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**Joint ICTP-IAEA School of Nuclear Energy Management**

*5 - 23 November 2012*

**Workforce Planning for Nuclear Power Programmes**

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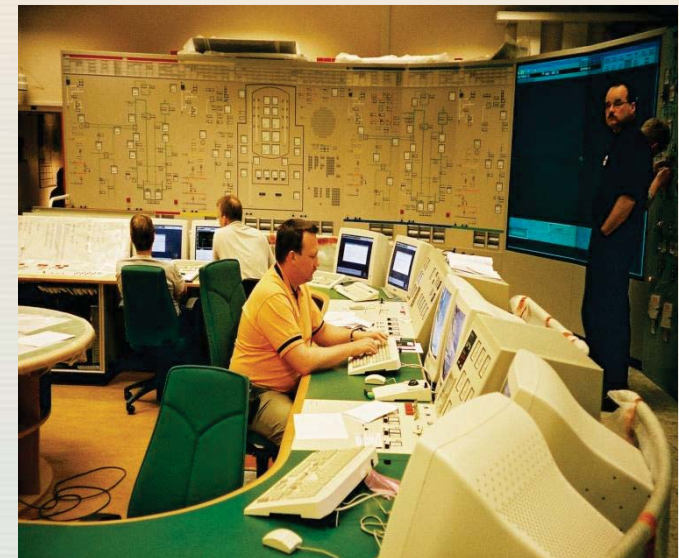
# 5<sup>th</sup> Nuclear Energy Management School Trieste, Italy - 20<sup>th</sup> November 2012

## Workforce Planning for Nuclear Power Programmes

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*Atoms for Peace: The First Half Century  
1957–2007*



# Objectives

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

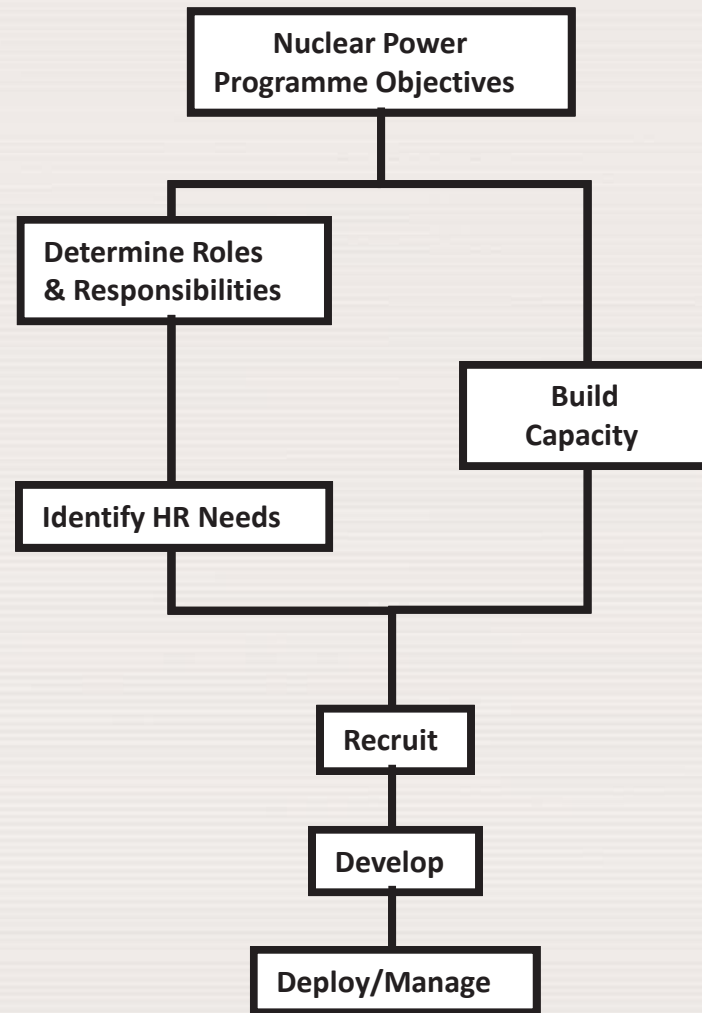
- Describe what is meant by” Workforce Planning”
- Define the key organisations in a nuclear power programme for workforce planning purposes
- Describe the roles and resource requirements of the key organisations in each of the 3 phases of Infrastructure development
- Describe the typical make-up of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

# BACKGROUND

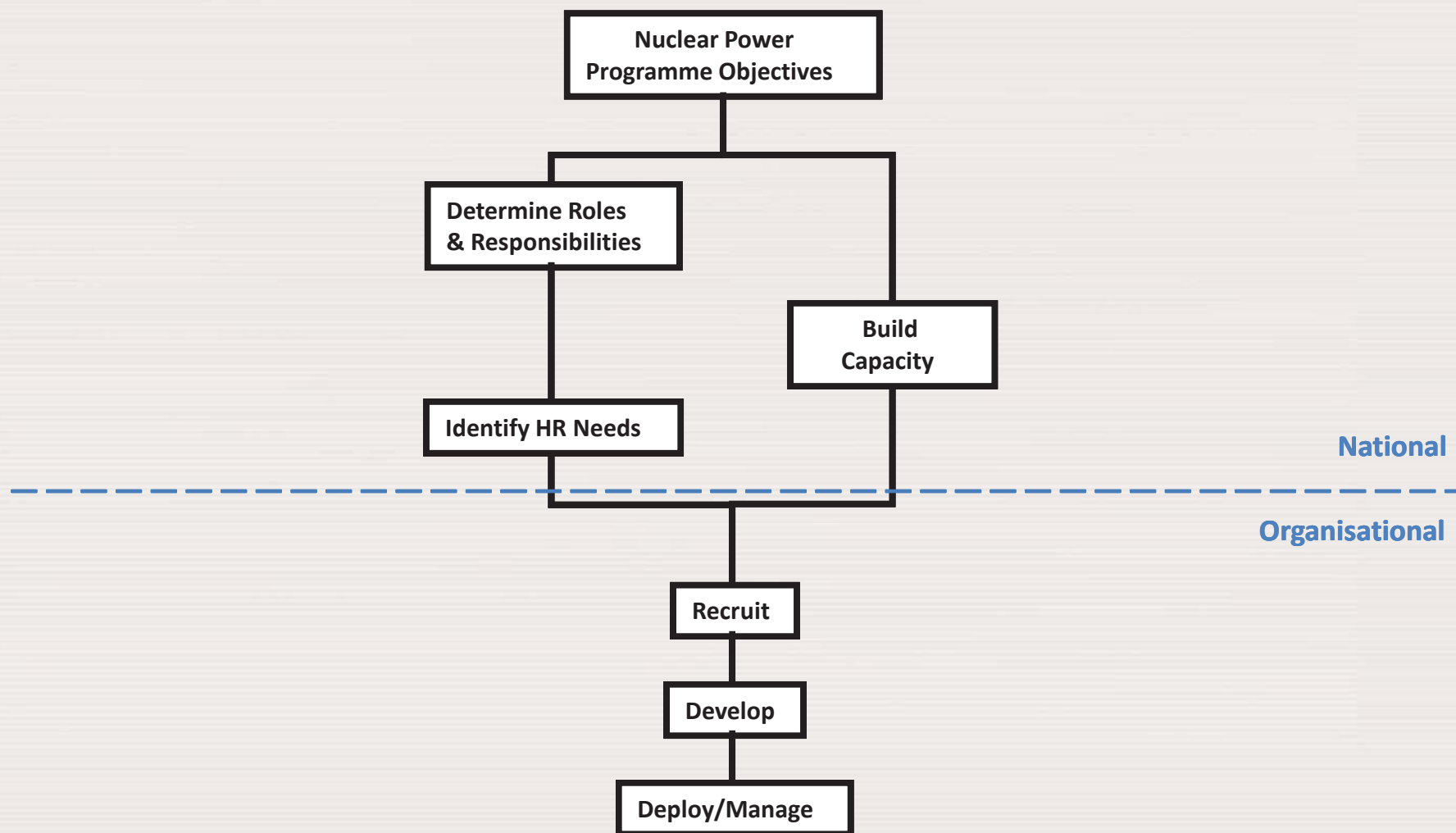
# Capacity Building, HR and NKM



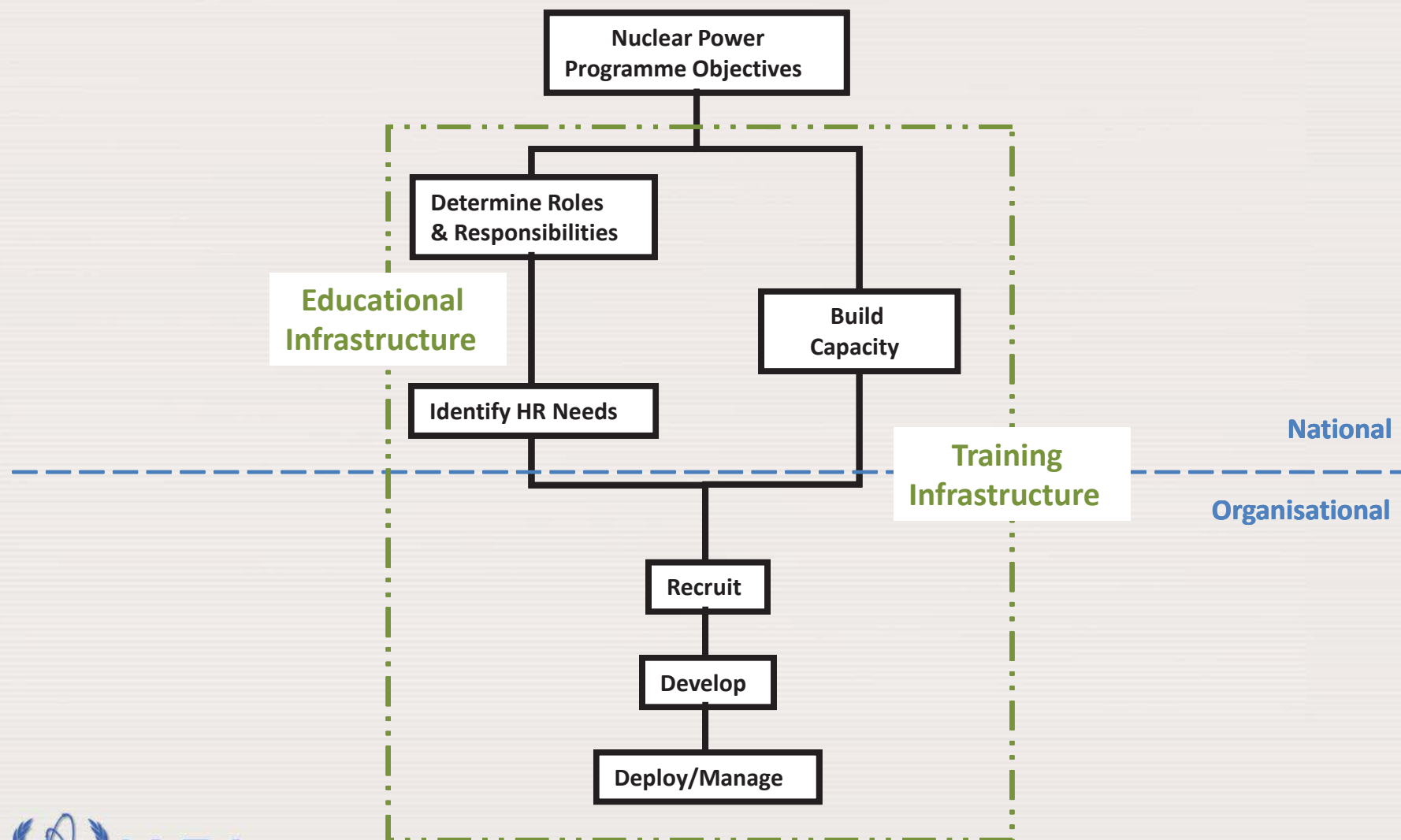
# HUMAN RESOURCES 'ROADMAP'



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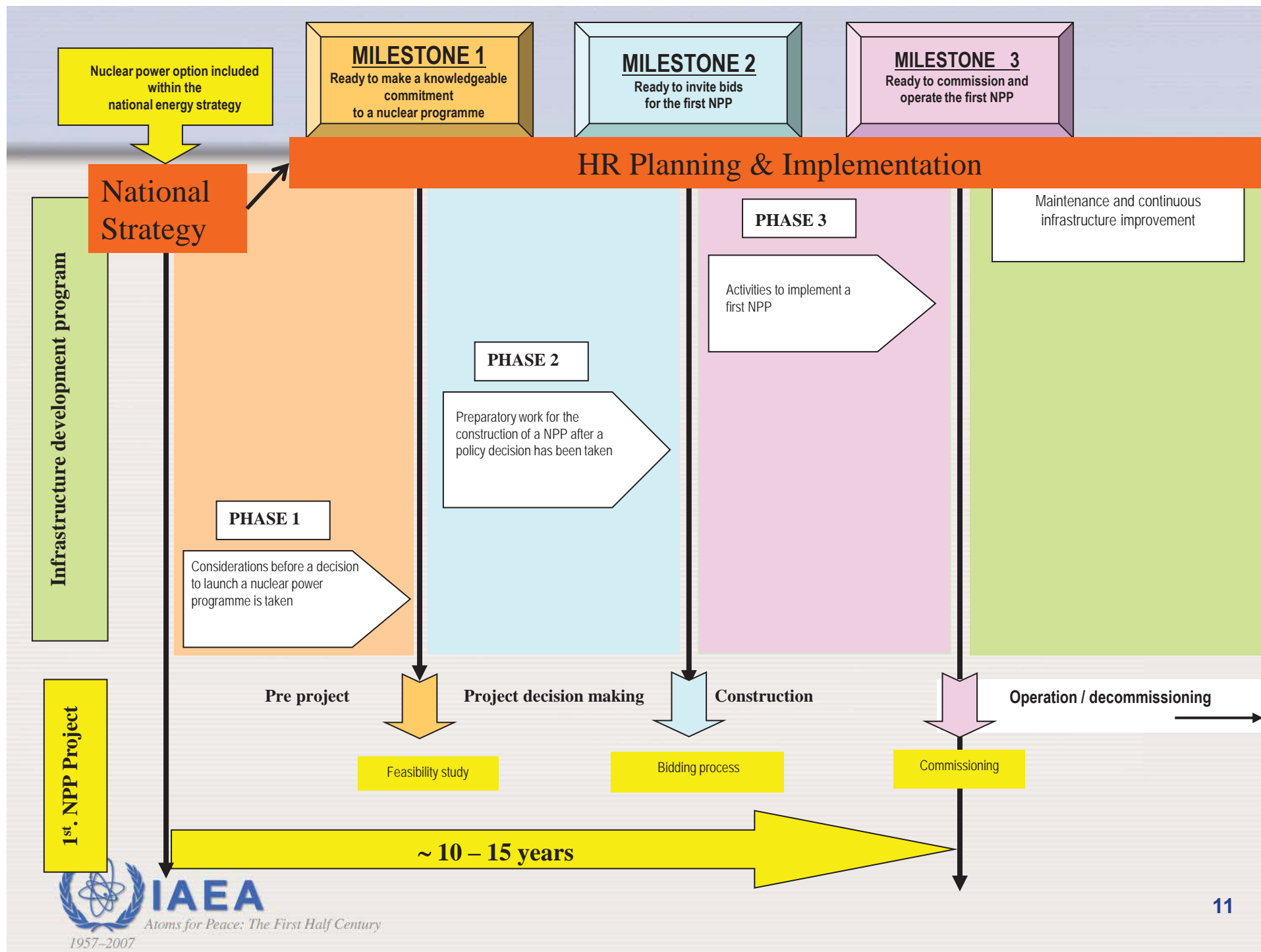


# **“MILESTONES' APPROACH”**

# Key infrastructure issues

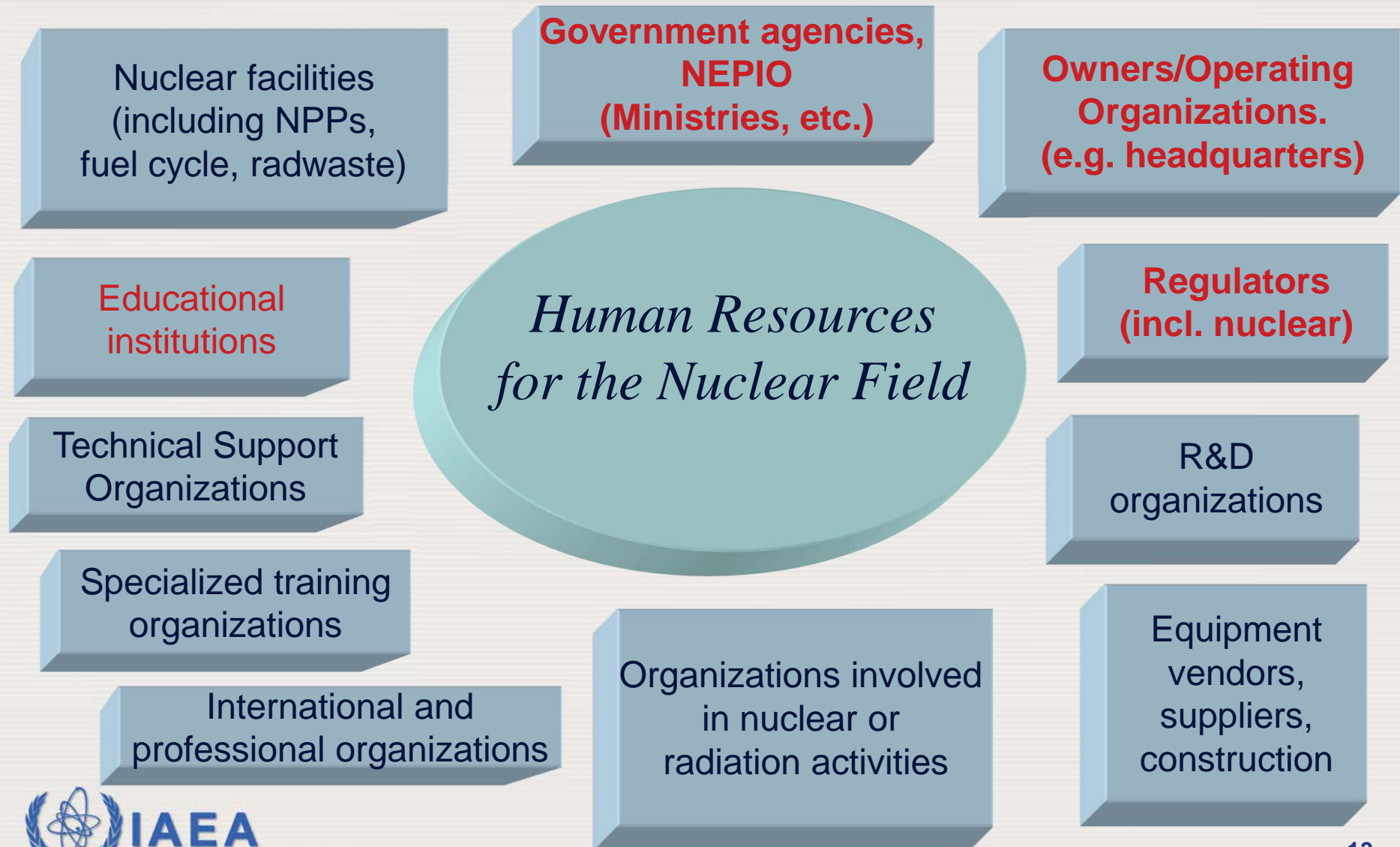
- National position
- Nuclear safety
- Management
- Funding and financing
- Legislative framework
- Safeguards
- Regulatory framework
- Radiation protection
- Electric grid
- Stakeholder involvement
- Site and supporting facilities
- Environmental protection
- Emergency planning
- Security and physical protection
- Nuclear fuel cycle
- Radioactive waste
- Industrial involvement
- Procurement
- **Human resource development**

***Note: All 19 issues have a Human Resource component***



# HUMAN RESOURCES MANAGEMENT AND WORKFORCE PLANNING

# Organizations with HR requirements



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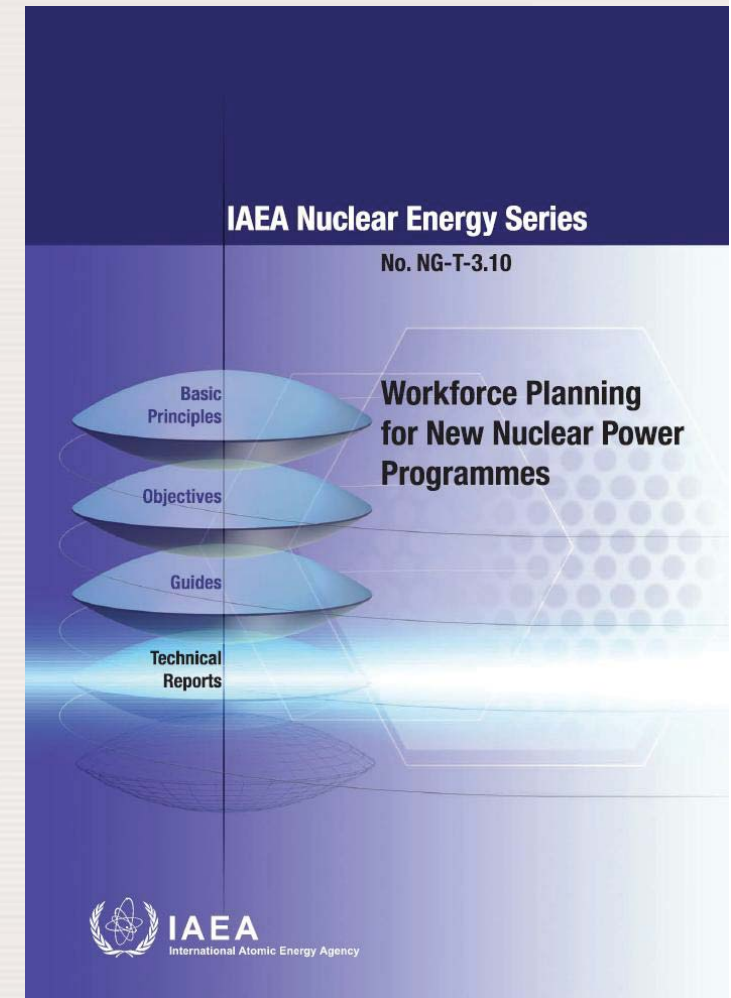
# HR responsibilities of management

- 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

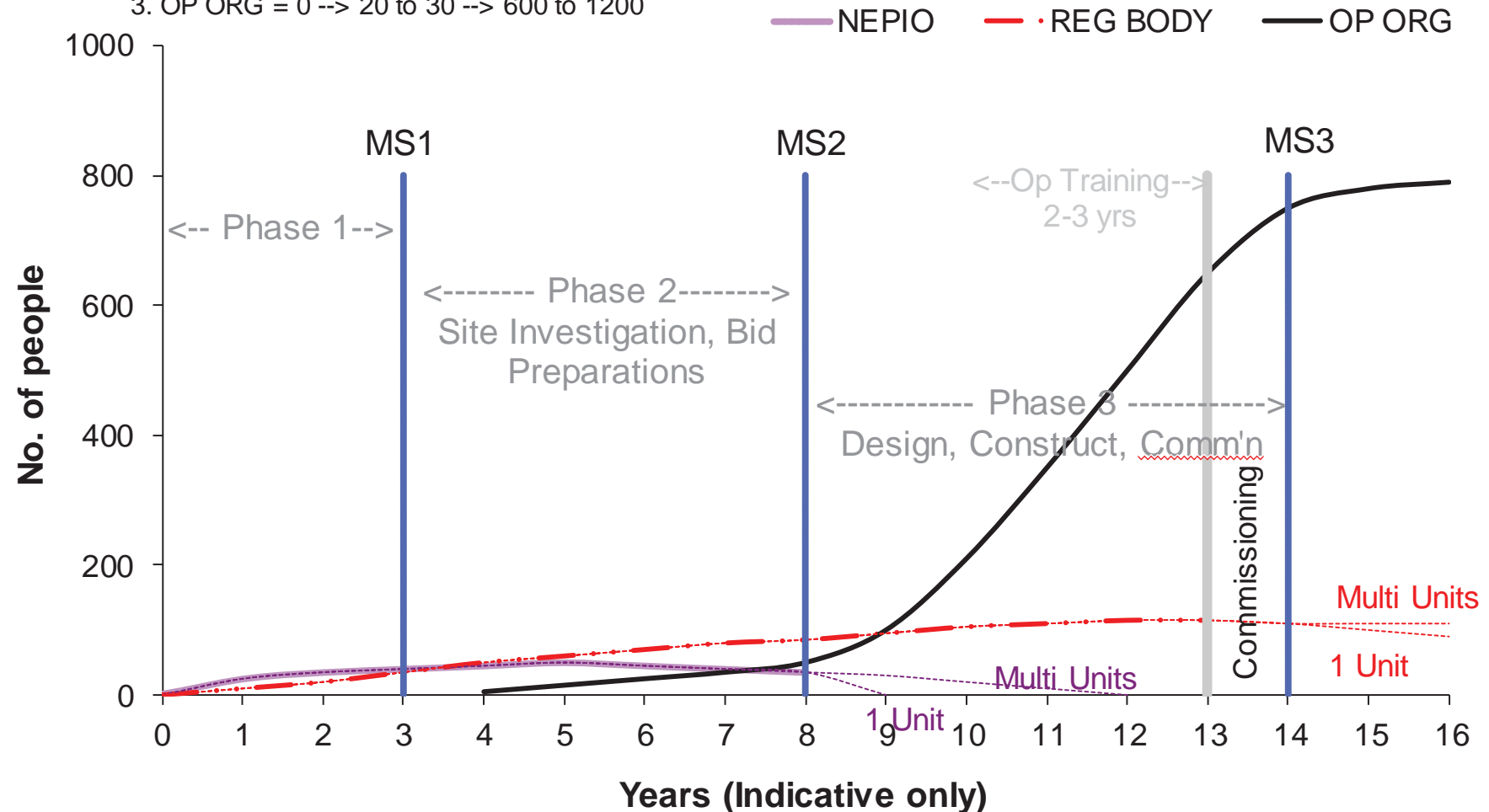
# HR Development - Phase 3

- 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



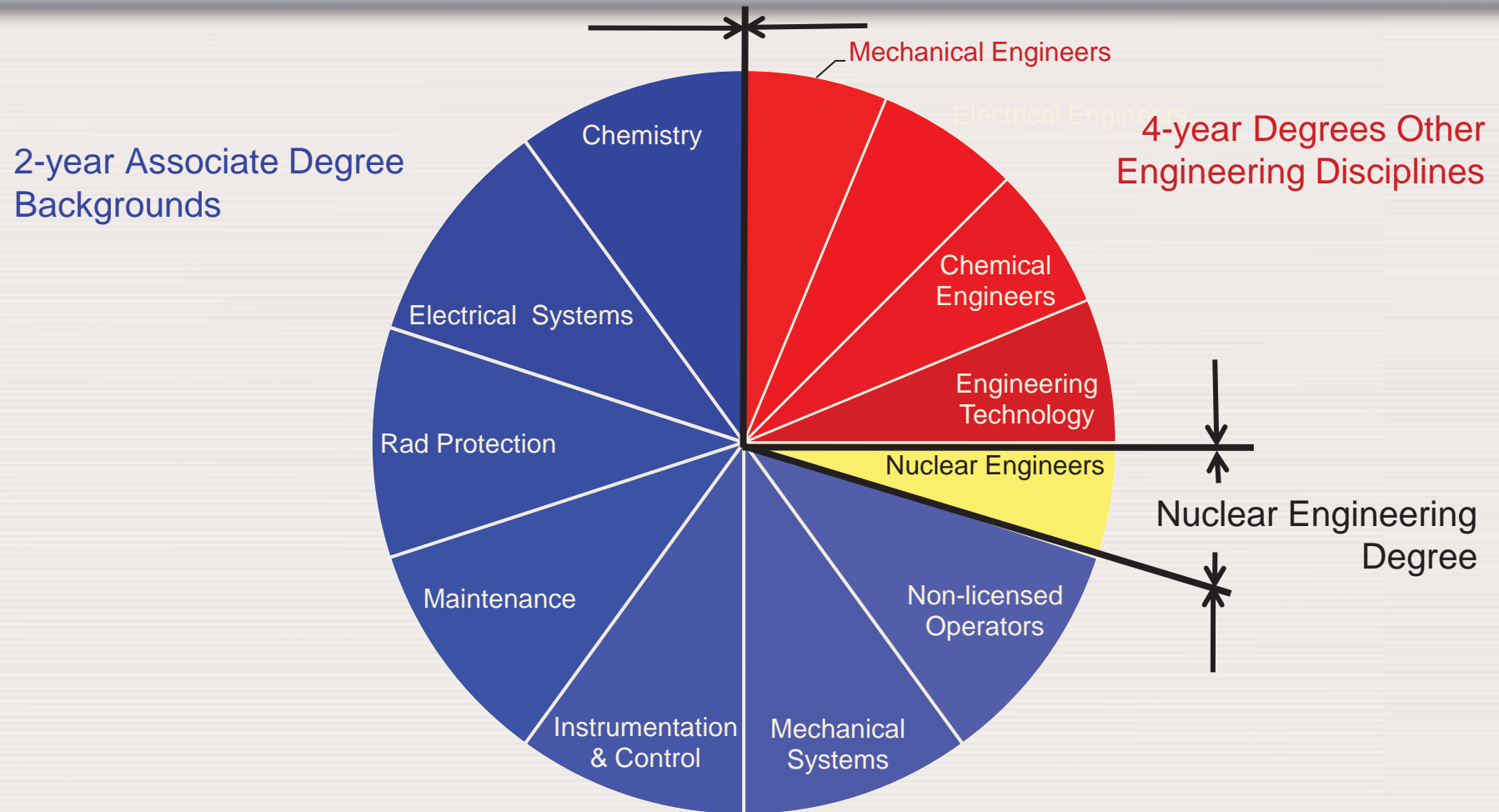
# Phasing of resource requirements

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



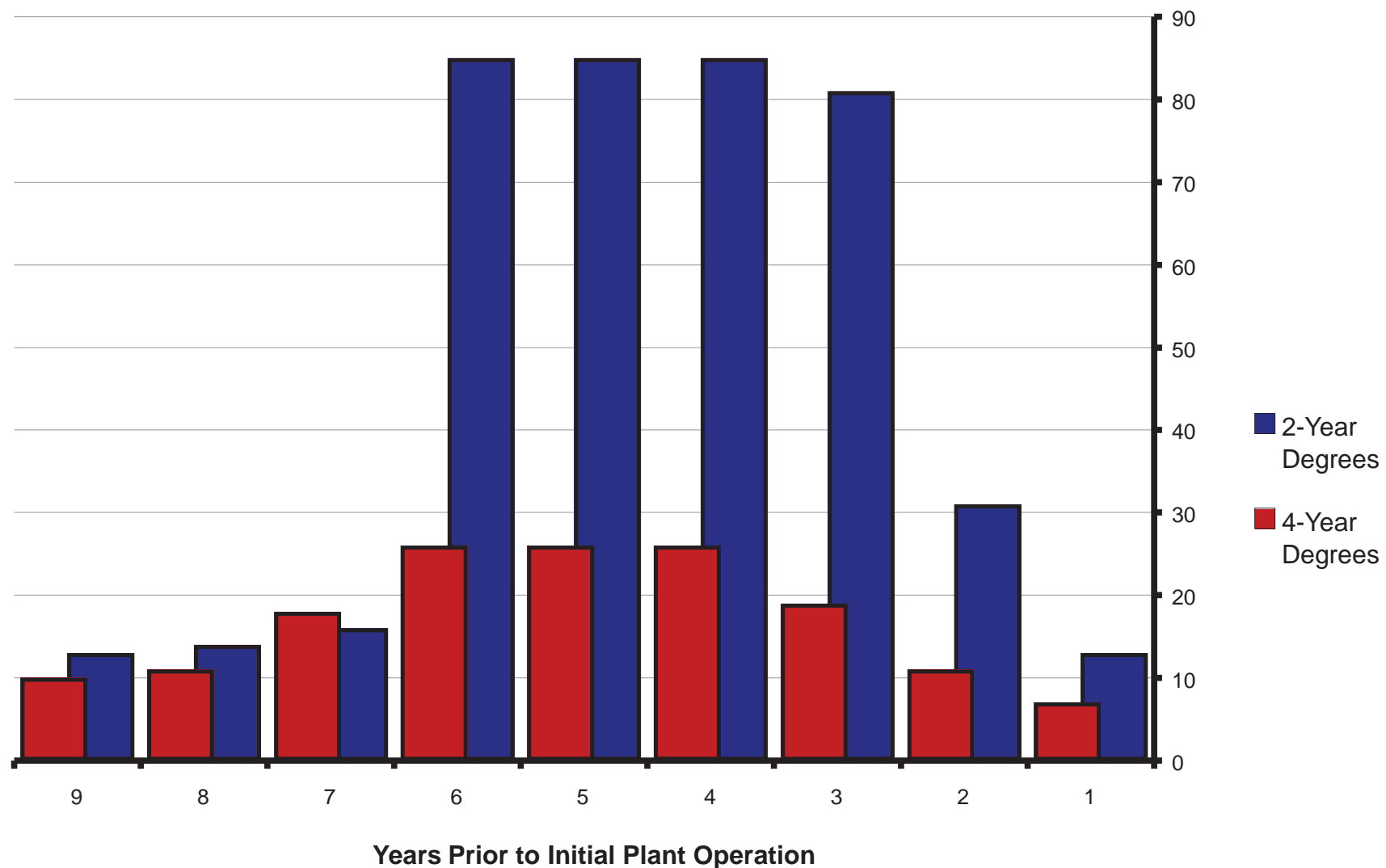


## Example Distribution of Disciplines for the Nuclear Workforce



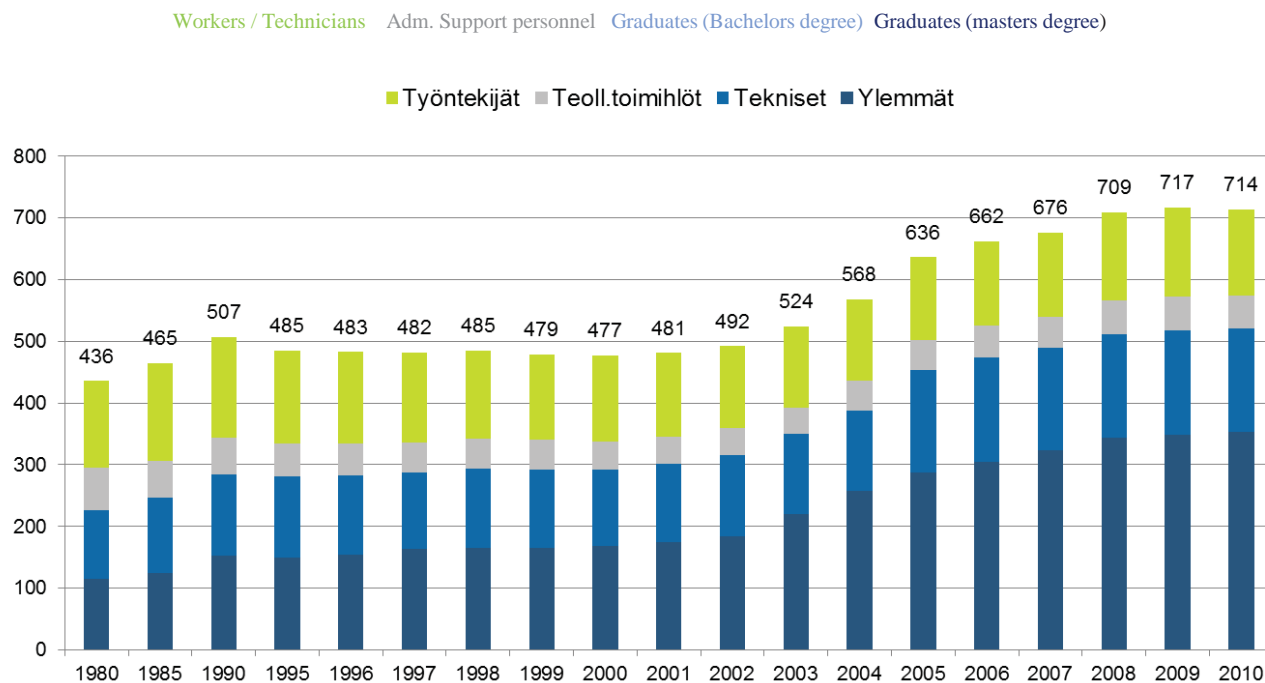
Source: Lee Peddicord  
TAMU, USA

## Timing of Workforce Employment Before Plant Operation



# Case Finland / Olkiluoto 3

## Permanent TVO staff members 1980-2010

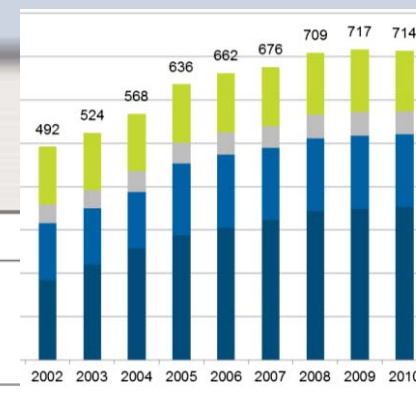
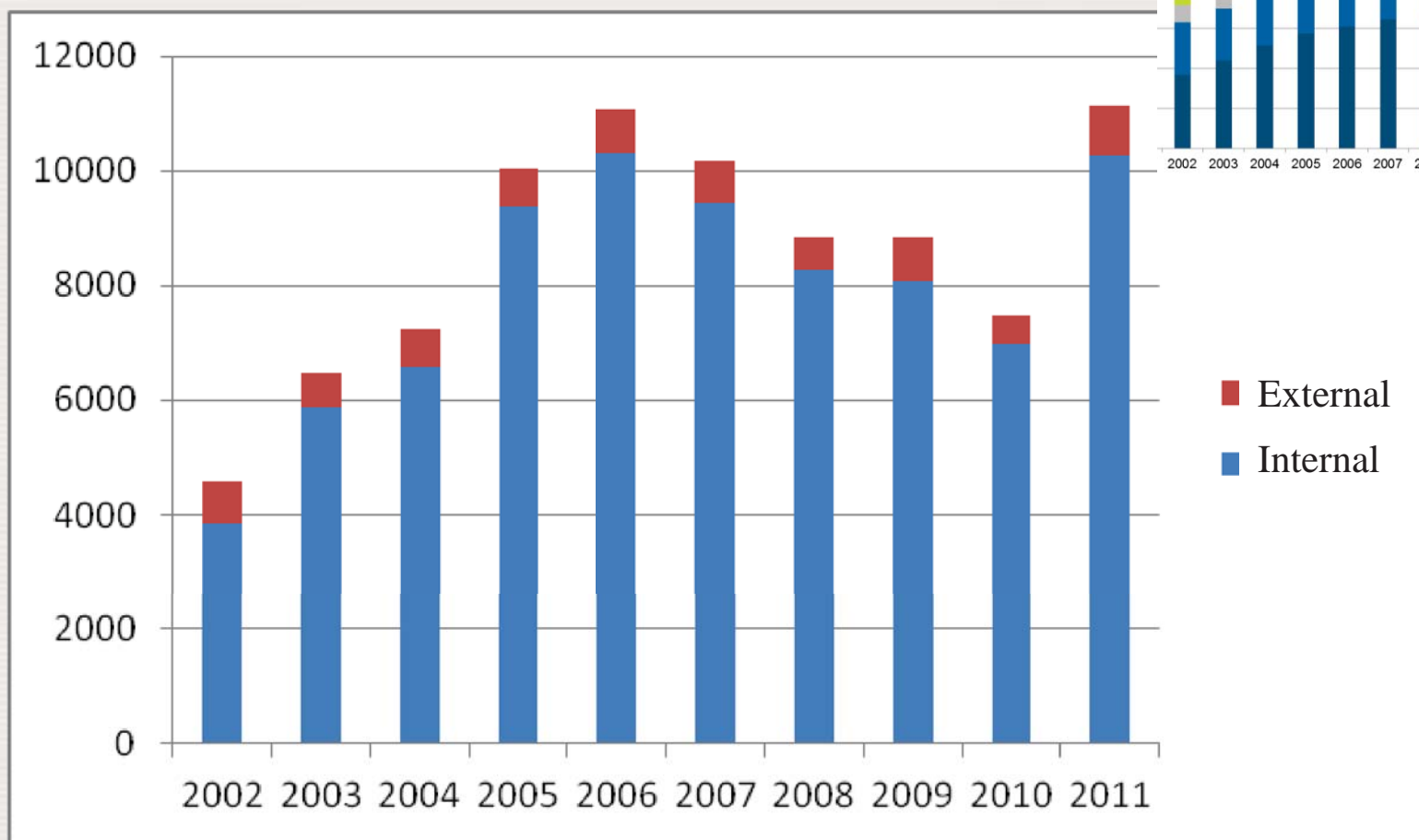


Year	Training days **
1997	4056
1998	4339
1999	4191
2000	4473
2001	4893
2002	4587
2003 *	6476
2004	7255
2005	10037
2006	11065
2007	10166
2008	8847
2009	8835
2010	7482
2011	11137

\*) 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



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# Case Finland / Olkiluoto 3

## DETAILS OF TVO PERSONNEL

	2007	2008	2009	2010	2011
Personnel, permanent, December 31	676	709	717	714	738
Male	541	567	567	560	569
Female	135	142	150	154	169
Personnel, fixed-term, December 31	74	68	80	84	75
Average age of employees <sup>1)</sup>	44.8	44.4	44.6	44.7	44
Average number of years of service <sup>1)</sup>	15	15	15	15	15
Training days / person	15.2	12.7	10.6 <sup>2)</sup>	8.9	13.1
Training days total	10,166	8,869	8,835 <sup>2)</sup>	7,482	11,137

<sup>1)</sup> The data is only reported for permanent personnel.

<sup>2)</sup> In January 2011, an error was identified in the training figures for 2009 and the figures were corrected.

## THE IN-HOUSE TRAINING DAYS FOR TVO EMPLOYEES

Theme	2007	2008	2009	2010	2011
General technology	282	32	52	85	75
Nuclear power plant technology	674	1,317	1,143	1,064	1,704
Plant engineering	2,594	2,169	1,879	1,195	1,937
Operating technology	1,925	1,549	1,810	2,009	2,680
Maintenance	661	490	433	421	505
Protection and preparedness	1,192	1,131	1,338	946	965
Administration and finance	542	284	204	172	123
ADP and IT	304	302	130	140	480
Co-operation and communication	540	357	215	306	456
Other training	732	640	854	628	1,353
Total	9,446	8,271	8,058	6,966	10,278



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# 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-3.10 - Workforce Planning for New Nuclear Power Programmes (2011)
- 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-3.1 - Initiating Nuclear Power Programmes: Responsibilities and Capabilities of Owners and Operators (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
- 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



# THANK YOU - ANY QUESTIONS?



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[www.iaea.org/OurWork/ST/NE/index.htm](http://www.iaea.org/OurWork/ST/NE/index.htm)