Current Status of NPPs Decommissioning in Taiwan

29 October, 2019
1. Background and Regulations

2. NPPs Decommissioning in Taiwan
   2.1 Current Status of Chinshan Decommissioning Plan
   2.2 Current Status of Kuosheng And Maanshan Decommissioning Plan

3. Summary
1. Background and Regulations
### Overview of Nuclear Power Plants in Taiwan

<table>
<thead>
<tr>
<th>Plant</th>
<th>Chinshan</th>
<th>Kuosheng</th>
<th>Maanshan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactor Type</td>
<td>BWR-4</td>
<td>BWR-6</td>
<td>PWR</td>
</tr>
<tr>
<td>Containment Type</td>
<td>Mark-I</td>
<td>Mark-III</td>
<td>Large, Dry Post-Tensioned</td>
</tr>
<tr>
<td>Thermal</td>
<td>1,804 MWt</td>
<td>2,943 MWt</td>
<td>2,822 MWt</td>
</tr>
<tr>
<td>Electric</td>
<td>636 MWe</td>
<td>985 MWe</td>
<td>951 MWe</td>
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</table>

#### Commercial

<table>
<thead>
<tr>
<th></th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>12/6/1978</td>
<td>7/16/1979</td>
</tr>
<tr>
<td>Date</td>
<td>12/28/1981</td>
<td>3/15/1983</td>
</tr>
<tr>
<td>Date</td>
<td>7/27/1984</td>
<td>5/18/1985</td>
</tr>
</tbody>
</table>

#### Scheduled Permanent Cessation Date

<table>
<thead>
<tr>
<th></th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>12/05/2018</td>
<td>12/15/2019</td>
</tr>
<tr>
<td>Date</td>
<td>12/27/2021</td>
<td>3/14/2023</td>
</tr>
<tr>
<td>Date</td>
<td>7/26/2024</td>
<td>5/17/2025</td>
</tr>
</tbody>
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Taiwan Power Company
ISFSI was constructed completed but the license is pending due to local government. Fuel may stay in the core for years after operating license expired.

The current strategy is reducing maintenance costs while maintaining safety.

Unrestricted release: the total annual effective dose equivalent should **not exceed** 0.25 mSv/yr.

Submitted **three years prior to** scheduled permanent cessation of nuclear reactor facilities.

Decommissioning work shall be completed **within 25 years**.

Adapt **DECON Method**

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Regulatory Timeline of Decommissioning for Nuclear Reactor Facilities in Taiwan

Within six months after completion of the decommissioning of nuclear reactor facilities, the licensee shall submit the Environmental Radiation Monitoring report (ERM) to regulator for review and on-site final inspection.
2. NPPs Decommissioning in Taiwan
Decommissioning should adopt immediate dismantlement method and complete decommissioning work in 25 years.
2.1 Current Status of Chinshan Decommissioning Plan
Current Status of Chinshan Decommissioning Plan

- **2015.11.24** Submitted to AEC
- **3 Rounds Review**
- **2017.06.28** Approved by AEC

2016 2017 Permanent cessation of CS #1 2018.12.05 Permanent cessation of CS #2 2019.07.16

- **2016.01.06** submitted to EPA
- **2019.03.18** 3rd EIA review meeting
- **2019.07.02** EIA has approved

- The decommissioning permission of Chinshan NPPs was approved on 2019.07.12 and has been effective since 07.16

Taiwan Power Company
Site Utilization Plan of Chinshan NPPs

- 345 KV Switchyard
- Radwaste Storage Warehouse (2)
- ISFSI (2)
- Unit 1
- 69 KV Switchyard
- Low-Level Waste Storage Trench
- Unit 2
- Reservation Area
- New Storage Warehouse
- Radwaste Storage Warehouse (1)
- ISFSI (1)
- Concrete and Steel Separation Area
- Temporary Storage Area (Waste meeting the Release Criteria)

Taiwan Power Company
Schedule of Chinshan NPPs Decommissioning

Transition Phase (8 yrs)
- Final shutdown
- Set up ISFSI & radwaste storage area
- SNF transferred to SFP
- Engineering planning
- Systems drainage and decontamination

Dismantlement Phase (12 yrs)
- SNF transferred to ISFSI
- TB large components dismantlement
- RPV and internal dismantlement
- SFP dismantlement
- Primary containment decontamination
- Decontamination of concrete and buildings

Final Site Survey Phase (3 yrs)
- Buildings demolition
- Land remediation
- FSS

Site Restoration Phase (2 yrs)
- FSS report
- Site restoration

2018
2021
2024
2027
2030
2033
2036
2039
2042
2044

2018
2021
2024
2027
2030
2033
2036
2039
2042
2044

Transition Phase (8 yrs)
Dismantlement Phase (12 yrs)
Final Site Survey Phase (3 yrs)
Site Restoration Phase (2 yrs)
### ChinShan Phase I Dry Storage Facility

<table>
<thead>
<tr>
<th>Dry Storage Type: Concrete Cask</th>
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<tbody>
<tr>
<td><strong>Dry Storage System</strong>: INER-HPS (Technology transferred from NAC-UMS)</td>
</tr>
<tr>
<td><strong>Facility Size</strong>: 0.45 hectare</td>
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</tbody>
</table>
| **Storage Capacity**:  
  - 56 assemblies per cask  
  - 30 casks in maximum (1,680 assemblies) |
| **Boundary Dose limit**: 0.05 mSv / y / person |

The concrete pad, soil preparation and storage equipment are all in place and completed.

**Dry Run (Cold Test)** started in June, 2012

The permission of Soil and Water Conservation Facility is under review by the Local government. **Hot Test suspended. Project got stuck.**
- As the ISFSI(1) could not put in service, the SFP does not have extra space to accept fuels from reactor core.

- Transient phase then divided into pre- and post-stage, depends on the date of the fuel removed from core.

- ROC-AEC had notified that the regulatory requests during the pre-transient stage, will be mainly the same with those in operational period.

- Chinshan NPPs had modified the TS and FSAR into the PDTS & PDSAR to assure nuclear safety during the pre-transient stage.
Considering spent nuclear fuels will be kept in RPV during decommissioning period, AEC request TPC shall follow the requirement of MODE 5 to maintain the safety of the reactor.

However, for TPC, in order to reduce maintenance costs and maintain the safety, TPC submit Pre-Defueled SAR (PDSAR) and Pre-Defueled TS (PDTS) to AEC for regulatory control.

Follow the classification in PDSAR and PDTS, TPC can do the system Evaluation, Recategorization and Transition (SERT) to isolate and abandon unnecessary system.
## Preliminary Work

### Waste Management
- Waste Management Facility Planning and Construction
- 2nd Phase ISFSI Site Preparation and Construction

### Operation and Maintenance
- System evaluation and reclassification
- System abandon and Isolation

### On-site Preparation
- Document and Procedure Transfer
- Site characterization survey
- Preliminary dismantling (non-contaminated)
2.2 Current Status of Kuosheng And Maanshan Decommissioning Plan
Current Status of Kuosheng And Maanshan Decommissioning Plan

• Kuosheng Current status of Planning
  ➢ Kuosheng Decommissioning Plan was submitted to AEC on DEC. 27, 2018 for review.
  ➢ Environmental Impact Assessment has held a public meeting. The EIA report is being prepared and is expected to submit to EPA on Oct, 2020 for review.
Maanshan Decommissioning Plan is being prepared by TPC and is expected to submit to AEC for review on July. 26, 2021.
3. **Summary**
The decommissioning permission of Chinshan NPPs was approved on **July 12, 2019** and has been effective since **July 16**.

Following the **PDSAR** and **PDTS**, SERT procedure provides the criteria and methodology for determining and evaluating changes to the safety and quality classification of Systems.

The isolation of the non-safety related system is still ongoing.

The **Waste Management Area** and the **Radiation Detection center** are being planned and set up.
• Kuosheng Decommissioning Plan was submitted to AEC on Dec. 27, 2018.

• Maanshan Decommissioning Plan is being prepared and is expected to be submitted to AEC for review on July 26, 2021.
Thanks for Your Attention

Chinshan Nuclear Power Plant