



 KOREA INSTITUTE OF NUCLEAR SAFETY



# Knowledge Creation, Management and Transfer

-Based on Korean Case-

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- ❑ What is the Regulatory Competency?

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# I. Part I International Approach

1. Role of RSO/TSO
2. What is the Regulatory Competency?

# Role of RSO/TSO

## □ Necessity of TSO

- ❖ (GSR-1 4.3) If the regulatory body is not entirely self-sufficient in all the technical or functional areas necessary to discharge its responsibilities for review and assessment or inspection,
  - *it shall seek advice or assistance, as appropriate, from consultants.*
  - *Then, this TSO is to ensure that the consultants are effectively independent of the operator.*

# Role of RSO/TSO

## □ RSO/TSO

- ❖ RSO : Regulatory functions are carried out based on legal backup
  - *Assume regulatory responsibility of technical aspects*
  - *Activities are supported by legal bases*
- ❖ TSO : Regulatory functions are consigned by contract
  - *Provide Technical support for the regulatory decision on the nuclear safety*
  - *Provide an expert consultation to the RB for the decision making process*

## □ Mission of RSO/TSO

- ❖ To make sure the technically sound decision making
  - *In keeping abreast of fast technology development*
  - *In ensuring technical consistency upon various technical disciplines*

# What is Regulatory Competency?

## □ Regulatory Functions(GS-R-1);

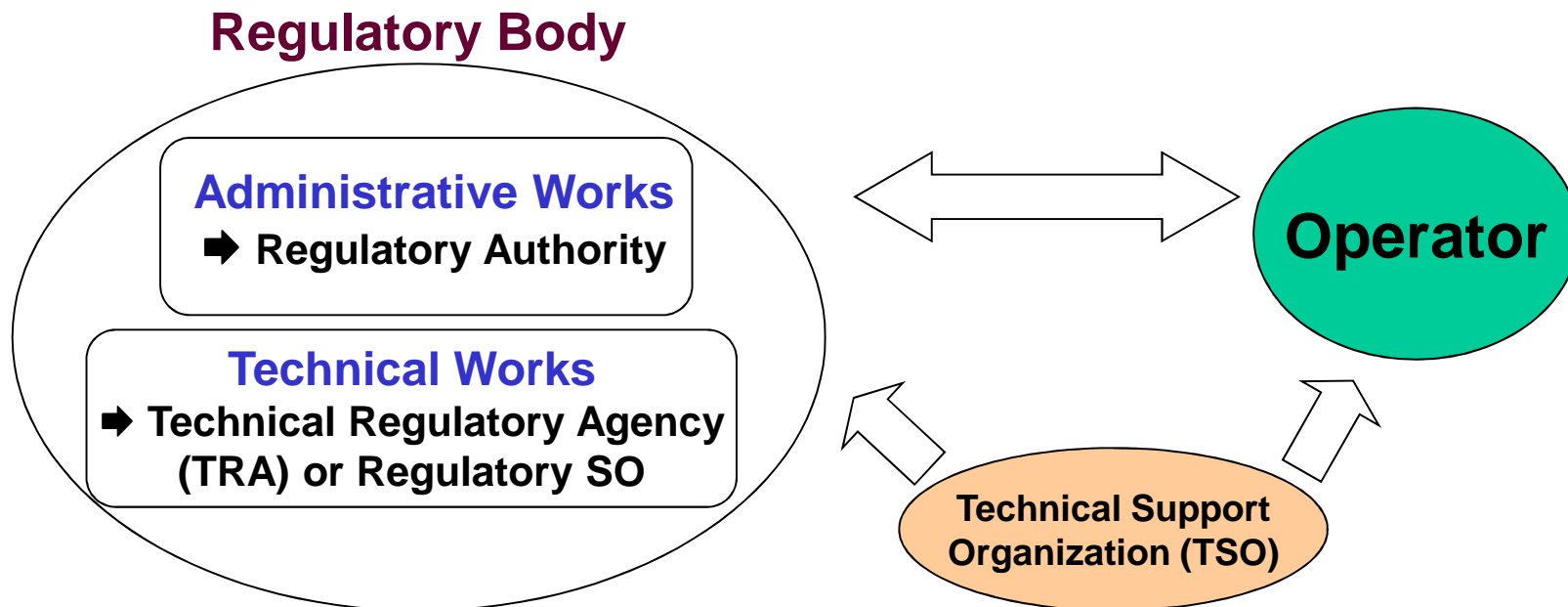
- ❖ Authorization;
- ❖ Review and Assessment;
- ❖ Inspection and Enforcement;
- ❖ Development of Regulations and Guides

## □ Regulatory Competency (TECDOC-1254)

- ❖ A Group of Knowledge, Skills and Attitudes needed to perform regulatory functions
  - *Knowledge : the depth and breadth of absorbed and retained information by the mental faculty of a person that would enable that person to deal with different situations, changes, and the unexpected*
  - *Skills : the demonstrated abilities and expertness of a person to perform a task to prescribed standards as judged by an evaluator*
  - *Attitudes : the appreciation and the practiced behavior of a person to perform a job or a task with due diligence*

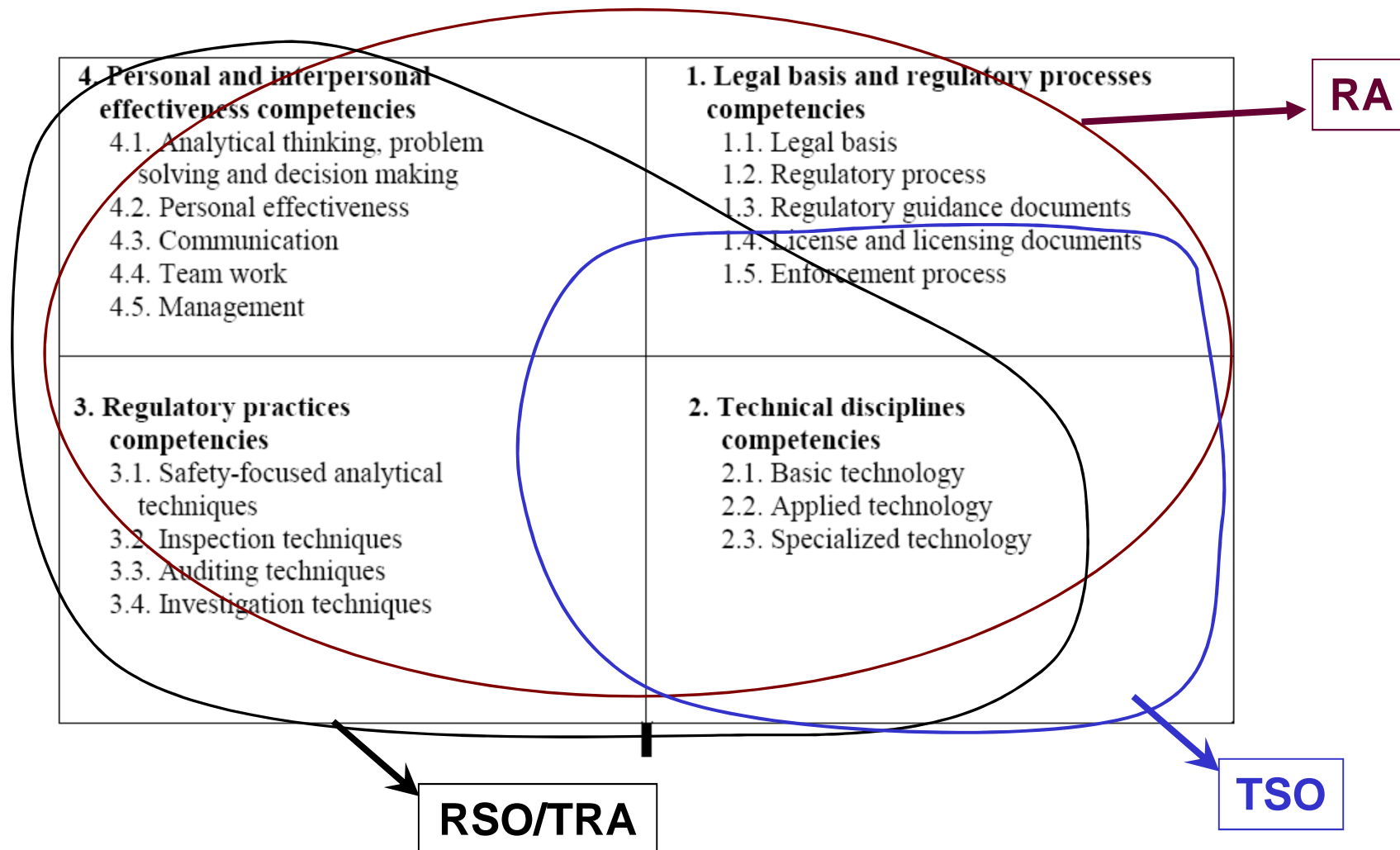
# Regulatory System and Competency

- ❑ Roles and Functions of Regulatory Body (IAEA GS-R-1)
  - ❖ **Administrative matter:** Authorization and Enforcement
    - *Competence can be adopted from other practices and areas.*
  - ❖ **Technical matter:** Review and assessment, inspection, and development of regulations and guides
    - *Competence will be developed from actual hand-on practices for longer time.*
- ❑ Regulatory Body (IAEA Safety Glossary)
  - ❖ An authority or a system of authorities as having legal authority for conducting the regulatory process



# Regulatory Competency

## □ Competency model for Regulatory Body (IAEA TECDOC-1254)





# Regulatory Competency

## □ Provision of Needed Competencies

- ❖ Recruitment of personnel
- ❖ Use of contractors and consultants
- ❖ Staff Qualification System
- ❖ Training program to achieve regulatory body competency



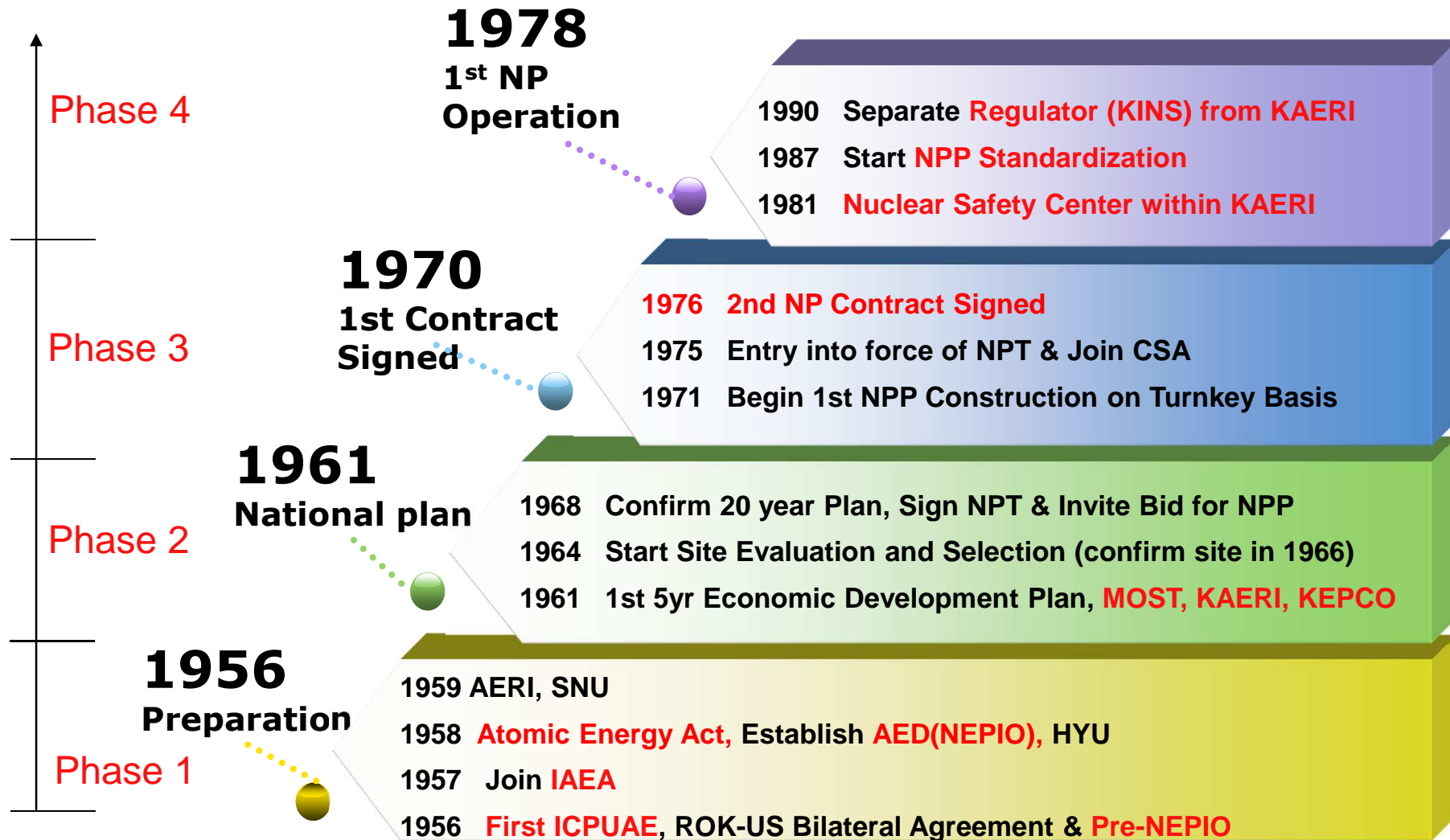
## II. Korean Cases

1. **Establishment of Safety Dedicated Organization**
2. **Capacity Building**
3. **Knowledge Management**
4. **Knowledge Sharing**

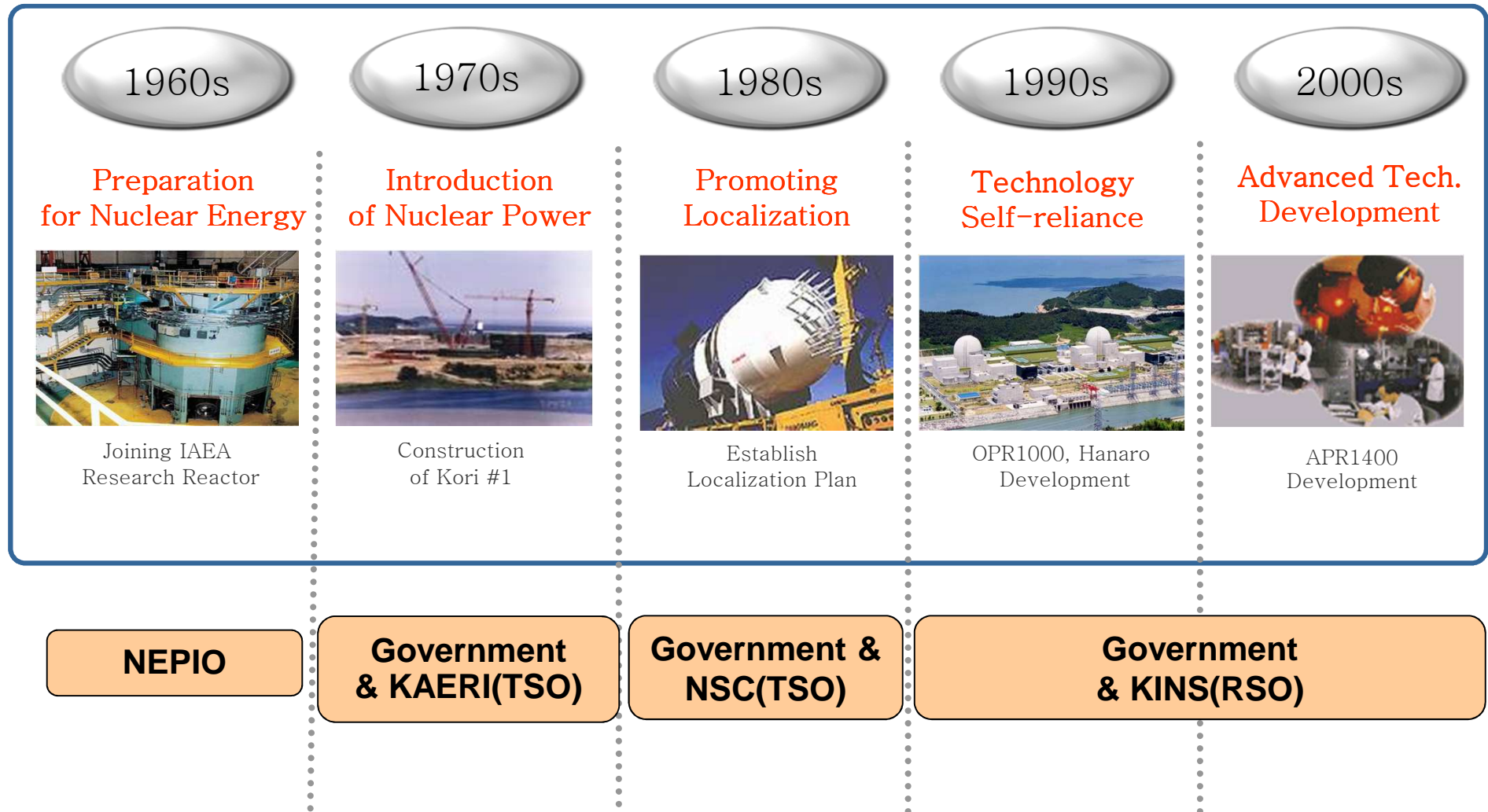
# Key elements of RSO/TSO

- ❑ Safety Dedicated Organization
- ❑ Endeavoring for Capacity Building
- ❑ Appropriate Knowledge Management
- ❑ Knowledge Sharing

# Overview of nuclear program-Initial stage



# An Overview of Korean Nuclear Programs



# Establishment of Safety Dedicated Organization

## □ Establishment of Safety Dedicated Organization

### ❖ Nuclear Safety Center

- *was established in 1981 as part of KAERI to build up safety expertise*
- *It was necessary to have a expert organization to address the safety issues, rapidly increasing from reactors (one NPP in operation and two under construction) in early 1980.*

### ❖ Korea Institute of Nuclear Safety

- *was established in 1990 to ensure the independence of Regulation*
- *KAERI was a major player in the National Localization Program for Nuclear Technology. As a result, the regulatory independence was in question unless the safety regulation was separated from the promotion.*

# Establishment of Safety Dedicated Organization

## □ Legal foundation of KINS activities

- ❖ Following authority of MEST are delegated to KINS
  - *Safety review related to authorization, permit, designation and approval of nuclear facilities*
  - *R&D of regulatory standards and safety regulation*
  - *Inspection, confirmation and check-up*
  - *License examination*
  - *Safety review and Management in relation to radiation use*
  - *Education and training for the regulatory capacity*
  - *Survey of radiation environment*
- ❖ Following activities should be provides for Regulatory support
  - *Development of nuclear safety regulation policy*
  - *Radiological Disaster Control and Response*
  - *Maintenance of Preparedness against Radiological Disaster*

# Capacity Building

## □ Knowledge Buildup as a learning organization

### ❖ Early 1980s

- *Many highly qualified staff transferred from Research Inst.*
- *OJT at the construction site and Oversea training*
- *Recruit of experienced personnel from Industries*

### ❖ Late 1980s ~ Late 1990s

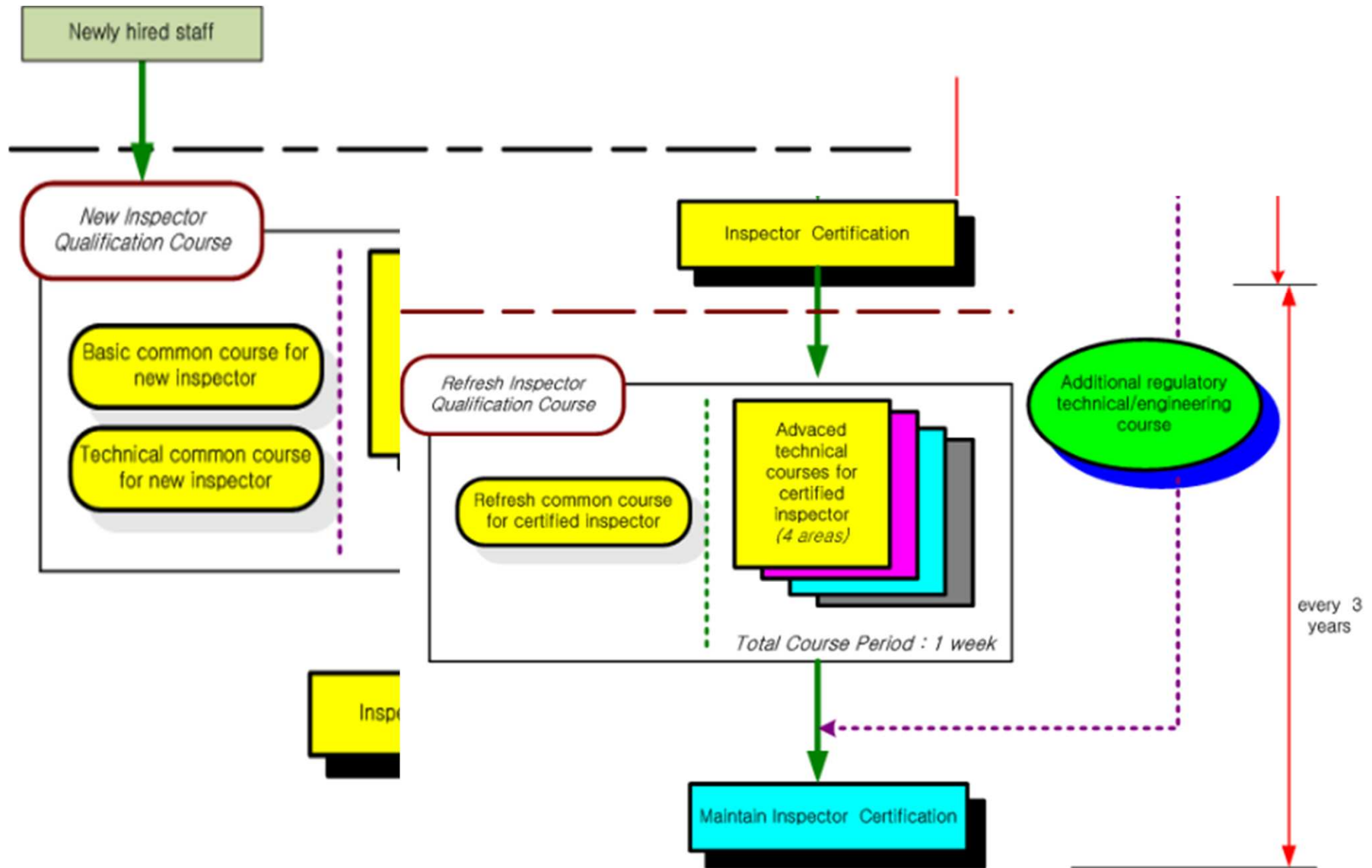
- *Active participation in the safety review and inspection*
  - *Licensing for Yonggwang 3&4 (CE design)*
  - *Licensing for Wolsong 2, 3 & 4 (AECL design)*
  - *Licensing for Ulchin 3&4 (first standardized units of OPR-1000)*

### ❖ Since 2000

- *Safety review for Korean Peninsula Energy Development Organization (KEDO)*
  - *Construction of two PWRs in North Korea*
- *Participation in the development of APR-1400 as a safety partner*
- *Introduction of PSR for Operating units*
- *Safety review for Continued operation for Kori unit 1*



# Capacity Building-E&T for Inspector



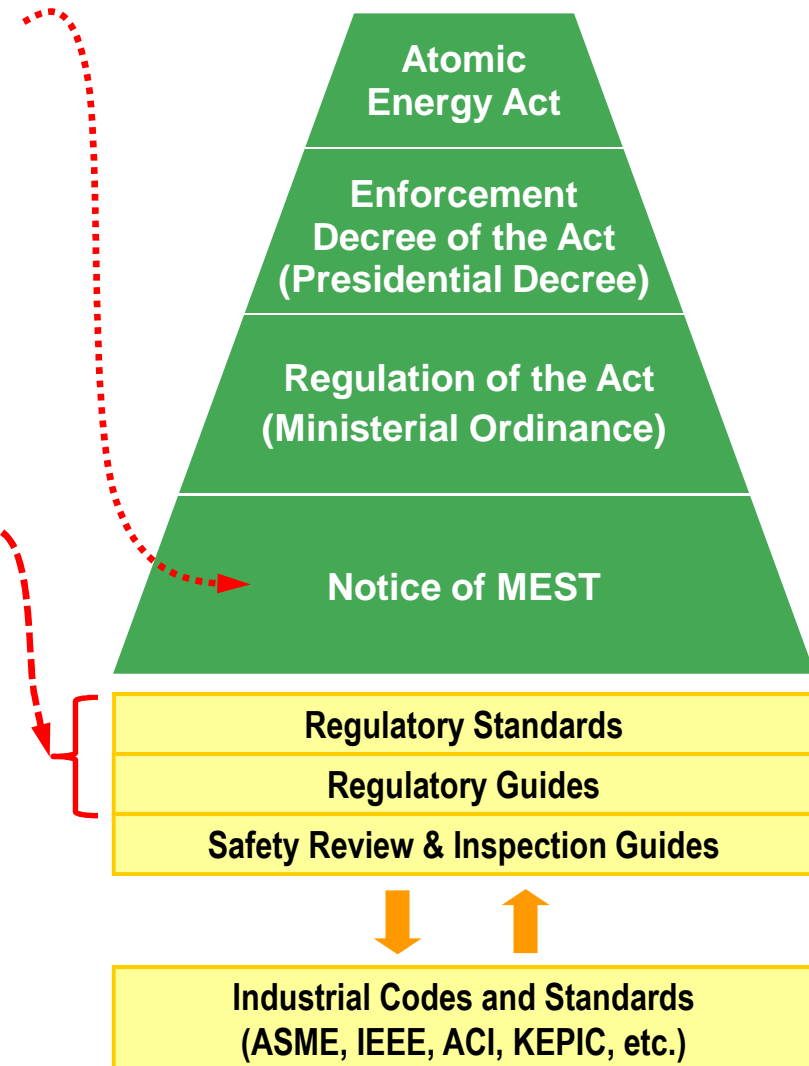
# Capacity Building-Development of Safety Standards

## ❑ Endorsement of Industry C&S

- Korea Electric Power Industry Code (KEPIC) is endorsed as Technical code of Nuclear Reactor Facilities

## ❑ Development of Regulatory Guidance

- For safety review and inspection



# Capacity Building-Education and Training

<b>In-house Program</b>	<b>Leadership Development</b>	Courses for Executives, Managers (Candidates), Employees, and New Recruits
	<b>Management Issues Sharing</b>	- Customer Satisfaction (CS) Course, - Ethics Management Course
	<b>Common Competency</b>	Courses on Planning, Creativity, Interpersonal Relationship, Communication, Problem Solving, Project Management, etc.
	<b>Regulatory Competency</b>	Courses required by law such as Radiation Protection & Emergency Preparedness Course/Regulatory Inspector's Course Regulatory Professional Technology Course
	<b>Functional Competency</b>	Courses on budget, finance, administration, IT skill, language, anti-corruption, information security, etc.
	<b>Commissioned</b>	Outside Training Programs
<b>International Cooperation Program</b>	<b>International Training &amp; Education</b>	- International Nuclear Safety Master Degree Program - Training course in collaboration with IAEA - Tailored professional regulation course - OJT course on regulatory oversight of NPP construction
<b>Program for the public</b>	<b>Community Partnership</b>	- Nuclear Safety Introduction Program for General Public - Radiation Protection Training for Non-nuclear emergency personnel - Nuclear Safety Course for Environmental Monitoring Group - Technical course for college students

# Capacity Building-Research & Development

## □ Safety Research Program

**Promote Regulatory Competence and Globalize Korean Standards**

**Establishment of Global Standards**

**Development of Global Safety Standards**

**Long-Term and innovative R&D Project**

**R&D on Future Reactors and Fuel Cycle**

**International Cooperation & Joint Research**

# Knowledge Management- Structure optimization

## □ Line Structure (Before mid 1990s)

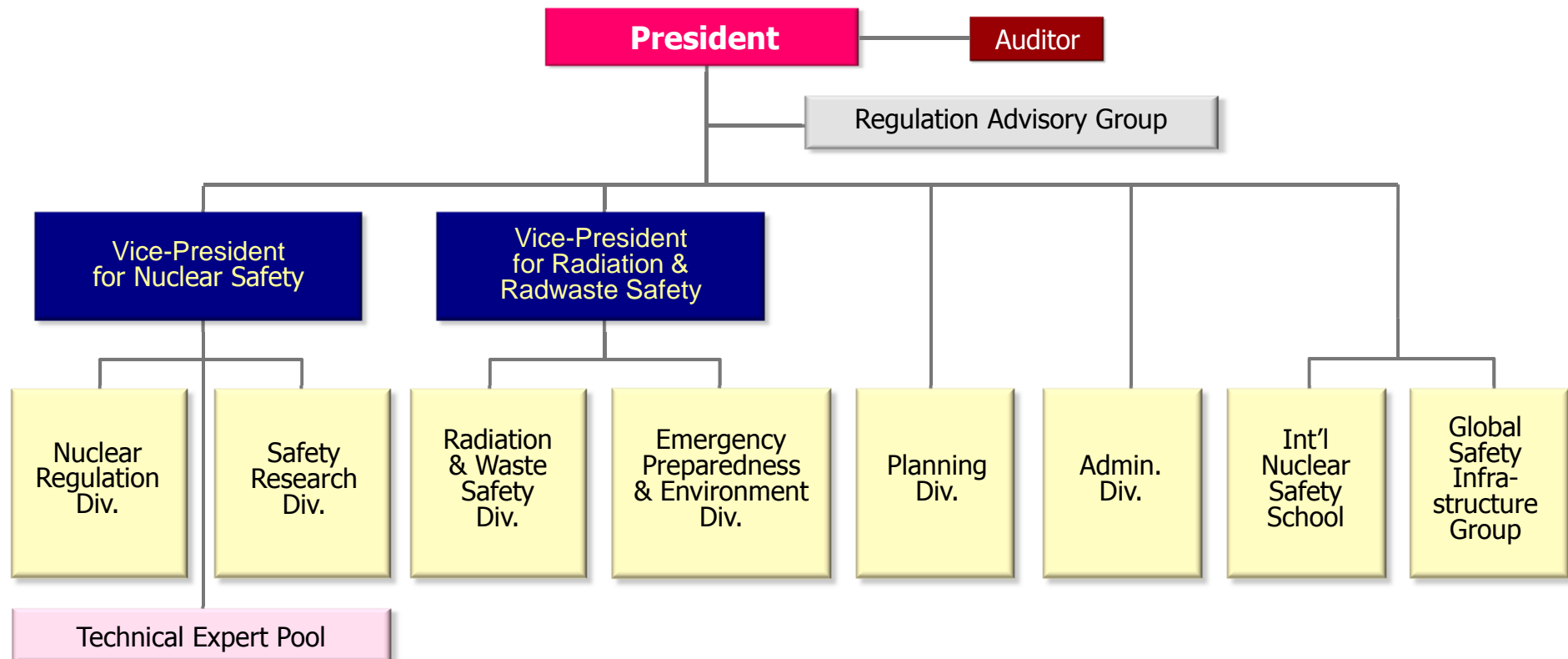
- ❖ Safety Review Department
- ❖ Safety Inspection Department
  - *Periodic safety inspection for operating units*
  - *Preoperational inspection for constructing units*
- ❖ Problems found in knowledge transfer and in consistent technical decisions

## □ Matrix Structure (Since mid 1990s)

- ❖ Regulation led by Project managers
- ❖ Technical provisions made by multi-disciplinary engineering departments
  - *Same person responsible for the same review and inspection areas*
- ❖ Technical departments being in charge of Knowledge buildup

# Knowledge Management- Structure optimization

## □ Current Structure of KINS



# Knowledge Management through IT support systems

## ❑ MIDAS

- ❖ Internal work process: project management, job assignment, administrative control,...

## ❑ SAFER

- ❖ Safety review and Inspection related activities,...

## ❑ R-TRACER

- ❖ Incident evaluation, finding tracking, operational experience feedback,...

## ❑ RASIS

- ❖ Radiation safety Information, Source lifetime control,...

## ❑ Atom-CARE

- ❖ Emergency response, Online monitoring,...

## ❑ START

- ❖ Real time radiation source tracking

## ❑ And so on...

# Knowledge Management through IT support systems

## - MIDAS Portal -

The screenshot shows the MIDAS Portal interface with several key areas highlighted:

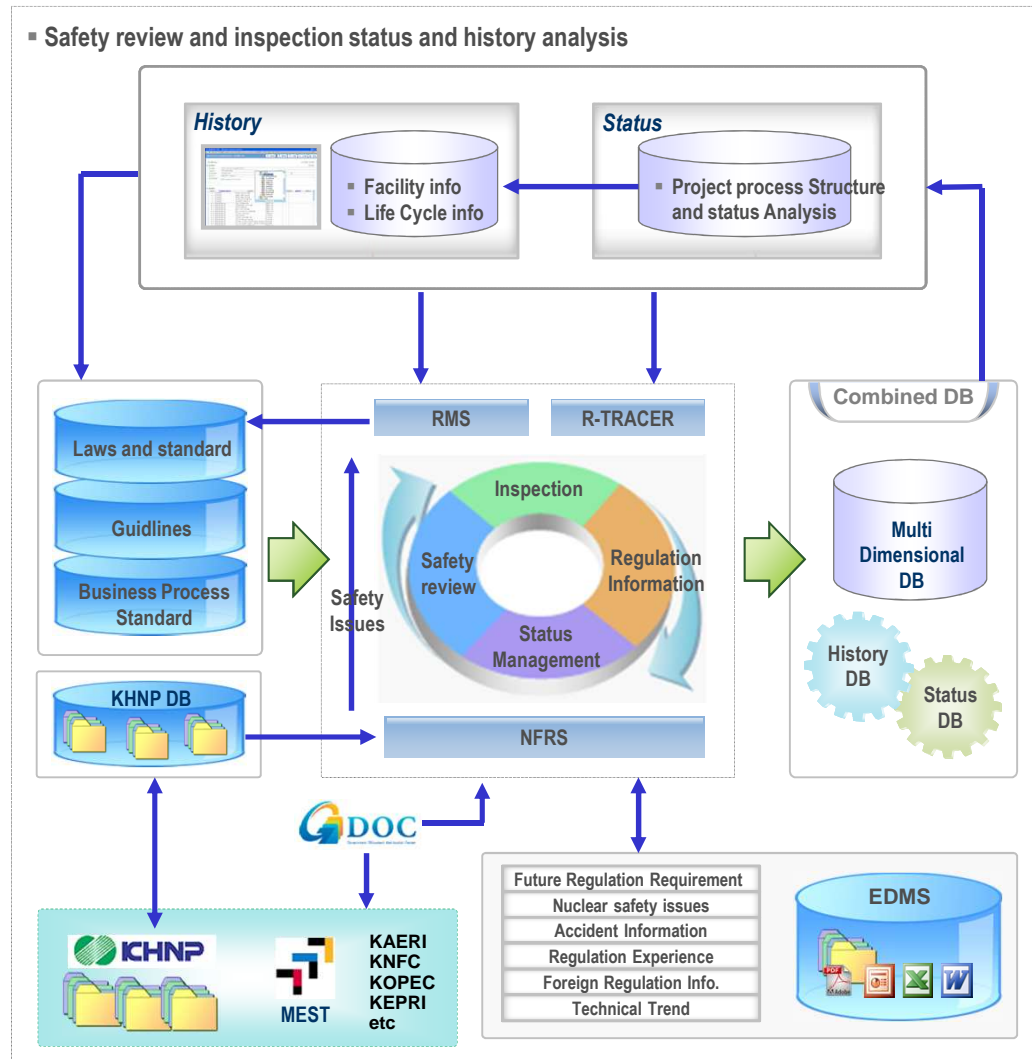
- Summary Information:** Located at the top left, it includes a search bar and navigation links like '통합문서함', '나의업무', '진행업무', and '완료업무'.
- Abstracted Icons:** Located at the top right, it features a row of icons for various services such as 'MIDAS 주요업무' and 'MIDAS 주요링크'.
- BPM area:** A central section for Business Process Management, showing a list of tasks and their status.
- Board area:** A section for news and announcements, displaying a list of items with dates and categories.
- KMS area:** A section for Knowledge Management, showing a list of documents and their details.
- Frequently used Menu Link:** A section at the bottom right containing links for 'HELP DESK', 'HELP 요청', 'FAQ', and 'Q&A'.

- ❑ Support Ubiquitous Single Sign On(SSO)
  - ❖ By using e-mail, public certificates or SMS
- ❑ Provide security management
  - ❖ LDAP and authority management s/w
- ❑ Integrated User Interface
  - ❖ Entire request menu, e-mail link, SMS, staff info, and search
  - ❖ Personalized summary information of BPM , groupware, KM and schedules
  - ❖ BPM(Business Process Management)
  - ❖ Board, single line notice, KM, and board
  - ❖ Schedule, frequently used menu, quality management, helpdesk, etc



# Knowledge Management through IT support systems

## - NFRS(Nuclear Facility Regulatory System) -

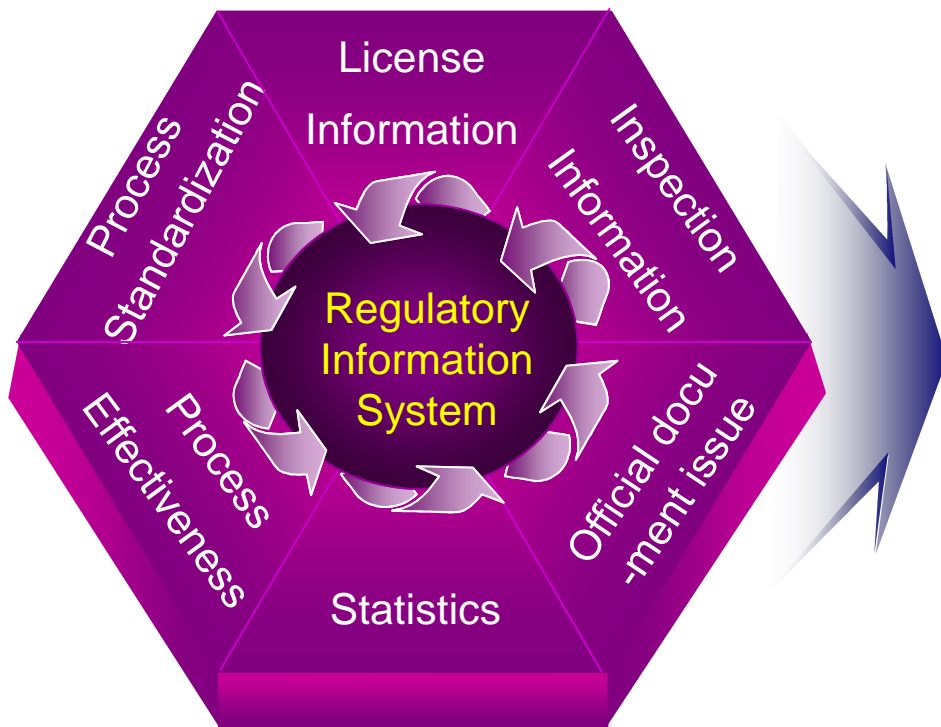


- ❑ BPM based safety review inspection on nuclear facility
  - ❖ Various business process optimized
- ❑ Information based safety regulation
  - ❖ Data and information automatically accumulated
- ❑ Electronic documents based business processing with MEST
  - ❖ All Documents classified and saved in the system systematically

# Knowledge Management through IT support systems

## □ RASIS (Radiation Safety Information System)

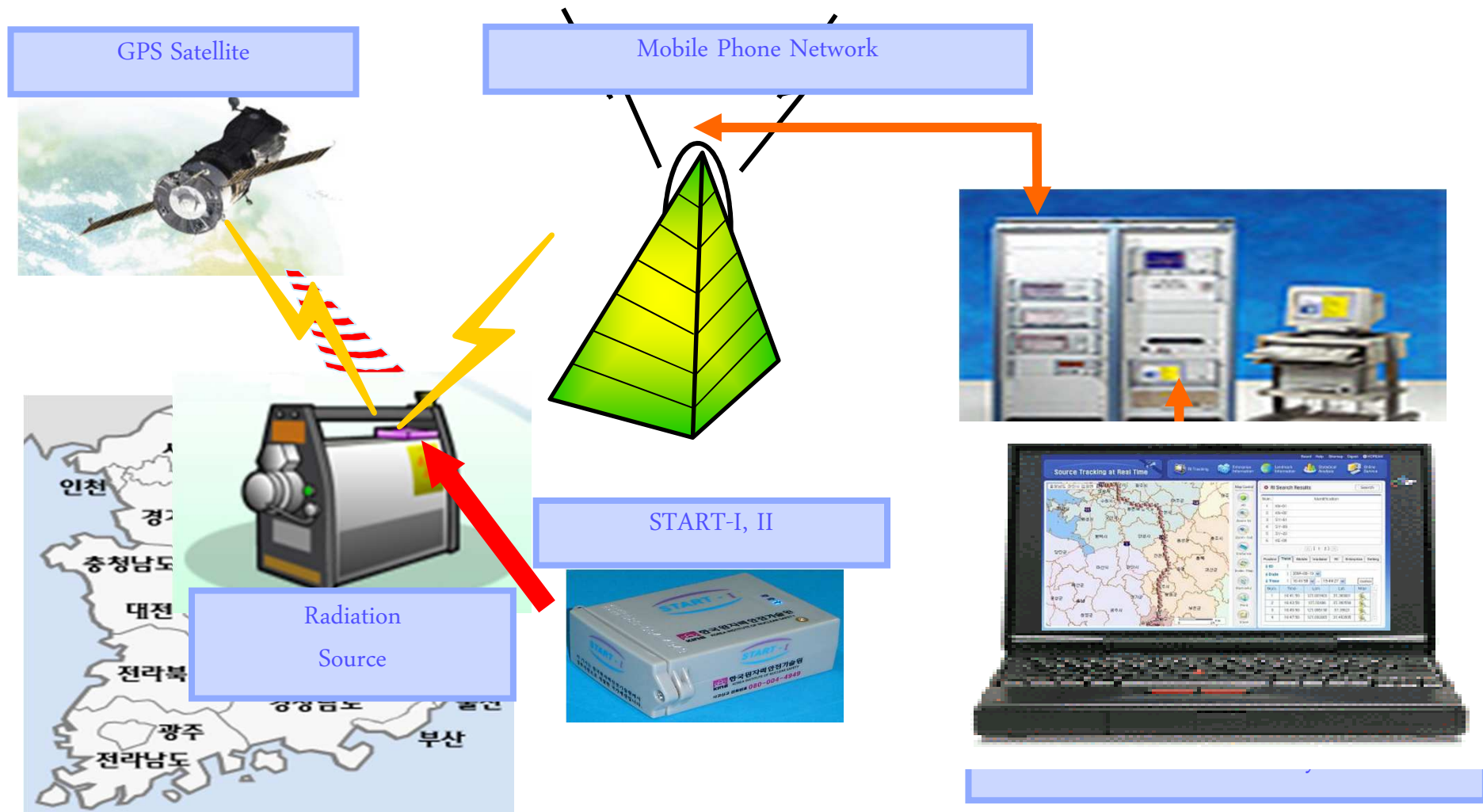
- Operated since 1999
- User : Regulator (MEST/KINS)
- Features



<b>Licensing work</b>	<ul style="list-style-type: none"><li>● Review of RI license application</li><li>● History of RI license</li><li>● Transportation</li></ul>
<b>Inspection</b>	
<b>Statistics</b>	<ul style="list-style-type: none"><li>● Real-time statistics data production</li><li>● Process analysis data production</li></ul>
<b>Procedure</b>	
<b>Official Document</b>	<ul style="list-style-type: none"><li>● Real-time document circulation</li><li>● On-line application &amp; handling</li></ul>

# Knowledge Management through IT support systems

## □ START (Source Tracking at Real Time)



# Knowledge Sharing

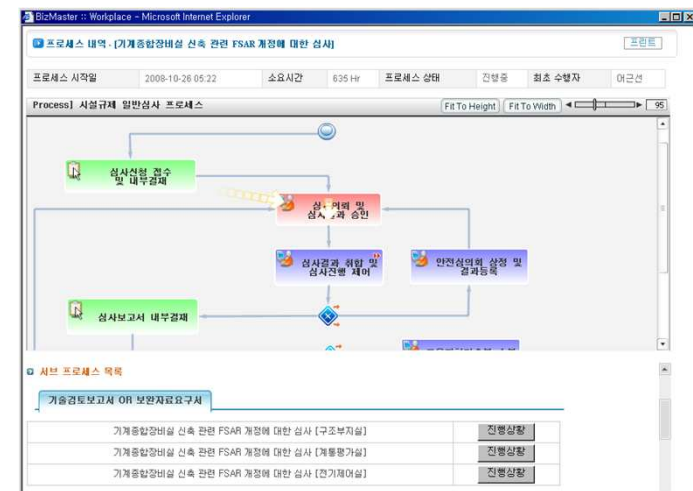
## □ SAFER system

### ❖ Purpose

- *Establishing systematic and efficient regulation process for growing workload and need for safety regulation*
- *Promoting regulatory recordkeeping for identifying comprehensive safety of facilities*
- *Enhancing regulatory expertise and capabilities*

### ❖ Enabling

- *Integrated systematic management of regulation with efficiency and effectiveness*
- *Consistent and continuous regulatory decision-making*



# Knowledge Sharing

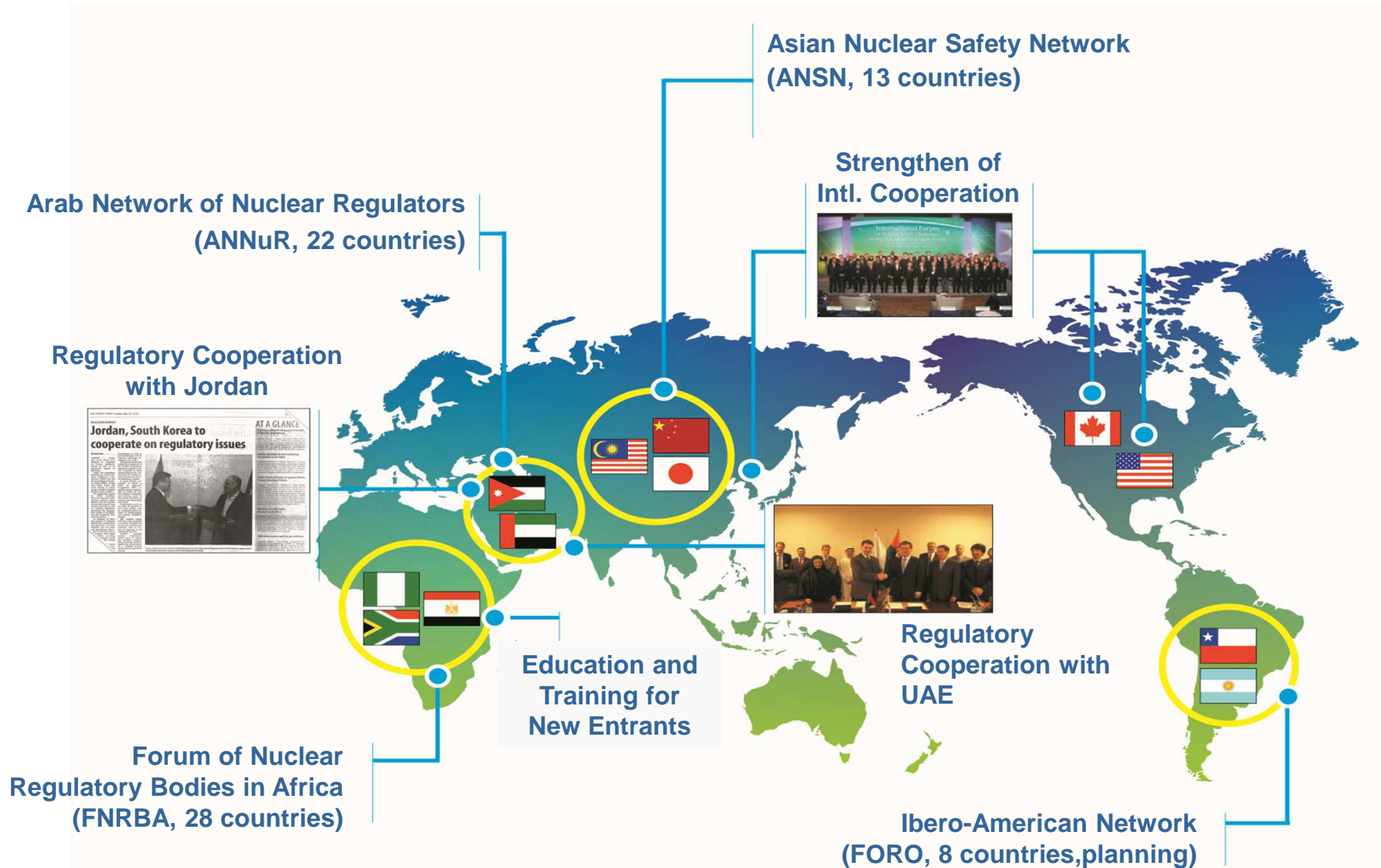
## □ Discussion, Dissemination and Sharing

### ❖ Nuclear Safety Information Conference

- *Effective communication between Regulators and Industries*
- *To Address nuclear safety issues and to share the knowledge and views*
- *With ~1,000 participants from industries and regulators*



# Knowledge Sharing-International Cooperation



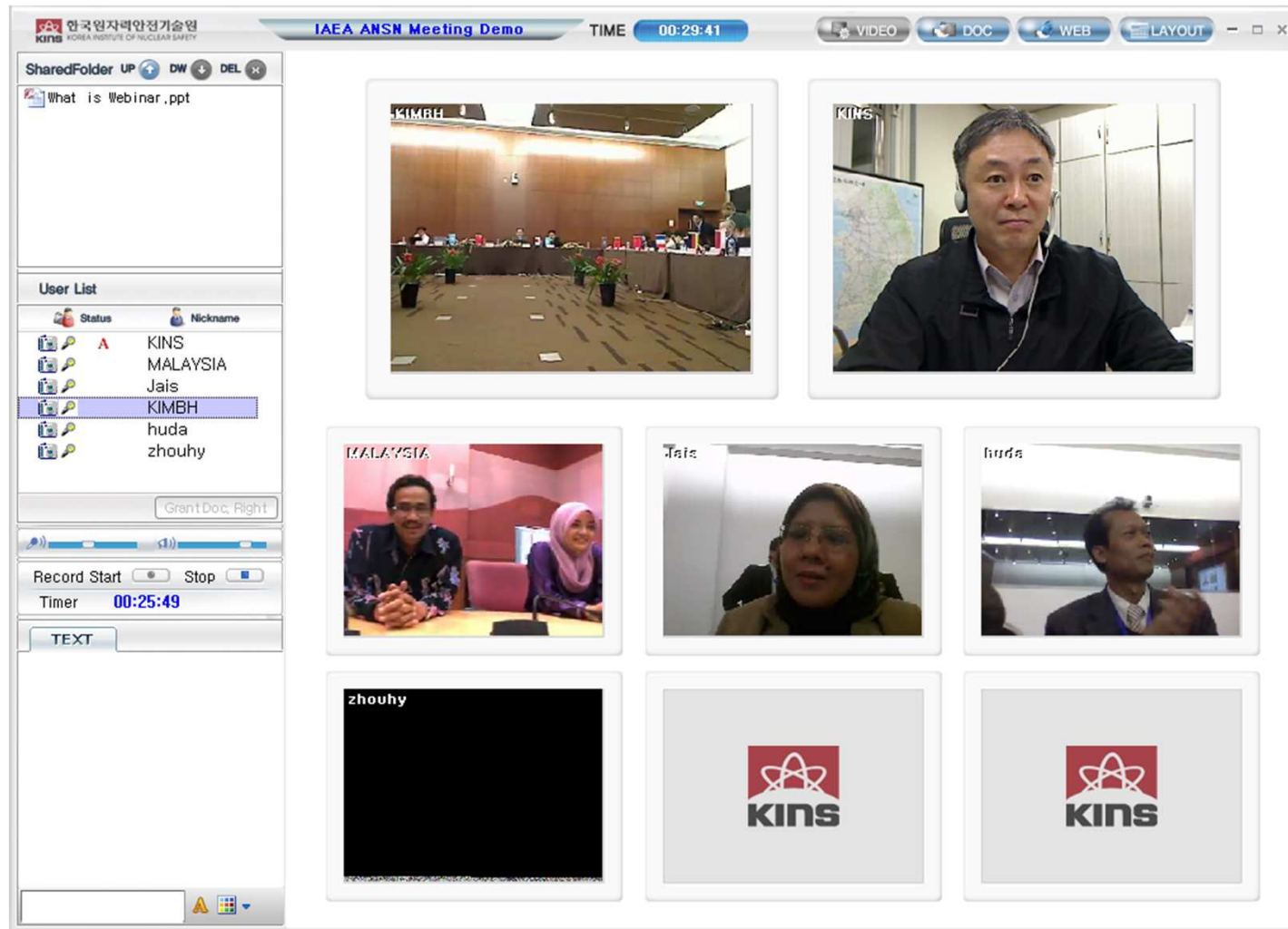
# Knowledge Sharing

## □ International E&T programs

- ❖ Co-hosted/supported Training Courses (with IAEA, etc.)
  - *Conducted in the form of training courses or workshops*
    - *Basic Professional Training Course (with IAEA)*
    - *Regulatory Control of NPP (with IAEA)*
    - *RI School (with WNU)*
- ❖ Tailored Professional Training Courses
  - *To provide flexible programs tailored to the stage of nuclear power program of the specific countries*
- ❖ Special OJT for NPP
- ❖ Individual training program
- ❖ KINS-KAIST Nuclear Safety Master's Degree Program
  - *To develop high level regulatory capabilities and competency*
  - *Nuclear Academy Course + Safety Regulation Experiences*

# Knowledge Sharing

## □ Virtual TSO supported by Video Communication





# Knowledge Sharing

Integrated Regulatory Infrastructure Support Service

Supporting tools for New Entrants

# IRISS

Integrated Regulatory Infrastructure Support Service  
The Package for National Nuclear Safety Network

IAEA Safety Standards  
Global Nuclear Safety & Security Network

Review & Inspection Support

Roadmap & Implementation

Education & Training

IT-Based Tools

IAEA INSAG-22, Safety Standard Series SF-1,  
GS-R-1,3 & 4, DS-424, etc.



## III. Conclusion

# Concluding Remarks

- ❑ Regulatory Body has appropriate competencies related to
  - ❖ Legal basis and regulatory process,
  - ❖ Technical disciplines,
  - ❖ Regulatory practices,
  - ❖ Personnel and interpersonnel effectiveness.
- ⇒ When the regulatory body is not entirely self-sufficient in all the technical or functional areas, it needs a technical support.
- ❑ Mission of RSO/TSO
  - ❖ To make sure the technically sound decision making
    - *In keeping abreast of fast technology development*
    - *In ensuring technical consistency upon various technical disciplines*
- ❑ The RSO/TSO should improve continuously its competencies.
- ❑ KINS was presented as an example of the RSO/TSO

# Concluding Remarks

- As a technically responsible organization, the RSO/TSO should address, in an appropriate way, the Safety Challenges in a Flat, Mixed and Open World, through;
  - ❖ International cooperation between new entrants and NPP countries in the Flattening world
  - ❖ Harmonized safety approaches for the Mixed Reactor Generations
  - ❖ Transparency and Objectivity in New Environments More Open to the Information.

**Thank you very much**

**KINS**

