# The Status of License Renewal Application and Evaluation in Taiwan

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The Fifth USNRC/TAEC Bilateral Technical Meeting
Washington D.C June21-22,2007



Taiwan power company

INER

Industrial Technology Research Institute

Entergy

E&C

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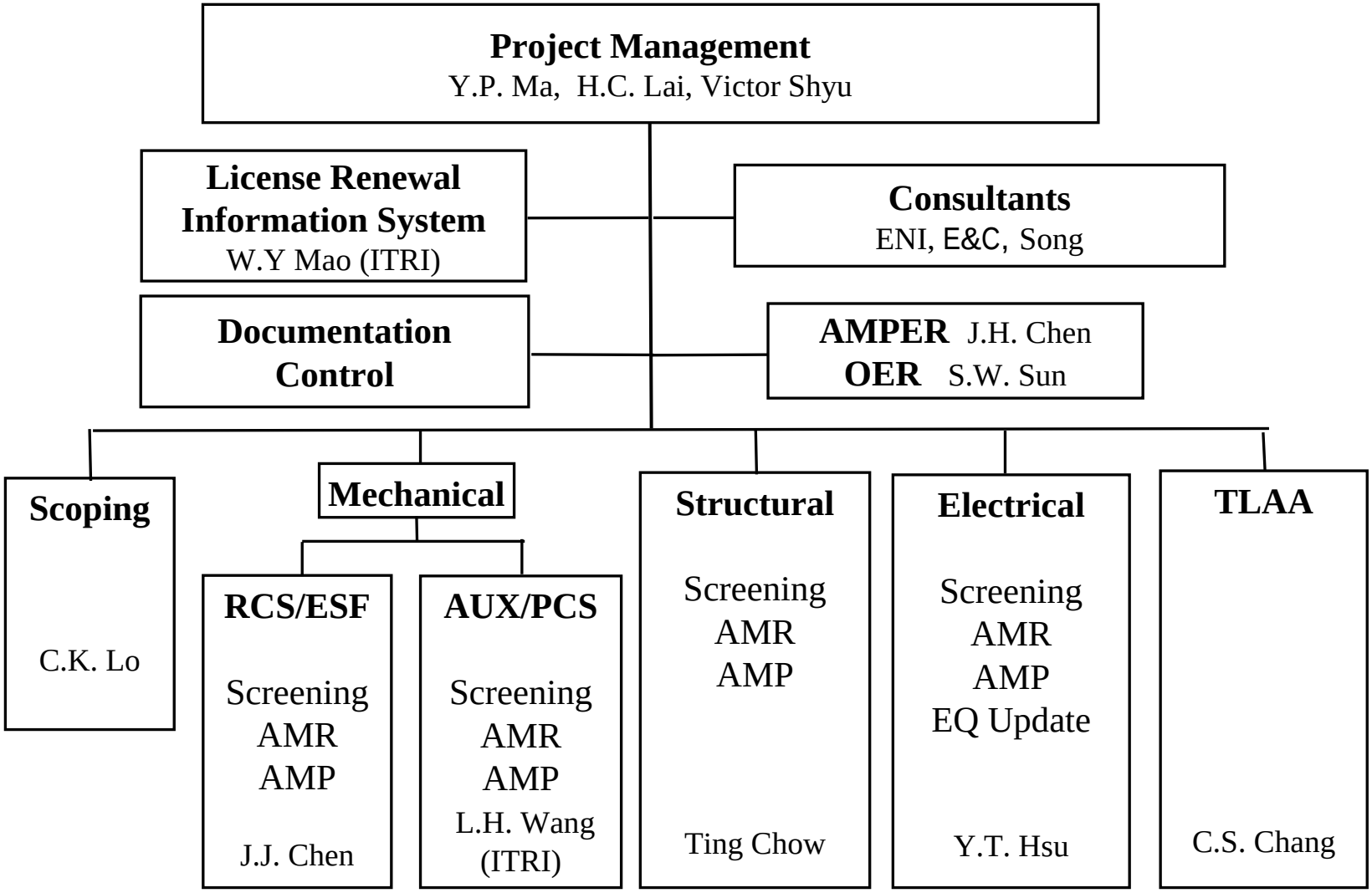
# 1. Introduction

- Up to date, 48 US nuclear units has been granted a 20 years license renewal, 7 under NRC review, 24 announced, based on 10CFR54 regulation.
- The schedule of evaluation of 3 nuclear power plants in Taiwan is Chinshan, Kuosheng and Maanshan sequentially within 10 year period . ( start from 2005 to 2014)

# 1. Introduction

- For CSNPS (Chin Shan NPS), the first NPS of TPC (Taiwan Power Company), the two units were commercially operated from 1978 and 1979, respectively. The license renewal process are been applied to them for a 20 years license renewal.
- The CS-TLIPA (Time-Limited Integrated Plant Assessment) Project was established under Ms. Fiona Wang's supervision of TPC in June 2005. It includes domestic participations, such as
  - INER (Institute of Nuclear Energy Research),
  - ITRI (Industrial Technology Research Institute),
  - E&C (E&C Eng. Co.),
  - Mr. Song,
  - foreign support from ENI (Entergy Nuclear Inc.).

# CS-TLIPA Project Configuration



# License Renewal Information System (LRIS)

## at http://www.cs-tlipa.com.tw/tlipa/index.asp

# 2. Milestones

- April 2004, Ms. Fiona Wang of TPC came back to Taiwan from a 4 months studying on LR in US.
- June 7~10 2005, Mr. Garry Young and Mr. Alan Cox of ENI were invited to Taiwan to give a five-day training course on LR process.
- June 20 2005, TPC contracted out CS-TLIPA project to INER. It includes subcontract to ITRI, ENI, E&C, and Song.
- March 2006, Dr. P.T. Kuo and Dr. Kenneth Chang of USNRC were invited to introduce “US License Renewal Process” at ROCAEC.
- From April to June 2006, 17 members of CS-TLIPA team were sent to the US to observe the NRC audit on the LR application of Vermont Yankee and Pilgrim.

# Mile Stones (Cont.)

- Oct 2006, Mr. Garry Young and Mr. Alan Cox of ENI came to Taiwan to give an 5-day on-site review on the CS-TLIPA internal evaluation reports.
- From Nov 2006 to Feb 2007, 34 CS-TLIPA internal evaluation reports were reviewed by ENI engineers and revised.
- May 2007, CS-LRA (License Renewal Application) was reviewed by TPC and revised.
- June 19~20 2007, CS-LRA was reviewed by Peer Reviewer from several US nuclear plants at NEI (Nuclear Energy Institute).
- CS-LRA will be ready to submit for the review and approval of ROCAEC before the end of 2007.

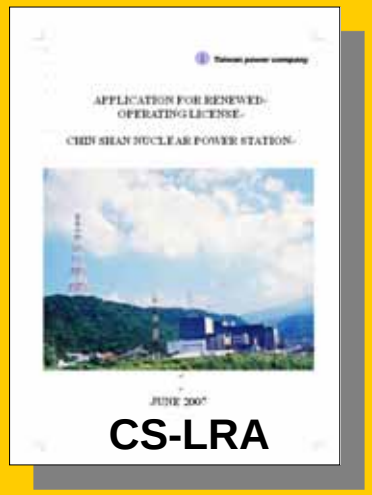
# 3. Related Activities

- MUR Power Uprating: CSNPS is seeking a 1.7% power uprating by MUR (Measurement Uncertainty Recapture) method concurrent with its 20-year license renewal pursuit. The CS-LRA covers necessary evaluation up to operation conditions under 101.7% of original rated power.
- MR and Structure Base-Line Inspection: CS-MR (Maintenance Rule) programs was initiated before CS-TLIPA project. To be complied with MR, the Structure Base-Line Inspection of CSNPS was conducted by CS-TLIPA.
- EQ (Environmental Qualification) components management program was updated by CS-TLIPA.

# 4. Project Reports

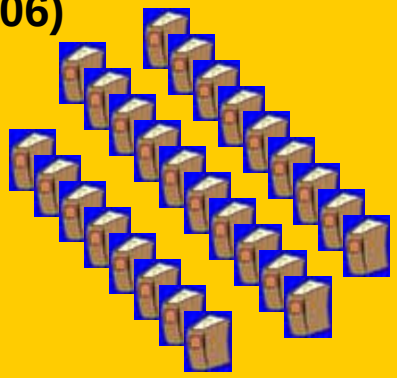
**42 AMPERs (PD-02)**

**Scoping (PD-01)**




**CS-LRA**

**35 AMRs (PD-06)**



**P&ID Markup**

**OER (PD-05)**

**TLAA (PD-03)**

**Fatigue (PD-04)**

# Project Reports (Cont.)

- Scoping Result
  - 29 out of 48 mechanical systems are scoped in.
    - 4/4 RCS systems
    - 8/8 ESF systems
    - 2/10 PCS systems
    - 15/26 AUX systems
  - 20 out of 95 structural systems are scoped in.
  - All 38 electrical systems are scoped in, then the active or short-lived components will be screened out in AMR (Aging Management Review) process.

# Project Reports (Cont.)

- Mechanical
  - Aging Management Review (AMR): 29 AMRM reports in total.
    - RCS: 4
    - ESF: 8
    - PCS: 2
    - AUX: 15
  - Aging Management Program (AMP): 30 AMP reports in total.

# Project Reports (Cont.)

- Structural
  - Aging Management Review (AMR): 6 AMRC reports in total.
    - Primary Containment
    - Combination Structure
    - Emergency Intake Structure
    - Process Facilities
    - Yard Structure
    - Bulk Commodities
  - Aging Management Program (AMP): 8 AMP reports in total.

# Project Reports (Cont.)

- Electrical
  - Aging Management Review (AMR): 1 AMRE reports.
    - Insulated cables and connections
    - Transmission conductors
    - Switchyard bus
    - High voltage insulators
  - Aging Management Program (AMP): 4 AMP reports in total.

# Project Reports (Cont.)

- AMPER (Aging Management Program Evaluation Report), summarize all the 42 programs, including mechanical, structural, and electrical.
  - New/Existing
    - 10 new programs
    - 32 existing programs
  - Consistent with NUREG-1801
    - 31 consistent with NUREG-1801 (may have enhancement)
    - 10 with exception to NUREG-1801
    - 1 plant specific

# CSNPS Program Consistency with NUREG-1801

| Number | Program Name | Plant -Specific | NUREG-1801 Comparison | | |
|---|---|---|---|---|---|
| | | | Programs Consistent with NUREG-1801 | Programs with Enhancements | Programs with Exceptions to NUREG-1801 |
| 1) | ASME Section XI ISI/IST | | ✓ | | |
| 2) | Water Chemistry | | | ✓ | ✓ |
| 3) | Reactor Head Closure Studs | | ✓ | | |
| 4) | RPV ID Attachment Welds | | ✓ | | |
| 5) | Feedwater Nozzle | | | ✓ | ✓ |
| 6) | CRD Return Line Nozzle | | | | ✓ |
| 7) | IGSCC | | ✓ | | |
| 8) | RPV Instrument Penetrations | | ✓ | ✓ | |
| 9) | RPV Internals | | | ✓ | ✓ |
| 10) | CASS Thermal Aging | | ✓ | | |
| 11) | Flow-Accelerated Corrosion | | ✓ | | |
| 12) | Bolting Integrity | | ✓ | ✓ | |
| 13) | Open-Cycle Cooling Water System | | | | ✓ |

# CSNPS Program Consistency with NUREG-1801

| | | | | | |
|---|---|---|---|---|---|
| 14) | Closed-Cycle Cooling Water System | | ✓ | | |
| 15) | Crane Inspection | | ✓ | ✓ | |
| 16) | Compressed Air Monitoring | | | | ✓ |
| 17) | Fire Protection | | | ✓ | ✓ |
| 18) | Fire Water System | | | ✓ | ✓ |
| 19) | Buried Piping and Tanks Surveillance | | ✓ | ✓ | |
| 20) | Aboveground Steel Tanks | | ✓ | | |
| 21) | Fuel Oil Chemistry | | | ✓ | ✓ |
| 22) | Reactor Vessel Surveillance | | ✓ | ✓ | |
| 23) | One-Time Inspection | | ✓ | | |
| 24) | Selective Leaching of Materials | | ✓ | | |
| 25) | Buried Piping and Tanks Inspection | | ✓ | ✓ | |
| 26) | Class 1 Small Bore-Piping | | ✓ | | |
| 27) | System Walkdown | | ✓ | ✓ | |
| 28) | Inspection of Miscellaneous Piping Components | | ✓ | ✓ | |

# CSNPS Program Consistency with NUREG-1801

| | | | | | |
|---|---|---|---|---|---|
| 29) | Lubricating Oil Analysis | | | | ✓ |
| 30) | ASME Section XI, Subsection IWE | | ✓ | | |
| 31) | ASME Section XI, Subsection IWL | | ✓ | | |
| 32) | ASME Section XI, Subsection IWF | | ✓ | | |
| 33) | 10 CFR 50, Appendix J | | ✓ | | |
| 34) | Masonry Wall | | ✓ | | |
| 35) | Structures Monitoring | | ✓ | | |
| 36) | Inspection of Water-Control Structures | | ✓ | | |
| 37) | Protective Coating | | ✓ | | |
| 38) | Non-EQ Insulated Cables and Connections | | ✓ | | |
| 39) | Non-EQ Inaccessible Medium-Voltage Cables | | ✓ | | |
| 40) | Non-EQ Electrical Cable Connections | ✓ | | | |
| 41) | Metal Fatigue | | ✓ | ✓ | |
| 42) | Environmental Qualification of Electrical Components | | ✓ | | |

# Project Reports (Cont.)

- TLAA (Time-Limited Aging Analysis), includes
  - Reactor Vessel Neutron Embrittlement Analyses
  - Metal Fatigue Analyses
  - Environmental Qualification Analyses
  - TLAA in BWRVIP
  - Plant-Specific TLAA
- Three approaches
  - Enveloped in original calculation
  - Re-calculate
  - Need AMP management

# Project Reports (Cont.)

- Fatigue Analysis
  - Reactor Pressure Vessel and internal component
  - Class 1 piping
  - Containment and suppression pool
  - Non Class 1 piping
- All mechanical components are complied with the requirement of extended operation except feedwater sparger and small portion of Class 1 piping. Will re-calculate the fatigue data.
- Existing GE design operation transient numbers may be exceeded during the extended operation. Will re-evaluate the anticipated design operation transient numbers for extended operation.

# Project Reports (Cont.)

- OER (Operating Experience Review):
  - All Aging Effect Required Management (AERM) identified were consistent with NUREG-1801.
    - Corrective Maintenance (CM) records, RER, DCR, outage report, NRC Generic Letter, Information Notice, etc., in a period of the past 7 years, were reviewed.
    - Maintenance engineers of all systems were interviewed.
  - The effectiveness of existing AMP were verified.
    - Inspection records, NCD, outage report, and audit reports were reviewed.
    - Responsible engineers of applicable procedure were interviewed.

# 5. Summary

- A multiple discipline project as License Renewal needs participation from different resources.
- US supports from NRC and nuclear industry help to leverage the license renewal process for CS-TLIPA project.
- The peer review from several different utilities in the US adds confidence of CS-LRA to ROCAEC and the public.
- TLIPA team is willing to participate in peer review of other new LR application in the US.