A Practical Example of the Implementation of an NPP Human Performance Promotion Program and a Safety Culture Peer Review in China

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General Information Shared with You from China
Nationwide Electric Generation Distribution in China

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<th>Year</th>
<th>Others</th>
<th>Nuclear Power</th>
<th>Hydropower</th>
<th>Thermal Power</th>
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<tr>
<td>2005</td>
<td>0.11%</td>
<td>2.15%</td>
<td>16.20%</td>
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<td>2006</td>
<td>0.25%</td>
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<td>2007</td>
<td>0.27%</td>
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<td>14.94%</td>
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<td>2008</td>
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<td>16.45%</td>
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<td>2009</td>
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<td>1.95%</td>
<td>14.26%</td>
<td>83.05%</td>
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<td>2010</td>
<td>1.94%</td>
<td>1.80%</td>
<td>15.99%</td>
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<td>2011</td>
<td>1.57%</td>
<td>1.85%</td>
<td>14.03%</td>
<td>82.55%</td>
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<td>2012</td>
<td>2.01%</td>
<td>1.99%</td>
<td>17.40%</td>
<td>78.60%</td>
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</tbody>
</table>

Reference: China Nuclear Power Report
Unit Capacity Factor Trend of NPPs in China from 2002 to 2012

① NPPs in China have operated safely and stably since 1991.
② INES Level II or higher event does not take place.
③ The discharge of radioactive effluents is far below the state regulatory limits.

Average UCF: 89.9% in 2010, 89.7% in 2011, 89.4% in 2012
Status of NPP Units Constructed in China
Activities of NPP Human Performance Promotion Program

---- The program started systematically in 2009 at utility (CNNC) level
Mechanism of Events
## HU Theory We Followed

### Organization Strategy

1. Equipment Performance
2. Administration
   - Training & Qualification
   - Plan & Guidelines
3. Culture Management
   - Learning & Understanding
   - Propaganda
4. Oversight Management
   - HU Committee & Working Group
   - Assessment
   - Corrective Actions
   - Continuous Improvement

### Personnel Strategy

1. Human Error Prevention Tools
2. Utilization of those tools in periods of work preparation, implementation and feedback respectively.
Step 1: Organization

- NPP human performance promotion committee
- NPP human performance working group
- Members come from CNNC HQ, all NPPs and TSO (RINPO)
- Duties of all parties involved.
Step 2: Investigation & Plan

- International HU Seminar
  - Train the Trainer Program
- Five-year HU Development Program and Yearly Plan
- Localization of Overseas Products (e.g. Video Clips)
  - WANO Pre-job Briefing
  - WANO Task Observation & Coaching
  - Utility Human Error Prevention Tools
  - The Practical Coach.
Step 3: Establishment of CNNC Own HU Management System

- Training Textbook & Reference
  - Fundamental, severe accidents, HU events
- Human Error Prevention Manual
  - 11 human error prevention tools
- Technical Guidelines
  - Questioning attitude, Post-job brief
- Training Materials
  - PPT, domestic video clips, examination questions
- NPP HU Management Guidelines
- HU Event OE Manual
  - In OP, MA, CY areas
Step 4: Training, Propaganda, Workshop and Competition Activities

- Classroom training + Computer Aid
  - For managers
  - For plant and contractor’s employees
- Poster
- E-learning
- Workshop of Human Error Prevention Tools Application
- Knowledge and Skill Competition of Human Error Prevention
Step 5: Keeping HU Promotion Program Ongoing

- Establishing close tie between HU Training and Basic Safety Qualification (8+1)
  ① Industry Safety
  ② Safety Culture
  ③ Quality Assurance
  ④ Emergency Response
  ⑤ Radiation Protection
  ⑥ First Aid
  ⑦ Fire Protection
  ⑧ Security
  ⑨ Human Performance

- Plant Employees first, then extending the coverage to contractor’s employees
Step 6: Evaluation

- Conducting utility observation & coaching activity of human error prevention tools application on site during outage
  - It was implemented once in 2011.
  - 10 reviewers from HQ & other NPPs worked on site one week.
  - PO&C was drafted and used.
  - Employees know human error prevention tools and in the course to use them skillfully.
Step 7: Continuous Improvement

– Post-based human error prevention tools development.
– Establishment of human performance laboratory.
– NPP HU program self-assessment.
– HU performance indicators and benchmarking.
– Developing HU event OE manual in more areas.
– ......

Road Map
1. The “I don’t know” problem was solved. More efforts will made to solve “I don’t do it skillfully & naturally” problem.

2. The NPP performance of safe & reliable operation is enhanced and the number of Licensing Operational Event (LOE) decreases year by year.

3. The program starts from knowledge import and ends at localization of implementation.
Nuclear Safety Culture
Peer Review Practices
Step 1: Investigation and Scheme

– IAEA SCART Seminar

– WANO NSCA TSM

– The reasons why NSCA is selected:
  • Up to 2011, NSCA was conducted more than 100 times in US NPPs.
  • NSCA uses shorter site duration (One week).
  • The survey and interview analysis software used in NSCA demonstrate that the *quantitative analysis* can be achieved.
  • WANO published 《Principles for a Strong Nuclear Safety Culture》 in 2006.
Step 2: Site Observation of NSCA

- To dispatch 3 engineers to USA in the duration of three weeks.
- To observe two NSCAs at different NPPs.
- One week stayed at INPO for learning & discussing.

- To work out PO&C based on WANO GL 2001-07, 2002-01, 2002-02, & 2006-02 (8 principles and 56 attributes)
- 650 pages Manual to guide the method of each activity in the full process (meeting, questionnaire, interview, data collection, etc.).
- Software in Chinese to achieve statistics function.
Step 4: Peer Review Activities

- 10~12 reviewers from HQ & other NPPs buildup the team.
- Survey to all employees, around 60 site interviews, meeting observations and data analysis are typical type of activities.
- Once for an NPP per year.
- Two safety culture peer reviews were conducted.
- Two more were planned to be conducted in 2013 and 2014 respectively.
1. Safety culture peer review is at its initial stage in CNNC. Employees need time to correctly link facts with principles/attributes.

2. After first run of peer review, the results of 4 reviews will be analyzed for better understanding.

3. We are underway to seek the most suitable way for safety culture assessment in China.
Final Conclusion

1. Four years human performance promotion program implementation awakens and consolidates NPP employees’ **consciousness** on human error prevention and safety culture, and points out the direction to strive for, which guarantees NPP safe and reliable operation.

2. TSO can make great contributions on program implementation due to:
   - Long term, experienced personnel, full time working in the area.
   - Cross-plant and cross-organization experience.
   - Institutional advantage.
Thank You for Your Attention!