Joint ICTP-IAEA School of Nuclear Energy Management

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Workforce Planning for Nuclear Power Programmes

PAGANNONE Brenda

International Atomic Energy Agency, IAEA
Department of Nuclear Energy
Wagramer Strasse 5, P.O. Box 100, A-1400 Vienna
AUSTRIA
Workforce Planning for Nuclear Power Programmes

Brenda Pagannone
Department of Nuclear Energy
International Atomic Energy Agency
b.pagannone@iaea.org
Objectives

By the end of this presentation you should be able to:

• Describe what is meant by ”Workforce Planning”
• Define the key organisations in a nuclear power programme for workforce planning purposes
• Describe the roles and resource requirements of the key organisations in each of the 3 phases of Infrastructure development
• Describe the typical make-up of the workforce for an operating organisation
BACKGROUND
Capacity Building, HR and NKM

Capacity Building – National Environment

Workforce Planning

- National Capability/Needs
- National/International Education & Training Capability/Requirements

Organisational - Internal

- Succession Planning
- Career Management
- Remuneration
- Performance Management
- Recruitment
- Training & Development

Human Resources and Knowledge Management

IAEA

Atoms for Peace: The First Half Century

1957-2007
HUMAN RESOURCES ‘ROADMAP’

Nuclear Power Programme Objectives

- Determine Roles & Responsibilities
- Identify HR Needs

Build Capacity

- Recruit
- Develop
- Deploy/Manage
HUMAN RESOURCES ‘ROADMAP’

- Nuclear Power Programme Objectives
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National
Organisational
HUMAN RESOURCES ‘ROADMAP’

Nuclear Power Programme Objectives

Determine Roles & Responsibilities

Identify HR Needs

Build Capacity

Educational Infrastructure

Training Infrastructure

Recruit

Develop

Deploy/Manage

National Organisational
“MILESTONES’ APPROACH”
Key infrastructure issues

- National position
- Nuclear safety
- Management
- Funding and financing
- Legislative framework
- Safeguards
- Regulatory framework
- Radiation protection
- Electric grid
- **Human resource development**

*Note: All 19 issues have a Human Resource component*
Preparing for assuming commitments & obligations

Infrastructure development program

1st. NPP Project

Commissioning

Operation / decommissioning

Nuclear power option included within the national energy strategy

MILESTONE 1
Ready to make a knowledgeable commitment to a nuclear programme

MILESTONE 2
Ready to invite bids for the first NPP

MILESTONE 3
Ready to commission and operate the first NPP

National Strategy

PHASE 1
Considerations before a decision to launch a nuclear power programme is taken

PHASE 2
Preparatory work for the construction of a NPP after a policy decision has been taken

PHASE 3
Activities to implement a first NPP

MILESTONE 1
Ready to make a knowledgeable commitment to a nuclear programme

MILESTONE 2
Ready to invite bids for the first NPP

MILESTONE 3
Ready to commission and operate the first NPP

PHASE 1
Pre project

Preparation study

PHASE 2
Project decision making

Bidding process

PHASE 3
Construction

Commissioning

HR Planning & Implementation

Maintenance and continuous infrastructure improvement

~ 10 – 15 years

1st. NPP Project

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Atoms for Peace: The First Half Century

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HUMAN RESOURCES MANAGEMENT AND WORKFORCE PLANNING
Organizations with HR requirements

- Nuclear facilities (including NPPs, fuel cycle, radwaste)
- Educational institutions
- Technical Support Organizations
- Specialized training organizations
- International and professional organizations
- Government agencies, NEPIO (Ministries, etc.)
- Owners/Operating Organizations. (e.g. headquarters)
- Regulators (incl. nuclear)
- R&D organizations
- Equipment vendors, suppliers, construction
- Organizations involved in nuclear or radiation activities

Human Resources for the Nuclear Field
HR responsibilities of management

• Senior management should ensure that the necessary individual competences are available for the effective and efficient operation of the organization.

• Senior management should evaluate both present and expected needs for competences against the competences already available in the organization – WORKFORCE PLANNING

(IAEA Safety Guide GS-G-3.1 Application of the Management System for Facilities and Activities)
IAEA guidance on Workforce Planning

• Addressing the Workforce requirements for each of the three phases focusing on three main organisational entities identified as having specific responsibilities within the “Milestones” document:
  – NEPIO
  – Regulatory Body
  – Operating Organisation

• Focus especially on Phases I & II, recognising that Vendor(s) may provide significant assistance for Operating Organisation during Phase III
Workforce Planning

“The systematic identification and analysis of what an organization (and a country) is going to need in terms of the size, type and quality of workforce to achieve its objectives. It determines what mix of experience and competencies are expected to be needed, and identifies the steps that should be taken to get the right number of the right people in the right place at the right time. Further, the term workforce is intended to refer to all personnel involved in the programme.”
Workforce Planning – Key Issues

• Define the objectives of the Nuclear Power Programme as this can influence the competencies to be acquired by the Member State

• Member States must be realistic about the gaps in national capability and the potential to close them

• For effective Workforce Planning define the roles, responsibilities and functions of all the organizations (even if not established) in Phase 1

• Define the strategy for closing these gaps as it may impact the Bid Invitation Specification
HR Development - Phase 1

• NEPIO established – Development of NEPIO members?
• Knowledge and skills needed to support a nuclear programme identified by NEPIO
• Fundamental issue of National involvement – what level of involvement is desired versus what level of capability exists or can realistically be developed?
• Review of educational infrastructure
• All competencies needed for the feasibility study unlikely to be available locally – Consultants?
• Workforce/Staffing Plans prepared and integrated for all involved organisations
Challenges in Phase 1

Lack of experience in Phase 1 may be alleviated by:

• Contracting out whole Work Packages (WP) to experienced consultants, including requirements to utilize/train national staff in delivering the work package

• Contracting with consultants to become ‘temporary’ staff working with nationals to deliver WP and develop national staff

• Engaging senior consultants to ‘coach’ national staff in specific areas of competence

• Establishing Bi- and Multi-lateral relationships with governments, regulatory agencies, vendors, utilities, educational institutions, etc.
HR Development - Phase 2

In preparation for inviting bids to construct a first NPP:

- Key organisations established and undertaking necessary Human Resource development within own responsibilities

- Sufficient human resources are in place to be an “Intelligent Customer”

- A Systematic Approach to the Training (SAT) of human resources needed for plant operation is initiated

- HR issues, including SAT requirements, are addressed in requirements for suppliers (turnkey assumed)

- Workforce/Staffing Plan(s) updated
Recruitment considerations

• Attracting expatriate personnel who have worked in the nuclear sector abroad

• Attracting experienced foreign personnel, either as employees (if permitted by national labour laws/regulations) or as consultants

• Recruiting experienced personnel from appropriate national industries such as fossil power generation, process/production, oil and gas industries, research reactors (if appropriate) who will already have many of the required competencies to work in the nuclear industry

• Remember recruitment is a two-way process – allow for loss of staff to other industries/countries
Gaining ‘Nuclear’ experience in Phase 2

Opportunities to gain experience outside MS include:

• Establishing Bi- and Multi-lateral relationships with governments, regulatory agencies, vendors, utilities, educational institutions, etc.

• IAEA Training courses, Fellowships and Internships

• Formal courses of overseas study

• Building staff training and development assignments into potential contracts with vendors, service providers, etc.

• Developing ‘strategic alliances’ with vendors/equipment suppliers whereby national organisations obtain licenses to manufacture components in-country, which can include training and qualification in the country of origin
HR Development - Phase 3

• All human resources needed to commission and operate the first NPP are in place (and fully trained)
• All training programmes available to ensure competence of staff (Vendor assistance available as required)
• Education and training programmes for continuing flow of qualified people are in place
• Resourcing of any identified Technical Support Organisations (TSOs) established
• Workforce/Staffing Plan(s) updated
Phasing of resource requirements

1. NEPIO = 10 --> 50 (Depending on Expert Group Support) --> 0 (close to)
2. REG BODY = 50 --> 150+Tech Support
3. OP ORG = 0 --> 20 to 30 --> 600 to 1200
Example Distribution of Disciplines for the Nuclear Workforce

2-year Associate Degree
Backgrounds

4-year Degrees Other Engineering Disciplines

Source: Lee Peddicord
TAMU, USA
Timing of Workforce Employment Before Plant Operation

Source: Lee Peddicord TAMU, USA
Permanent TVO staff members 1980-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Workers / Technicians</th>
<th>Adm. Support personnel</th>
<th>Graduates (Bachelors degree)</th>
<th>Graduates (masters degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>436</td>
<td>465</td>
<td>507</td>
<td>485</td>
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<tr>
<td>1985</td>
<td>485</td>
<td>483</td>
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<td>1990</td>
<td>485</td>
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<tr>
<td>1995</td>
<td>477</td>
<td>481</td>
<td>492</td>
<td>524</td>
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<td>1996</td>
<td>568</td>
<td>636</td>
<td>662</td>
<td>676</td>
</tr>
<tr>
<td>1997</td>
<td>709</td>
<td>717</td>
<td>714</td>
<td></td>
</tr>
</tbody>
</table>

*) Construction site work for Olkiluoto 3 started
**) for staff members for 2 operating unit (Olkiluoto 1&2) and for Olkiluoto 3
Training days (for TVO staff members) during years 2002-2011
# Case Finland / Olkiluoto 3

## Details of TVO Personnel

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel, permanent, December 31</td>
<td>676</td>
<td>709</td>
<td>717</td>
<td>714</td>
<td>738</td>
</tr>
<tr>
<td>Male</td>
<td>541</td>
<td>567</td>
<td>567</td>
<td>580</td>
<td>569</td>
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<tr>
<td>Female</td>
<td>135</td>
<td>142</td>
<td>150</td>
<td>154</td>
<td>169</td>
</tr>
<tr>
<td>Personnel, fixed-term, December 31</td>
<td>74</td>
<td>68</td>
<td>80</td>
<td>84</td>
<td>75</td>
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<tr>
<td>Average age of employees 1</td>
<td>44.00</td>
<td>44.4</td>
<td>44.6</td>
<td>44.7</td>
<td>44</td>
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<tr>
<td>Average number of years of service 1</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
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</tr>
<tr>
<td>Training days / person</td>
<td>15.2</td>
<td>12.7</td>
<td>10.6</td>
<td>8.9</td>
<td>13.1</td>
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<tr>
<td>Training days, total</td>
<td>10,186</td>
<td>8,869</td>
<td>8,835</td>
<td>7,482</td>
<td>11,373</td>
</tr>
</tbody>
</table>

1. The data is only reported for permanent personnel.
2. In January 2010, an error was identified in the training figures for 2009, and the figures were corrected.

## The In-House Training Days for TVO Employees

<table>
<thead>
<tr>
<th>Theme</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>General technology</td>
<td>262</td>
<td>32</td>
<td>52</td>
<td>85</td>
<td>75</td>
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<tr>
<td>Nuclear power plant technology</td>
<td>674</td>
<td>1,117</td>
<td>1,143</td>
<td>1,054</td>
<td>1,704</td>
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<td>Plant engineering</td>
<td>2,594</td>
<td>2,189</td>
<td>1,879</td>
<td>1,198</td>
<td>1,987</td>
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<tr>
<td>Operating technology</td>
<td>1,925</td>
<td>1,540</td>
<td>1,810</td>
<td>2,000</td>
<td>2,680</td>
</tr>
<tr>
<td>Maintenance</td>
<td>661</td>
<td>480</td>
<td>433</td>
<td>421</td>
<td>505</td>
</tr>
<tr>
<td>Protection and preparedness</td>
<td>1,392</td>
<td>1,131</td>
<td>1,398</td>
<td>946</td>
<td>965</td>
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<tr>
<td>Administration and finance</td>
<td>542</td>
<td>264</td>
<td>204</td>
<td>172</td>
<td>123</td>
</tr>
<tr>
<td>ADP and IT</td>
<td>304</td>
<td>302</td>
<td>183</td>
<td>140</td>
<td>480</td>
</tr>
<tr>
<td>Co-operation and communication</td>
<td>540</td>
<td>357</td>
<td>215</td>
<td>306</td>
<td>456</td>
</tr>
<tr>
<td>Other training</td>
<td>732</td>
<td>640</td>
<td>654</td>
<td>628</td>
<td>1,353</td>
</tr>
<tr>
<td>Total</td>
<td>9,446</td>
<td>8,271</td>
<td>8,058</td>
<td>6,966</td>
<td>10,278</td>
</tr>
</tbody>
</table>
Key Education and Training considerations

- Majority of permanent workforce is needed for the Operating Organisation, once NPP is commissioned; typical workforce for a 2-Unit NPP is 600-1200 personnel
- Around 50 - 70% of workforce are required at non-graduate level, i.e. ‘Technicians’
- Of the graduate workforce (20 – 35%) only around 20% (or ~ 5% of total workforce) need a Nuclear Engineering background
- Training / experience requirements for very specialist roles can be 5-10 years
- In the Regulatory Body, % of graduates is much higher (> 50%) but specialist technicians are still needed
Supporting IAEA Documentation

- NG-T-6.1 – Status and Trends in Nuclear Education (2011)
- NG-G-2.1 - Managing Human Resources in the Field of Nuclear Energy (2009)
- NG-T-3.6 - Responsibilities and Capabilities of a Nuclear Energy Programme Implementing Organisation (2009)
- TECDOC 1555 – Managing the first NPP Project (2007)
- TECDOC 1522 – Potential for sharing NP infrastructure between countries (2006)
- TECDOC 1501 - Human resource issues related to an expanding nuclear power programme (2006)
- TECDOC 1390 - Construction and commissioning experience of evolutionary water cooled nuclear power plants (2004)
Objectives – have we met them?

By the end of this presentation you should be able to:

• Describe what is meant by” Workforce Planning”
• Define the key organisations in a nuclear power programme for workforce planning purposes
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• Describe the typical make-up of the workforce for an operating organisation
THANK YOU - ANY QUESTIONS?

...atoms for peace.

www.iaea.org/OurWork/ST/NE/index.htm