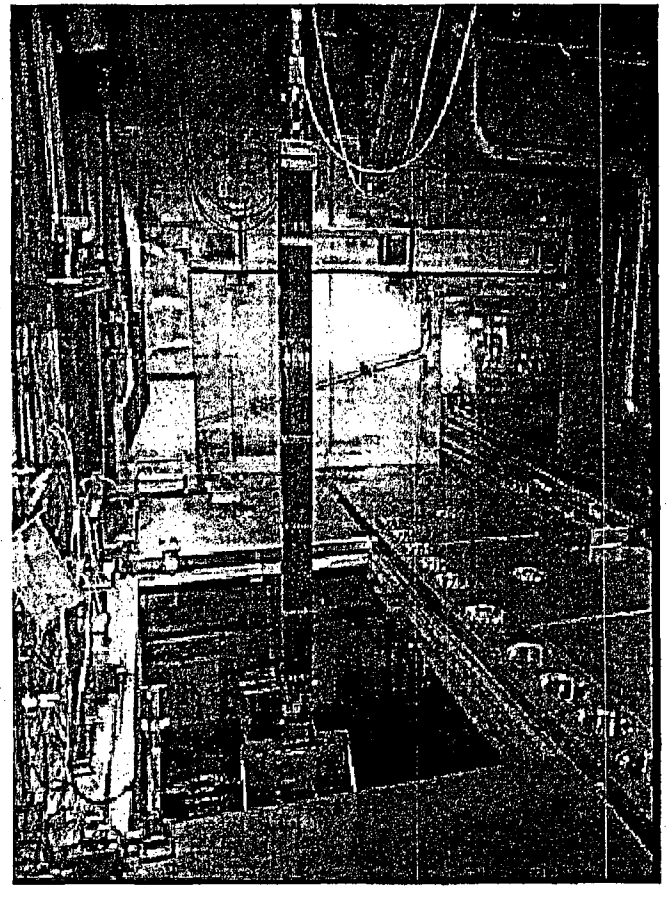
T0 : Dry unloading facility (3)

- *Statistics as of Dec 2002*
  - ***2,770 casks unloaded to date***
  - ***26,630 PWR Fuel Assemblies unloaded***
  - ***11,271 BWR Fuel Assemblies unloaded***
  - ***15,074 MTU Fuel Assemblies unloaded***
  - ***Average time to unload = 60 hours***
  - ***Average dose to workers < 0.33 Man-mRem / cask***



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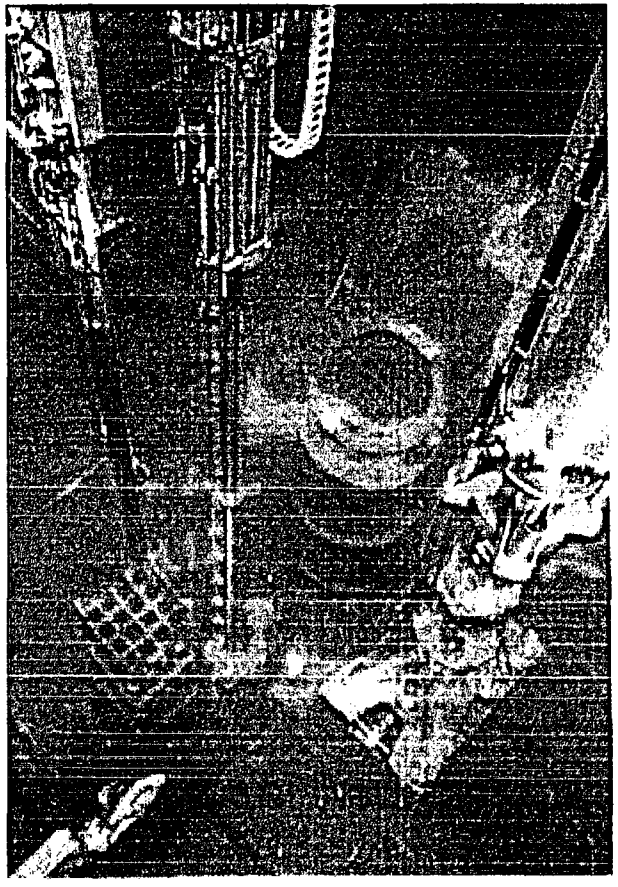
NPH : Wet unloading facility (1)



- Cask receipt on its lorry from AML staging area
- Remove impact limiters
- Cask tilting
- Transfer into preparation cell to sample gas, balance pressure, re-filling, install contamination protection sleeve, prepare lid for removal ...
- Transfer cask to pool for unloading under water
- Transfer back to washing cell for decontamination and prepartion for return to AML

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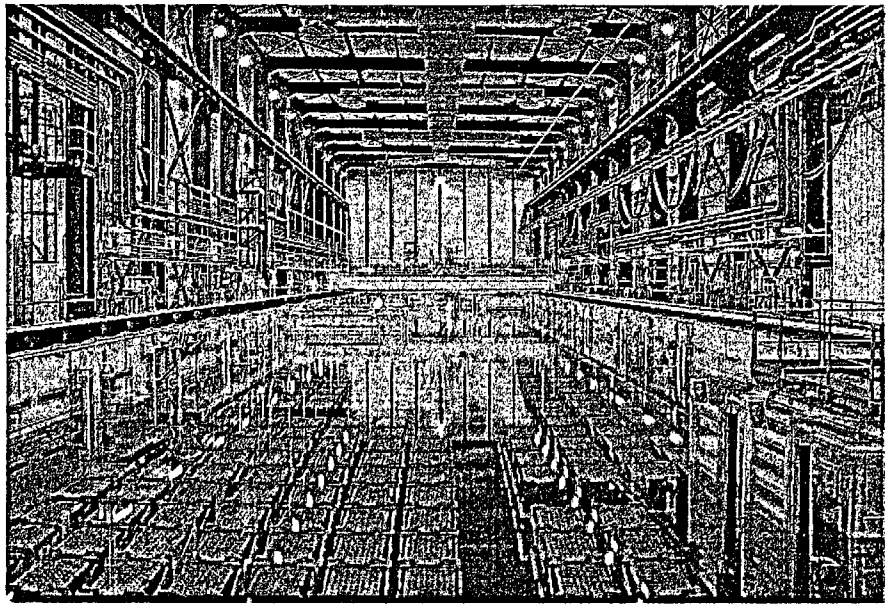
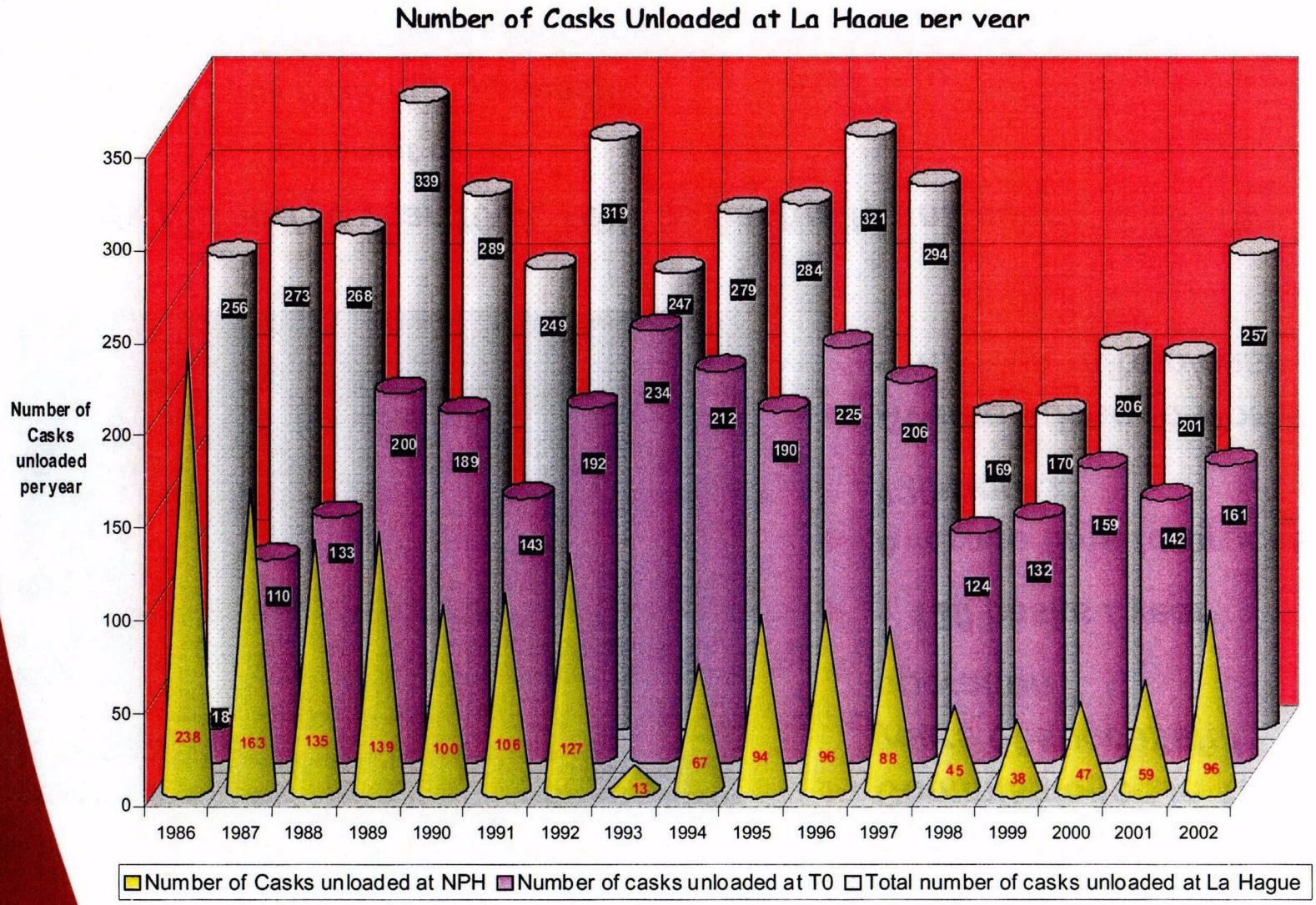
NPH : Wet unloading facility (2)



- Commissioned in 1981, 22 years of successful operation
- ~ 120 casks / year
- Average time to process = 120 hours
- Average dose to workers < 1.5 Man-mRem/cask

- By the end of year 2002, NPH has actually unloaded :
  - 1,651 different casks
  - 12,488 PWR Fuel Assemblies
  - 3,801 BWR Fuel Assemblies
  - 6,152 Metric Tons of Uranium in Fuel Assemblies

T0 & NPH : 17 years of Statistics (1)



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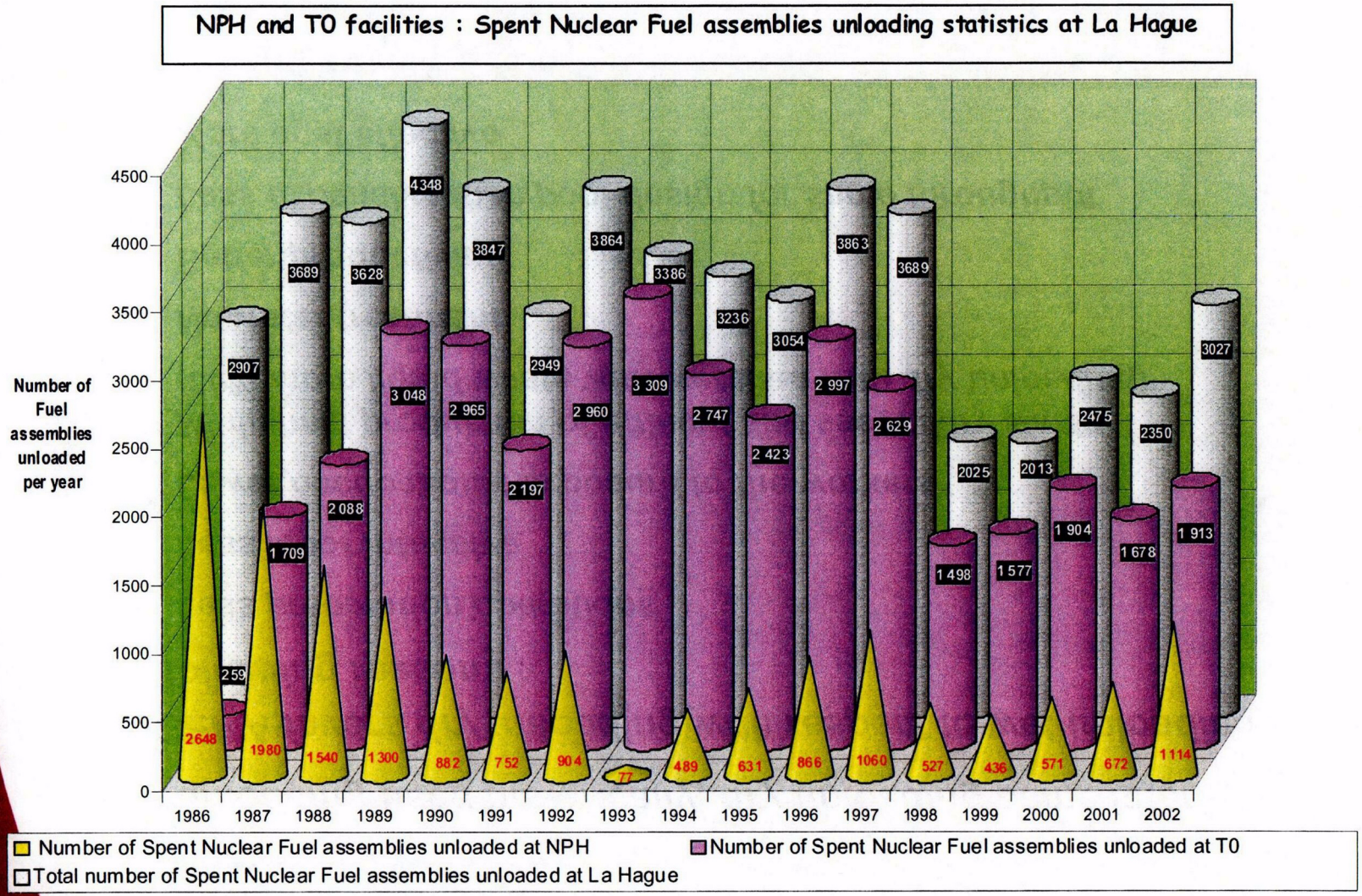
T0 & NPH : 17 years of Statistics (2)



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C02

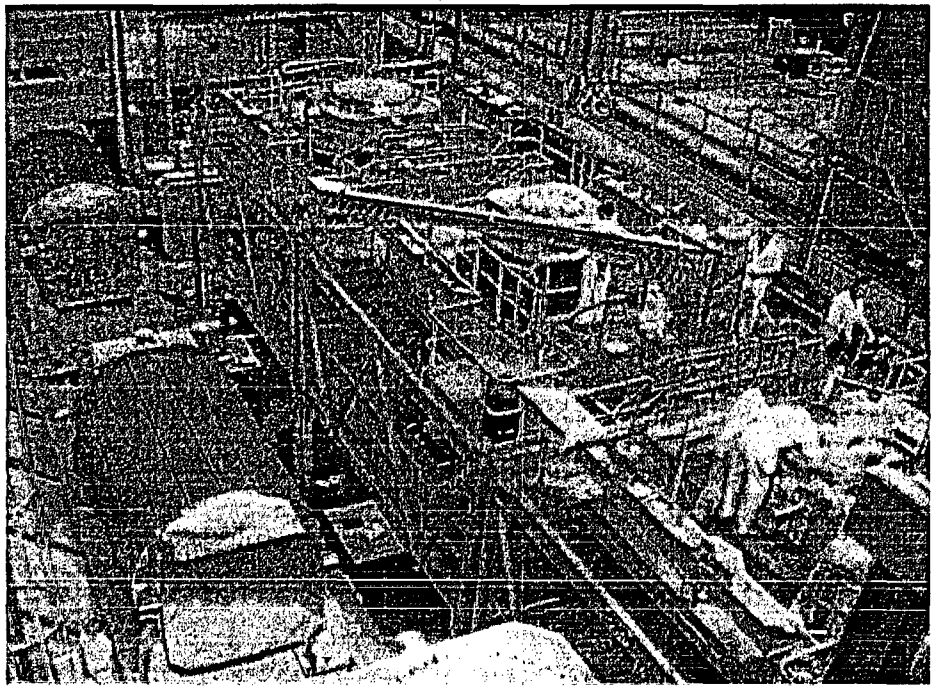
Wet versus Dry ?

- *Wet unloading used historically, dry unloading came later*
- *COGEMA favors dry unloading with respect to wet unloading for the following reasons :*
  - *Less preparation operations*
  - *Less labor intensive*
  - *Lower occupational exposure to the workers*
  - *Minimimal production of effluent and secondary waste (60% more liquid waste with wet than with dry unloading)*
  - *No water treatment*
  - *Better productivity*
  - *Less expensive than pool design for same throughput*
  - *More cost effective*

Wet versus Dry ?

- *Wet unloading still in use at La Hague*
  - *Allows unloading of any type of casks with flexibility including*
    - *Including MTR fuel and*
    - *« Exotic » casks not cost effective to unload dry*
  - *Devoted at specific operations (ex: BWR fuel assemblies sleeve removal before transfer to shearing & dissolution)*
  - *T0 dry unloading can be considered as the large throughput production facility and NPH as the specific case unloading facility*

AMEC : Casks maintenance facility

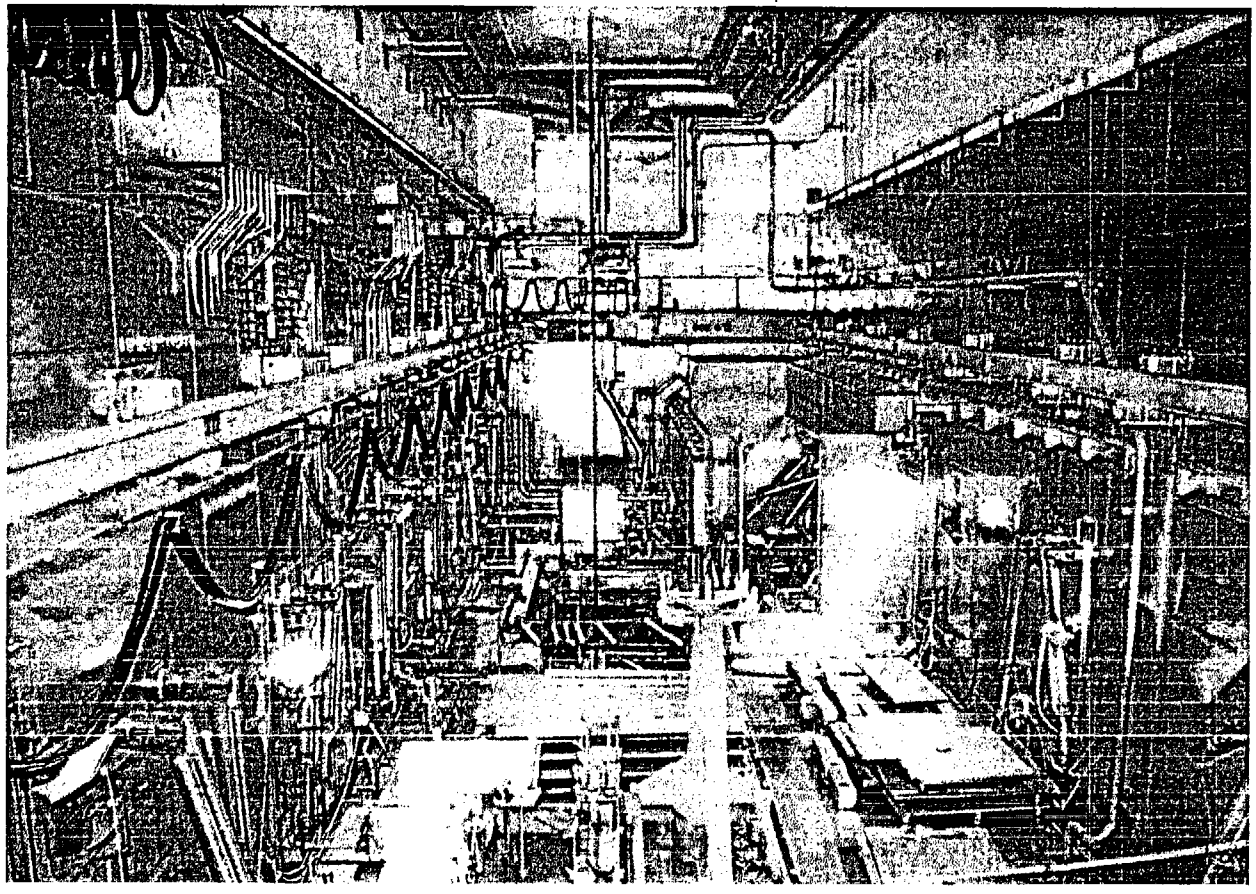


- *Re-certification of casks*
- *Internal maintenance : shielding consistency ; mechanical maintenance of baskets ; seals exchange ....*
- *External maintenance : trunions strength tests ; bolts and threadings inspection ; coooling fins inspection ....*
- *Repairs and modifications : shielding increase ; seal bearing surface repair ...*
- *Contingency intervention in case of upset in the unloading facilities*

AMEC : Casks maintenance facility

- *AMEC statistics*
  - *Start-up in 1983*
  - *20 years of successful operation*
  - *~ 20 different types of casks maintained*
  - *~ 60 casks processed per year with 185 maintenance operations performed*
  - *Average dose to the workers < 4.56 Man-mRem / operation*

R1 / T1 : Shearing and Dissolution facilities



- *Large Hot Cells for remote maintenance of the mechanical shearing and dissolution equipment*

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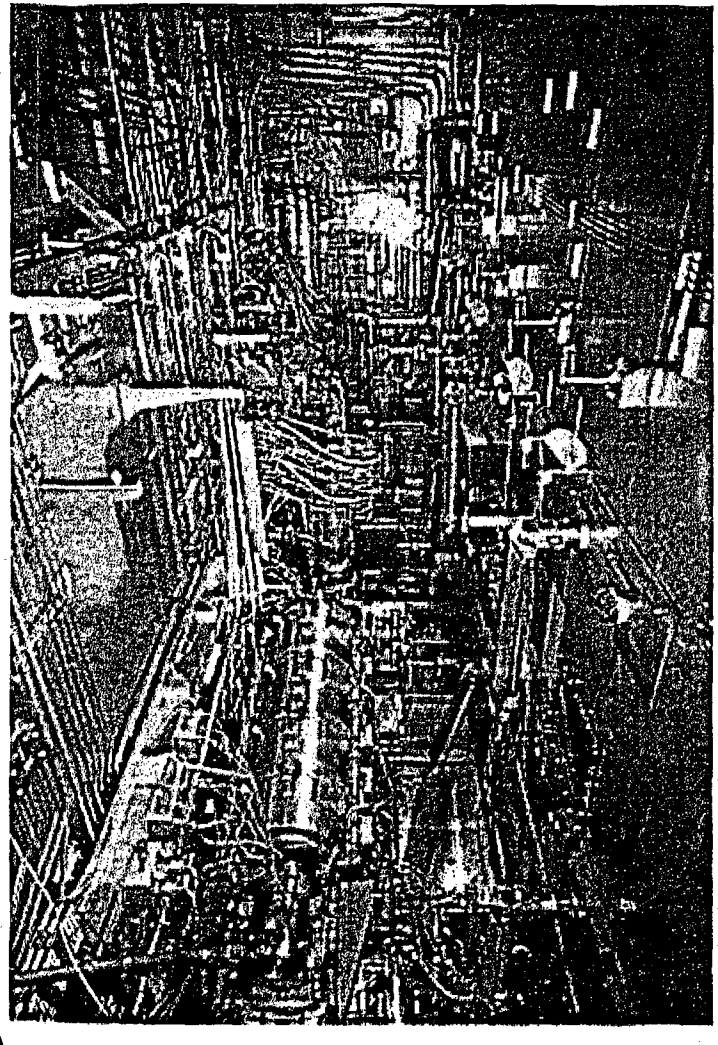
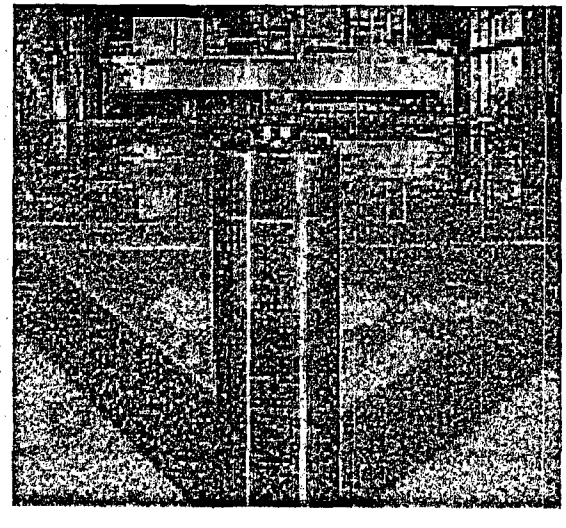
R7/T7 : Vitrification facilities



- *2 plants ; 3 parallel lines per plant ; 6 large Hot Cells per plant*
- *HLW glass canisters handling*
  - *415 mm dia x 1100 mmm heigth*
  - *750,000 Ci gamma (max)*
  - *3800 Ci alpha (max)*
  - *1,400,000 Rad/h at contact*
  - *> 800 canisters handling operations/year .*



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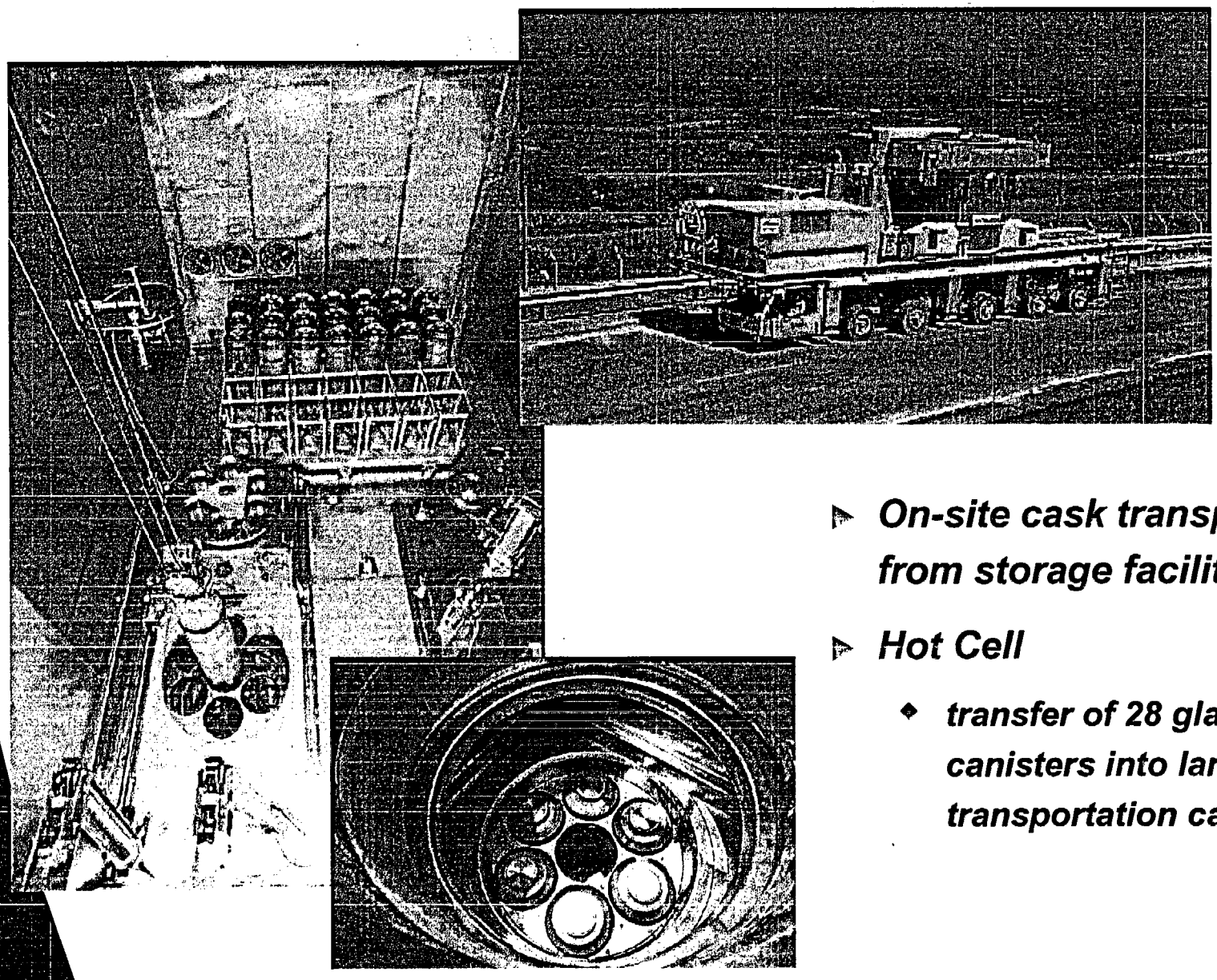
DRV : Glass logs return facility (1)



- *On-site cask transporter from storage facilities*
- *Hot Cell*
  - *transfer of 28 glass canisters into large transportation cask*

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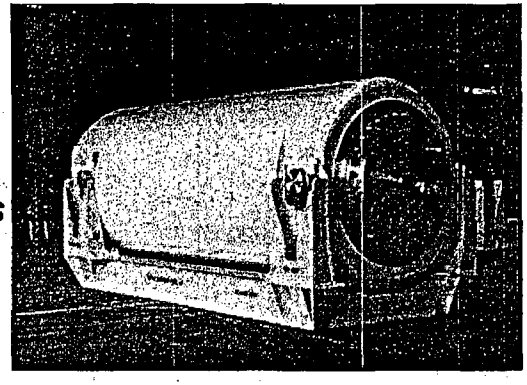
DRV : Glass logs return facility (2)

- *Canisters stored in interim storage vaults transferred into transportation cask for return to waste owners*
- *On site transport of glass logs from 3 interim storage facilties to DRV transfer facility by means of :*
  - *Type B equivalent site shuttle cask (7 canisters, 65 tons)*
  - *Multiwheel transporter (MAFI)*
- *Docking of shuttle cask to the DRV hot cell ; transfer of each canister by crane to a buffer*
- *Inspection of canisters for conformance to customer's authorities specifications*
- *Transfer of 28 canisters into transportation or transportation/storage cask (TN28)*
- *Stastistics*
  - *Active Startup in 1994*
  - *70 Casks loaded to date and shipped back to owners*
  - *1850 Canisters loaded to date*
  - *Average dose to workers per TN28 cask*
    < 2 Man-mRem / cask



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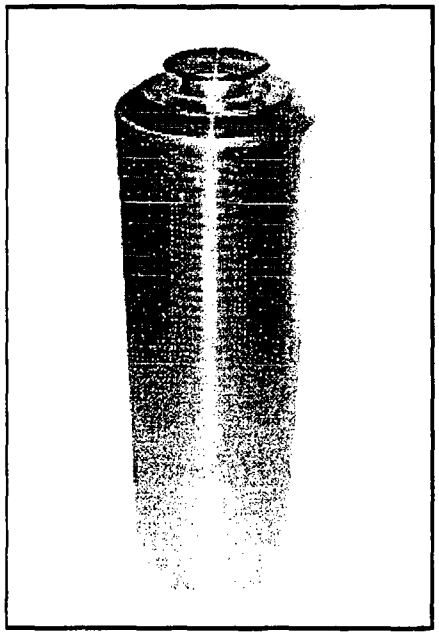
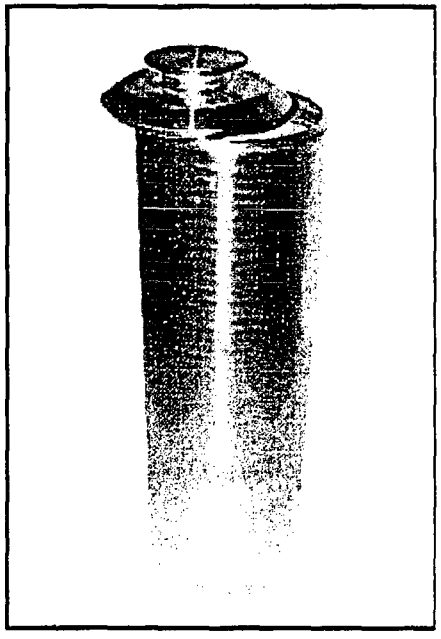
ACC : HIGH LEVEL solid waste processing facility



Glass canister



Hulls, end-fittings, technological waste canister

- *Hulls + end fittings + operations & maintenance High Level Waste*
- *Volume reduction by factor of four (compaction),*
- *Use same geometry as vitrified waste canister 's : the « Universal Canister » concept*

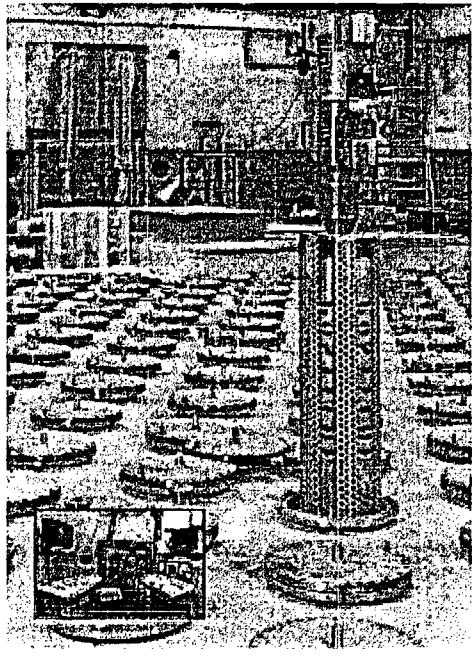
COGEMA

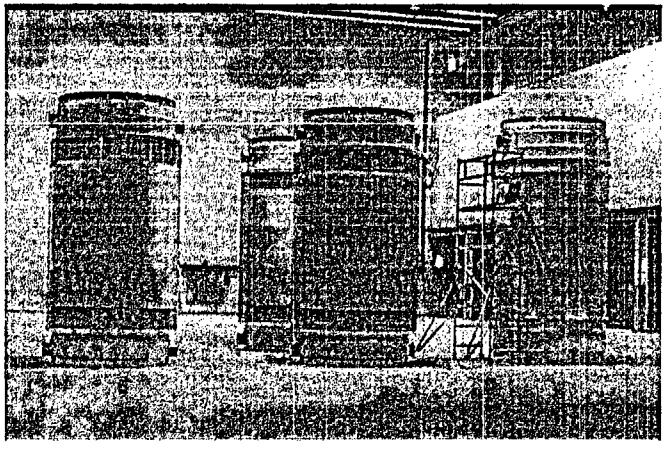
ACC : HIGH LEVEL solid waste processing facility

- *Optimize canister handling from production to storage and final disposal at the customer's*
- *Includes an interim storage facility (ECC) with automatic emplacement transporters*
- *Waste return to owners via the same DRV facility as for glass canisters*
- *ACC is the latest facility Designed, Built & Commissionned at La Hague by COGEMA*
  - *Active startup in 2002*
  - *building : 60 m long, 45 m wide and 30 m high,*
  - *420 rooms*
  - *8 hot cells*
  - *22 high safety mechanical in-cell equipment including 2 super-compactors, 6 safety cranes and a number of automated trolleys and handling systems*

Spent Fuel Drying

- *Feedback from experience in spent fuel and HLW drying*
  - *NUHOMS*
    - *Canisters drying before closure*
  - *CASKs*
    - *Fuel drying before cask closure*
  - *CASCAD*
    - *Dry storage of MTR and Naval fuel drying before canister closure*
  - *CHERNOBYL*
    - *Spent fuel canistering and drying*





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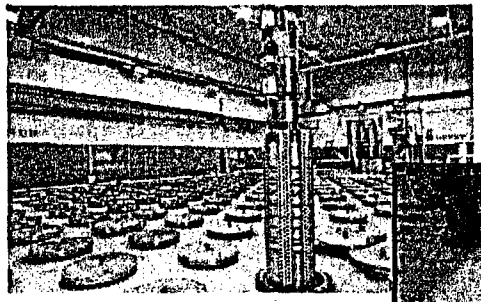
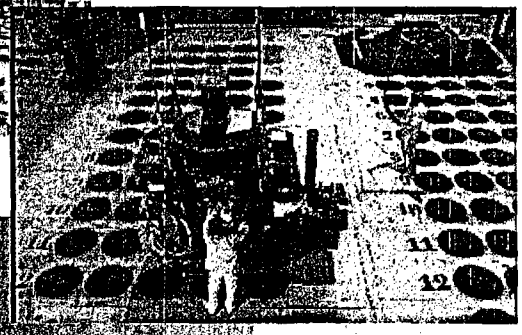
Spent Fuel & HLW Storage

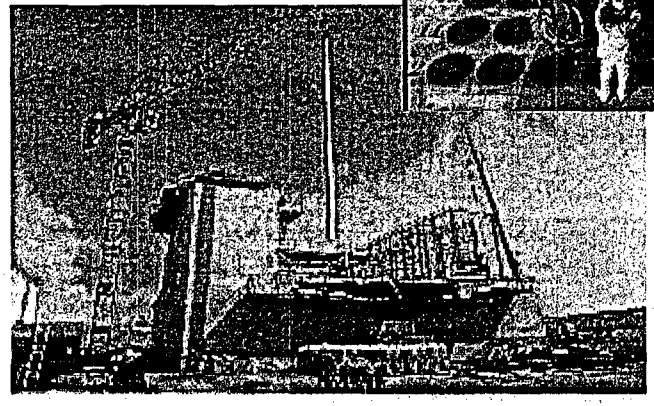
- *Experience in Multiple designs*
  - *vault SNF*
  - *vault HLW glass*
  - *Vault Multipurpose*
  - *NUHOMS Casks*
  - *Metal Casks*
  - *Mostly natural draft cooling*



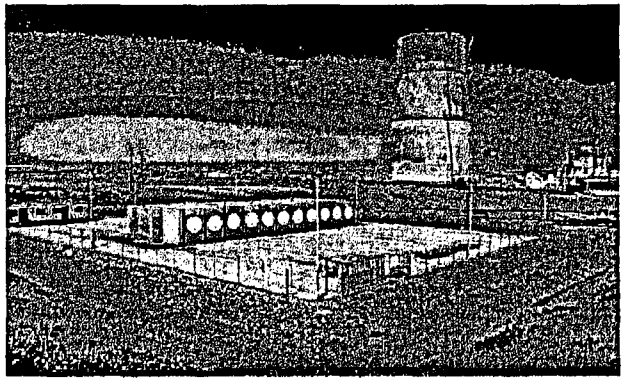
CASCAD (SNF)



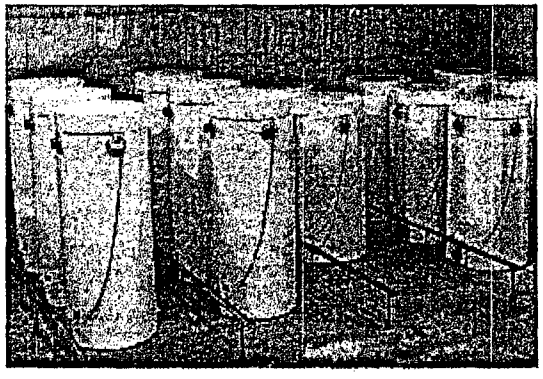
AVM (HLW)



EVSE (HLW)



NUHOMS (SNF)



TN24 (SNF)

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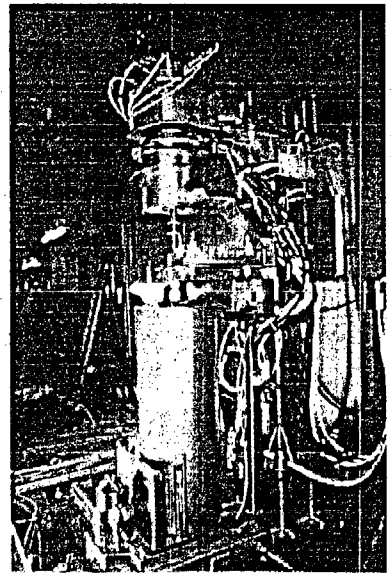
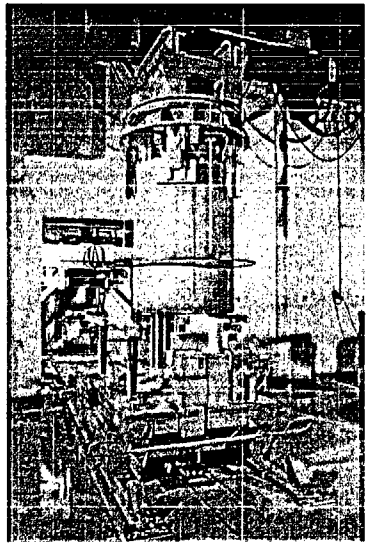
Other Experience

- *Welding of Canisters & Thick Metal Pieces*
  - *Universal Canisters welding*
  - *Plutonium canisters welding*
  - *Large reactor equipment welding*
  - *NUHOMS fuel canisters welding*



- *STE3 & AD2 Waste Treatment facilities*
  - *Liquid waste processing (evaporation, filtration, co-precipitation, ion-exchange ..)*
  - *Solid waste processing (sorting, compaction, size reduction, decontamination, thermal processing ..)*
  - *Nuclear Assay*
  - *Waste encapsulation (grouting, etc.)*