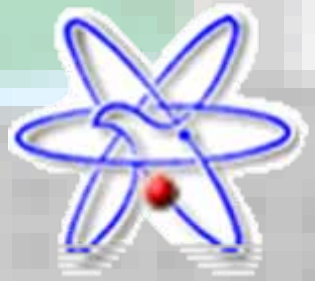
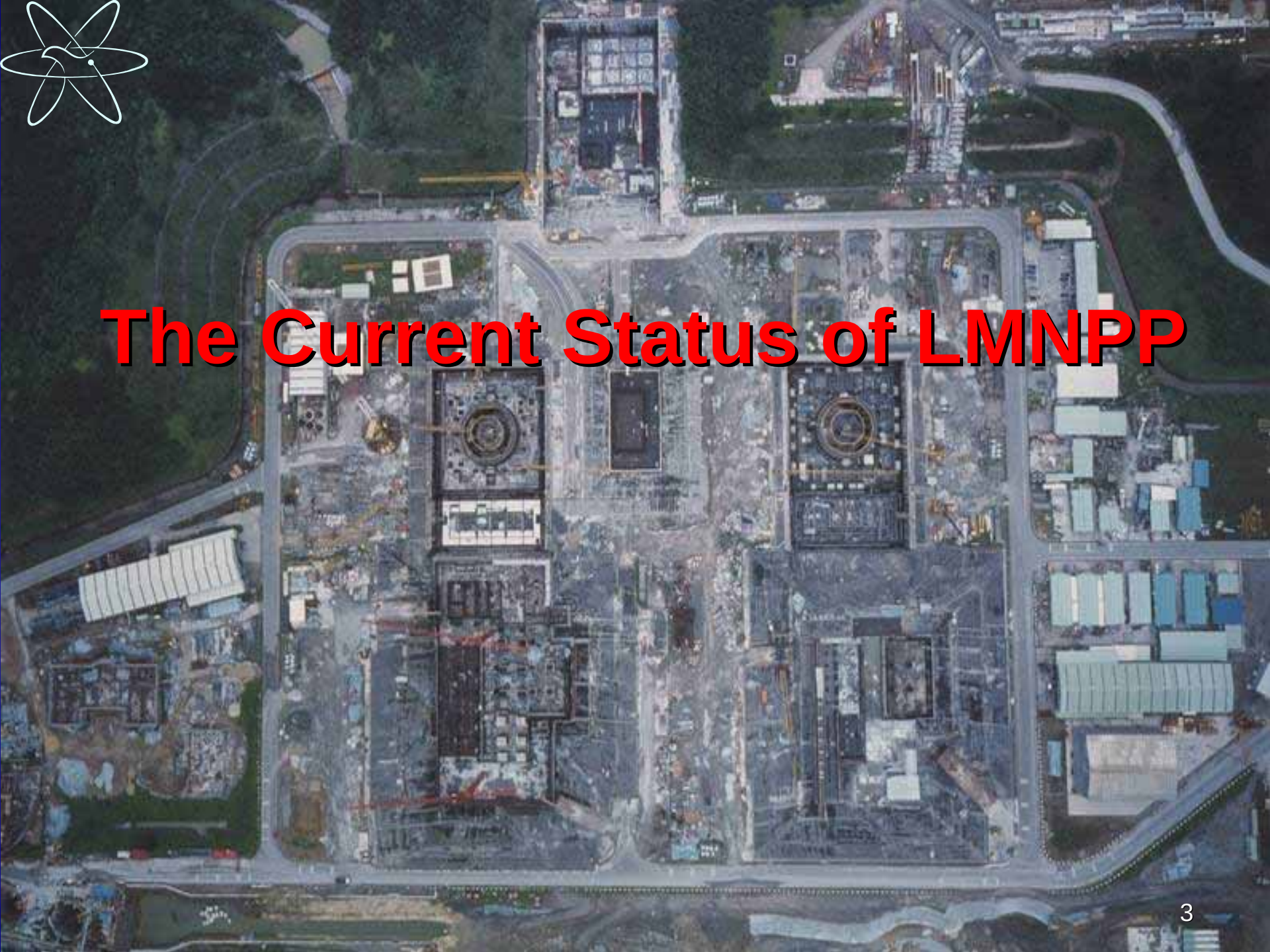
The Introduction of Lungmen Nuclear Power Plant



Department of Nuclear Regulation
Atomic Energy Council, R.O.C.

Outline

- The current status of LMNPP
- Licensing and Inspection Activities
- The unusual events during construction
- Major observation by authority
- Conclusion



The Current Status of LMNPP

Progress of Lungmen Project

1980 Lungmen Project proposed

1996.6 GE ABWR Awarded

1999.3 Construction Permit issued

First Concrete pouring

2000.10 Lungmen Project Suspended by DPP government

2001.2 Lungmen Project Resumed

2005.3 Unit 1 RPV Sitting

2006.10 Unit 2 RPV Sitting

2007.7 161kV Energized (only partial electric distribution systems installed)

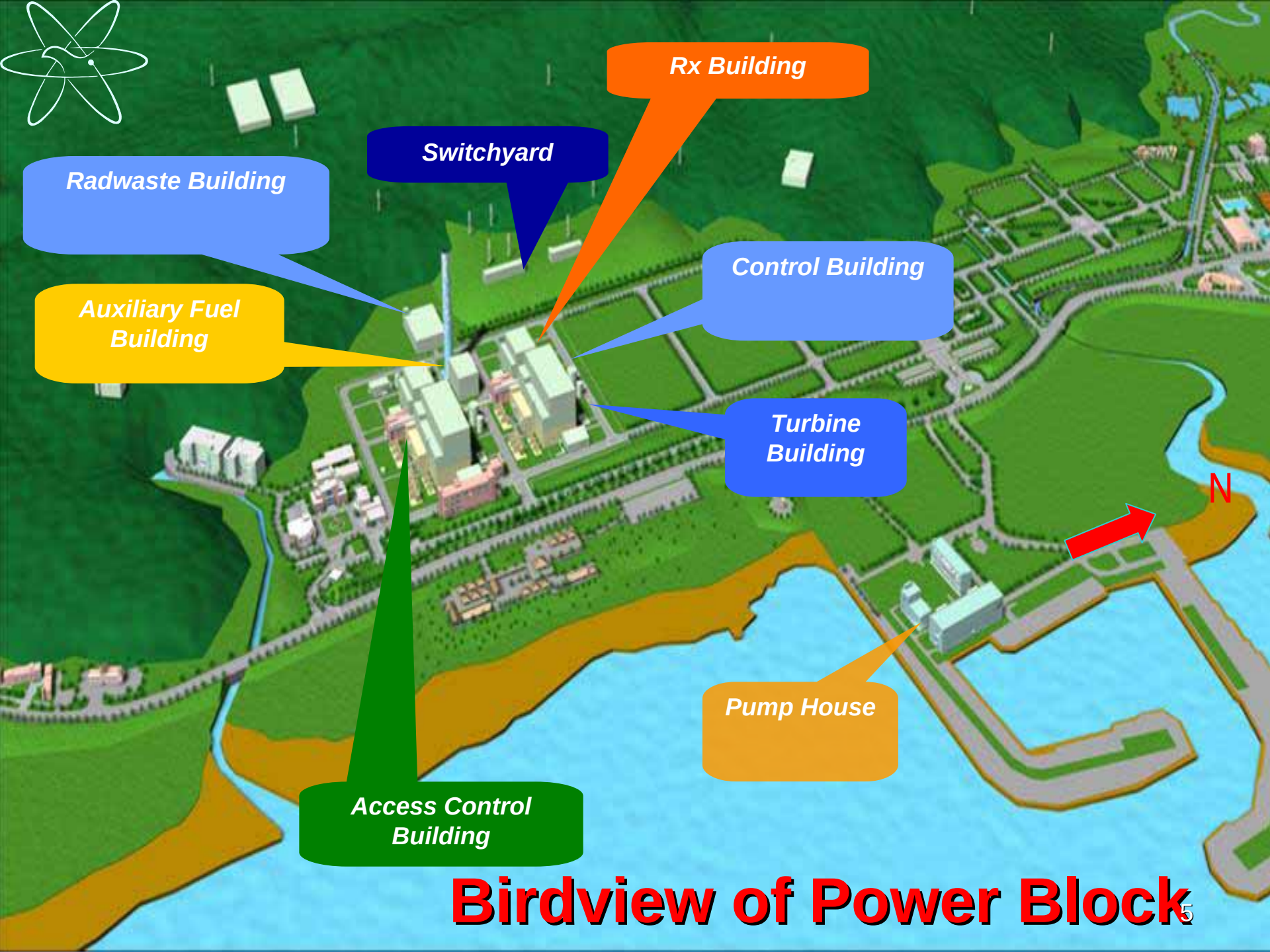
2008.11 Unit 1 RPV Hydro test

2009.7 Pre-op tests start

2010.4 ECCS Pre-op

2010.8 FIV

Present



Birdview of Power Block

Reactor Building

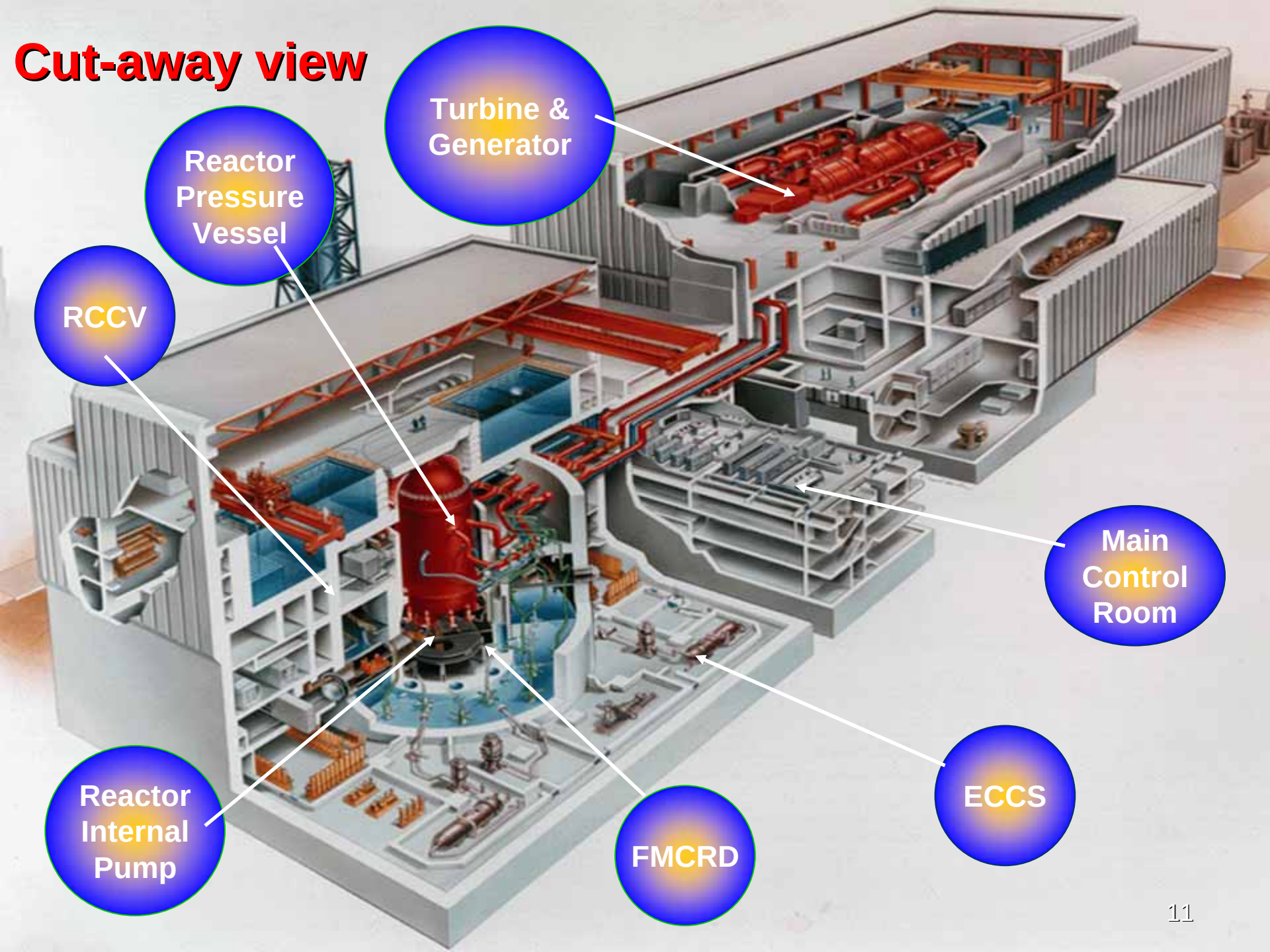
Control Building


Turbine Building

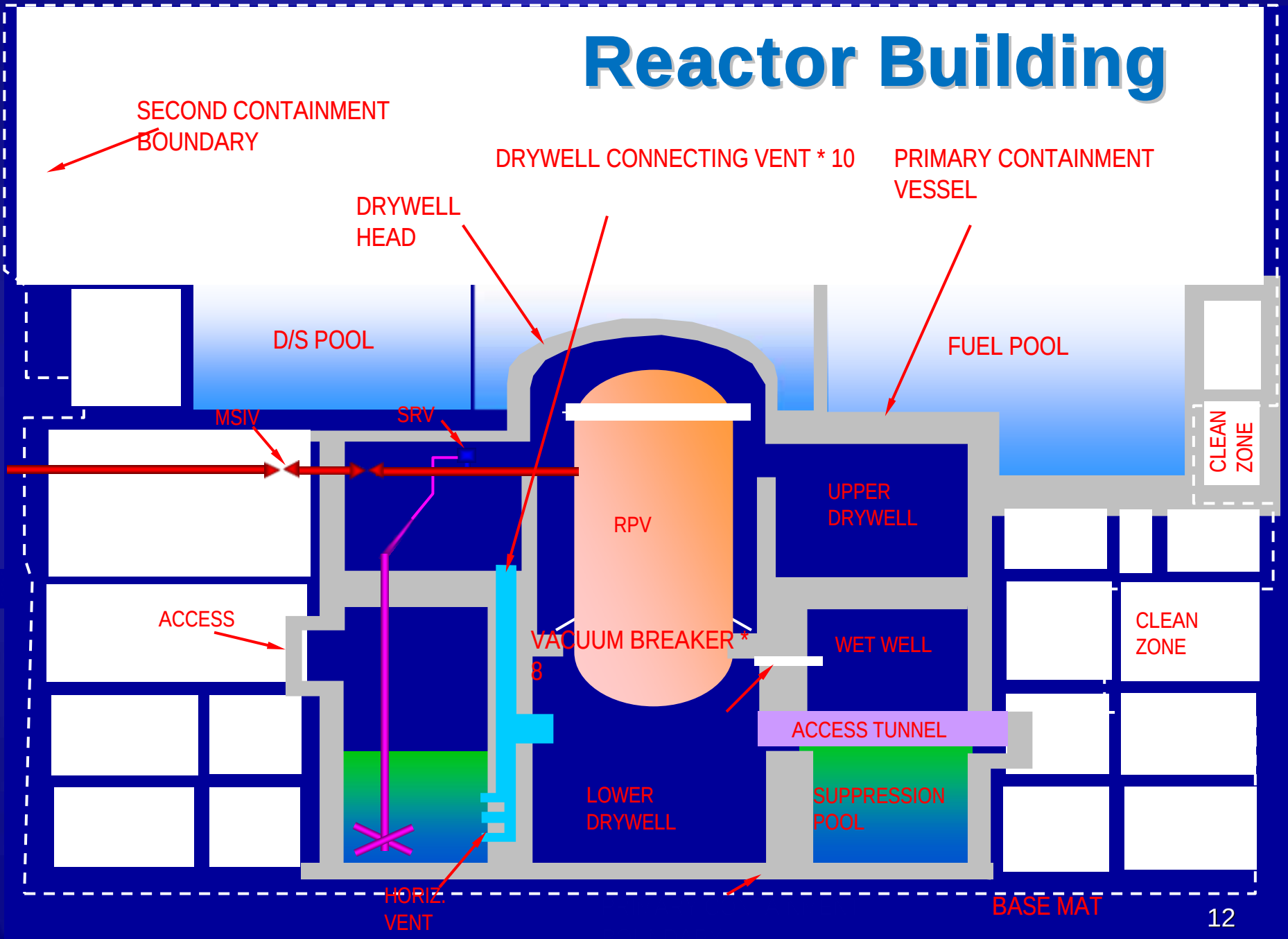
Auxiliary Fuel Building

Radiwaste Building

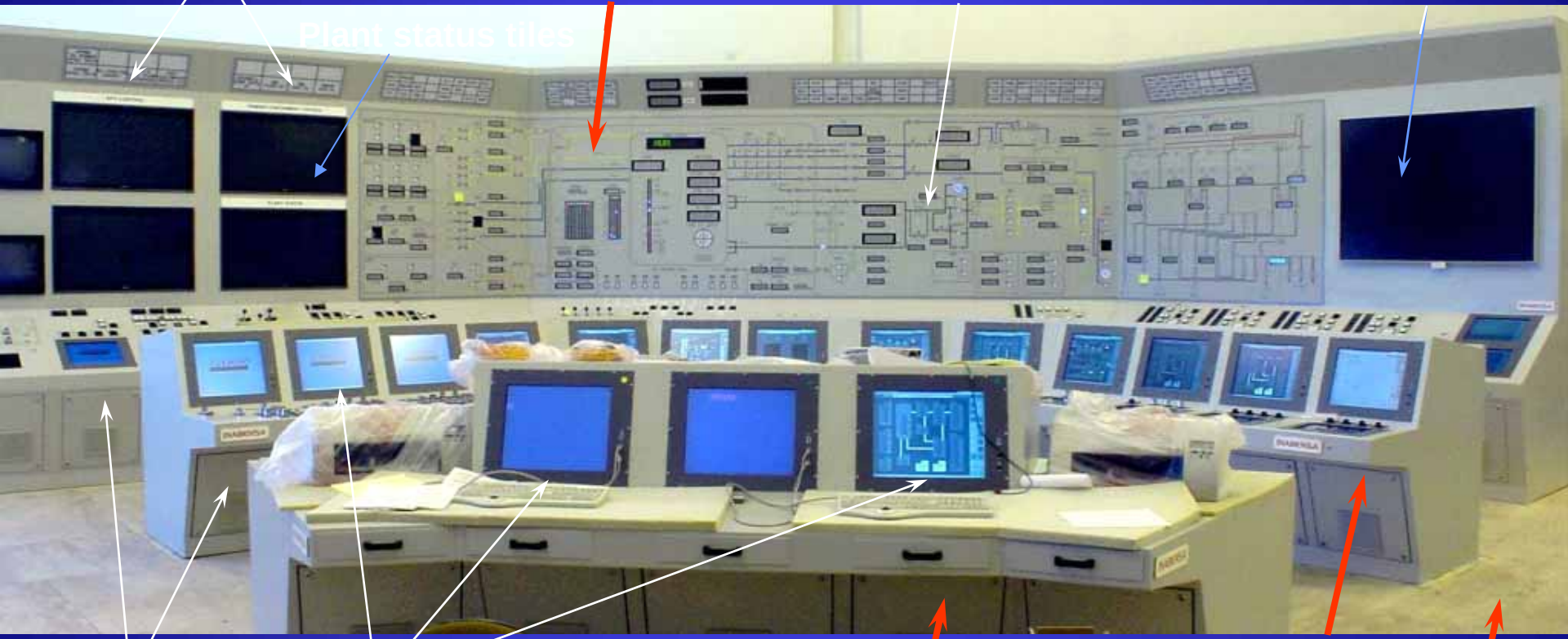
Cut-away view



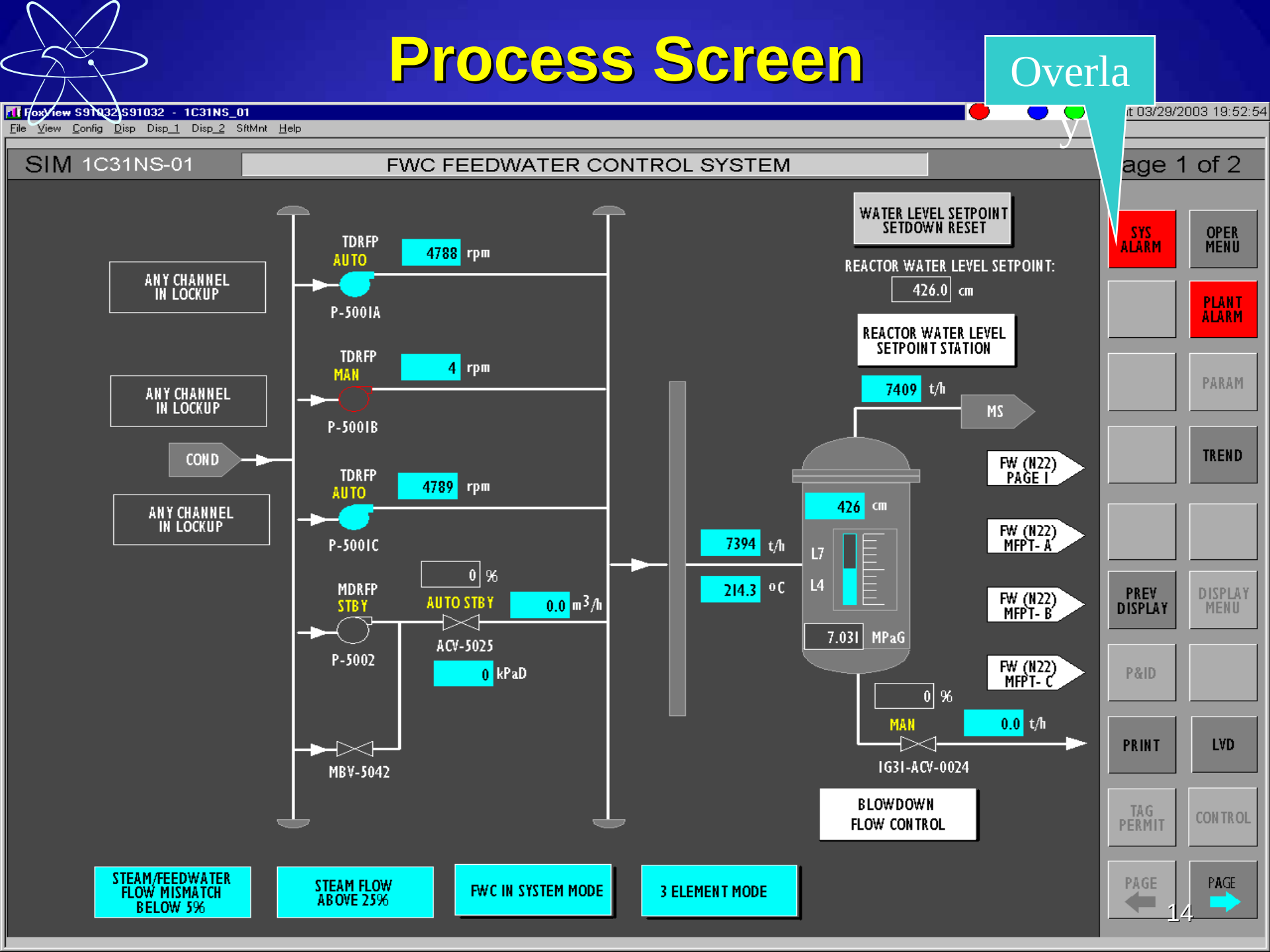
Reactor Building



Main Control Room



Process Screen



Current Status

The Lungmen progress issued by **Taipower Company (TPC) as follows: (As of 8/31/ 2013)**

Total Accumulated Progress(%)					
Category (weight)	Design (19%)	Procurement (15%)	Construction (58%)	Startup* (8%)	Total (100%)
Unit 1	99.77	100	97.70	63.63	95.71
Unit 2	98.96	100	96.72	20.00	91.5

***Numbers under startup represent initial test activities (Post Construction Test, Pre-op test, procedures preparation)**

Current Status of #1 - Construction

- The construction of Lungmen Project has almost completed. But there are still some deficiencies that should be improved, such as:

  The 18 construction improvement action items

- Currently Lungmen Project are working on the 18 construction improvement action items to fix the identified problems, including those of RCCV liner, surface mounting plate, cable tray seismic enhancement, and fire protection.

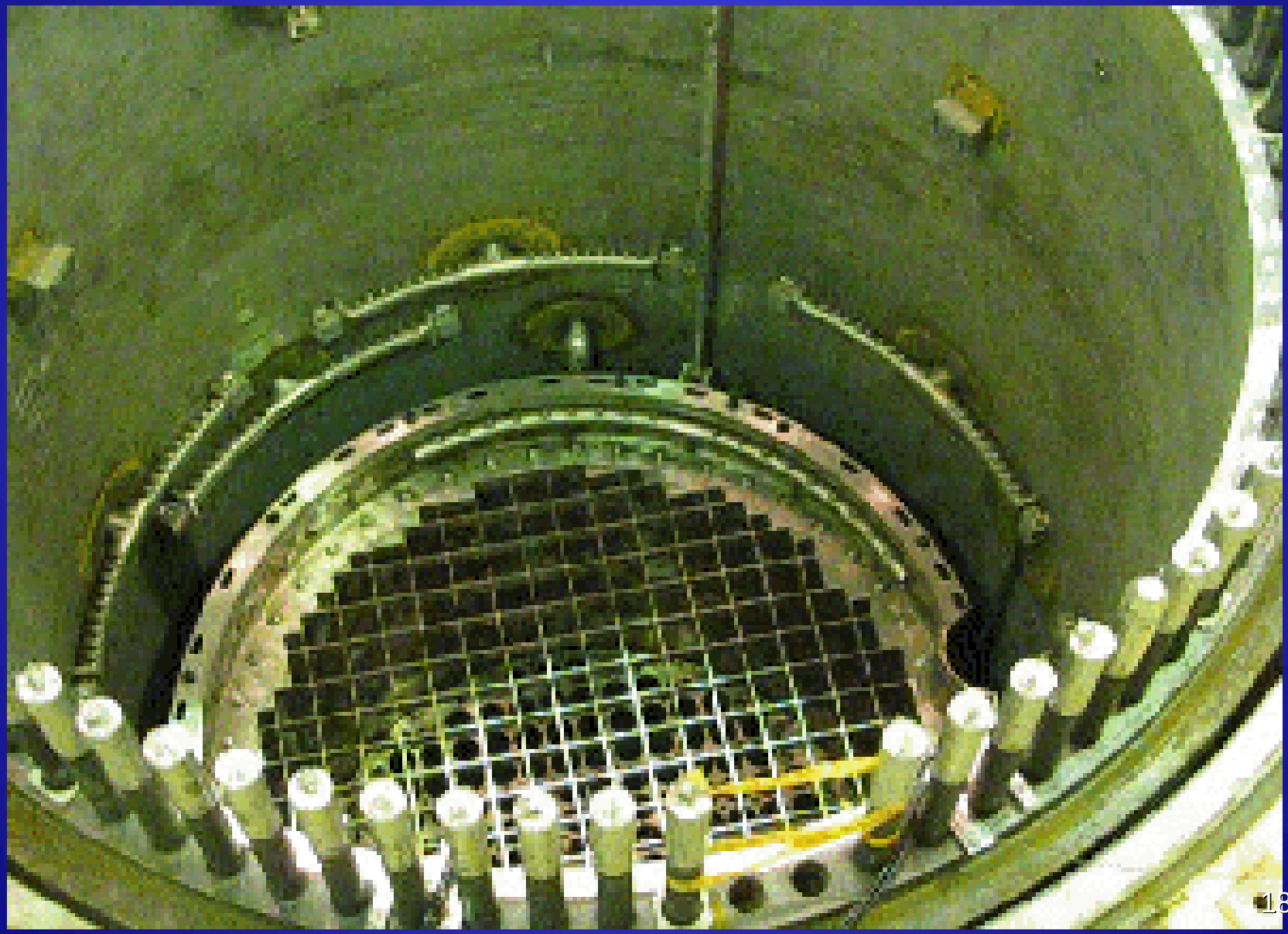




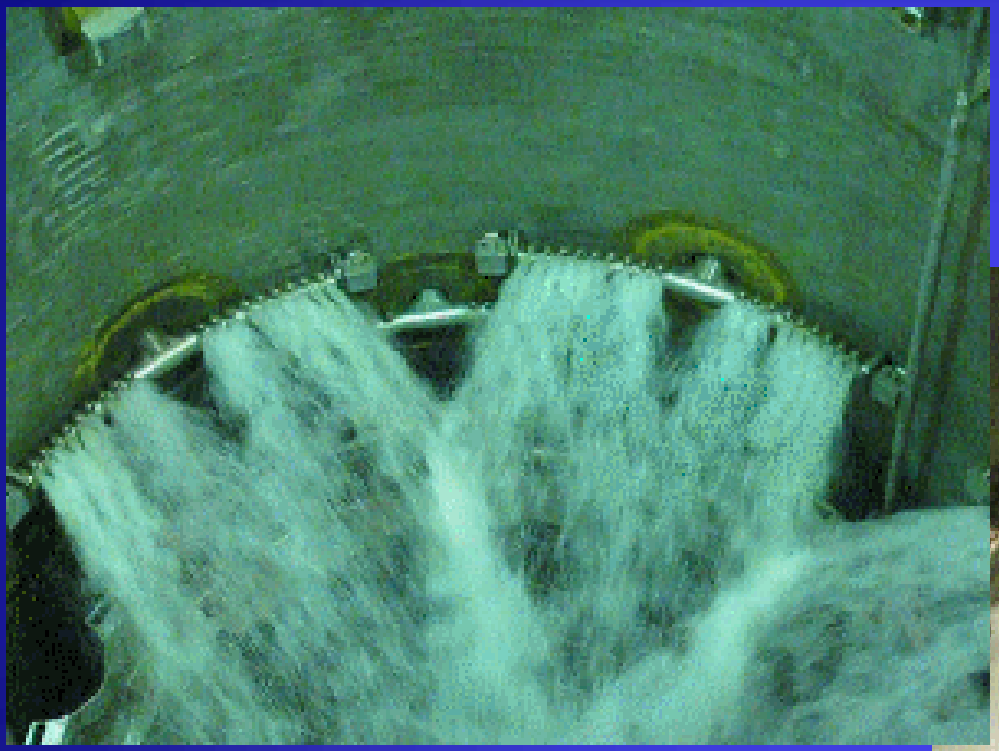
Current Status of #1 - Testing

- 126 systems are to be tested
- Currently, 119 systems have been fully turned over and 7 partially turned over for pre-operational testing
- In terms of pre-op test procedures, there are 308 procedures that should be finished before fuel loading, 19 under execution, 173（56 %） finished testing and are reviewed by SORC

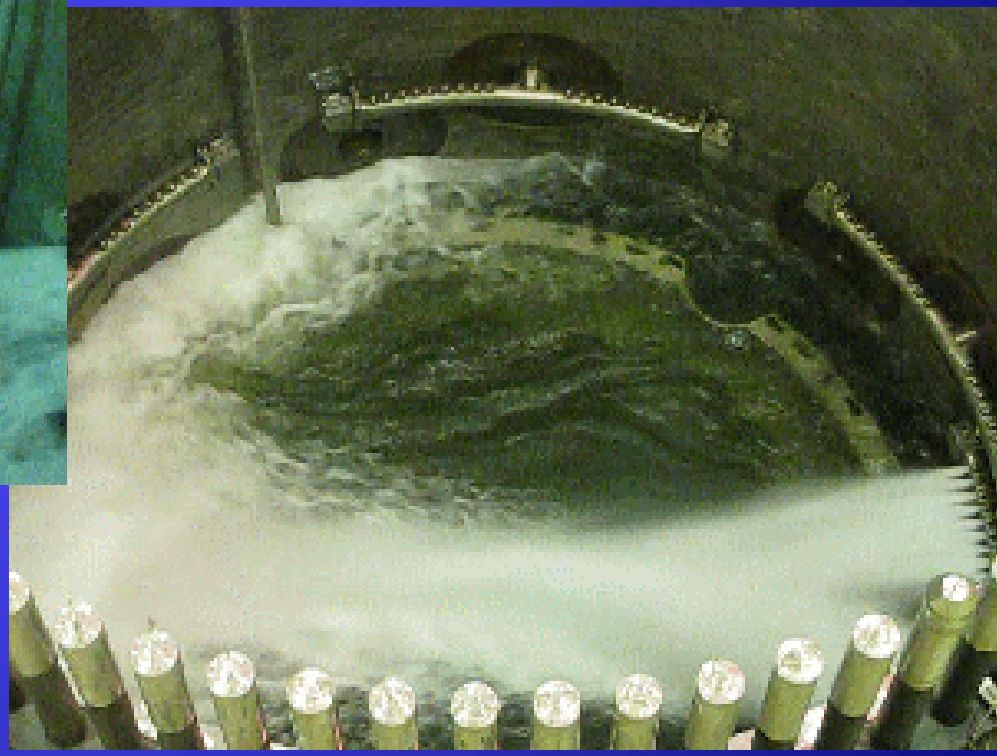
ECCS-HPCF C



ECCS-LPFL

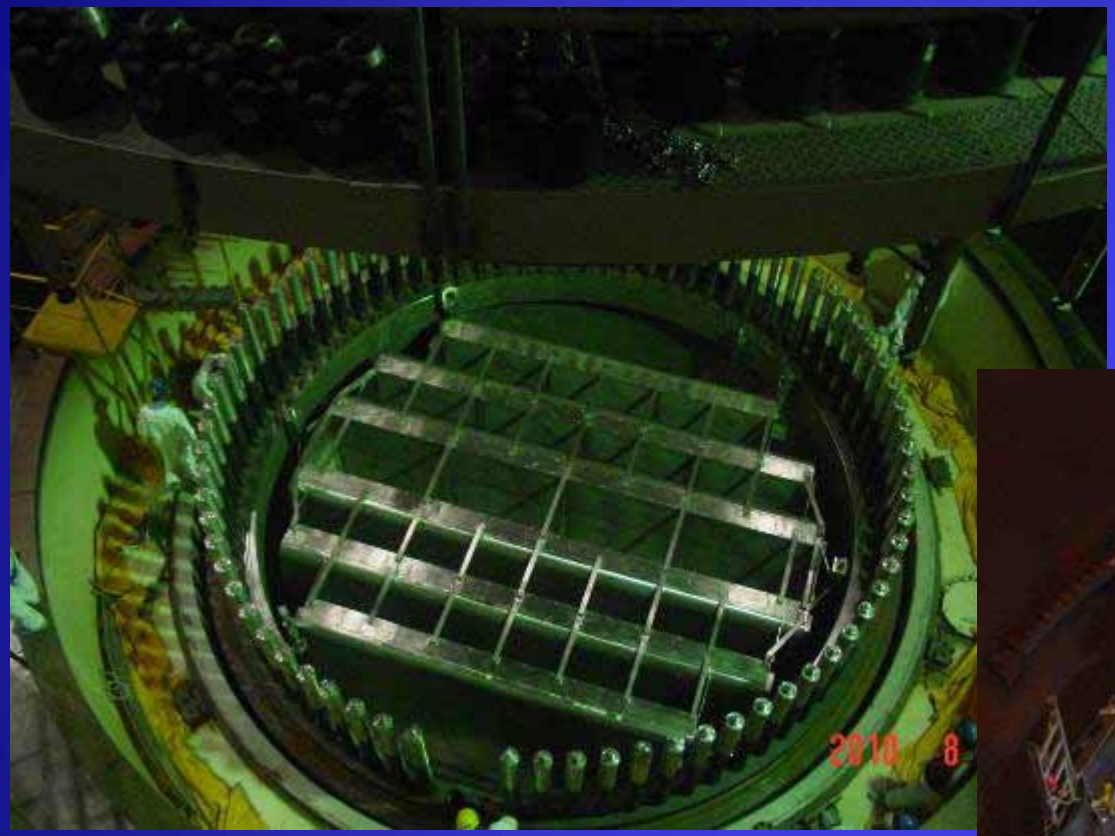


LPFL A



LPFL C

Flow Induced Vibration Test



Pre-FIV

Post-FIV Inspection

International Cooperation

Current Status of #1 – Testing (cont.)

- For the 308 pre-op test procedures, there are 187 pre-op test reports which should be submitted to AEC, and 65 reports have been submitted.
- Because of the 2-stage system Turnover of Lungmen Project, the pre-op testing had been progressing partly and had lasted for a long time. **Therefore, the public still query the effectiveness of the pre-op testing.**

Current Status of #1 – Testing (cont.)

- For verifying system function integrity and reliability, TPC promised to **perform pre-op re-test** for systems finishing pre-op test and approved, except ones that can't re-build the test conditions in 2013.
- TPC calls senior engineers from other 3 NPPs to form the Reinforced Safety Evaluation Task Force, to perform turn-over package review, walkdown, and pre-op re-test

Current Status of #1 – Testing (cont.)

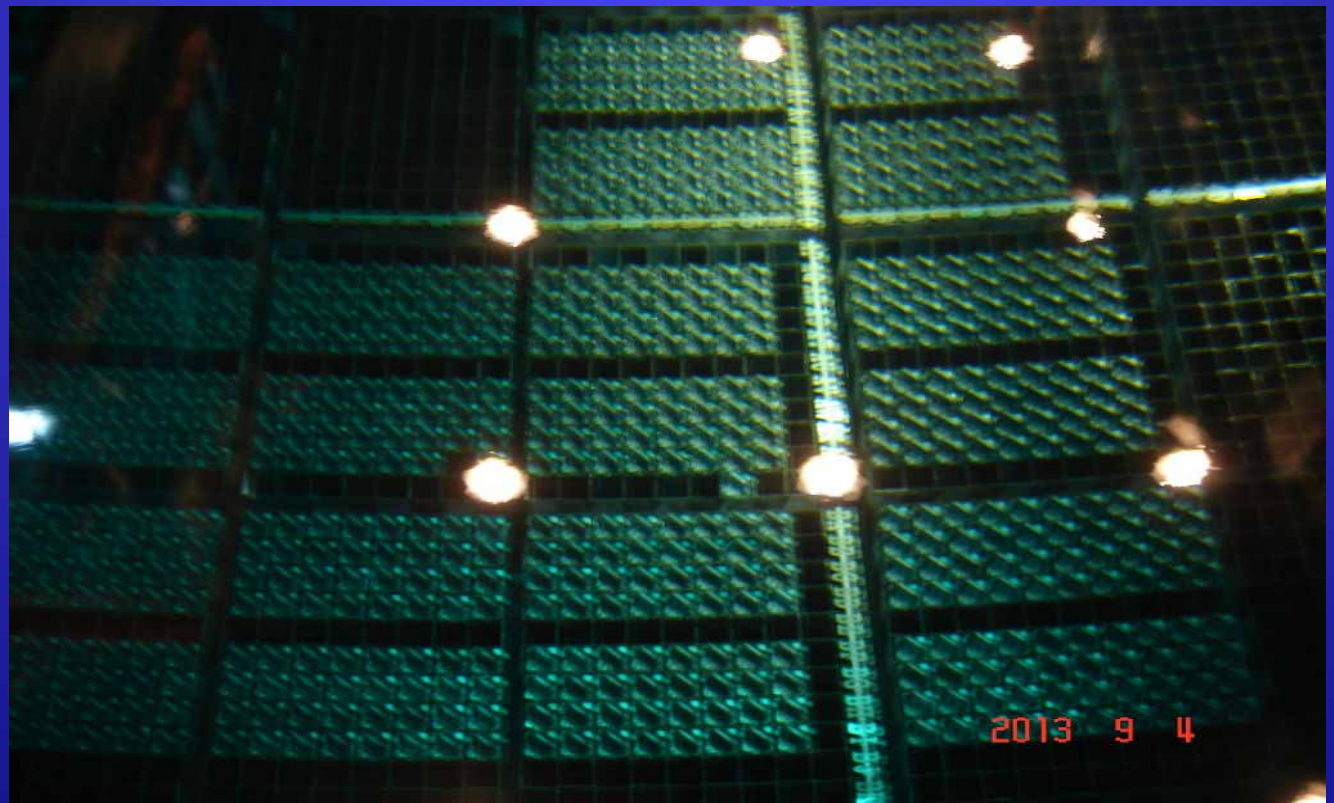
- The duties of Reinforced Safety Evaluation Task Force are reviewing the system turnover package and auditing the re-test.
- Both of the pre-op test reports should be submitted to AEC. The first one is reference materials; the other is the formal documents.
- Currently, 60 pre-op re-test procedures have been fully completed.

Current Status of #1 – Improvement Action Items

- The results of Post-Fukushima Safety Evaluation requires Lungmen to perform seismic and tsunami simulations, add two gas turbine generators, sea wall, and spent fuel pool instrumentation, … etc.

Fuel Loading Permit

- AEC required TPC to complete 75 tasks, including the approval of System Function Test Reports, before applying the fuel loading permit



Licensing and Inspection Activities

Basic Regulatory Laws

➢Nuclear Reactor Facilities Regulation Act

Article 5

For the construction of nuclear reactor facilities, an application for *construction permit* shall be filed with the competent authorities, and the construction shall not commence until the application has been reviewed and approved by the competent authorities to meet with the following standards and requirements and the competent authorities have issued a construction permit…

Basic Regulatory Laws (cont.)

Article 6

Even after the completion of construction of nuclear reactor facilities, the facilities *shall not be loaded with the nuclear fuel, unless the competent authorities have reviewed and approved its final safety analysis report*, and the corrective actions of inspection findings during the construction and the system functional tests thereof have been passed. Unless the competent authorities have *reviewed and approved the power test* therefore and then issued *an operating license* therefore, no nuclear reactor facilities, having been loaded with the nuclear fuel, shall be formally operated.

Basic Regulatory Laws (cont.)

Article 14

During the construction or the operation period of nuclear reactor facilities, *the competent authorities may dispatch the inspector to inspect the facilities at anytime*, and may require the licensee to submit relevant materials; wherein, the licensee shall not evade, interfere with or refuse the same. If there is anything not conform to the prescription or if the public health/safety or environmental ecology may be endangered, the competent authorities shall order the licensee to improve the situation or take any other necessary measures within a prescribed time period. If the situation is serious, the licensee does not improve it nor take necessary measures within the prescribed period, the competent authorities may order the licensee to *cease the working on the scene, or operation thereof, or may revoke the license or permit the operation only under a limited power. ….*

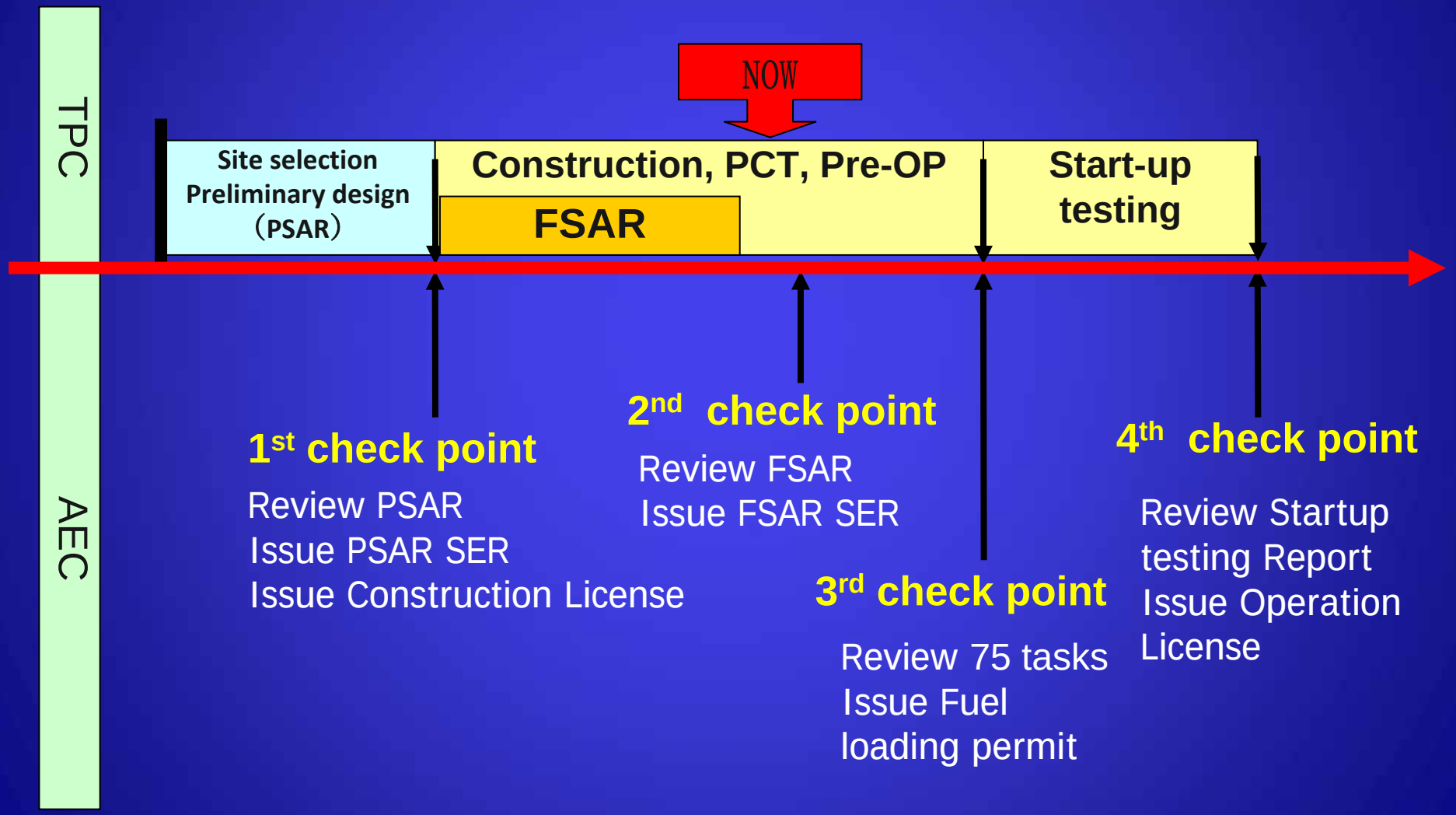
The Process of licensing to LMNPP

- A two-step licensing review process is adopted for nuclear plant in Taiwan.
- For Lungmen Project, a construction permit was issued following a preliminary safety analysis report (PSAR) being satisfactorily reviewed in March 1999.
- AEC started the construction inspection, including resident inspection, after issuing construction permit.

The Process of licensing to LMNPP (cont.)

- Taipower Company submitted first version of FSAR in August 2007 for AEC's review.
- After over 3 years of review, AEC is currently preparing a draft safety evaluation report (SER).
- AEC will conduct readiness inspections for Lungmen plant to confirm the FSAR commitment before issuing fuel loading permit.

The Process of licensing to LMNPP



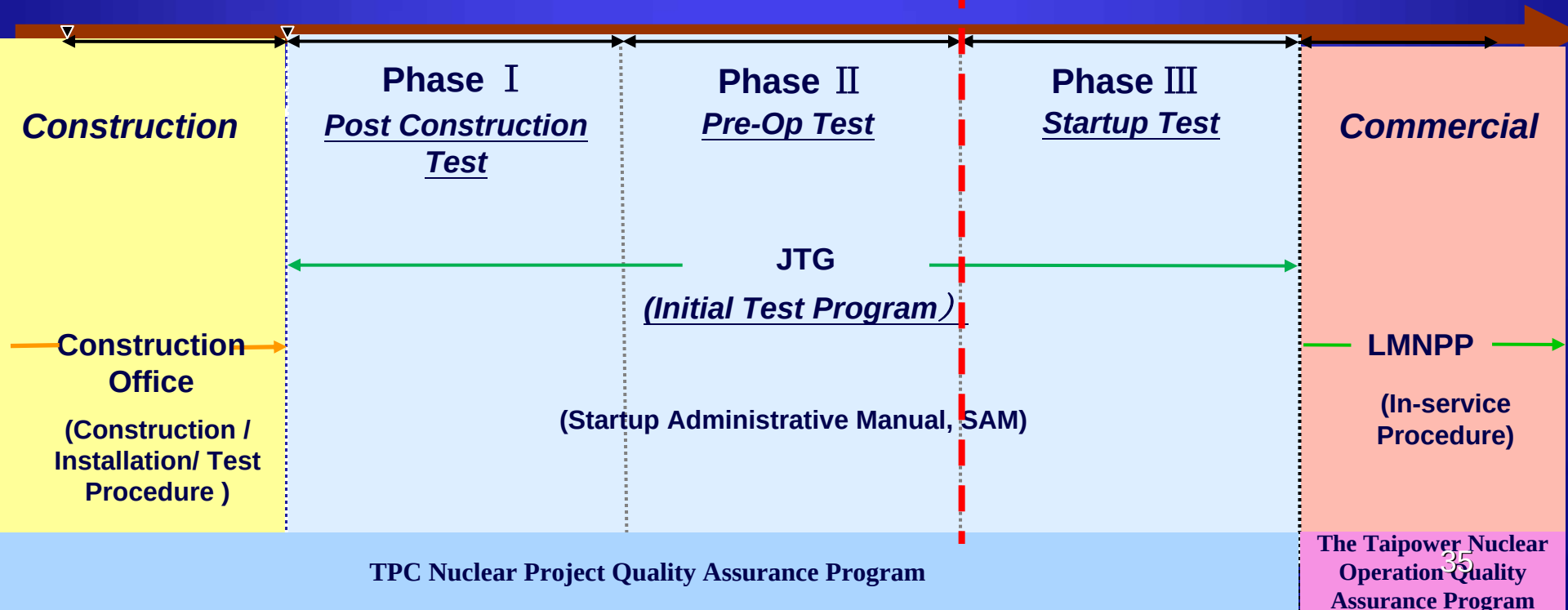
The Qualification of LMNPP's Operator

- As plant operators play a key role in their dynamic responses to normal operations and anomalies, their qualification and ability are among the main themes for nuclear safety.
- Plant operators and senior operators are required to pass stringent tests, including written examination, plant walk-through and simulator operation, before they are allowed to work at the main control room of the plant.

Construction Inspection Framework

- Construction Program Inspection
  - Design Change Process Inspection
    - Construction testing Inspection
      - Operation Readiness Inspection
        - Pre-Op Testing Inspection

- Operation Program Inspection
  - Lo-Power testing Inspection
    - Operation Readiness Insp.
      - Power ascension Insp.
        - ROP transition Insp.



Overview of Regulatory Activities

(1) Routine Inspection

The resident inspection, periodic inspection, and special taskforce inspection

(2) Quality Control Inspection

TPC NED,NSD, and AE--S&W , etc

(3) Quality Inspection of Contractors /Vendors

- Domestic Contractors /Vendors –New Asia Co., CSBC, and CTCI, etc
- Oversea Contractors/Vendors -- Hitachi, IHI, and Toshiba, etc. (Japan)
  General Electric,DRS, and Invensys , etc. (USA)

Overview of Regulatory Activities (cont.)

(4) Safety Analysis Review

- Review of 119 follow-up items of PSAR
- Review of PSAR Amendments, and
- Review of FSAR.

(5) Lungmen Regulatory Meeting

(6) Other Special Regulatory Activities

- Review of Seismic Analysis
- digital I & C

Place：Job Site of LMNPP

Activity：Periodic inspection, special taskforce inspection

Place：Toshiba/
IHI Factory
(Japan)

Activity：Quality
Inspection of
Overseas Vendors

Place：CTCI & CSBC Factory

Activity：Quality Inspection of Domestic Vendors