Human Resources Development Challenges for Nuclear Newcomers

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Global coordination of E&T players in France

Academic education

- **Academic institutions**
  - Engineering and master degree level
  - Operator in nuclear education & training
  - Technician level and vocational training
    - Ministry of Education (Prof. High schools)
    - IRI/AFPI, etc...

- **Hands-on training**

- **Industrials**
  - Leading companies in the nuclear industry
    - AREVA
    - EDF
    - GDF Suez
    - GIIN

- **Research, Safety, etc…**
  - Safety Authorities
  - Technological Research
  - Waste management

- **French State departments**
  Higher education and research, Industry, Environment and Energy, Defense, and Foreign Affairs
Topics

The Importance of Human Resources Development (HRD).

Essential aspects of an HRD strategy.

Focus on HRD of selected stakeholders.

Conclusion and take away messages.
The importance of HRD.
Recognized as first priority by IAEA. Human resources form the cornerstone for all infrastructure activities!

A nuclear program offers job creation opportunities.

HRD has a strong lever effect on program sustainability
- Safety and safety culture?
- Program performance?
- Public acceptance?

Engaging in a nuclear program is a long term commitment…

19. Procurement
18. Industrial Involvement
17. Radioactive Waste Management
16. Nuclear Fuel Cycle
15. Security & Physical Protection
14. Emergency Planning

13. Environmental Protection
12. Site & Supporting Facilities
11. Stakeholder Involvement

10. Human Resources
9. Electrical Grid
8. Radiation Protection
7. Regulatory Framework
6. Safeguards
5. Legislative Framework

4. Funding & Financing
3. Management
2. Nuclear Safety
1. National Position

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Infrastructure</th>
<th>Laws, Regulations, Standards</th>
<th>National Organisation &amp; Control</th>
<th>Strategy</th>
</tr>
</thead>
</table>

The importance of HRD. Background.
The importance of HRD. Nuclear energy is a long time commitment.

Human resources must be dealt with carefully from the very beginning of the program and over its life cycle.
The importance of HRD.
Dealing with a wide range of stakeholders.

- Decision makers
  - Government
  - Investors
  - Insurances
- Regulators & Safety Authorities
- Fleet owner operator
- Nuclear waste mgt. orga.
- Supply chain
  - Engineering
  - Manufacturing
  - Construction
  - Maintenance
- Education and training
- Research

Different activities, different competences, different time frames…
…But a similar need for a global and integrated HRD solution!
The importance of HRD. Sequence and anticipation of HRD.

Sequence and anticipation of HRD:

Pre-project decision making and launching

Project life cycle control

Decision makers

Regulators and safety authorities

NEPIO

Utility

Engineering suppliers

Manufacturing suppliers

Construction suppliers

Maintenance suppliers

Research, education and training

3+ Y

7+ Y

60+ Y

Anticipation for HRD

Complement to initial education
The importance of HRD. Considering “nuclearization”.

Resource categories

- Nuclear specialists working on the process (research, core design, safety experts).

- Staff having to deal with interfaces with the process (plant systems engineering, operation managers).

- Staff having no contact with the process (manufacturing, non nuclear maintenance).

Note: Figures are indicative and account for all staff involved in the program. They significantly vary from one stakeholder to another.
Essential aspects of HRD strategy.
Essential aspects of HRD strategy. A look at country’s strategy.

- Plug and light!

- Limited HRD challenge

To develop a new national industry
- National
- Regional
- International

Extended HRD challenge
Essential aspects of HRD strategy. Factors influencing the choice of a national strategy.

- **National development**
  - Energy mix.
  - Social & Economical situation.
  - Job market (national, regional, international).
  - Industrial development.
  - Level of infrastructures.
  - National education & training capabilities.

- **International network**
  - Relations with established nuclear countries.
  - Level of internationalization of stakeholders (industry, research, education and training).

- **National nuclear program key characteristics**
  - Targeted level of installed power.
  - Timeframe for program implementation.

Make use of local as well as international cooperation, e.g. strategic partnership involving an experienced utility and the selected technology and related vendor.
Essential aspects of HRD strategy. Building a HRD strategy.

Subsequent slides assume that a certain level of localization of nuclear activities is decided.

- Basically two approaches
  - Hiring from abroad
    + Quick
    + Experience
    - Cost
    - Turnover
    - Limited resources
  - Developing national resources
    + Jobs creation
    + Motivation of people
    + Autonomy
    - Delay
    - Potential tension on resources shared with other sectors

A flexible mix dependent on country’s individual situation

Attract – Retain - Develop
Essential aspects of HRD strategy. Adapting with project phases.

<table>
<thead>
<tr>
<th></th>
<th>Pre-project</th>
<th>Program decision making</th>
<th>Fabrication and construction</th>
<th>Operating of the fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiring from abroad</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Educating internationally</td>
<td>+</td>
<td>++</td>
<td>++</td>
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<tr>
<td>Educating nationally</td>
<td>++</td>
<td>+++</td>
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<tr>
<td>Bridging training for unemployed</td>
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<td>Bridging training for mobility staff</td>
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<tr>
<td>Vocational training</td>
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More + means higher interest in the solution

Note: There is no fixed solution valid for all cases. Here is assumed one country with no nuclear history, but established industrial, education and training capabilities that can adapt to cope with the new needs.
Essential aspects of HRD strategy. Managing critical phases.

Two critical phases

- Steep ramp up at program launch.
- Significant ramp down at end of construction phase.
- Strong ramp down also when decommissioning will start... But this is another story!

Assumptions: Fleet of several blocks (10 to 15) with aggressive construction scheme and development of an ambitious national nuclear industry.
Focus on HRD for selected stakeholders.
Focus on HRD. Owner Operator.

Assumptions:

- High degree of localization with a long-term objective of a rather self-relying national nuclear industry
- Quite ambitious nuclear power program (NPP fleet)

Project management, procurement, contract, site management

- Engineering degree necessary.
- Several hundred people with steep ramp up before decision making phase.
- Gradual transfer into fleet engineering team.

Fleet operation and maintenance

- To be recruited early enough, long and extensive training.
- A few thousands people (ca 350 per block).
- Involved in key activities (e.g. commissioning, prep. of operation).
- Small fraction of nuclear specialists
Focus on HRD.
Supply Chain.

- Assumptions: strong localization strategy.
- Local supply chain will represent the strongest opportunity for jobs creation.
- Generally easy to develop with local resources.

<table>
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<th>Engineering</th>
<th>Manufacturing</th>
<th>Construction</th>
<th>Maintenance</th>
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<tbody>
<tr>
<td>➢ Several hundreds people, ramp up before contract award.</td>
<td>➢ Several thousands per block during fabrication and construction. Steep ramp up!</td>
<td>➢ Several thousands per block during construction. Steep ramp up!</td>
<td>➢ Several hundreds per block.</td>
</tr>
<tr>
<td>➢ Detailed engineering then support to engineering.</td>
<td>➢ Several hundreds per block in support to operation</td>
<td></td>
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</tbody>
</table>
Conclusion and take away messages
Conclusion and take away messages

- HRD solution is dependent upon country’s economical, societal, industrial situation and development strategy.

- HRD to be integrated in the global HCB approach (education and training, KM, knowledge networks).

- Maximum local benefit with national development.

- International collaboration and partnership with competent and experienced partners is recommended (lever effect).

- Anticipation is key.

HRD for a nuclear program is challenging but achievable. Countries already did it and are ready to build long term partnerships.
Special French Side Event

NUCLEAR EDUCATION & TRAINING IN FRANCE
AND
SUPPORT TO NEWCOMER AND EXPANDING COUNTRIES

Wednesday, 14 May 2014
From 17:30 to 19:00
IAEA VIC, C Building, Board Room C, 4th floor
Human Resources Development Challenges for Nuclear Newcomers

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