

International Conference on Knowledge Management in Nuclear Facilities

Findings and Recommendations
Conference Rapporteur
B. Barré, France



IAEA

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

The conference

- Broad cooperation with the
 - European Atomic Forum (FORATOM),
 - European Commission (EC),
 - Japan Atomic Energy Agency (JAEA),
 - Nuclear Energy Institute (NEI),
 - OECD Nuclear Energy Agency (OECD/NEA),
 - World Nuclear Association (WNA) and
 - World Nuclear University (WNU).
- Shared IAEA effort between the lead Department of Nuclear Energy and the Department of Nuclear Safety and Security



International Conference on
Knowledge Management in Nuclear Facilities

Looking back...

- Calls for action by the IAEA General Conference since 2002 in several resolutions
- This conference is organized as part of the response to those resolutions.
- It also builds on the first conference on *Nuclear Knowledge Management – Strategies, Information Management and Human Resource Development*, organized by the IAEA in 2004 in France.



International Conference on
Knowledge Management in Nuclear Facilities

Conference Statistics

- 145 contributions, keynotes, papers and posters were submitted
- 212 participants and 20 observers from 42 Member States and 10 international organizations.
- This considerably exceeds initial expectations with regard to the number as well as the broad range of topics and contributors.
- This conference is far larger than the 2004 conference, a clear indication of the **growing importance of this topic.**



International Conference on
Knowledge Management in Nuclear Facilities

Why Now ?

Rising concerns about Security of Supply and Climate Change

Improved NPP Safety and Reliability :

“Renaissance” in Europe and the Americas, continuing Growth in Asia

Changing of the Guard and demographic gap

Human Capital (= knowledge) is worst bottleneck

Fast IT progress, and strong IT culture in young generation

→ Both Need and Opportunity for NKM



International Conference on Knowledge Management in Nuclear Facilities

« Management »: an ambiguous word ?

Create – Validate – Disseminate – Transmit



Organizing and optimizing K Processes



International Conference on Knowledge Management in Nuclear Facilities

Strategic Contribution of NKM

- Nuclear knowledge management can
 - contribute to maintaining the core knowledge that must be in place to **operate existing plants safely**;
 - help achieve **gains** in economic and operational performance;
 - help preserve existing knowledge and channel it towards future **innovations**;
 - help assure the smooth and effective **transfer** of the knowledge of today's generation to the next generation.



International Conference on
Knowledge Management in Nuclear Facilities

Where are we now?

- In 2004: phase of raising awareness and introducing nuclear knowledge management as a new approach
- In 2007: **NKM is known and used** as management approach

But there is room for improvement!



International Conference on
Knowledge Management in Nuclear Facilities

NKM is used as management approach

Key nuclear organizations have introduced and apply NKM as corporate management approach with top-level commitment

- Examples:
 - Regulators and TSOs: US NRC, German GRS
 - Utility: French EdF, German EnBW, Canada Bruce Power, Several NPPs individually
 - R&D organizations: Korea KAERI, India IGCAR
 - Vendor: Canada AECL, France/Germany AREVA NP, ...
 - Governmental: AEC India, ...



International Conference on
Knowledge Management in Nuclear Facilities

NKM is spreading fast in Organizations

Strategy level

- Knowledge considered as key resource
- Link between good KM and economics
- KM addressed in company's internal policy document

HR Management

- Overlap between new and leaving staff
- Mentoring programmes
- Integrated training approach for new and existing staff

Information Management

- A professional, personalized integrated information, document and communication webplatform for staff

Process Management

- Knowledge management as crosscutting
- Communities of practice



International Conference on
Knowledge Management in Nuclear Facilities

NKM for National Planning

- Recognition of the need to *actively* plan for the **education** of the next / young generation
- Appreciation of nuclear knowledge as scientific and technical **heritage** and of our *inter-generational responsibility* to pass it on
- Understanding that the availability of nuclear knowledge is **a must for safety**



International Conference on
Knowledge Management in Nuclear Facilities

Role of the IAEA

- The IAEA is in a position to be *the global focal point and driver* for nuclear knowledge management work in Member States, in cooperation with NEA, WANO...
- Past IAEA activities were instrumental
 - to raise awareness (2004 conference)
 - to share experiences (guidance publications)
 - to assist in self-assessments (Knowledge Assist Visits)
 - to network education and training (ANENT, WNU, ENEN, others)



International Conference on
Knowledge Management in Nuclear Facilities

Findings



IAEA

Atoms for Peace: The First Half Century
1957-2007

Findings Opening Session

Despite rebound in NE enrollment, people are likely to be the worst bottleneck. Even in « established » nuclear countries, there are generation gaps

Nuclear Power is a complex, knowledge-based unforgiving technology, needing Science + Engineering + Experience & *specific* Facilities

R&D and OE feedback necessary to create knowledge

Needs for strong foundations (S&T), robust processes, applied to entire lifecycle

Gen IV provides a vision & focusses R&D

KM is the key to the holistic approach to RDD&D



IAEA

Atoms for Peace: The First Half Century
1957-2007

International Conference on
Knowledge Management in Nuclear Facilities

Findings Session 1

Technical competence is an indispensable basis of the regulator's independence, and *the very basis* of TSOs role

There are progresses toward regulatory harmonization

2007 better than 2004: Concrete implementation cases, structured approach

Top Management must engage themselves

Tools are important, but *will to share* knowledge is essential

2 tasks for regulators: Implement their own KM and keep oversight of licensees KM



International Conference on
Knowledge Management in Nuclear Facilities

Findings Session 2

There is competition for a limited pool of trained talents, and competition with Bio-Nano-Info for a limited pool of Science students

Utilities are responsible to provide/share and control knowledge needed by their (sub)contractors

Project Mgt and Quality Mgt are drivers for KM



International Conference on
Knowledge Management in Nuclear Facilities

Findings Session 3

Nuclear R&D has potential beneficial spin-off if properly linked to industry and academia

Research results should be as open as possible, *within commercial & security limits*

Transfer of tacit knowledge from oldtimers to newcomers is important but not easy

Multidisciplinary teams of experienced and young employees insure efficient continuous knowledge transfer

Textbooks from experts (from several countries) are robust KM tools

Simulation codes embody large amounts of knowledge

By identifying gaps, KM may be a driver for R&D



International Conference on
Knowledge Management in Nuclear Facilities

Findings Section 4

NKM has a cost **but also benefits** : Safety, Economics, Innovation

Role of end-users : Achieve a **right balance** between supply and demand of knowledge at optimal cost

There is a life-Cycle of nuclear knowledge (*)

Education and training : Structure knowledge and knowhow and **prepare the next generation** of experts

International cooperation strengthens the scientific basis while sharing the costs

More HR needed in non-power radiation application



International Conference on
Knowledge Management in Nuclear Facilities

An open Issue: Value & Retrievability of old knowledge ?

« *We do not need to preserve everything* »

→ How to dispose of obsolete knowledge ?

« *Keep everything: Terabytes are cheap and we don't know what will be needed 20 years from now* »

→ How to preserve digital data against support and software obsolescence ?



International Conference on
Knowledge Management in Nuclear Facilities

Recommendations



IAEA
Atoms for Peace. The First Half Century
1957-2007

Strategic Recommendations

- Nuclear knowledge management should become an *integral part of all nuclear activities* on project, corporate and national levels:
 - As part of all large nuclear *projects*;
 - As part of the corporate or institutional management system of all *organizations* involved in research, development and utilization of nuclear energy and radiation technologies;
 - As part of *national (governmental)* nuclear development plans and policies



International Conference on
Knowledge Management in Nuclear Facilities

Recommendations Opening Session

IAEA & NEA to « advertise » the renaissance, to **attract young talents**: no knowledge transfer without somebody to transfer it to
IAEA & NEA to manage **their own** knowledge
Use the guidance of **retired senior experts** (no substitute for experience)
Bring operators into the design teams
Bring operators and designers into regulatory teams and TSOs



International Conference on
Knowledge Management in Nuclear Facilities

Recommendations Session 1

Further development is needed to **better manage tacit knowledge**

IEAE should play a key role in developing **KM guidelines for regulators**, especially in countries starting a nuclear programme

Open *some kind of* access to IRS



International Conference on
Knowledge Management in Nuclear Facilities

Recommendations Session 2

Integrated KM System must last longer than Companies (100 years from Research to Decommissioning)

Structuring KM is vital to get the right information to the right person at the right time → **Include KM in the Standard Nuclear Performance Model**

NK is an intellectual capital for all Stakeholders: Data must be secured and shared at the same time

Nuclear training needs Cross-training development

Employees are busy on daily jobs: **it's up to the Management** to emphasize Knowledge transfer



International Conference on
Knowledge Management in Nuclear Facilities

Recommendations Session 3

Nuclear Research Centers should be closely linked to academia and industry

Some research results and data bank *cannot* be made public, but one should keep this situation to a strict, justified, **minimum**

Oldtimers should write textbooks

Motivate the experts to **share** their tacit knowledge and **record** their explicit knowledge

A stable and robust **IP framework** is important for KM



International Conference on
Knowledge Management in Nuclear Facilities

Recommendations Session 4

Organizations to **recognize and reward** knowledge transfer

IAEA to provide Best Practices Guidelines **BPG** for the **evaluation** of nuclear knowledge packages, and for the management of **IP** and access rights

IAEA to provide guidelines for a « **minimum knowledge package** » to enter the nuclear field



International Conference on
Knowledge Management in Nuclear Facilities

YGN Survey

Over 40% young professionals in the nuclear industry find their jobs “Okay” to “Very disappointing”

No margins in staffing prevents motivating career evolutions ?

300 answers from 37 countries



International Conference on
Knowledge Management in Nuclear Facilities

Recommendations YGN

Employers should support YGN participation

Employers should use YGN as « ambassadors » in public outreach and recruitment

Management practices should promote professional growth, quality work, efficient use of resources

Mentoring programmes should become standard industry practice.



International Conference on
Knowledge Management in Nuclear Facilities

Recommendations to the IAEA

To contribute to establishing a global nuclear knowledge culture :

- Remain *the* global forum for advancing the use of nuclear knowledge management
- Continue to provide guidance and assist in self-assessments and programme development
- Extend your “customer base”: Target the regulators (and TSOs)
- Issue regular Status Reports on NKM



International Conference on
Knowledge Management in Nuclear Facilities

A Few Drops of Wisdom

Knowledge is the currency for innovation

A Safety Culture without managing the organizations knowledge is hardly conceivable

There is a strong empirical side to KM: you acquire expertise in KM only by doing it in your own organization

Knowledge become lost when not put into practice

Conversion of tacit to explicit knowledge is difficult, sometimes impossible



International Conference on
Knowledge Management in Nuclear Facilities

A Few Drops of Wisdom

Information has a shelf life, skills/experience improve all the time

Possessing relevant knowledge is no guarantee that it will be used appropriately in all situations

Listening to an experienced story is more efficient than reading a book or watching a Powerpoint presentation

No job is complete unless the paperwork is done

Knowledge is no knowledge if you cannot retrieve it



International Conference on
Knowledge Management in Nuclear Facilities

A Few Drops of Wisdom

A nuclear plant is not "just another steam plant"

University teachers like to write textbooks;
professionals do not

KM is not just a Google search

One size does not fit all

Coming together is a beginning

Keeping together is a progress

Working together is a success



International Conference on
Knowledge Management in Nuclear Facilities

Last, but not least

It's All About People !



International Conference on
Knowledge Management in Nuclear Facilities

What's in it for IAEA ? (1)

- NKM is being used by (leading) nuclear organizations, including regulators, TSOs, utilities, NPPs and designers and vendors.
- NKM has become an *agreed best practice* for such organizations.
- The IAEA can assist in two ways
 - *Document* Best Practices
 - *Help applying* them through direct assist missions



International Conference on
Knowledge Management in Nuclear Facilities

What's in it for IAEA ? (2)

- NKM can contribute more on the national nuclear programme planning level
 - To efficiently channel existing knowledge towards *innovation* in national and international programmes
 - To address workforce planning and capacity building as national long-term issue
- The IAEA can assist
 - in the development of integrated national knowledge and workforce planning tools
 - In conducting pilot support studies with interested Member States



International Conference on
Knowledge Management in Nuclear Facilities

What's in it for IAEA ? (3)

- Rising expectations correspond to a rising demand for nuclear knowledge
- Nuclear knowledge has to be understood better as economic intellectual capital
- The IAEA can assist in
 - Providing a global forum to discuss and evaluate future knowledge needs for a renaissance
 - Conduct pilot work to address knowledge as intellectual capital



International Conference on
Knowledge Management in Nuclear Facilities