



Safety and reliability improvements in OSIRIS

C. BLOCQUEL

Nuclear Energy Direction

Department of Reactors and Nuclear Services

CEA/SACLAY, 91191 Gif-sur-Yvette cedex, FRANCE



CEA Saclay – Main nuclear facilities



INB 50
LECI
(hot cells)

INB 72
Solid waste
facility

INB 48
SATURNE
(dismantled)

INB 77
POSEIDON
(irradiators)

INB 43
ALS
(dismantled)

INB 40
OSIRIS
(70 MW reactor)

INB 101
ORPHEE
(14 MW reactor)

INB 29
CIS-BIO
(isotopes for
medicine)

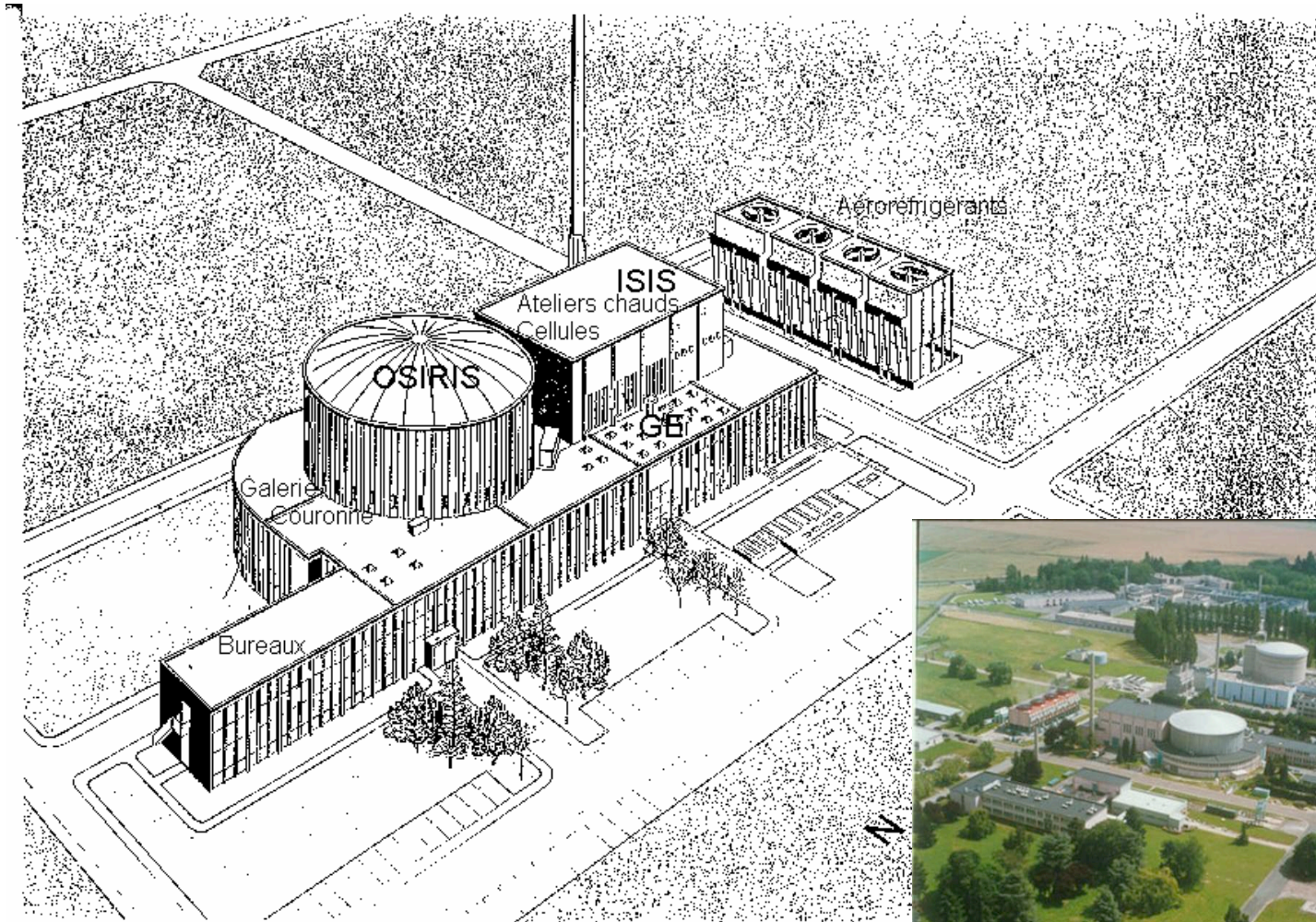
INB 49 – LHA
(dismantling)

INB 18
ULYSSE
(training reactor
dismantling)

INB 35
Liquid waste
facility



THE EXPERIMENTAL PLATFORM



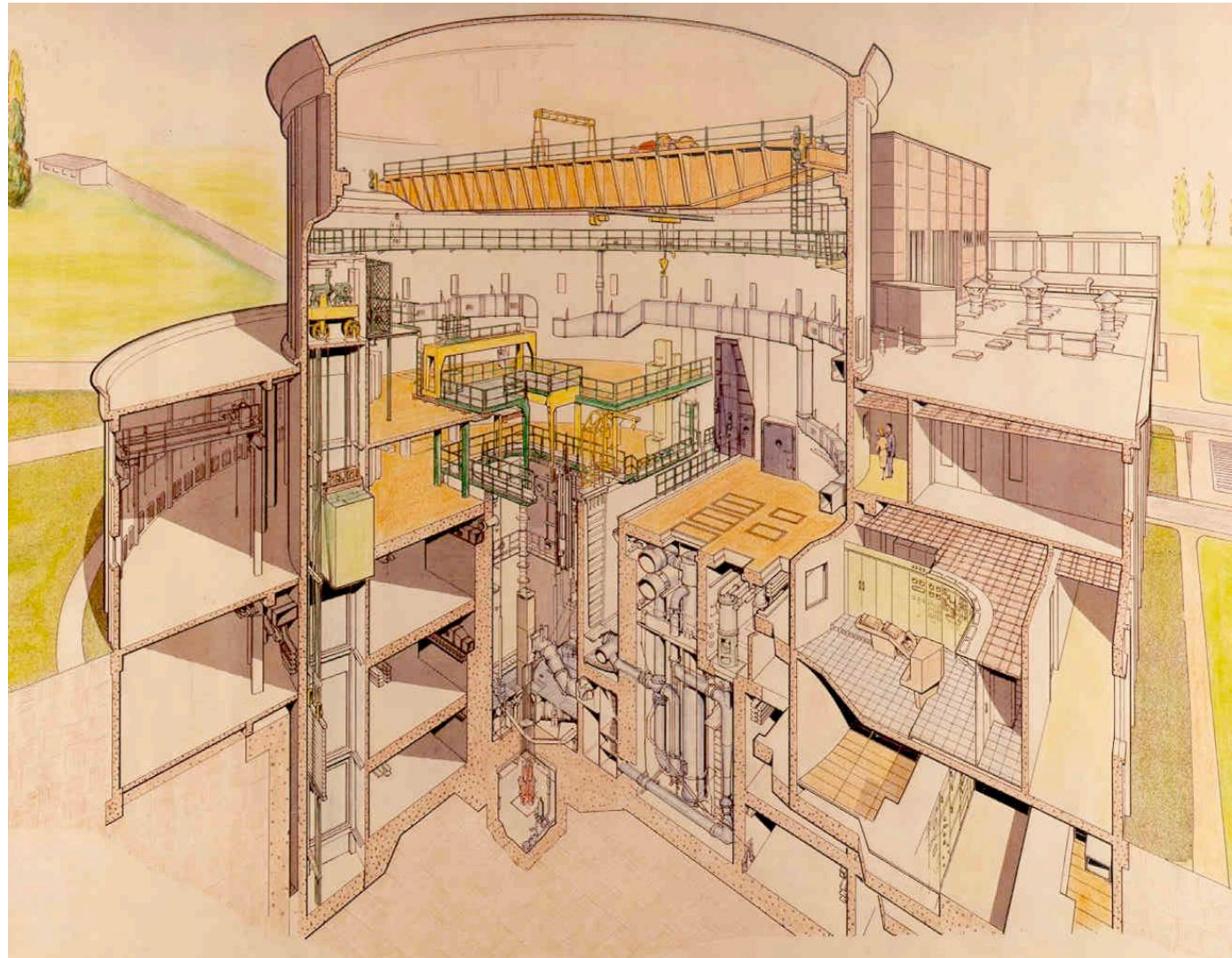
MAIN EVENTS



- ❖ Start of construction end of 1963
- ❖ Installation authorised 08/06/1965
- ❖ First divergence ISIS 28/04/1966
- ❖ First divergence OSIRIS 08/09/1966
- ❖ First cycle OSIRIS 08/09/1966
- ❖ Power 50 MW 07/10/1966
- ❖ Power 70 MW 11/12/1968
- ❖ New core Caramel 25/07/1979
- ❖ Conversion to Silicide fuel OSIRIS 1996
- ❖ Silicide core in ISIS Nov 1998
- ❖ Safety reassessment Nov 1999



VERTICAL SIGHT

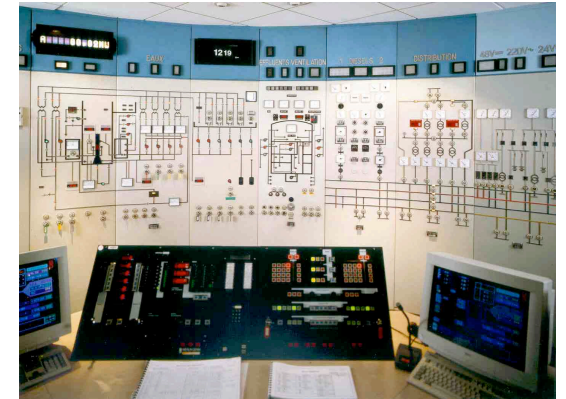


OSIRIS – MAIN UPGRADING OPERATIONS

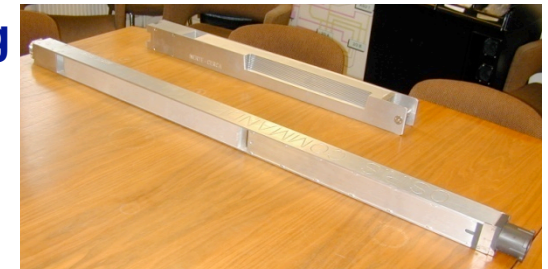


Safety function : Reactivity

1992-93 Replacement of instrumentation and control - Centralized data processing finished in 93



1996-97 Replacement of fuel housing (and conversion Caramel to Silicide)



2005 Upgrading emergency panel

2004-06 Replacement of instrumentation and control of Isis



OSIRIS – MAIN UPGRADING OPERATIONS



Safety function : Cooling

1993 Partial replacement of primary admission pipe

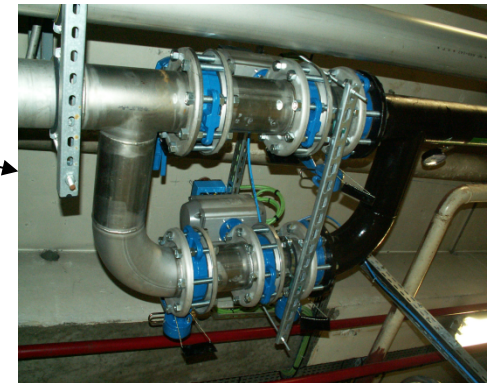
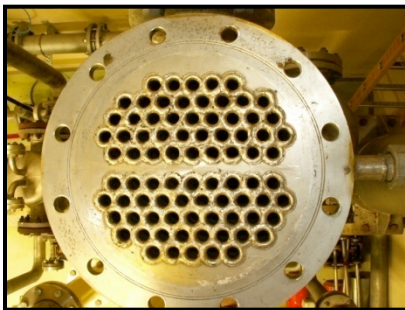
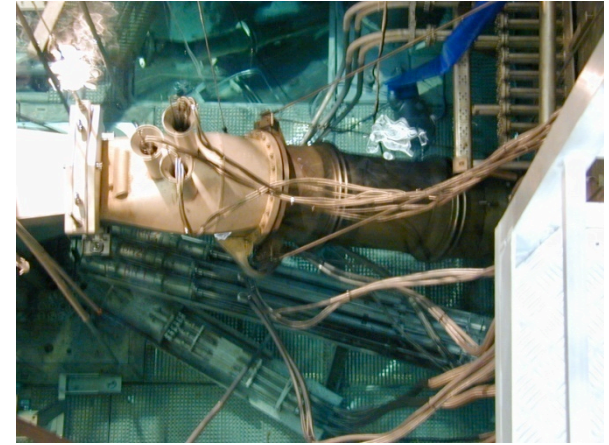
1996-97 Replacement of cellular core structure

Visual inspection of primary circuit and pool

2003 & 2006 Non destructive controls on primary core circuit

2006 Osiris exchangers controls
Setting an emergency pool-filling circuit

2008 Isis exchangers control

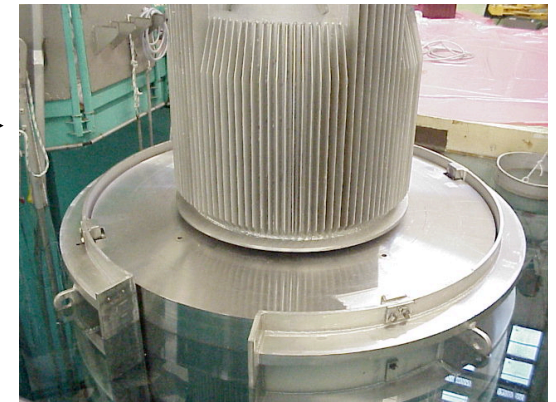
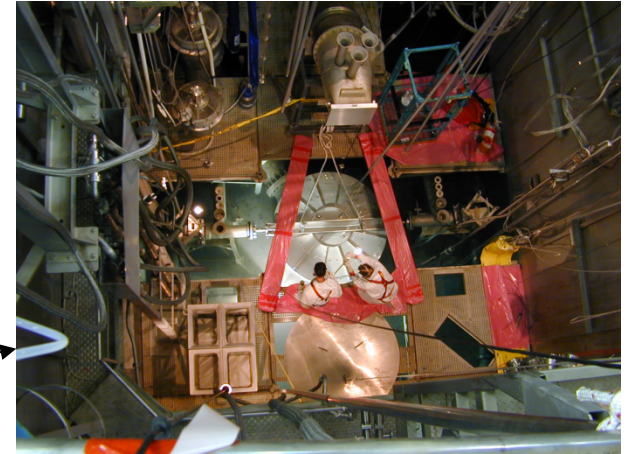


OSIRIS – MAIN UPGRADING OPERATIONS



Safety function : Containment

- 1988-89 Doing up of the liquid waste storage tanks
- 1994-95 Doing up of decay tanks on primary core and pool circuits
- 1999-2000 Doing up the 1, 2 & 3 channels
- 2001-02 Replacement of core tank
Double containment on liquid waste storage tanks
Liner on channel n° 3
- 2000-03 Upgrading static confinement
- 2004 Decay tanks inspection
- 2006 Loads bridling device in channel 2
- 2007 Decay tanks inspection
- 2009 Core decay tank casing repair



STATIC CONTAINMENT UPGRADING OPERATIONS



1977 Isis pool refurbishment

2001 Containment fissures repairs

2003 Batches containment upgrading

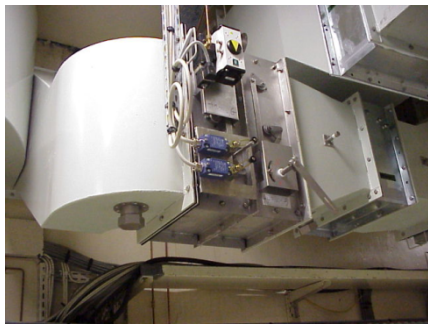
Registers and valves on ventilation circuit

2003-06 Regulation ventilation valves

2006 Extension of channel door

2005-07 Gaseous effluents room containment

2008 Replacement of a containment
g
ing and cleaning hot cell n



OSIRIS – MAIN UPGRADING OPERATIONS



Safety function : Radioprotection

- 1983** **Radiation Protection Control Panel**
- 2000 & 2005** **Refurbishment of survey devices of secondary circuit activity**
- 2004-06** **Replacement of information treatment units**
- 2008** **Setting of flow-meters inside ventilation exhaust chimney**



OSIRIS – MAIN UPGRADING OPERATIONS



Support functions

1988-1989 Complete revision of emergency power units

1990 Replacement of 48 V supply network

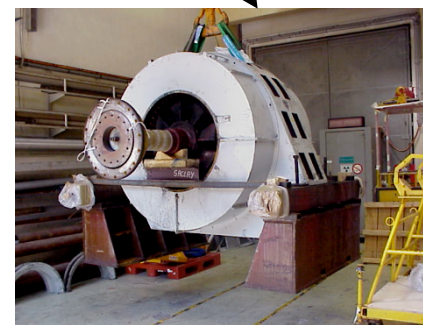
Replacement of low voltage switchboards

1999-2000 Requalification of emergency power units

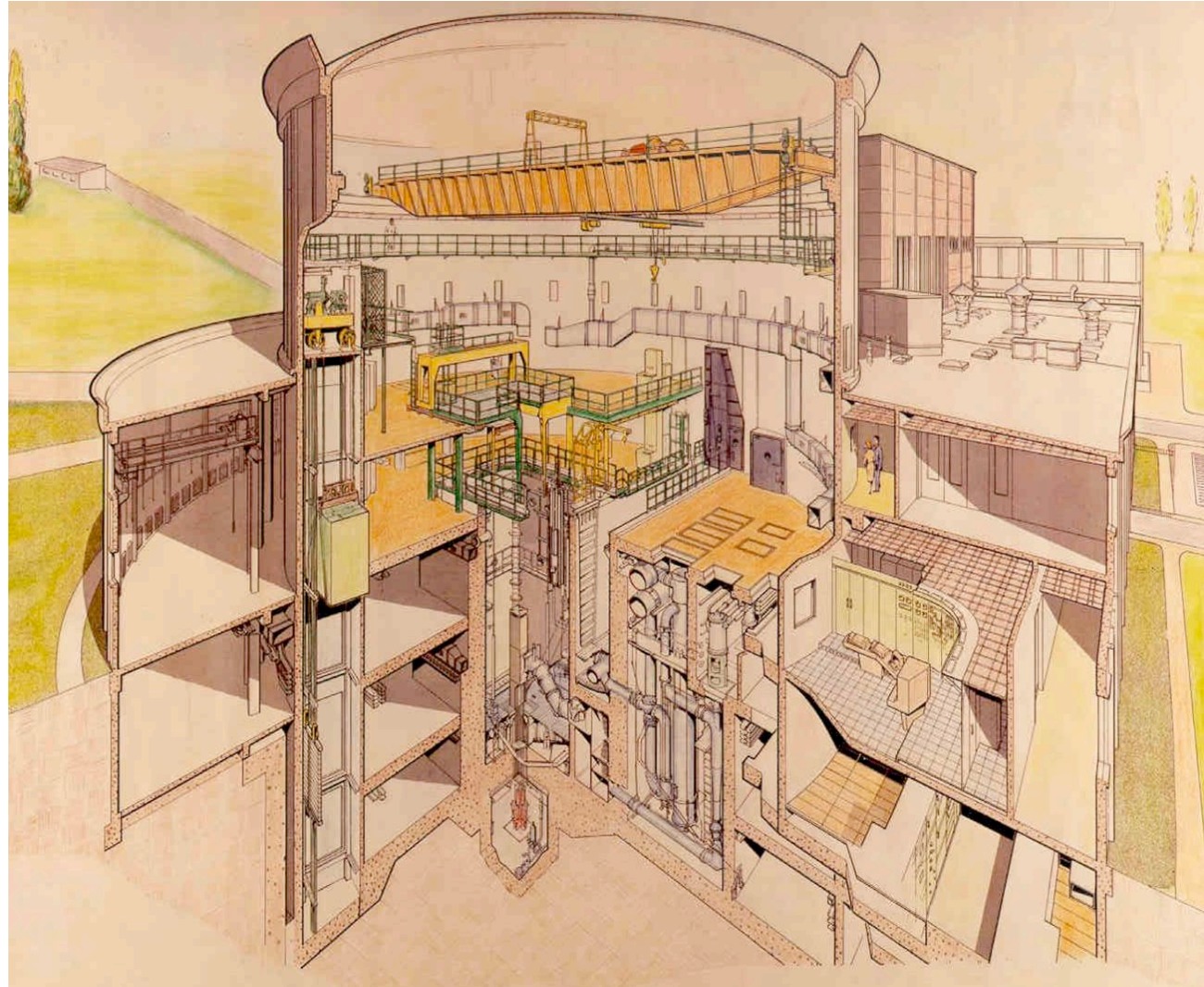
2000 Replacement of rectifiers and wavers

2005-07 Heavy maintenance of diesel engines and alternators

2004-08 Replacement of HV/LV Transformers



SAFETY IMPROVEMENT 2008 - 2010

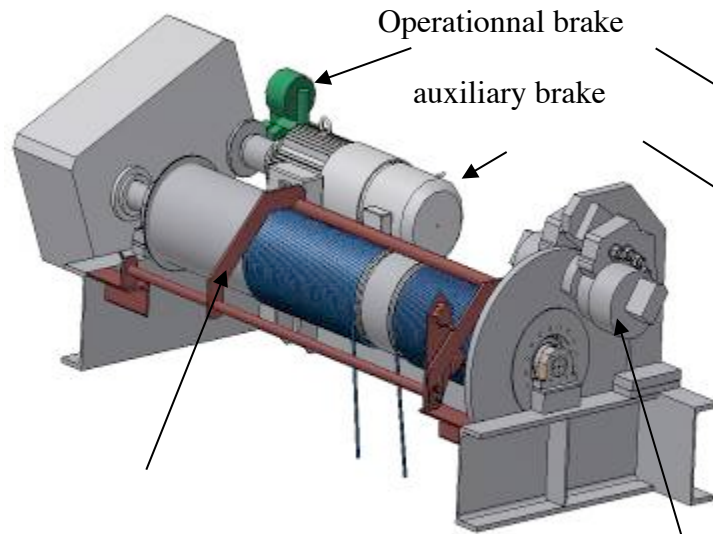


Hoistering improvement

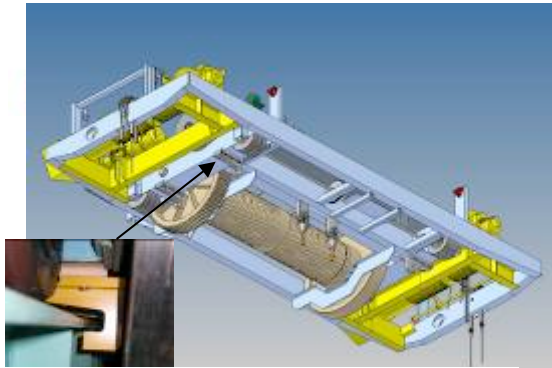


Fiability improvement of lifting means (hot workshop crane – Osiris crane – Isis crane – other hoists)





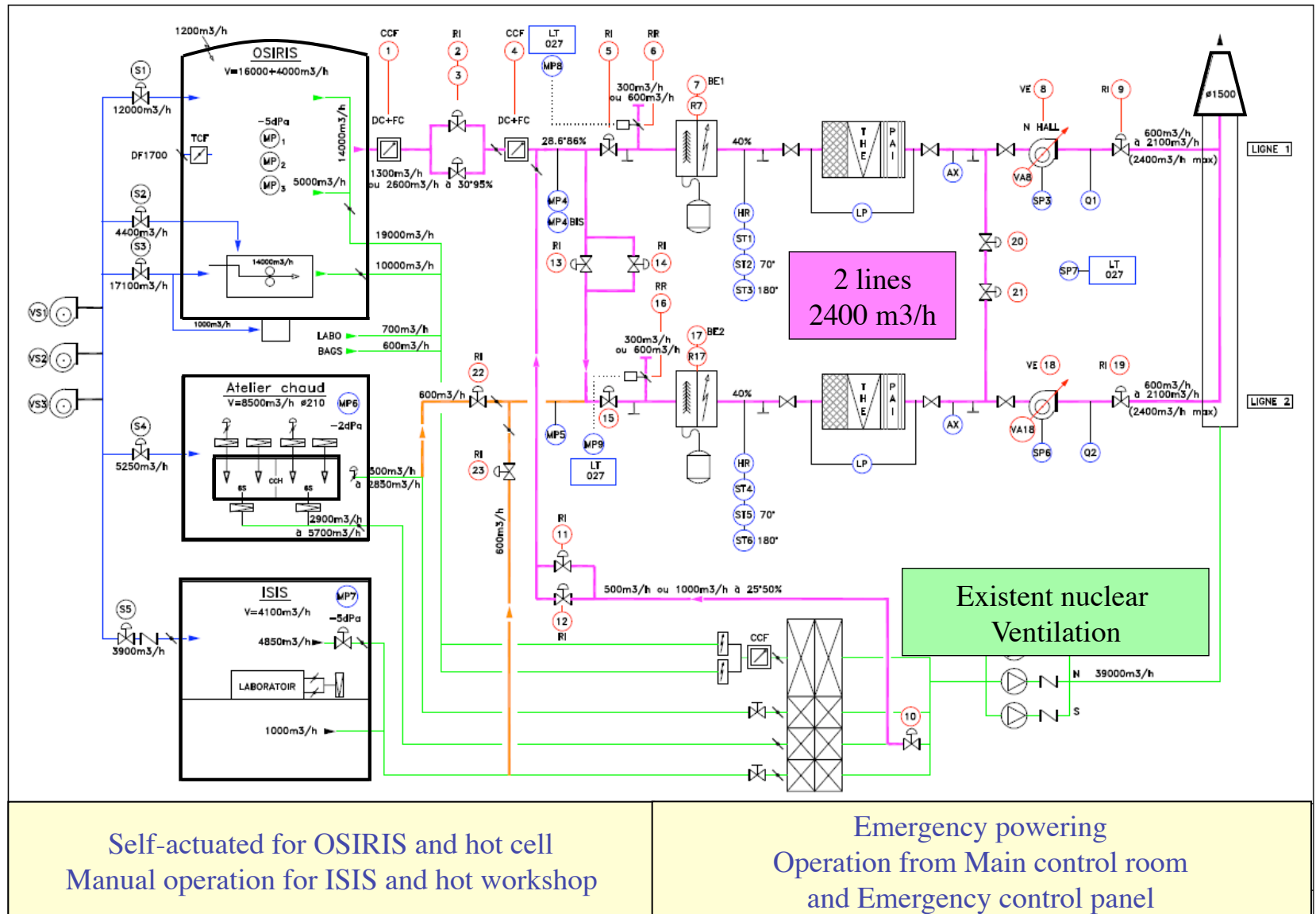
- Redundancy wire ropes, three brakes
- Safety power supply circuits act independently from operating control circuit
- Vertical and lateral movements interlocked
- Speed control



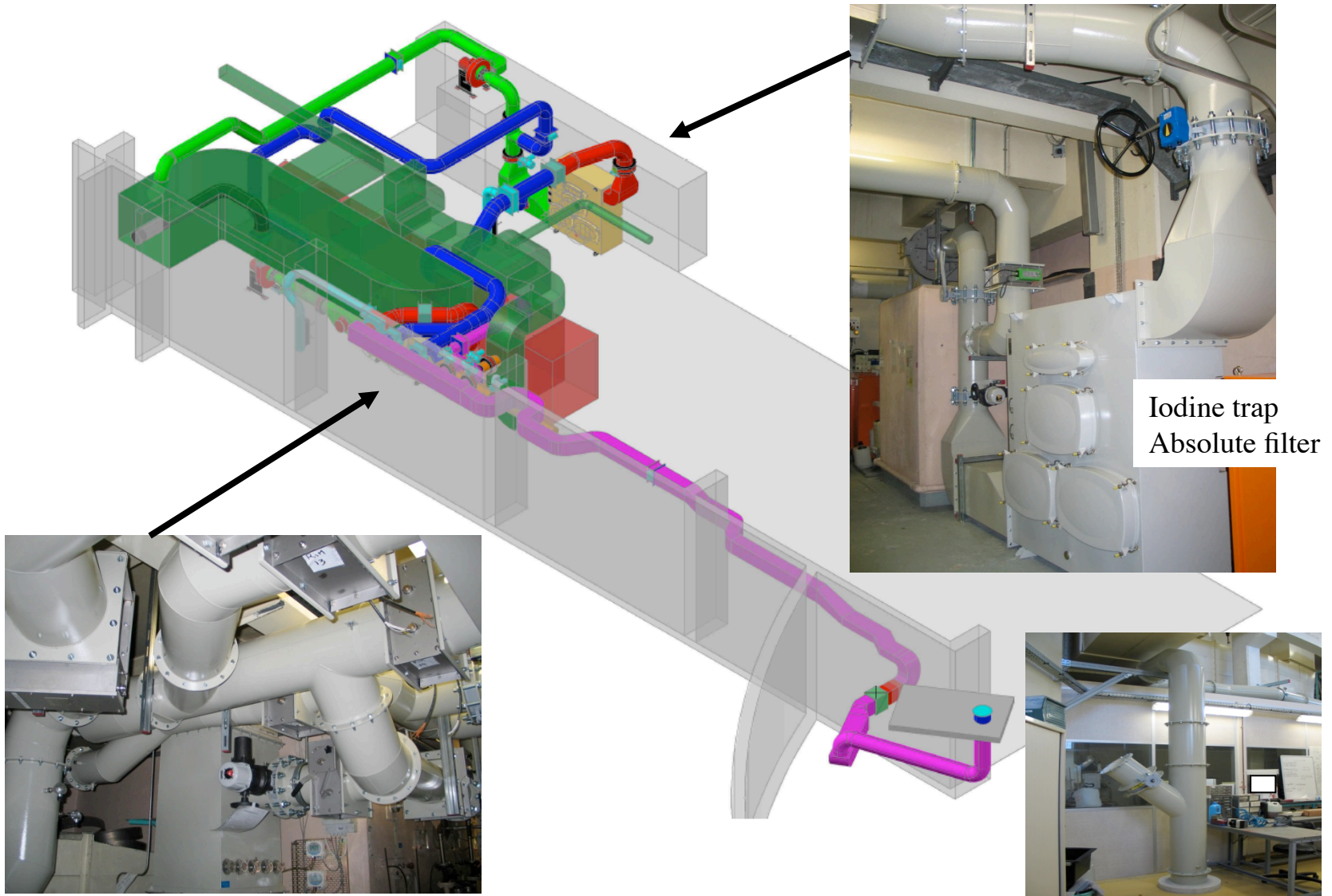
Trolley anti-derailment

Safety brake on rope drums





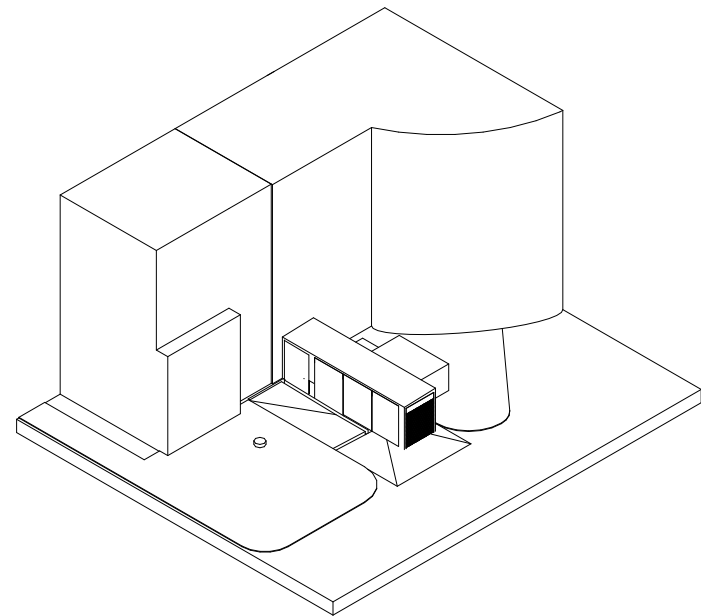
Post-accident ventilation



Trucks' hatch



In order to give an extension of the containment during loading and unloading phases



Control rods mechanisms room's containment



Upgrade the tightness of the room in order to reduce radioactive liquid transfers to the environment

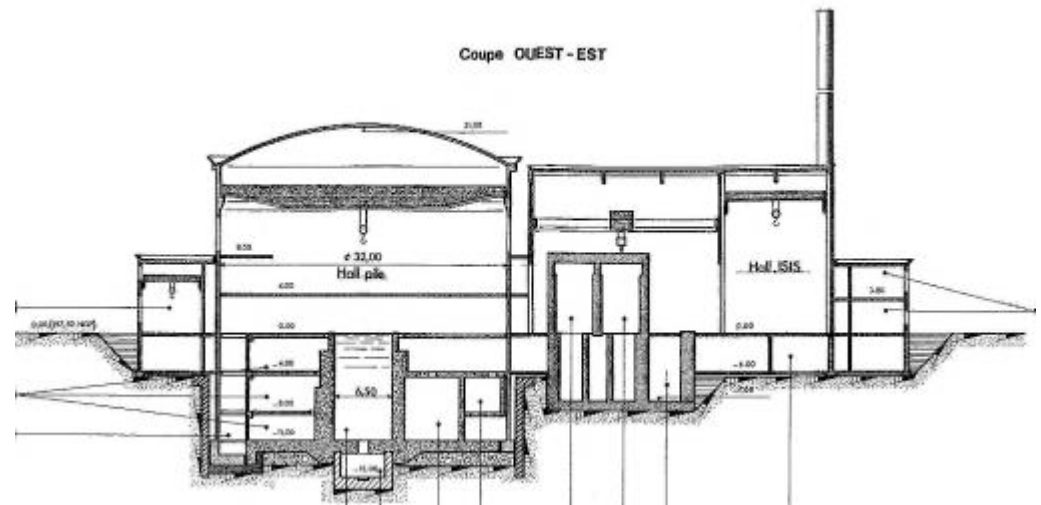
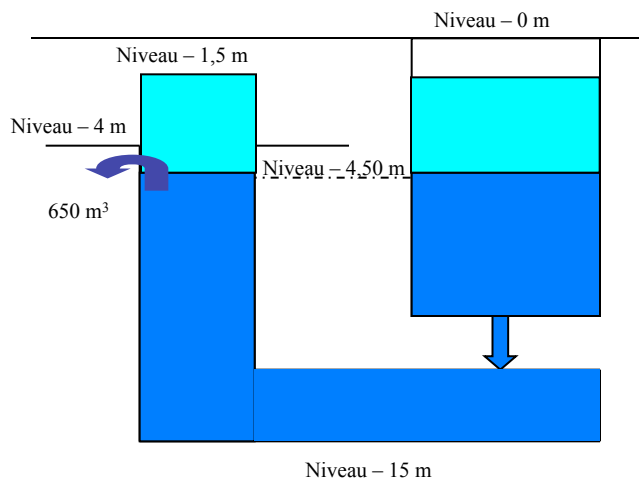
**Heavy operation
(5 months)**



Limit the pool level's going down



In case of a leak towards control rods mechanisms room or a BORAX accident, limit the pool level's going down and avoid overflows in the plant



Increase the tightness and strength of the structures



Walling up PANES and SIDE-LIGHTS
on Isis and hot workshop structures



Increase the tightness and strength of the structures



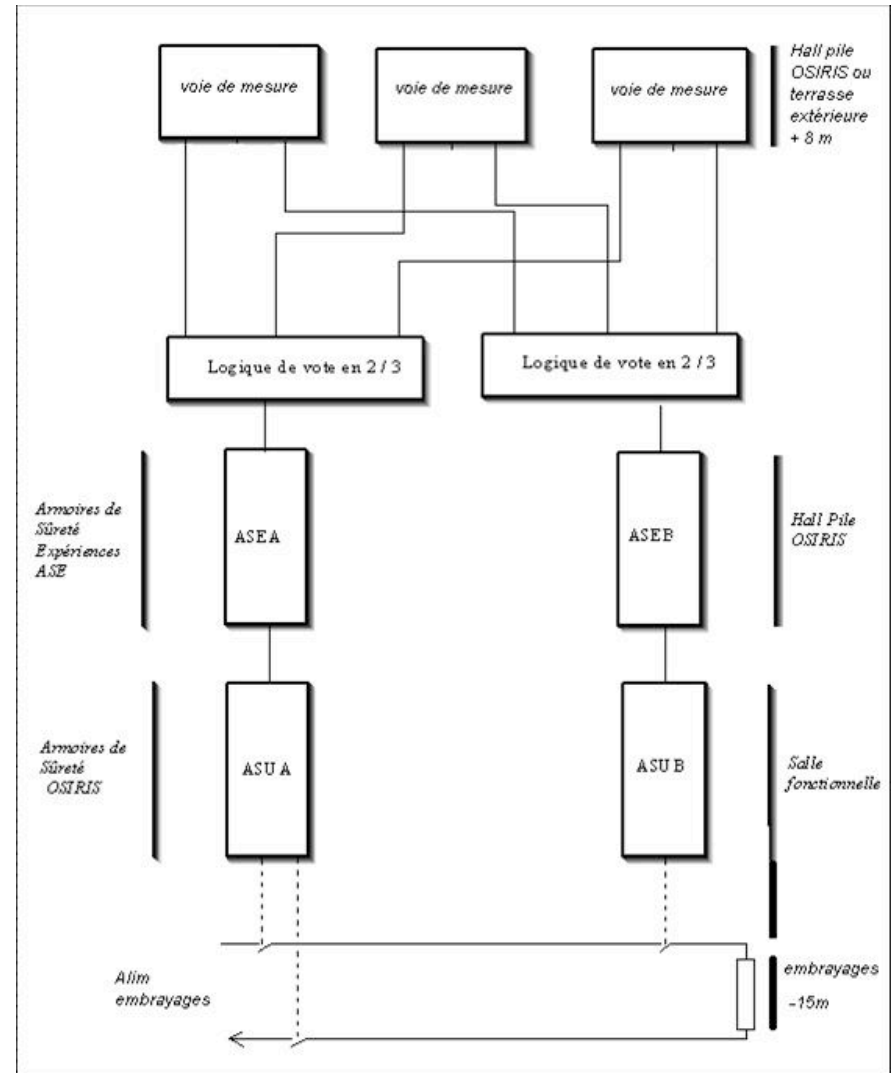
Automatic shutdown in case of external hazards



After detection of

- ✓ Earthquake
- ✓ Outside explosion

Equivalent system to dome accelerometers detecting plane's fall



Forecast schedule

