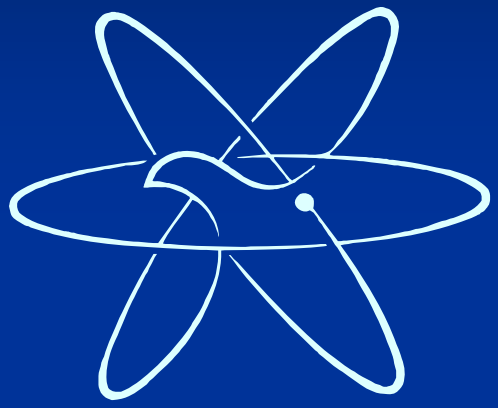
AEC's Response to Fukushima Accident in Japan



Department of Nuclear Regulation
Atomic Energy Council, Taiwan

10th AEC-NRC Bilateral Technical Meeting
Washington, D. C., U.S.A.
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Outlines

- Introduction
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Introduction (1/2)

- State of Emergency was declared on March 11, 2011 by Japan's nuclear regulator, NISA, on the Fukushima Daiichi nuclear power plant after a powerful earthquake and subsequent tsunami struck and crippled the plant, causing reactors in a devastated conditions and radioactivity releases.
- On April 12, NISA uprated the severity of the Fukushima Daiichi accident to highest INES Level 7

Introduction (2/2)

- In Taiwan, AEC formed a special taskforce to monitor the daily situation at Fukushima by various channels and post the plant conditions on the website. Several press conferences were held since the accident occurred.
- AEC also cooperates with other government agencies to take a series of actions such as: monitoring the environmental radiation level, sampling import goods from Japan, and surveying contamination of air travelers from Japan, etc.
- For the plant examinations, AEC requested the TPC to verify the capability of NPPs to respond both the DBA and beyond-DBA accident. That includes 11 near-term and 1 mid-term actions.

Near-term Actions for Operating NPPs (1/11)

- Re-examination of Capability for Loss of All AC Power (SBO)
  - Normal/ Emergency Electric Power
  - Reliability and Endurance of Onsite/ Offsite AC/DC Power
  - Reliability and Endurance of EDG/GTG
  - Turbine-Driven Injection Pump
  - Instrumentation and Control
  - Compressed Air System
  - Normal/ Emergency Communication System
  - Supporting systems required for the above functions

Near-term Actions for Operating NPPs (2/11)

- **Re-evaluate Flooding and Tsunami Protection**
  - **Walkdown and Verify the Integrity of Accessible doors, barriers, and penetrations**
  - **Function, Mechanism, Process and SOP for the Design of Flooding and Draindown**
  - **Prevention of Mudflows and Landslides**
  - **Function, Mechanism, Process and SOP for the Design of Tsunami and Flooding**

Near-term Actions for Operating NPPs (3/11)

- Ensure Integrity and Cooling of Spent Fuel Pool
  - Walkdown and Verify Seismic Design and Heavy-Load Drop Effects of SFP
  - Reassess the Capabilities of Normal and Backup Cooling of SFP
  - Enhance the Cooling/Makeup and Contingency Measures of SFP
  - Calculate the Heatup for Full Core Off-load with Loss of Cooling, Justify the Safety of Full Core Off-load

Near-term Actions for Operating NPPs (4/11)

- Assess Heat Removal and Ultimate Heat Sink
  - Timing and Method of Emergency Depressurization of the RPV
  - Capability of Heat Removal for RPV, S/P, and CTMT
  - Capacity, Supporting Systems, and Backup of Ultimate Heat Sink
  - Seismic Designs of Intake Structures
  - Water Sources and Contingency Measures of Heat Removal
  - Prevention and Contingency Measures for Damage or/and Plugging of Intake Structures from Tsunami
  - Alternatives of Ultimate Heat Sink
  - Injection Path and Equipment's Power for Water Sources
  - Seismic Designs and Integrity of Raw Water Reservoirs and Piping

Near-term Actions for Operating NPPs (5/11)

- EOPs re-examination and re-training
  - Completeness and Comprehensive of Contingency Procedures and Guidelines
  - Completeness and Compliancy of Training for Shift Staff and Outsourcing Personnel
  - Function of Agreements/ Contracts to Mitigate the Emergency Condition
  - Mechanisms, Processes, and Procedures to send Outsourcing Personnel into High Radiation Area
  - Verify the Adequacy of Above Dispatching by Drills

Near-term Actions for Operating NPPs (6/11)

- The procedure to abandon the reactor
  - If a catastrophic accident occurs as Fukushima Daiichi plant, the standard procedure to announce and abandon the severely damaged nuclear reactor shall be established on a timely manner.

Near-term Actions for Operating NPPs (7/11)

- Support between different units
  - Walkdown and Verify the Mitigating Capability of Equipment and Countermeasures to provide Inter-unit Support
  - Enhance the Countermeasures and Backup between Units
  - Examine the Operation of MCRs in the Process of Inter-unit Support

Near-term Actions for Operating NPPs (8/11)

- Considerations for Compound Accidents
  - Walkdown and Verify the Weakness of Mitigating Features, that damaged by the interaction with Seismic/Tsunami/Flooding
  - Verify the Consequences for Degradation or Spurious Actuation of Fire Protection Systems and Accessory Equipment
  - Verify the Negative Effects of Heavy-load Drop in the Seismic Events
  - Examine the Coping Capability of Plant while Offsite Resources are Unable to Arrive in Time

Near-term Actions for Operating NPPs (9/11)

- **Mitigation Beyond DBA Events**
  - Verify the Function of Equipment for Mitigating Severe Accidents
  - Verify the Operations of TSC for Accidents Management
  - Verify the Operability of Alternate Water Sources
  - Verify the Possibility of Hydrogen explosion
  - Evaluate Negative Effects of Heavy-load Drop of CTMT, Rx. Bldg., and Fuel Bldg.
  - Protection of the Staff against from H2 explosion or Heavy-load Drop
  - Verify the Effects and Consequences of Beyond Design Basis Tsunami
  - Enhancement of the seismic Design to 0.4g from 0.3g for Chinshan BWR-4 plant

Near-term Actions for Operating NPPs (10/11)

- Preparedness and backup equipment
  - Verify the Completeness of Equipment, Features, Tools and Spares Required by Procedures or/and Guidelines
  - Verify the Onsite and Offsite Temporary Support Systems and Their Backup
  - Verify the Preparedness of Equipment, Features, Tools and Spares
  - Clarify the amounts of Boron, Radiation Shielding, and Protective Clothes

Near-term Actions for Operating NPPs (11/11)

- **Manpower, Organization, Safety Culture**
  - **Verify the Manpower of NPP available to Cope with Normal Operations and Natural Disasters**
  - **Recommend the Enhancement of NPP's Safety and Support from INER after the Government Reform**
  - **Verify the Countermeasures and Improvement of Safety Culture**

Mid-term Actions for Operating NPPs

- **Periodic Integrated Safety Assessment**
  - **Routine Periodic Assessment for every 10 Years**
  - **To Include the Coping Capability of Fukushima Accident**
  - **To advance the schedule by 2 year for Maanshan NPP**

Evaluation for Lungmen Plant

- No immediate threat since no nuclear fuels in the reactor
- Some Procedures still are under development
- Complete the required actions similar to operating NPPs before the initial fuel Loading
- Two Gas-Turbines Generators should be installed in Lungmen

  - the completion date now is set to June 30, 2013 or the date for issuing operating license of Unit 1, whichever is earlier.

Concluding Remarks

- AEC will continuously collect and monitor the most current plant conditions at Japan
- AEC will review TPC's countermeasures and perform necessary inspections for all NPPs in Taiwan to ensure plant safety
- Taiwan, as part of global nuclear community, hopes to participate in the international forum to discuss and share lessons learned form Fukushima Daiichi accident

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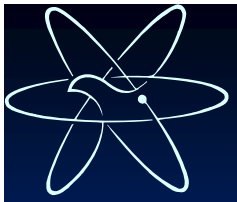
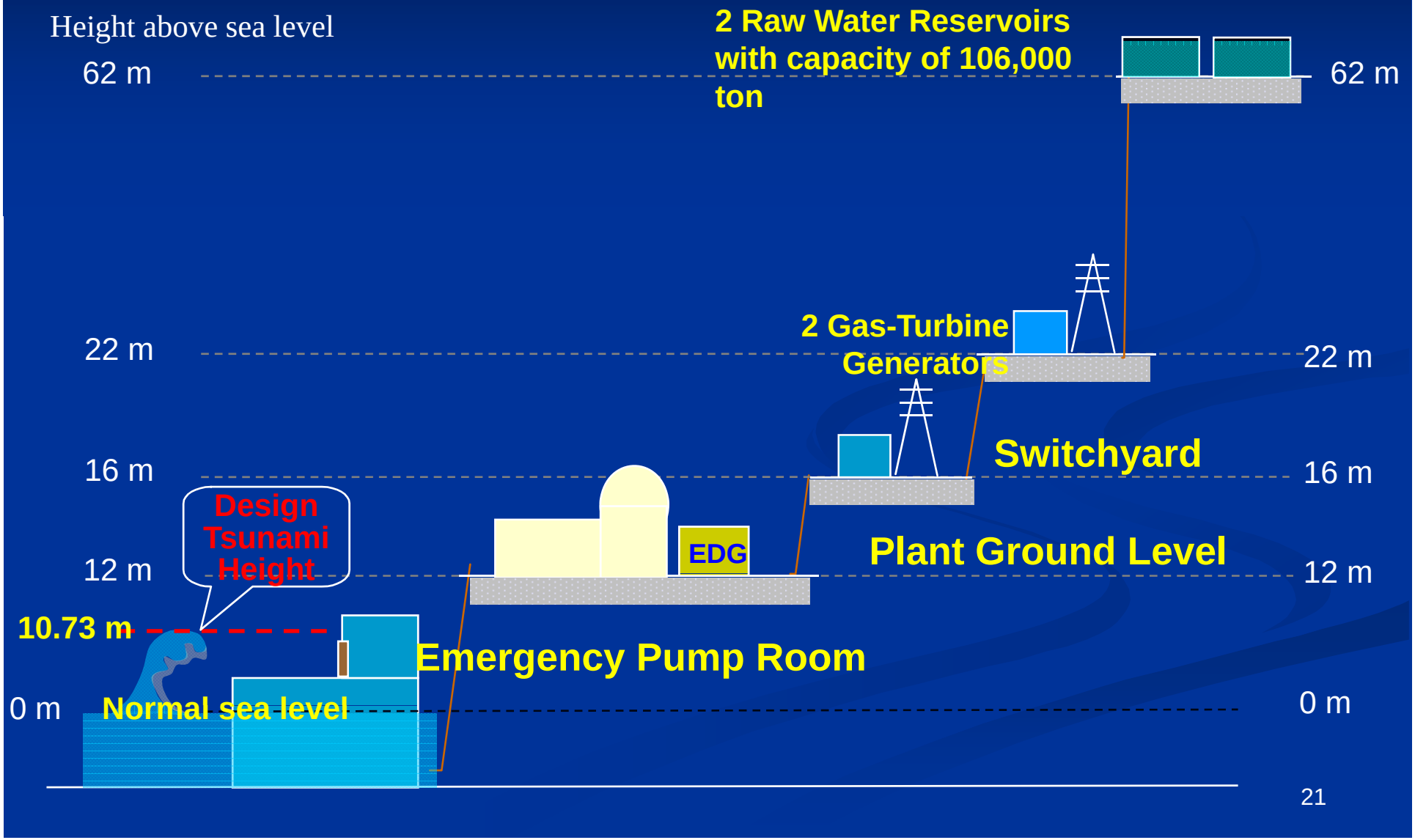
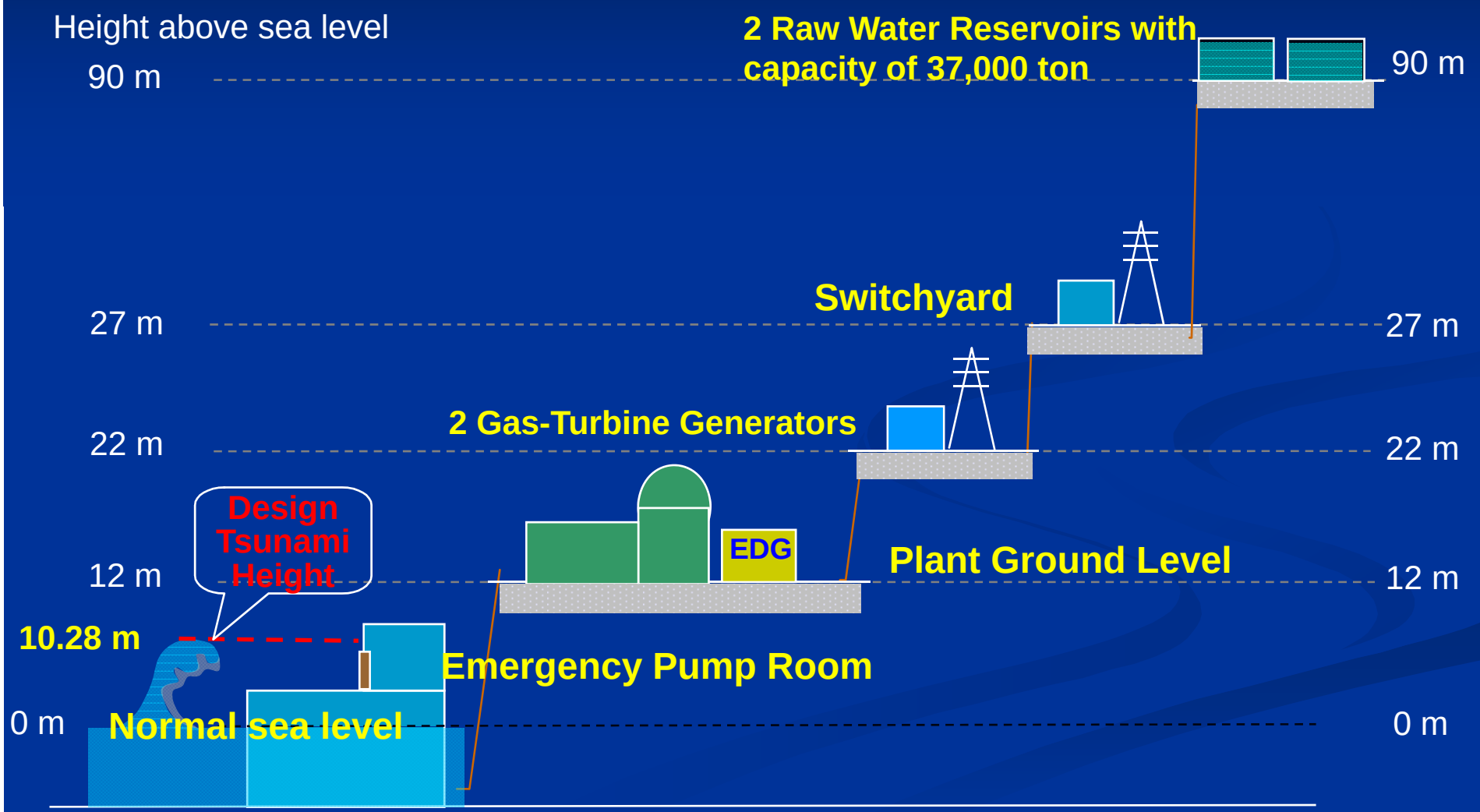


Thank You for Your Attention

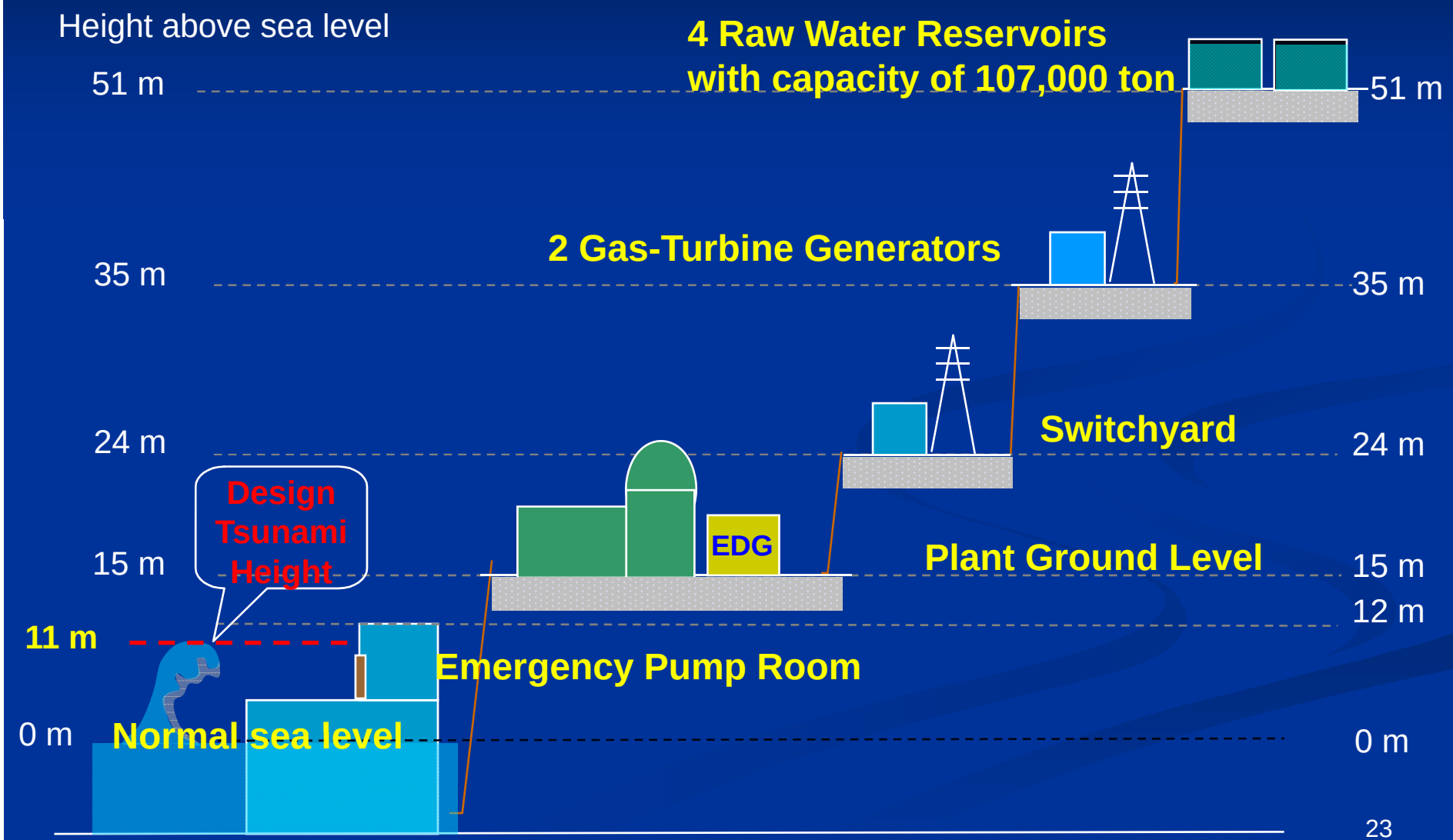
Heights of Major Facilities of Chinshan Nuclear Power Plant



Heights of Major Facilities of Kuosheng Nuclear Power Plant



Heights of Major Facilities of Maanshan Nuclear Power Plant



Heights of Major Facilities of Lungmen Nuclear Power Plant