Human Resources Development for the Nuclear Industry

IAEA Conference

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March 2010, Abu Dhabi

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Nuclear power Development Plan

Now, China installed electric power capacity is > 860GW. Current nuclear power installed capacity is 9.10GWe, 11 units and ~1%. While 24 units are under construction, 25.40GWe.

National Nuclear power development program up to 2020:
~5% of installation capacity
~80GW
How to develop the HR effectively and efficiently to meet the safe and sound development of NP as nuclear power is indispensable for the sustainable development??

Demand of HR development

HR development shall cover the whole process and fields of various nuclear application to ensure the safety of nuclear industry in case of self-reliance development.
Experience and effect of HR develop.

China covers the expertise in importation and exportation of Nuclear Power Plants (NPPs) and has the experiences for HR development of both domestic and overseas.

1. Self-reliance development of nuclear industry:
   - Nuclear R&D since 1955
   - 300MWe PWR first as a cradle 40 years SNERDI
   - CNP 600 (M310 based) CPR1000 (M310 based)
   - CNP 1000
   - CAP1400/1700 (Passive technology based from W)

2. Importation of M310 and EPR from France, Candu 6 from Canada, VVER from Russia and AP1000 and passive technology from Westinghouse USA.

3. Exportation of 340MWe to Pakistan

4. G-IV SCWR, and G-V TWR Cooperation with Terra Power Co. of Bill Gates

1. HR development for domestic NP

| The First Self-design and Self-construct NPP in Mainland China Qinshan 300 MWe NPP | The first introduced NPP from French Dayabay NPP 2×980MWe NPP |

With development of NP, China has brought up a HR team through design, manufacture, construction, operation and management of NPP.

- Mentoring (master/apprentice system at the beginning)
- Using the NPP in operation as the cradle Qinshan and DYB
2. HR development for the exportation

China exported two NPP and co-developed the HR for the plant operation, design, site technical service and maintenance with PAEC.

SNERDI took on 396 man-months classroom training and 1286 man-months on-job training.
Owner managed to do the design independently with reviews from SNERDI for some items in NPP for the building and practicing design capability.

The owner’s design institute was set up in the process and the design capability was established gradually on basis of the indigenous study and abilities obtained from China.

Now, the owner is fully able to operate the NPP safely and reliably on self reliance due to efficient management and development of HR.
### 3. HR development for NP introduction

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<tr>
<th>Units</th>
<th>Type</th>
<th>Country</th>
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<tbody>
<tr>
<td>Daya bay (2×980MW)</td>
<td>M310</td>
<td>France</td>
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<td>Lingao I (2×990MW)</td>
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<tr>
<td>Qinshan III (2×720MW)</td>
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<td>Tianwan (2×1060MW)</td>
<td>VVER</td>
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<tr>
<td>Tanahan I (2×1700MW)</td>
<td>EPR</td>
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<td>Sanmen 1 (2 x 1250MW)</td>
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Shadow Training of AP1000 introduction

- Adopts a Sino-foreign joint project management mode (JPMO/SPMO), to implement the project management for Nuclear Island and for project management on site.
- Establishes management procedure system and standardized management process.
**Technology Transfer**

The AP1000 technology transfer contract now is carrying out in SNPTC and SNERDI, in which includes five contracts between SNPTC and WEC joint team. The TT documents are enormous and divided into 21 parts basing on the specialty and the computer analytical codes are hundreds.

- CRT  Classroom Training at SNERDI
- OJT  On-Job-Training at Westinghouse

<table>
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<th>OJT</th>
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<tr>
<td>The sum of man-days</td>
<td>6072</td>
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**Experience and effect of HR develop.**

**The Pellet**

A brochure publication for Westinghouse Nuclear Fuel. Published by employees and editors.

**Design participation under AP1000 subcontract of Westinghouse.**

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3. HR countermeasures for booming NP

1. Establishment of national infrastructures
   Proper establishment of national infrastructures is the basis of nuclear safety and NP HR development.

Universities with nuclear engineering faculty

R&D organizations

Safety review administration

Relevant facilities
2. Foreseeing demand of HR development

Foreseeing demand of HR development is indispensable.

Proper programming, planning

Before the NP programs implement

A detailed plan for the HR development by referring other advanced NP corporations for HR development.

SNPTC
May, 2007 under China long term NP plan

Can meet the supportive and following project needs
HR countermeasures for booming NP

The NP industry should in fair weather make provision for rainy days, and think long-term.

More than ten universities

- Tsinghua University
- Shanghai Jiaotong University
- Xian Jiaotong University
- Harbin Engineering University

After 2015, along with young man growth during practical work, it will come into a stable period gradually.

University education, self learning and job training

1 University education

- Before students leave from universities
  - Properly integrated to intensively study the nuclear technology and philosophy one year (from different or relevant disciplines)
  - Go back university after some years engineering

2 Self learning

Study everywhere, Grow every second

Web education
3. Job training

- Orientation training: Company culture, quality system, management procedures, and basic NP knowledge.
- Pre-service training: Study codes and standards, computer software, etc.

On-job training

Normal training, occupational qualifications continuing education, academic education, senior helping junior, technical exchanges between engineers, etc.

The training will run through the whole work life

4. Market or value oriented—internationalized

The NP industry needs to be market or value oriented to attract more brilliant students and talents to reduce the pressure of HR development of nuclear engineering

- Broad career path
- More remuneration
- Incentive systems

Attract various talents to join the NP industry
5. Building perfect HR cultivating system

- Good allocation of NP training resources
- Comprehensive and systematic NP training system (technology and management)
- Etc.

For the country of newly developing NP

1. Bring up HR team
2. Well-structured of high-caliber people in a whole array of disciplines needed for the NP development
3. Comprised of senior management personnel and technology specialists

Corporate and learn from other developing or advanced NP country
What SNERDI for HR development

1. Knowledge management system
2. Web education platform (E-learning)
3. HR team cultivating system
4. Mentoring
5. Incentive system
6. Career planning

**1. Knowledge Management (KM)**

- The Goal of KM
  - Bring up learning organization, learning staffs
  - Raising core-competitiveness
  - Helping staffs getting required knowledge rapidly through KM, which can bring up specialists and expert in multi-skills, etc.
What SNERDI for HR development

1. Design Guideline
   - Standardized Design
   - E-library
   - Network courseware
   - Design experience feedback
   - Etc.

KM contents and functions

- Those who need knowledge at the time of required can get the right thing

2. Web education Platform
   - A modern training management process which improved the training effect.
   - Collection of learning resource, which can promote the communication and sharing of learning experiences.
   - Building of the advantage of core knowledge and experiences, which can enhance the KM.
**3. HR team cultivating system**
- Talented person echelon and specialized team
- Senior and junior, etc.

- Leader of field subject profession
- Experts of the company
- Academician of company

*The leader of subject will play important roles in subject planning, carrying out the plan, talented person echelon, team work, etc.*

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**4. Mentoring**
The system of master looking after apprentices or seniors looking after juniors

Rewarding excellent masters and apprentices on Teachers' Day (2009)

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**5. Incentive system**
- Performance management system
- Compensation system
- Good atmosphere, etc.

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**6. Career planning**
- Assessment for personal status
- The goal of career development
- A plan of working
Conclusion and thinking

Planning and communication early

Good mechanism

Increasing investment

Promoting and improving HR development for NP industry efficiently

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Thank You!

Welcome you to 2010 World Expo Shanghai