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Knowledge Transfer

AREVA experience & feed-back

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enela

An initiative of

AREVA axpo EnBW e·on urenco VATTENFALL

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Content

Two main parts

- **Some general consideration on Knowledge Transfer and Knowledge Management**
- **AREVA experience and feed back**

Internal knowledge management

- Knowledge management with in AREVA
- A new corporate department for education, training and people development
- The European Nuclear Energy Leadership Academy
- Pursue our strategy in enhancing the role of our technical experts
- First steps' accompaniment in the company
- Benefit even more of our (future) retirees: a new policy

Knowledge transfer experience

- Overview on reactor development
- Some example of technology and associated knowledge transfer
- FROG: cross fertilization from the feed back experience

Part One
General consideration on Knowledge Transfer Knowledge Management

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Content

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Knowledge transfer first sight astonishment

- **Some introductory questions:**
  - What is knowledge?
  - Is it transfer or exchange?
  - From whom and to whom?
  - Why or why not transfer?
  - How to best transfer?
  - How to evaluate the success of the transfer?

- **By the way:**
- **Knowledge transfer is a part of the global knowledge management effort**

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Knowledge?

- Knowledge covers a very large variety of concepts
  - From very general and “basic” information
  - To very specific or detailed
  - *From very conceptual and theoretical*
  - *To very practical and concrete oriented*
- Knowledge is not a pile of documents (parchment, book, CD…)
- Knowledge is something to be used by somebody's brain

- Know what (to do) ➔ instruction
- Know how (to do it) ➔ understanding
- Know why (do it that way) ➔ expertise, open door to improvement and progress

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Flash back

- To develop knowledge needs time and money (both can be very high) … and some luck to avoid wrong ways
- It can be developed on public or private funding or, in most cases, by an interaction process
- Human history of development shows a general trend to
  - Extend and enlarge the common humanity knowledge heritage
  - Protect more precisely (in content, in time) specific knowledge
- Refer to the always bigger libraries available to students and
- to the development of Intellectual Property laws and rules

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Transfer from … to

- Which information shall we make accessible? – Why?
- Which information has to be secured? – Why?

From the internal point of view:

- If Knowledge is Power, then

  Knowledge shared is Power squared

But…

From the business point of view:

- Knowledge is an asset

  ➔ROI – “Return on Investment” dialectic

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How to transfer knowledge?

- One emitter, one receiver and a channel to transfer something
- The emitter should master the available knowledge and the communication channel

  ➔Train the trainers (content, pedagogy, training tools, language, cultural approach,…)
- The receiver should wish to receive, master the communication channel (availability, language, cultural approach,…) and needs to use this knowledge soon after

  ➔ to be clear on the objective of the transfer

  ➔ the efficiency measurement tool

  ➔ and be aware of the subjective obstacles

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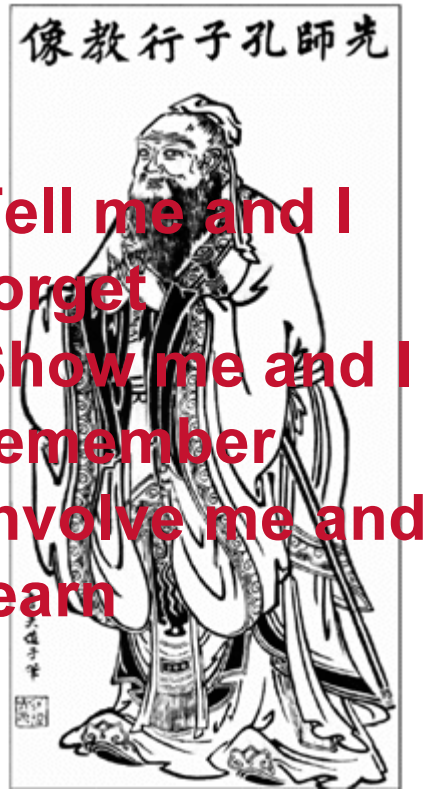
Pedagogy: how do we learn?

Kheops

Retention rate	cost
5%	
10%	
20%	
30%	
50%	
75%	
80%	



Tell me and I forget
Show me and I remember
Involve me and I learn

Confucius

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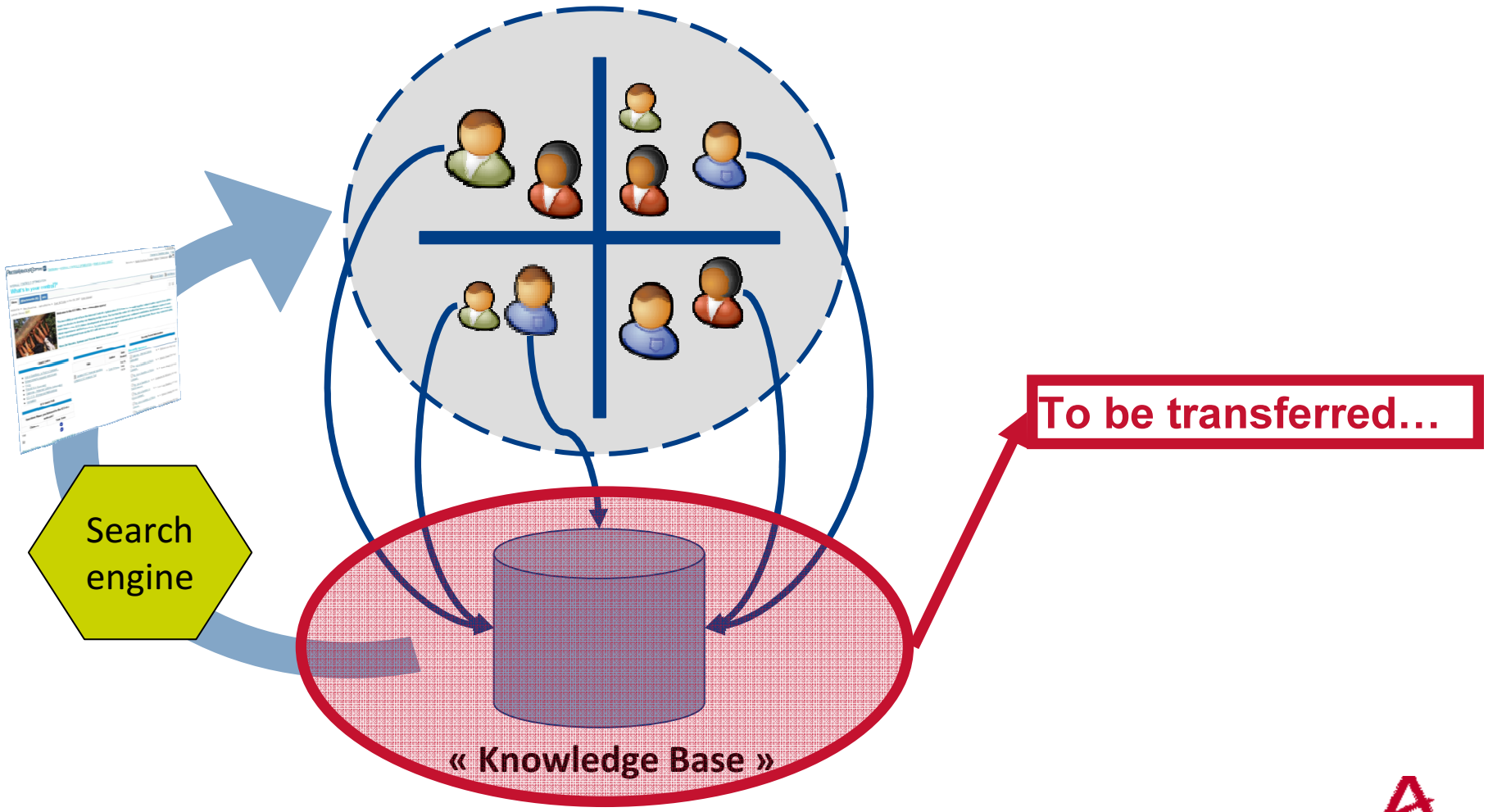
What knowledge transfer is NOT



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Results? - Disappointing…

Misconceptions:

- Knowledge transfer not targeting somebody's brain
  - No interaction with the future user (recipient of the transfer)
  - Deployed as a new process and not as a network
- Knowledge is a thing
  - An asset on the balance sheet
  - Something that can be stored
- Too little consideration for the audience
  - Global intent…
  - Who are the users?
  - In what context and situation?

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Knowledge transfer: efficiency measurement

Knowledge is a living thing

Efficiency of transfer should be measured

- **Not (only) through hardware ("paper") transfer**
  - **Not (only) through a quantity of document**
  - **Not (only) through the dimension of a database**
- **But…**
- **Through software ("brain") activity**
  - **Through number of people involved**
  - **Through network activity**
  - **Through cross reference**
  - **Through updates and continuous improvement of documents, practices, further passing around,…**

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Part Two
AREVA experience and feed-back

Internal knowledge management

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1. Knowledge management within AREVA

Top Learning Priorities for AREVA

- **Training / Technical Training**
  - Induction programs
  - Blending teaching and e-learning for effectiveness
  - Involving experts for technical education
- **People Networking**
  - Connecting people worldwide
  - Making it easy to identify experts
  - Including features and feedback to boost collaboration
- **Communities / Technical Networks**
  - Building trust among practitioners
  - Sharing critical knowledge in safe environments
- **Documentation (« AREVApedia »)**
  - Organizing Shared Knowledge (content data bases)
  - Between technical reports and PowerPoint
  - Shared glossary, thesauri, vocabulary
  - « AREVA knowledge » vs. Personal knowledge

Start Small
Think Big

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2. AREVA new corporate department for education, training and people development

AREVA University: training centers & tools

FRANCE

AIX-EN-PROVENCE
AREVA University - International Campus
385, avenue Augustin Fresnel
13857 Aix-en-Provence Cedex 3

PARIS
AREVA University
La Tour AREVA – 1, place Jean Millier
92084 Paris-La Défense

UNITED STATES

LYNCHBURG
AREVA NP Training Center
1300 Old Graves Mill Road
Lynchburg VA, 24501

RUNGIS
AREVA NP Services Training Center
Centre de formation
Parc tertiaire SILIC
20, rue Longjumeau - BP 60171
94533 Rungis Cedex

GERMANY

FRANKFURT
AREVA NP Training Center
Kaiserleistrasse 29
63067 Offenbach

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AREVA University
Example: a new AREVA Campus – Aix en Provence

- Scientific, technical, and operational training solutions for energy topics
  - Nuclear Essentials
  - Nuclear Safety culture
  - Nuclear Project Management
- Partnership with local stakeholders
- 1500 trainees in 2009
- Open to customers, partners and suppliers …

Aix Campus Opened in 2009

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SAF Study Simulator

- **Simulation of:**
  - Normal operation
  - Incident
  - Accident
  - Human error
- **Testing operation procedures**
- **Training with**
  - Overall scheme of the plant
  - Detailed presentation of the internal data
  - Deep physical understanding

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3. enela
European Nuclear Energy Leadership Academy

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Garching campus by Munich

An initiative of

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With the support of the European Commission

ENELA for whom? Target population

1- Graduates

Graduates with technical or non technical master level willing to acquire a high level complementary nuclear energy background before entering in this activity

2- High potential professionals

High potentials in managing positions and identified for leading positions in the European nuclear energy community a seeking a global view on nuclear energy concerns before enlarging their scope of responsibility

3- Policy Makers, Opinion Formers (NE stakeholders)

Policy Makers, Opinion Formers and public sector officers having to deal with nuclear energy concerns and wishing to get a high level multidisciplinary background

ENELA: how? Curriculum

1- Nuclear Energy Management Program (NEMP)

Typically: 4 months at ENELA premises + visit of industrial facilities + 6 months internship (total: about one year)

Mid term objective: Executive Master for Nuclear Energy Management
Possibly with Technical University of Munich

2- Nuclear Energy Leadership Cycle (NELC)

Typically: ~1week/month over a year + visit of industrial facilities + interaction with nuclear energy stakeholders + "homework" on specific issues

3- Nuclear Energy stakeholder

Typically: 2 days/month over half a year + visit of industrial facilities + interaction with high potential + report on specific issue

Conference cycle and working group sessions

Possibly shared with NELC

Curricula general content

International economy/energy issues

Nuclear safety, security, radiation protection, Safeguards

Nuclear science, technology, design

Personal development and leadership

Nuclear business issues

Nuclear legal and regulatory aspects

Presentation to Executive Committee / Publication

Emphasizing the double track: technical and non technical matters

For future middle and future top managers or stakeholders

4. AREVA Expertise Policy

The 3 expertise levels

- **Expert**
  - Recognized within their Business Units or their Business Groups
- **Senior expert**
  - Recognized within their Business Groups or the Group
- **International expert**
  - Recognized within the Group and, outside, by the international scientific community
- **13 domains et 83 sub-domains**

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A little bit of history: more than 30 years of existence of an expert's career path at AREVA

1980

- A group of specialists supporting the strong development of the nuclear industry
- Products oriented
- No managerial responsibility

1990

- The time of the « All managers » motto
- Products + Technology oriented
- A function
- Possible to combine with managerial responsibilities

2000

- One of the 3 career paths: Team management / Project management/ Expertise (with bridges)
- Technology oriented
- Neither a function, nor a title for life
- Possible to combine with R&D or engineering management

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What is expected from experts?

- **Support to business**
- **Development & strategy**
  - **Innovation and creativity**
  - **R&D planning process and technical follow-up**
- **Networking**
  - **Active membership in internal and external international network**
  - **External relationship with**
    - scientific societies and standardization bodies,
    - universities, institutes and laboratories
- **Knowledge sharing and transmission**
  - **Teaching at school or university,**
  - **PhD student coaching**
  - **Mentoring**
  - **Internal or customer training course**

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Expertise renewal

- **Recruitment**
  - **Confirmed experts in technological and scientific key-domains**
    - started in 2008 and 2009
    - More than 30 in 2010
  - **« Junior experts », so-called after a doctorate or right after university**
    - 17 in 2010 Voluntary doctorate thesis sponsorship and follow up
  - **AREVA Grant program launched in partnership**
    - with CEA and
    - major foreign universities (MIT, ETH Zürich, Imperial College).
    - Objective : 10 à 12 AREVA grants per year
- **Experts stand at the core of the knowledge transmission process**
  - **Experts' networks, as knowledge transmission vector**
  - **Book of knowledge: update the existing collection and complement it**
  - **Plan for expert succession, mentoring of younger experts**

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5. First steps' accompaniment in the company

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Support to the newly hired

- Get the (complementary) basics on the technical and non technical aspects of nuclear energy
- Get acquainted with the AREVA group, organization, business and processes
- Get the basics on the “difficult” issue related to nuclear energy global policy, public acceptance…

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Support to the newly hired

- **Three main tools**
  - **The new comers cycle**
    - 800 trainees in 2009 from around the globe
  - **The Business Group introductory**
    - Cycle 6000 trainees/year in France, Germany, US
    - ~60 employees today expected to triple
  - **The site presentation (security, practical aspects,…)**
- **It is a key moment to transfer the global knowledge about nuclear energy (safety culture, security, …)**
- **It is the entry point to further specialized and dedicated courses all along the professional life**

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AREVA Seniors
Des talents durables

6. Benefit even more of our (future) retirees: a new policy

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An innovative answer to the challenge of best using the expertise and knowledge of future retirees

- **A challenge: the population of experienced, senior staff is expected to shrink rapidly**
  - **An unfavorable age structure with a lot of experienced people reaching retirement age**
  - **Even though average retirement age is increasing both in France and Germany**

  ⇒ **An overwhelming amount of knowledge is about to leave**

- **Two actions lines in a specific senior policy**
  - **Anticipate the transfer of knowledge of the future retirees**
    - By defining early enough the recipient person / team – tool: experience interview
    - from experienced experts to the young generation
  - **Offer a post retirement collaboration scheme**

    (“experconnect” partnership)

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An innovative answer to the challenge of best using the expertise and knowledge of future retirees

- **Action line 1 : Experience interview is conducted about two years before the foreseen date of retirement. An action plan is set up with management and HR**
- **Action line 2 : post retirement collaboration scheme**

  Retirement is an opportunity both for the company and the individuals

  - **Retirees have time and are mobile (free from a number of constraints)**
  - **Many retirees have a desire to pursue an activity and to pass on their knowledge, but in a lighter framework (no interest in a career/financial progress anymore)**
  - **They can be fully dedicated to further transferring their experience and competencies by working on precise assignments**
  - **AREVA guarantees and strictly controls the legal framework in which the retired experts skills are “re-used”.**
  - **A dedicated actor : “experconnect”.**

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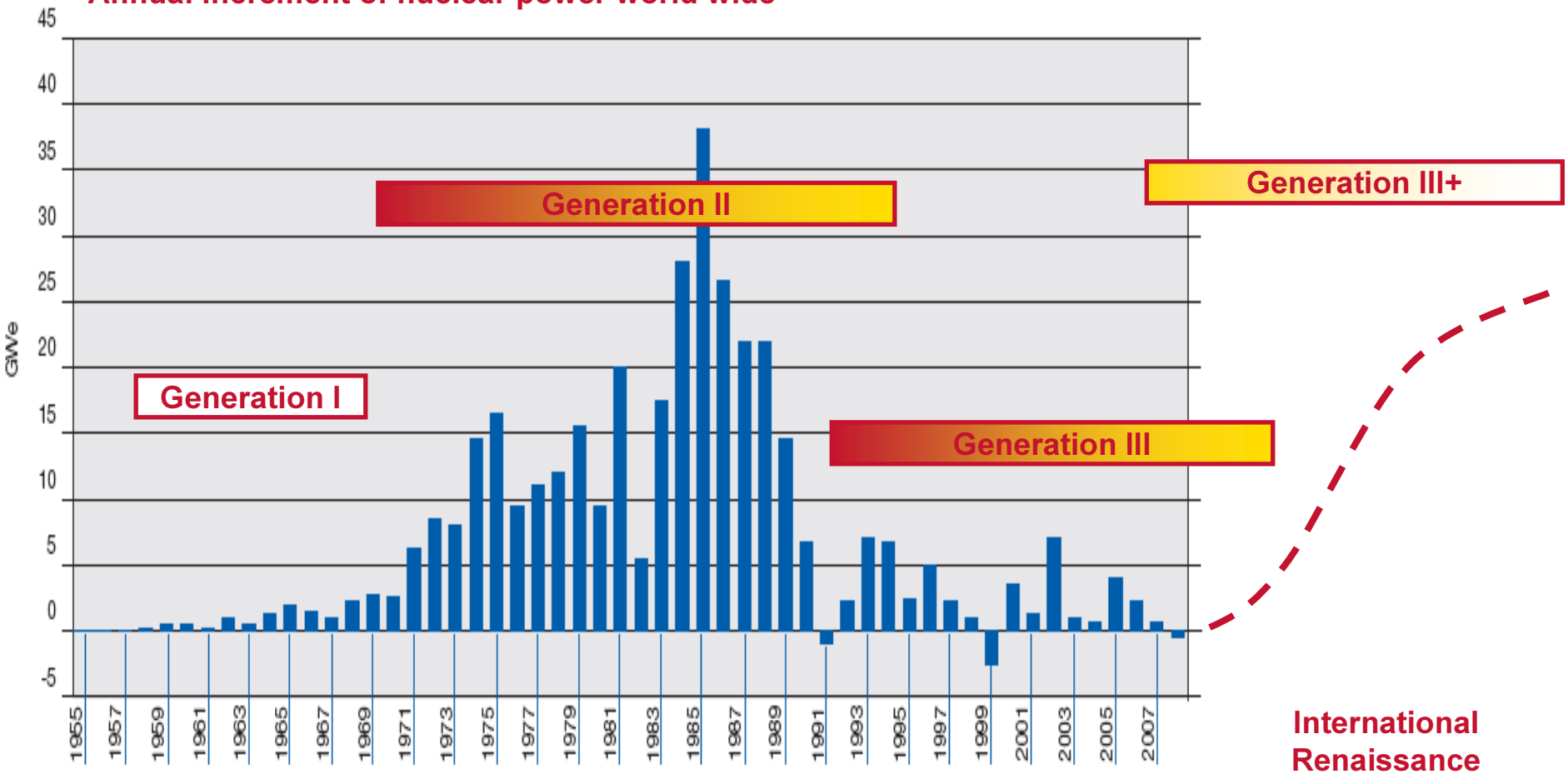
1. Overview on reactor development

Reactor generation

Annual increment of nuclear power world wide



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AREVA's International Track Record

- **AREVA = 102 "NPP/Nuclear Island" built in 12 countries:**
  - **2 countries hosting most of the Units : France & Germany**
  - **10 other countries, namely :**

Belgium	The Netherlands
Spain	Switzerland
Finland	Argentina
Brazil	People's Republic of China
Republic of Korea	Republic of South Africa

➔ **Some of the above countries were "new-comers" at the time their reactors were built**

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Human resources & Knowledge Management / Transfer: a key factor for success

- If one look at the French past program, rapid growth in nuclear development has shown as being feasible but new challenges arise from
  - the wide range of countries,
  - the different safety authorities, and
  - the looking for “series effect” in the countries concerned
- Knowledge Management and
- Knowledge Transfer are, in this context, of paramount importance

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2. Technology and associated Knowledge Transfer experience

AREVA and its partners (1/2)

AREVA has a long and successful experience of contracting with countries having developed a nuclear program

- **Koeberg 1&2 Two 900 MWe with ESKOM**
  - **Contract signature: June 1976**
  - **Grid connection: Unit 1: April 1984, Unit 2: July 1985**
- **Angra 2 One 1200 MWe with ELETRONU**
  - **Contract signature: January 1976**
  - **Grid connection: July 2000**
- **Ulchin 1&2 Two 900 MWe with KEPCO**
  - **Contract signature: November 1980**
  - **Grid connection: Unit 1: April 1988, Unit 2: April 1989**

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AREVA and its partners (2/2)

AREVA has a long and successful experience of contracting with countries having developed a nuclear program

- **Daya Bay 1&2 Two 985 MWe with GNPJVC**
  - **Contract signature: September 1986**
  - **Grid Connection: Unit 1: August 1993 Unit 2: February 1994**
- **Ling Ao 1&2 Two 985 MWe with LANPC**
  - **Contract signature: October 1995**
  - **Grid Connection: Unit 1: May 2002 Unit 2: January 2003**
- **And many others**

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Adherence with the principles of AIEA

- AREVA as Supplier will respond, provided the Customer country complies with INSAG recommendations
- AREVA as Supplier will respond only if the Customer (Utility) complies also
- AREVA as Supplier commits to:
  - Offer proposals based on proven technologies and complying within internationally Safety Criteria
  - Design, construct and commission the Plant in accordance with internationally accepted Safety Criteria taking into account specific local conditions
  - Support the Plant Owner in the long term (implementation of modifications, sharing Operational Experience, information on Component Aging,…)
  - Follow the "Systematic Approach for Training" (SAT)

The EPR™ case

- Reference Plant: **EPR™ Reactor in construction in 3 countries**
- **Construction license awarded in 3 countries**
- **Design certification ongoing in two other countries**
- **Benefiting from experience feedback in design, construction and operation from all ongoing projects.**

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Example of the Chinese program: Embedding a nuclear culture

- **Phase 1, 1986 – 1990: Starting with the right foot**
  - Training 120 engineers and managers in France to constitute at first a sound basis: operations, maintenance, safety, radiological protection.
  - Identification of future managers based on ability to integrate the nuclear culture.
  - Learning quality and event reporting, beginning with civil work and component erection
- **Phase 2, 1991 – 1994: reaching safety and operational goals**
  - On-the-job training in China during construction and commissioning
  - Coaching for a successful commissioning and initial operation; 20 to 56 French advisors in "Shadow" position for main operational and safety positions

Reaching the "Critical Mass" in quality from the start

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The proven recipes are the best

- **In the frame of the Taishan Project, Transfer of EPR™ Nuclear Island Technology including:**
  - **Transfer of more than 100 000 design and manufacturing documents**
  - **Transfer of more than 60 computer codes or embedded software**
  - **Large trainings program, for Know How and Know Why, on direct or indirect safety related aspects:**
    - **37 trainings, for 223 Chinese engineers in 2009**
    - **85 trainings, for at least 500 Chinese engineers in 2010**
    - **To be further specified for the subsequent years until 2028**
- **Such Transfer of Technology will allow a CGNPC subsidiary-AREVA Joint Venture Company to be first in charge of the design activities of the subsequent EPR™ Units to be implemented in China**

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Principles of the Self Reliance program

- In the frame of the Taishan Project, the contract includes the objectives for the owner to become self reliant in all the disciplines necessary for implementing and managing the future Chinese EPR™ Projects.
- The Self Reliance program consists in incorporating CGNPC Engineers within AREVA Engineering teams in order to learn by doing
- The Chinese Engineers contribute for around 1 500 000 man hours in the Engineering activities led by AREVA.
  - 300 000 hours in Assisted Production in Europe
  - 1 200 000 hours in Task Production activities in China

“ Up to now, more 120 Chinese Engineers from CGNPC, have participated to the Design activities of TAISHAN Project in Europe

And about 350 Chinese Engineers are expected to be mobilized for Detailed Design Activities in China

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3. FROG: cross fertilization from the nuclear power plants operation feed-back experience

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FROG: a large network of knowledge sharing, action oriented

- The FROG gathers since 1991 the operators of NPP
  - equipped with AREVA Nuclear Island, Nuclear Steam Supply Systems, major reactor cooling components,
  - for which AREVA has provided large engineering support or maintenance work
- Mission: The FROG is dedicated to building strong and efficient teaming for mutual cooperation, assistance, and sharing of its members' experience and expertise, to support the safe, reliable, and cost-effective operation of its members' nuclear power units
- They exchange their experiences and may initiate technical programs to improve the operation of equipments.

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An active network to share and solve issue

A very active network since almost 20 years (October 1991)

- 38 Steering Committee Meeting
- 15 TC sessions on Steam Generator
- 8 WG sessions on Outage Optimization
- 7 WG sessions on Risk Informed Application
- 11 WG sessions on Emergency Operating procedures
- 2 WG sessions on Diesels
- 7 WG sessions on Corrosion
- 8 WG sessions on Material ageing
- 2 specific Networks on
  - Ageing of equipment
  - Transformers failures

- **Technocratically speaking (ooh!) more than 3 meetings per year on different subjects since 20 years**

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Conclusion

- **AREVA has been for the last 30 years and is today actively**
  - **partnering with Foreign Industry**
  - **Managing internally efficiently the knowledge and**
  - **Transferring it to a new generation of engineers and managers**
- **Optimized mix of**
  - **technical assistance,**
  - **Knowledge and technology transfer and localization associated with**
  - **contracts implementation together with**
  - **continuous sharing of experience**

  has translated into success stories
- **Safety culture, safety management are key in the process (along with quality management and project management)**
- **This model can be applied with other countries in the frame of the new Nuclear construction programs**

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I leave it to you to consider whether I have (or not) transferred some piece of Knowledge…
and I

Thank you
for your attention

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